

L^AT_EX

2017

OBJECTIVES

- ▶ Introduction to L^AT_EX
- ▶ Hands-on
 - ▶ Basics of L^AT_EX
 - ▶ Math environments & commands
 - ▶ Including graphics
 - ▶ Creating Bibliography
- ▶ Helpful hints & resources

L^AT_EX IS LIKE MS WORD, ONLY BETTER !

What is L^AT_EX?

- ▶ Pronounced as 'lay-tech' or 'lah-tech'
- ▶ Document preparation system for high-quality typesetting
- ▶ Uses markup commands and a type setting program T_EX
- ▶ Used for publishing reports, books, scientific documents, etc

L^AT_EX SAVES FORMATTING TIME AND EFFORT

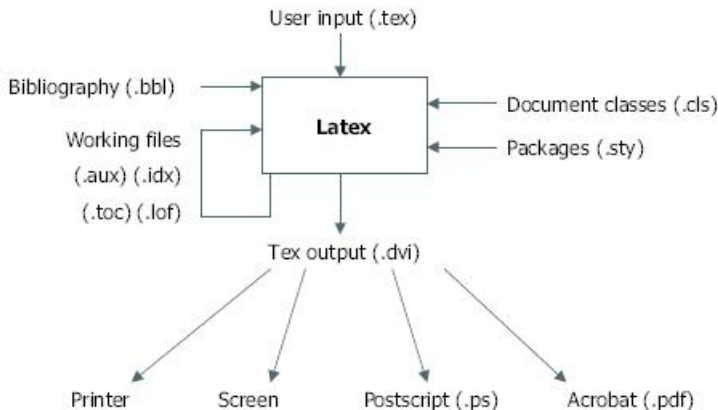
Concentrate on writing (content), NOT on formatting (appearance)

why use L^AT_EX?

- ▶ Consistent layout, fonts, tables etc. throughout the presentation
- ▶ Mathematical formulae can be easily typeset
- ▶ Indices, references, footnotes can be easily generated

HOW DOES L^AT_EX WORK?

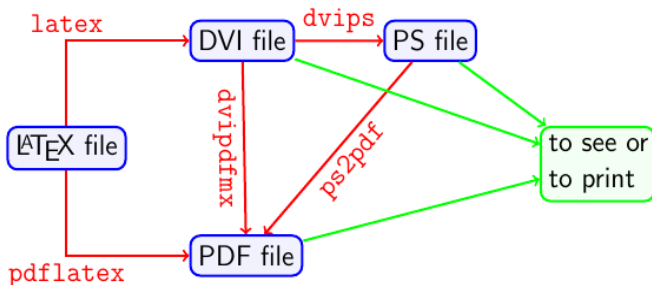
- ▶ Source text marked up with logical structure (like HTML)
- ▶ Document class tells L^AT_EX how to format the content



L^AT_EX OUTPUT FORMATS

Output formats available

- ▶ DVI - Device Independent file format
- ▶ PS - PostScript file format
- ▶ PDF - Portable Document Format



SETTING UP L^AT_EX

► Linux

Most distributions have a T_EXsystem including L^AT_EX.

Check software source for a T_EXpackage, otherwise install
TexLive directly

► Mac OS X

[MacTex](#) - A full T_EX system including L^AT_EX

► Windows

- [proTeXt](#) - Easy to install complete L^AT_EX system
- Download [MikTeX](#) and [TeXnicCenter](#) separately

```
\documentclass[12pt, letter paper, two side]{article}
\usepackage[utf8]{input enc}
```

```
\usepackage {comment}
```

```
\title{First document}
```

```
\author{Author Name}
```

```
\date{September 2015}
```

```
\begin {document}
```

```
\maketitle
```

```
\begin{abstract}
```

This work is based on adaptive signal processing techniques. Principle of adaptive signal processing is used to reduce the noise in the experimentally collected response functions.

```
\end{abstract}
```

In this document some extra packages and parameters were added.
There is encoding. \\ package on a page-size and font-size parameters

```
\begin{comment}
```

This material will not be showed in the pdf document. This is
a multi-line comment for authors reference

```
\end{comment}
```

```
\end{document}
```

First document

Author Name

September 2015

Abstract

This work is based on adaptive signal processing techniques. Principle of adaptive signal processing is used to reduce the noise in the experimentally collected response functions.

