

How do
L^AT_EX?

Eric Krause

Why
L^AT_EX?

Getting
Started

Formatting

Math Mode

Tabular
Mode

Graphics

Floats

Code
Listings

BibTeX

Conclusion

How do L^AT_EX?

<https://github.com/ekrause/LaTeX-Presentation>

Eric Krause

Portland State University
M.S. ECE, 2013

February 3, 2014

Why use L^AT_EX?

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- High quality output
- Unparalleled math/equation typesetting
- Powerful bibliography management
- Handles massive documents with ease
- Free and OS agnostic
- You get to use your favorite text editor
- Highly extensible
- **Focus on content, not formatting**

Don't use LaTeX if...

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Conclusion

- Never used a computer before
- Can't spare a few hours of practice in exchange for a life changing skill
- Never need to create documents (why are you here?)
- Afraid of the command line
- Weak, lazy, other personal flaws

Downloading and Using L^AT_EX

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Downloading

- **Linux** Check your software repository.
 - `sudo apt-get install texlive-full`
- **OS X** MacTeX
 - `http://www.tug.org/mactex/`
 - `brew install pdflatex`
- **Windows** ProTeXt
 - `http://www.tug.org/protext/`

Compiling [command line]

- `pdflatex -file-line-error -interaction=nonstopmode yourfile.tex`

Compiling [GUI]

- Click buttons and/or mash keyboard.
- If that doesn't work, try touching the screen or using voice commands.

Hello L^AT_EX!

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Source

```
1 \documentclass{article}
2
3 % this is a comment
4 \title{Cat gifs as Art}
5 \author{Eric Krause}
6 \date{September 2012}
7
8 \begin{document}
9
10 % generate title block
11 \maketitle
12
13 % let's add some content
14 Hello world!
15
16 \end{document}
```

Output

Cat gifs as Art

Eric Krause

September 2012

Hello world!

Function Syntax

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```
\includegraphics[width=1in]{~/picture.png}
```

"\" indicates
this is a
function

Name of the
function

Optional
parameter
override

Argument 1

Spaces and Escaped Characters

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- Additional spaces between words are ignored.
- Manually add spaces by escaping a space ‘\ ’
- Line break: (no indent) two backslashes ‘\\’
- Paragraph break (indent) two newlines (‘Enter’ twice)

	Unescaped Function	To Print, Type:
\	escape character, command identifier	\textbackslash
{ }	group and separate commands	\{ and \}
%	begin a line comment	\%
\$	enter/leave math mode	\\$
_	for subscripts (math mode)	_
^	for superscripts (math mode)	\textasciicircum
&	designate columns in tables	\&
#	reference arguments in functions	\#
~	insert unbreakable space	\textasciitilde

Common Text Formatting

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Source

```
1 Formatting:\\
2 \textbf{Bold Text}\\
3 \textit{Italic Text}\\
4 \emph{Emphasized Text}\\
5 (\textit{emph is \emph{
   smarter} than \textit{
6 \underline{Underlined Text}\\
7 \texttt{Monospace Text}}
```

Output

Formatting:
Bold Text
Italic Text
Emphasized Text
(*emph is smarter than textit*)
Underlined Text
Monospace Text

Sections and Subsections

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Source

```
1 \section{Vegetables}
2 Words.
3 \section{Fruits}
4 Section \thesection\ text.
5 \subsection{Apples}
6 More text.
7 \subsubsection{Braeburn}
8 Moar txt.
9 \section{Gourds}
10 wat.
11 \section*{Appendix}
12 Bees?
```

Output

1 Vegetables

Words.

2 Fruits

Section 2 text.

2.1 Apples

More text.

2.1.1 Braeburn

Moar txt.

3 Gourds

wat.

Appendix

Bees?

Lists

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Source

```
1 The three types of lists:\\\\
2 Itemize:
3 \begin{itemize}
4   \item these are bulleted
5   \item as such
6 \end{itemize}
7 Enumerate:
8 \begin{enumerate}
9   \item these are numbered
10  \item as you might expect
11 \end{enumerate}
12 Description:
13 \begin{description}
14   \item[thing A] text
15   \item[thing B] words
16 \end{description}
```

Output

The three types of lists:

Itemize:

- these are bulleted
- as such

Enumerate:

1. these are numbered
2. as you might expect

Description:

item A text

item B words

Formatting Miscellanea

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■ Quotes:

Backtick (```) for open quote, single quote (`'`) for close quote. ‘single’ or “double”

■ Centering

