

STARS L^AT_EX Tutorial

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Outline

Introduction

History of \LaTeX

Use of \LaTeX

Typesetting Text

Hello, World!

Fonts and Special Characters

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L^AT_EX

- ▶ Pronounced “lah-tech” or “lay-tech”
- ▶ Originally written by L. B. Lamport
 - ▶ Enables authors to typeset and print their work at professional quality
- ▶ Suited to large articles and books
 - ▶ Automatic numbering of:
 - ▶ Chapters
 - ▶ Sections
 - ▶ Theorems
 - ▶ Equations
 - ▶ etc
- ▶ Front-end To T_EX
 - ▶ Invented by Donald Knuth to typeset text and mathematical formulas.

Use of L^AT_EX

What can we use L^AT_EX for?

- ▶ Like we said before:
 - ▶ Books
 - ▶ Articles
- ▶ But also other things too!
 - ▶ This presentation (Using the “beamer” package)
 - ▶ Lab Write-ups/Reports
 - ▶ Exams
 - ▶ Letters
 - ▶ The list goes on!

L^AT_EX vs Word

Why use L^AT_EX when we have word?¹

- ▶ Separation of content and style
- ▶ Portability
- ▶ Flexibility
- ▶ Control
- ▶ Output
- ▶ Scalability
- ▶ Cost

¹<http://www.andy-roberts.net/misc/latex/latexvsword.html>

Getting L^AT_EX

Where can I get L^AT_EX?

- ▶ Google T_EXLive (<http://www.tug.org/texlive>)
 - ▶ This gets you all the necessary things to build a L^AT_EX source file, with lots of nice optional packages.
- ▶ Get a good L^AT_EX Editor (Optional but recommended)
 - ▶ Pick one that you think looks good from http://en.wikipedia.org/wiki/Comparison_of_TeX_editors
 - ▶ I prefer TeXmaker for Windows & Linux and TeXshop for Mac

Building a L^AT_EX Document

I have a .tex file, what can I do with it?

- ▶ Create a pdf
 - ▶ *pdflatex filename.tex*
 - ▶ Produces filename.pdf
 - ▶ Usually you want to run this more than once (2 or 3 times)
 - ▶ More on this later ...
- ▶ Create a .dvi file
 - ▶ Running *latex filename.tex* produces *filename.dvi*
- ▶ Create a ps (postscript) file
 - ▶ After running *latex filename.tex* run *dvi2ps filename.dvi* to generate a ps file
 - ▶ You can then convert the .ps file to pdf using *pdf2ps* but using *pdflatex* is easier and produces nicer looking papers.

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Hello, World!

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

```
% I am a comment
```

```
\begin{document}
```

```
Hello, World!
```

```
How are you?
```

```
Fantastic!
```

```
\end{document}
```

Hello, World! How are you?
Fantastic!

1



`\documentclass`

The `\documentclass[11pt]{article}` command is the first thing in any document, and tells LaTeX the type of document you are writing.

- ▶ 11pt can be replaced with 12pt or 10pt depending on your desired font size, along with other “options”
- ▶ article specifies the type of document that you are writing
- ▶ Choices include:
 - ▶ `article` – Articles in scientific journals, presentations, short reports, documentation, etc...
 - ▶ `report` – Longer reports spanning several chapters, small books, PhD theses
 - ▶ `book` – For real books
 - ▶ Others but those are the most common.

Hello, World!

`\begin{document}`

- ▶ The actual text portion of the document begins with a `\begin{document}` and ends with an `\end{document}`.
- ▶ Before the `\begin{document}` is where you define things such as the \LaTeX packages you are using, define any Macros you'd like to use in your document, or change any other settings.
- ▶ Everything after the `\end{document}` in the file is ignored.



Hello, World!

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

\author{John R. Hoare}
\title{The Best Hello, World Ever}
\date{April 9, 2010}

\begin{document}

\maketitle

Hello, World!