In this document some extra packages and parameters were added. There
is encoding.
package on a page-size and font-size parameters

UNDERSTANDING THE CODE & STRUCTURE

- ▶ Preamble of a document
- ▶ Basic formatting: abstract, paragraphs & newline
- ▶ Environments - Paragraph style and formatting

<pre>\documentclass{article} \usepackage{babel} \begin{document} \title{An Example} \maketitle ... <i>Contents</i> ... \begin{bibliography} ... \end{bibliography} \end{document}</pre>	<p>Preamble</p> <p>Front matter</p> <p>Body</p> <p>Back matter</p>
--	--

SECTIONING COMMANDS

L^AT_EX can organize, number and index chapters and sections of a document. There are upto 7 levels of depth for defining sections depending on the document class.

Command	Level
<code>\part{part}</code>	-1
<code>\chapter{chapter}</code>	0
<code>\section{section}</code>	1
<code>\subsection{subsection}</code>	2
<code>\subsubsection{subsubsection}</code>	3
<code>\paragraph{paragraph}</code>	4
<code>\subparagraph{subparagraph}</code>	5

```

\documentclass{article}

\begin{document}

\title{Title for this document}
\author{Name of the author(s)\backslash
        University,\backslash
        \texttt{Email}}
\date{\today}
\maketitle

\begin{abstract}
This is an abstract. This is an abstract. This
is an abstract. This is an abstract. This is an
abstract. This is an abstract. This is an
abstract. This is an abstract. This is an
abstract. This is an abstract. This is an
abstract.
\end{abstract}

%-----

\section{section Title}
Under first section. Under first section. Under first
section. Under first section. Under first section.
under first section. Under first section.

\subsection{subsection Title}
Contents of subsection. Contents of subsection.
Contents of subsection. Contents of subsection.
contents of subsection. Contents of subsection

\subsubsection{subsubsection Title}
Contents

\subsection{subsection Title}
contents of subsection. contents of subsection.
Contents of subsection. contents of subsection.
contents of subsection. Contents of subsection.
contents of subsection. contents of subsection.
contents of subsection.

%-----
\end{document}

```

Title for this document

Name of the author(s)

University,

Email

July 27, 2015

Abstract

This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract. This is an abstract.

1 section Title

Under first section. Under first section. Under first section. Under first section.
Under first section. under first section. Under first section.

1.1 subsection Title

Contents of subsection. Contents of subsection. Contents of subsection. Con-
tents of subsection. contents of subsection. Contents of subsection

1.1.1 subsubsection Title

Contents

1.2 subsection Title

contents of subsection. contents of subsection. Contents of subsection. con-
tents of subsection. contents of subsection. Contents of subsection.contents of
subsection. contents of subsection. contents of subsection.

BULLETS & NUMBERING

Unordered Lists

```
\begin{itemize}
  \item Item_1
  \item Item_2
  ....
\end{itemize}
```

The default labeling scheme:

Level 1 - *\bullet* (●)

Level 2 - (-)

Level 3 - *\ast* (*)

Level 4 - *\cdot* (·)

Ordered Lists

```
\begin{enumerate}
  \item Item_1
  \item Item_2
  ....
\end{enumerate}
```

The default numbering scheme:

Level 1 - 1,2,3...

Level 2 - a,b,c...

Level 3 - i,ii,iii...