```
\begin{center}  
    %centered text  
\end{center}
```

■ Verbatim

```
\begin{verbatim}  
    %won't be parsed by LaTeX  
    %great for console output  
\end{verbatim}
```

Math Mode

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- TODO: link to the latex math page.

- Begin and end inline equations:

$\$$ math goes here $\$$

- Begin and end display equations:

```
\begin{equation}
    math goes here
\end{equation}
```

- The only symbols accessed directly from the keyboard:

- $+ - = ! / () [] < > | ' :$

The rest are all commands!

- Spaces are ignored entirely in equations.

- How to remember them all? Don't! Use **Dextrify!**

- <http://detexify.kirelabs.org/classify.html>

Math Mode Examples

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Output:

Inline math mode:

I think $x(t) = a_0 + \sum_{n=1}^{\infty} [a_n \cos(n\omega_0 t) + b_n \sin(n\omega_0 t)] = \sum_{n=-\infty}^{+\infty} c_n e^{jn\omega_0 t}$ is a Fourier series or something.

Display math mode:

$$\frac{Dies}{Wafer} = \frac{\pi \cdot (Wafer \ Diameter/2)^2}{DieArea} - \frac{\pi \cdot Wafer \ Diameter}{\sqrt{2} \cdot Die \ Area} \quad (1)$$

Use display math mode for centered, numbered equations like equation 1 that you can refer to later.

Source:

```
1 \noindent \textbf{Inline math mode:}\\
2 I think $x(t)=a_0 + \sum\limits_{n=1}^{\infty} [a_n \cos(n\omega_0 t) + b_n \sin(n\omega_0 t)] = \sum\limits_{n=-\infty}^{+\infty} c_n e^{jn\omega_0 t}$ is a Fourier series or something.\\
3
4 \noindent \textbf{Display math mode:}\\
5 \begin{equation}
6 \label{eq:dies}
7 \dfrac{Dies}{Wafer} = \dfrac {\pi \cdot (Wafer \ Diameter/2)^2}{Die
   Area} - \dfrac {\pi \cdot Wafer \ Diameter}{\sqrt{2} \cdot Die
   Die \ Area}}
8 \end{equation}
9 Use display math mode for centered, numbered equations like
   equation \ref{eq:dies} that you can refer to later.
10 \end{document}
```

Using the Tabular Environment

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- 1 **Begin tabular mode** specifying the number of columns, alignment, and vertical lines.
- 2 **Input table rows** indicating separations between cells, specifying when to begin a new row, and where to include horizontal lines.
- 3 **End tabular mode**

Beginning A Tabular Environment

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Started using the following command:

```
\begin{tabular}[] {column specification}
```

- The environment we are starting is **tabular**.
- The type, location, and alignment of columns and vertical lines is given using the **column specification**
 - l — left-aligned column
 - c — center-aligned column
 - r — right-aligned column
 - p{width} — paragraph column, must specify width.
 - | — vertical line (|| = double, ||| = triple ...)

Adding Contents

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- Once in a tabular environment, table contents, separations between cells, and newlines are entered.
 - `&` — column separator
 - `\\` — start new row
 - `\hline` — horizontal line
 - `\newline` — start new line in cell (paragraph cells only)

Sample Table:

```
1 \begin{tabular}{|l||l|c|r|p{1in}||}\hline
2      & -Tubes & & -Sphere & & -Net & & -Web & \\\hline
3 Blog- & & x & & & & & x & \\
4 E-    & & & & x & & x & & \\
5 Inter- & & & & x & & & & \\
6 Web   & & x & & x & & & x & \\\hline
7 \end{tabular}
```


Tabular Example

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Conclusion

Output:

	-Tubes	-Sphere	-Net	-Web
Blogo-	x			x
E-		x	x	
Inter-		x		
Web	x	x		x

Importing Graphics

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- `\usepackage{graphicx}`
- Once `graphicx` is included, images are imported using:
`\includegraphics[options]{image name}`
- Useful optional parameters:
 - `width=xx` — manual width
 - `height=xx` — manual height
 - `angle=xx` — used to rotate image
 - `scale=xx` — manual scaling
- `[width=\textwidth] % full-page width`
- `[width=.5\textwidth] % half-page width`

Includegraphics Example

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Source

```
1 \documentclass{article}  
2 \usepackage{graphicx}  
3 \begin{document}  
4 \includegraphics[width=2in]  
    {../Resources/cat.jpg}  
5  
6 \end{document}
```

Output



Floats

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- A container that cannot be broken across multiple pages
- L^AT_EX defines **figure** and **table** floats
- Floats (should) have captions and references.
- Floats are automatically arranged by L^AT_EX , however you can manually specify placement

Float Placement

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Format:

```
\begin{figure} [placement specifier]
  \label {fig:cat}
  \caption { this is a photo of a cat }
  %... figure contents ...
\end{figure}
```

- To get number of the float:

```
\ref{name}
```

- Placement Specifiers:

- h --- Place the float (approximately) here
- t --- Position at the top of the page.
- b --- Position at the bottom of the page.
- p --- Put on a special page for floats only.
- ! --- Modifier. Override internal parameters LaTeX uses for determining "good" float positions.

Floats Example

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Source

```
1 \begin{figure}[h!]  
2   \centering  
3   \label{fig:astrocat}  
4   \caption{An awesome cat}  
5   \includegraphics[width=1in]  
     {cat.jpg}  
6 \end{figure}  
7  
8 \begin{table}[h!]  
9   \begin{center}  
10    \begin{tabular}{|| lcr ||}  
11      \hline  
12        1 & 2 & 3 \\\br/>13        4 & 5 & 6 \\\br/>14        7 & 8 & 9 \\\br/>15      \hline  
16    \end{tabular}  
17  \end{center}  
18  \caption{A simple table}
```

Output



Figure 1: An awesome cat

1	2	3
4	5	6
7	8	9

Table 1: A simple table

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- `\usepackage{listings}`
- Made specifically for listing source code.
- Syntax highlighting for all common languages.
- (Bad) Write/paste code into L^AT_EX document:

```
\begin{lstlisting}[options]  
    Paste your code here  
\end{lstlisting}
```

- (Good) Reference original source file:
`\lstinputlisting[options]{filepath}`
- http://en.wikibooks.org/wiki/LaTeX/Source_Code_Listings#Settings

Preferred Listing Settings

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Source

```
1 \usepackage{listings}
2 \usepackage[usenames,dvipsnames]{color}
3 \begin{document}
4
5 \lstinputlisting[
6     language=           Python,
7     basicstyle=         \footnotesize,
8     breaklines=         true,
9     commentstyle=       \color{ForestGreen},
10    keywordstyle=       \bf\color{RoyalBlue},
11    stringstyle=        \it\color{Plum},
12    numbers=            left,
13    showstringspaces=   false,
14    numberstyle=        \tiny\color{Gray},
15    frame=              single,
16    morekeywords=       {shuffle},
17    caption=            Python Bogosort
18 ]{../Resources/bogo.py}
```


Listings Example

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Listing 1: Python Bogosort

```
1  def bogo(x):  
2      count = 0  
3  
4      while not inorder(x):  
5          # if sorted, randomly shuffle  
6          shuffle(x)  
7          count = count + 1  
8  
9      # once sorted, return!  
10     print "Sorted! Attempts: " +  
11         count  
12     return x
```

Bibliographies with BibTeX

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1 Create a bibliography (.bib) file

```
1 @article{Meyer2000,  
2   author = "Bernd Meyer",  
3   title  = "A constraint-based framework for  
           diagrammatic reasoning",  
4   journal = "Applied Artificial Intelligence",  
5   volume = "14",  
6   issue  = "4",  
7   pages  = "327--344",  
8   year   = 2000  
9 }
```

2 Cite source:

```
~\cite{Meyer2000}
```

3 Include at end of document:

```
\bibliography{bibfilename}  
\bibliographystyle{plain}
```

4 Compile (with BibTeX)

Compiling with BibTeX

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- Recommended method, according to www.bibtex.org

1. `pdflatex mydocument`
2. `bibtex mybib`
3. `pdflatex mydocument`
4. `pdflatex mydocument`

- Don't like that?

<http://users.phys.psu.edu/~collins/latexmk/>

BibTeX Demo

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BibTeX citations are widely used in academics and available for free from ACM digital library, IEEE Xplore, and other libraries.

- ACM demo
- IEEE Xplore Demo

Example bibliography and cited document:

- bibliography
- cited document
- final output

Additional Resources

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- All example code listed in this presentation (anything with line numbers) located in Examples/
- Many additional examples (omitted from presentation) located in Appendix/
 - Custom sizing
 - Algorithms
 - Defining new functions
 - Custom header files
- The source code from this presentation
- First places to go for help:
 - <http://detexify.kirelabs.org/>
 - <http://en.wikibooks.org/wiki/LaTeX>
 - <http://tex.stackexchange.com/>
 - <http://lmgty.com/?q=listings+latex>

Questions?

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