\end{document}
```

The Best Hello, World Ever

John R. Hoare

April 9, 2010

Hello, World!

Hello, World!

Lots of Text

The Best Hello, World Ever

John R. Hoare

April 9, 2010

>Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam fringilla mollis lectus. Sed cursus laculis venis nec tempor. Nullam a interdum augue. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Maecenas varius conwallis mauris, ac egestas aene volutpat a. Ut a consectetur risus. Suspendisse phaselia, lectus vel nuncper laculis, nulla leo orare diam, non laoreet nisi lorem auctor nulla. Duis porta dignissim lectus. Nulla lobortis fringilla arcu, eget fermentum maestas pulvinar nisl. Sed pellentesque erat vitae purus orare a sodales libero consequat. Fusis massa nisl, dignissim ac tristique ac, laculis vel neque. Cras nisl dui, porta eu convalesco elit amet, tempor et ante. Amenas dui urna, vehicula eu convalesco sed, lectus at ipsum. Nullam vitae maestas venis, at convalesco nisl. Vivamus et mollitullus enim. Maestas vitae phaselia lectus.

Nulla sit amet erat a eam tristique laoreet laculis porttitor laoreet. Sed pretium enim vitae nulla elementum hendrerit. Donec pellentesque fringilla interdum. Amenas quis nisl est. Praesent id libero et quam elementum vehicula vitae in elit. Duis venenatis, ipsum nec nulla mollis, est lorem rhodend solis, eget phaselia nisi tortor sed ligula. Duis a eam sagittis. Fusis sed enim sed est adipiscing auctor a id lorem. Curabitur porta, justo vel fringilla suscipit, lectus libero maestas dicit, sed faucibus dui purus at erat. Quisque malesuada nisl nec tortor tristique enim sed vel a neque. Cras rutrum ultrices sagittis. Nulla a sagittis nisl, vel sagittis nulla. In diam ipsum, lectus eget orare sed, fermentum ac nisl. Phaselia lectus maestas, vestibulum sed mollis eu, rhodend a eros. Sed augue nulla, elementum nec vulputate sed, interdum at libero. Praesent enim ligula, accumsan suscipit viverra nisl, laculis quis maestas. Nam id purus lectus, ut dignissima aene.

Donec in elit libero. Maecenas a egestas solis. Nunc nisi lectus, auctor a maestas quis, vestibulum quis dicit. Sed est neque sed. Curabitur neque risus, blandit a ultrices sed, dapibus ac eros. Maecenas pulvinar volutpat erat, et interdum justo ultrices vitae. Nam elit turpis, aliquet ultrices laoreet sit amet, nulla ac diam. Amenas laoreet quam, porttitor nec vestibulum eget.

Hello, World!

Using Sections:

`\section{Introduction}`

(text)

`\subsection{SubIntroduction}`

(text)

`\section{Conclusion}`

(text)

The Best Hello, World Ever

John R. Hoare

April 9, 2010

1 Introduction

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam fringilla mollis luctus. Sed cursum iaculis urna nec tempor. Nullam a interdum augue. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Maecenas varius conavallis mauris, ac egestas aene volutpat a. Ut a consectetur risus. Suspendisse pharetra, lectus vel semper iaculis, nulla leo ornare diam, non laoreet nisi lorem auctor nulla. Duis porta dignissim luctus.

1.1 SubIntroduction