Level 4 - A,B,C...

```

\documentclass{article}
\usepackage[utf8]{input enc}


\begin{document}

\section{unordered lists}

\begin{itemize}
\item The individual entries are indicated with a
black dot, a so-called bullet.
\item The text in the entries may be of any length.
\end{itemize}

\section{ordered lists}

\begin{enumerate}
\item The label consists of sequential numbers
\item The numbers starts at 1 with every call to the enumerate
environment.
\end{enumerate}

\section{Nested Lists}

\begin{enumerate}
\item The labels consists of sequential numbers.
\begin{itemize}
\item The individual entries are indicated with a black dot,
a so-called bullet.
\item The text in the entries may be of any length.
\end{itemize}
\item The numbers start at 1 with every call to the enumerate
environment.
\end{enumerate}

\end{document}

```

1 unordered lists

- The individual entries are indicated with a black dot, a so-called bullet.
- The text in the entries may be of any length.

2 ordered lists

1. The label consists of sequential numbers
2. The numbers starts at 1 with every call to the `enumerate` environment.

3 Nested Lists

1. The labels consists of sequential numbers.
 - The individual entries are indicated with a black dot, a so-called bullet.
 - The text in the entries may be of any length.
2. The numbers start at 1 with every call to the `enumerate` environment.

MATHEMATICAL MODES

- **Inline mode** - Write formulas as a part of the text.

Math Environment - `\begin{math}...\end{math}`

L^AT_EX shorthand - `\(...\)`

T_EX shorthand - `$...$`

- The formula $(a + b)^2 = a^2 + b^2 + 2ab$ is in inline mode.

- **Display mode** - Write formulas that are not a part of the text/paragraph, thus put on separate lines.

Math Environment - `\begin{equation}...\end{equation}`

L^AT_EX shorthand - `\[...\]`

T_EX shorthand - `$$...$$`

- The same formula

$$(a + b)^2 = a^2 + b^2 + 2ab$$

is in display mode.

MATHEMATICAL COMMANDS

Fractions

$$\frac{x+y}{y-z}$$

$$\frac{\frac{1}{x} + \frac{1}{y}}{z}$$

Subscript and Superscript

Superscript: x^n ; x^{2n}

Subscript: x_n ; x_{2n}

Roots

$$\sqrt[5]{\frac{x+y}{y-z}}$$

Brackets

$$\left(\frac{x+y}{z}\right)^2 \times \left(\frac{x^2}{y^3}\right)$$

ADDITIONAL OPERATORS

L ^A T _E X markup	Renders as
<code>a_{n_i}</code>	a_{n_i}
<code>\int_{i=1}^n</code>	$\int_{i=1}^n$
<code>\sum_{i=1}^{\infty}</code>	$\sum_{i=1}^{\infty}$
<code>\prod_{i=1}^n</code>	$\prod_{i=1}^n$
<code>\cup_{i=1}^n</code>	$\cup_{i=1}^n$
<code>\cap_{i=1}^n</code>	$\cap_{i=1}^n$
<code>\oint_{i=1}^n</code>	$\oint_{i=1}^n$
<code>\coprod_{i=1}^n</code>	$\coprod_{i=1}^n$

MATH EXERCISE

- ▶ Buzz LightYear: To ∞ and beyond!
- ▶ ${}^nC_r = \frac{n!}{r!(n-r)!}$
- ▶ 50 apples \times **100** apples = lots of apples
- ▶ $\sum_{i=1}^n = \frac{n(n+1)}{2}$

SOLUTIONS

- ▶ Buzz LightYear: To ∞ and beyond!
- ▶ $\binom{n}{r} = \frac{n!}{r!(n-r)!}$
- ▶ 50 apples $\times \textit{100}$ apples = lots of apples
- ▶ $\sum_{i=1}^n = \frac{n(n+1)}{2}$