Nulla sit amet erat a enim tincidunt laoreet lacina partitor lorem. Sed pretium eros vitae nulla elementum hendrerit. Donec pellentesque fringilla interdum. Aenean quis nisi est. Praesent id libero et quam elementum vehicula vitae in elit. Duis venenatis, ipsum non mollis mollis, est lorem etiam odio, eget pharetra nisi tortor sed ligula. Duis a enim sapiam. Fusce sed enim sed est adipiscing auctor a id lorem. Curabitur porta, justo vel fringilla aeneque, lectus libero mattis dolor, sed faucibus dui purus at erat.

2 Conclusion

Donec in elit libero. Maecenas a egestas odio. Nunc nisi lectus, auctor a molestie quis, vestibulum quis dolor. Sed sed neque nisi. Curabitur neque risus, blandit ultricies sed, dapibus at eros. Maecenas pulvinar volutpat erat, ut interdum justo ultrices vitae. Nam elit turpis, aliquet ultrices laoreet sit amet, mollis ac diam. Aenean lacus quam, porttitor nec vestibulum eget, condimentum auctor dolor.



Changing fonts

- ▶ Use `\emph{text}` to *emphasize* a certain word in your text.
- ▶ To *italicize text* use `\textit{text}`.
- ▶ **To bold text** use `\textbf{text}`.
- ▶ TO PUT ALL TEXT INTO CAPITAL LETTERS (SMALL CAPS)
USE `\textsc{text}`.
- ▶ To typewriter-type text use `\texttt{text}`.

“Special” Characters

- ▶ Certain characters can not be used by themselves in \LaTeX .²

Symbol	Meaning	\LaTeX Code
#	Macro parameter Symbol	<code>\#</code>
\$	Math Typesetting Parameter	<code>\\$</code>
%	Comment	<code>\%</code>
&	Tabular column separator	<code>\&</code>
\	The command Character	<code>\textbackslash</code>
^	Math superscript character	<code>\^</code>
^	Actual Carrot	<code>\verb*^*</code>
_	Math Subscript Character	<code>_</code>
{	Argument Start Delimiter	<code>\{</code>
}	Argument End Delimiter	<code>\}</code>
~	Non-breaking space	<code>\textasciitilde</code>

²<http://faculty.uoit.ca/bohun/latex/special.html>



“Special” Characters

Other Special symbols can be looked up the corresponding command. (e.g. ©\copyright)

- ▶ <http://www.ctan.org/tex-archive/info/symbols/comprehensive/symbols-a4.pdf>
- ▶ Or just google “latex <symbol-name>”

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Introduction

- ▶ Environment starts with:
`\begin{environment-name}`
- ▶ Environment ends with:
`\end{environment-name}`



Text-related Environments

- ▶ document – We've seen this before... All the text goes within the document environment.
- ▶ itemize – Bulleted List
- ▶ enumerate – Numbered List
- ▶ list – Creating a list with a specific label.
`\begin{list}{label}{spacing}`
- ▶ center – Centered text
- ▶ verbatim – Print exactly what is entered in the verbatim environment
- ▶ flushleft or flushright – print the text flush with the respective side

Math-Related Environments

- ▶ `array` – Math Array (i.e. for creating Matrices in \LaTeX)
- ▶ `eqnarray` – Display a series of numbered equations
- ▶ `ams math package` `\usepackage{amsmath}`
 - ▶ Extremely common package for math and provides replacements for standard \LaTeX environments.
 - ▶ `align` – replaces `eqnarray`, use `align*` to suppress numbered equations

Table/Tabular

- ▶ Table is a floating environment (including caption)
- ▶ Tabular is the actual table