INCLUDING IMAGES - USING PACKAGES IN L^AT_EX

- ▶ Supports .eps, .jpeg, .png
- ▶ Include `\usepackage{graphicx}` in the preamble
- ▶ Syntax: `\includegraphics[attr1 = val1, attr2 = val2, ...]{image}`
- ▶ *figure* environment will take care of the placement of the picture with respect to the flow of the document
- ▶ The images have to be kept in the same folder

IMAGE EXERCISE

- ▶ `\includegraphics{image}`
- ▶ `\includegraphics[width = 1.2cm]{image}`
- ▶ `\includegraphics[scale = 0.5]{image}`
- ▶ `\includegraphics[scale = 0.5, angle = 45]{image}`
- ▶ `\includegraphics[trim = 3mm 8mm 3mm 1mm, clip]{image}`

SOLUTIONS



Figure: Original

SOLUTIONS



Figure: Width = 1.2cm



Figure: Scale = 0.5

SOLUTIONS



Figure: Scale = 0.4, Angle = 45



Figure: trim = 3mm 8mm 3mm 1mm

INCLUDING BIBLIOGRAPHY

Two ways to include bibliography

- ▶ **Bibitem** - Add each reference within the document
- ▶ **BibTex** - Store bibliography in an external file and link it to the .tex document

BIBITEM - REQUIRES MANUAL FORMATTING

- ▶ Adds references at the end of the document
- ▶ Cross-references and automatically numbered
- ▶ Requires manual formatting

Syntax - Creating bibliography

```
\begin{thebibliography}{widest_entry}
```

```
\bibitem[label_1]{cite_key_1} bibliographic information
```

```
\bibitem[label_2]{cite_key_2} bibliographic information
```

...

```
\end{thebibliography}
```

Syntax - Citing references

```
\cite{cite_key} - Single reference
```

```
\cite{cite_key_1, cite_key_2, ...} - Multiple references
```

```
\documentclass{article}
\usepackage[utf8]{input enc}
\usepackage[English]{babel}
```

```
\begin{document}
```

Here is an example illustrating the formatting of three different types of bibliography entries: an ordinary journal article by Knuth `\cite{Knuth92}`, a book Graham/Knuth/Patashnik `\cite{Concrete-math}`, an article published in a conference proceedings `\cite{Erdos01}`, and an unpublished paper by Simpson `\cite{Simpson}`

```
\begin{thebibliography}{9}
```

```
\bibitem{Erdos01} P.Erdős, \emph{A selection of
problems and results in combinatorics}, Recent trends
in combinatorics (Matrahaza, 1995), Cambridge Univ. Press,
Cambridge,2001,pp. 1-6.
```

```
\bibitem{Concrete-math}
R.L. Graham, D.E. Knuth, and O. Patashnik, \emph{Concrete Mathematics},
Addison-Wesley, Reading, MA,1989.
```

```
\bibitem{Knuth92} D.E. Knuth, \emp{Two notes on notation},
Amer. Math. Monthly \textbf{99} (1992), 403-422.
```

```
\bibitem{Simpson} H. Simpson, \emp{Proof of the Riemann Hypothesis},
preprint (2003), available at \url{http://www.math.drofmaths.edu/riemann.ps}
```

```
\end{thebibliography}
\end{document}
```

Here is an example illustrating the formatting of three different types of bibliography entries: an ordinary journal article by Knuth [3], a book Graham/Knuth/Patashnik [2], an article published in a conference proceedings [1], and an unpublished paper by Simpson [4]

References

- [1] P.Erdős, *A selection of problems and results in combinatorics*, Recent trends in combinatorics (Matrahaza, 1995), Cambridge Univ. Press, Cambridge,2001,pp. 1-6.
- [2] R.L. Graham, D.E. Knuth, and O. Patashnik, *Concrete Mathematics*, Addison-Wesley, Reading, MA,1989.
- [3] D.E. Knuth, Two notes on notation, Amer. Math. Monthly **99** (1992), 403-422.
- [4] H. Simpson, Proof of the Riemann Hypothesis, preprint (2003), available at <http://www.math.drofmaths.edu/riemann.ps>

BIBTEX - SIMPLER & EASIER

- ▶ Uses structured bibliography .bib file to be included in .tex document
- ▶ Generates bibliography according to specified style

Write Once, Use many approach

BIBTEX ENTRY FORMAT

```
@entry_type{cite_key},  
  field_name_1 = "fieldtext"  
  field_name_2 = "fieldtext"  
  ... }
```

- ▶ **entry_type** - article, book, online, phdthesis, etc.
- ▶ **field_name** - author, title, volume, year, publisher, etc.
- ▶ **cite_key** - user defined key to cite the reference

For example, if reference is a book

```
@book{HK,  
  author = "H.Kopka and P.W.Daly",  
  title = "A guide to Latex",  
  publisher = "Addison-Wesley",  
  year = 1999.  
}
```

USING BIBTEX DATABASE

- ▶ Import biblatex package
 - ▶ `\usepackage{biblatex}`
- ▶ Tell the compiler which .bib file to use
 - ▶ `\bibliography{bibfile_name}`
- ▶ Select bibliographic style
 - ▶ `\bibliographystyle{style}`
 - ▶ Standard styles - plain, alpha, abbrev, unsort
 - ▶ Publishers often supply their own style files (.bst)
- ▶ Citing Reference
 - ▶ `\cite{cite_key_1, cite_key_2, ...}`

```

\documentclass {article}

\pagestyle{empty}

\begin{document}

\section*{Example of Citations of Kind \texttt{plain}}

Citation of a Tribodynamics of spur gears "\cite{RefWorks:2}" and
Tribodynamics new algorithm "\cite{RefWorks:3}". Application of
damping models to gears "\cite{RefWorks:4}" and Phd thesis on elasto-hydro-
dynamic lubrication "\cite{RefWorks:5}". Application of elasto-hydrodynamic
lubrication to spiral bevel gears "\cite{RefWorks:6}".

\bibliographystyle{plain}
\bibliography{bibtexcitafiles}

\end{document}

```

Example of Citations of Kind plain

Citation of a Tribodynamics of spur gears "\cite{RefWorks:2}" and Tribodynamics new algorithm "\cite{RefWorks:3}". Application of damping models to gears "\cite{RefWorks:4}" and Phd thesis on elasto-hydro-dynamic lubrication "\cite{RefWorks:5}". Application of elasto-hydrodynamic lubrication to spiral bevel gears "\cite{RefWorks:6}".

References

- [1] S. C. Gopalakrishnan and T. Lin. Elastohydrodynamic lubrication damping of spiral bevel gears at moderate loads. *SAE International Journal of Passenger Cars-Mechanical Systems*, 8(2):721-725, 2015.
- [2] Qiang Lin. Friction in Mixed and Elastohydrodynamic lubricated contacts including Thermal Effects. PhD thesis, University of Twente, 2002.
- [3] A. Kalraman S.Li. A mixed eld model with asymmetric integrated control volume discretization. *Tribology International*, 42:1163-1172, 2009.
- [4] A. Kalraman S.Li. A spur gear mesh interface damping model based on elasto-hydrodynamic contact behavior. *International Journal of Power Trains*, 1(1):1-21, 2011.
- [5] A. Kalraman S.Li. A tribo-dynamic model of spur gears. *Journal of Sound and Vibration*, 332:493-5078, 2013.

ONLINE TUTORIALS & RESOURCES

- ▶ CEAS Library L^AT_EX resources
<http://guides.libraries.uc.edu/latex>
- ▶ Online L^AT_EX links & tutorials
 - ▶ [Basic Tutorial by Andrew Roberts](#)
 - ▶ [The L^AT_EX wiki book](#)
 - ▶ L^AT_EX Project <http://www.latex-project.org/>

Questions??

Thank you for attending the workshop!!