```

\begin{table}
\centering
\caption{An Example Table}
\begin{tabular}{r | c l }
\hline
ASDF & 1 & 30 \\
\hline
B & 20 & 4 \\
BC & 3 & 5 \\
\hline
\end{tabular}
\end{table}

```

Table: An Example Table

ASDF	1	30
B	20	4
BC	3	5

Figure

- ▶ The *figure* environment is used for creating Figure Floats.
- ▶ A figure can be pretty much anything:
 - ▶ A Picture
 - ▶ Text
 - ▶ An Algorithm
 - ▶ etc.

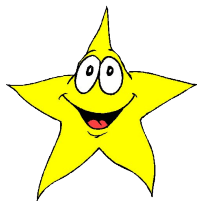


Figure: A Star

```
\begin{figure}  
\centering  
\includegraphics[width=1in]{imgs/star.png}  
\caption{A Star}  
\end{figure}
```

Float Placement

```
\begin{table}[Placement]
```

```
⋮
```

```
\end{table}
```

```
\begin{figure}[Placement]
```

```
⋮
```

```
\end{figure}
```

By default, \LaTeX does a pretty good job placing a figure in a good place in your document. However, you can tell \LaTeX where to put it (with priorities).



Float Placement

h	Place the float here, i.e., approximately at the same point it occurs in the source text (however, not exactly at the spot)
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.
!	Override internal parameters Latex uses for determining "good" float positions.
H	Places the float at precisely the location in the \LaTeX code. Requires the float package, e.g., <code>\usepackage{float}</code> . This is somewhat equivalent to h!.

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Math Environments

To typeset math equations within a sentence use `$ $`.

Ex: Euclidean distance is $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$ where the first point is (x_1, y_1) and the second point is (x_2, y_2)

To typeset math equations on its own line and centered use `\[\]`

Ex: Euclidean distance is:

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

where the first point is (x_1, y_1) and the second point is (x_2, y_2)

Example Equations

Ex: Euclidean distance is:

```
\[ \sqrt{(x_{1} - x_{2})^2 + (y_{1} - y_{2})^2} \]
```

where the first point is (x_{1}, y_{1})

and the second point is (x_{2}, y_{2})

Ex: Euclidean distance is:

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

where the first point is (x_1, y_1) and the second point is (x_2, y_2)

Example Equations

```
\[ \Delta = \sum_{i=1}^N w_i (x_i - \bar{x})^2 \]
```

$$\Delta = \sum_{i=1}^N w_i (x_i - \bar{x})^2$$

```
\begin{equation}
P(x) = \frac{x - a}{b - a}
\end{equation}
```

$$P(x) = \frac{x - a}{b - a} \tag{1}$$



Matrices

```
\[ x = \left[ \begin{array}{cccc} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{array} \right]
```

$$x = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix}$$

AMS Math

- ▶ AMS Math is a \LaTeX package that provides more symbols and more powerful math environments than \LaTeX alone.
- ▶ To use, place the following before your `\begin{document}` statement:

```
\usepackage{amsmath} % assumes amsmath package installed  
\usepackage{amssymb} % assumes amsmath package installed
```

○
○○○○

○○○○○○
○○○

○○
○○○○

○
○○

Symbols

- ▶ Far too many symbols for me to show you.
 - ▶ Refer to the Comprehensive \LaTeX Symbol List:
<http://www.ctan.org/tex-archive/info/symbols/comprehensive/symbols-a4.pdf>
- ▶ Many \LaTeX editors will show a list of symbols that you can select graphically as well.
- ▶ Often times, the command for the symbol makes sense: i.e. Θ is `\Theta`, α is `\alpha`, etc.

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Referencing Other things in your document

- ▶ \LaTeX creates numbers for everything automatically...
Sections, Tables, Figures, Etc.
- ▶ Often you'll want to refer to those. (i.e. According to Figure 1. ...)
- ▶ This is done by creating a “label” for those things using `\label{label}`, and whenever you want to reference it use `\ref{label}`
- ▶ Example: “As we can see in figure `\ref{figure:awesome}`, \LaTeX is quite helpful.”

BIB_TEX

- ▶ BIB_TEX is a reference management tool for formatting lists of references.
- ▶ You can use a Bibliography Management Tool, or create the .bib files by hand. (http://en.wikipedia.org/wiki/Comparison_of_reference_management_software)
- ▶ Every entry in your .bib file has a “key” which you can then reference in your document by doing `\cite{key}`

BIB_TEX

- ▶ At the end of your .tex file, you tell L^AT_EX where your bibliography is:
`\bibliography{bibliography_filename_without.bib}`
- ▶ Then, to compile your document (for example called document.tex) you will run:

```
pdflatex document.tex  
pdflatex document.tex  
bibtex document  
pdflatex document.tex  
pdflatex document.tex
```

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Version 1.09.



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Version 3.7, April 1999.



David R. Wilkins.

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<http://www.maths.tcd.ie/~dwilkins/LaTeXPrimer/>,
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