

Introduction to L^AT_EX

A Method for Scientific Writing

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Introduction

- ▶ What, Why, Where and How of \LaTeX
- ▶ Writing \LaTeX (Basics)
 - ▶ Space, Reserved Characters
 - ▶ Commands
 - ▶ Comments
- ▶ Document Structure
- ▶ Elements
 - ▶ Text Formatting
 - ▶ Tables and Lists
 - ▶ Graphics, Images & Figures in \LaTeX
 - ▶ Maths

Common Problems in Typesetting Documents with Word

- ▶ Poor typographic control.
- ▶ "Badness" is difficult to resolve.
- ▶ Image embedding (instead of external links) and limited image editing options.
- ▶ Unexpected surprises when using external text.
- ▶ Unprofessional look.

What is L^AT_EX?

T_EX is software developed by Donald Knuth for typesetting documents.

- ▶ low level markup language and compiler
- ▶ very powerful, but difficult to use

L^AT_EX is a collection of software built around T_EX to make life easier

- ▶ macros and scripts to convert L^AT_EX commands to T_EX
- ▶ many packages for doing complex formatting/layouts

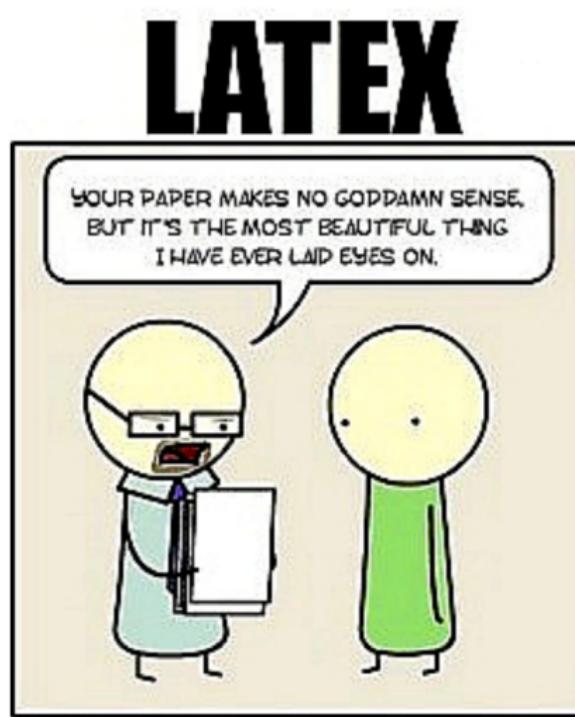


Why L^AT_EX?

- ▶ Allows you to concentrate on content and structure, rather than layout and presentation
- ▶ Keeps formatting consistent throughout the document
- ▶ No design or typography knowledge required
- ▶ Excellent for writing mathematical expressions or equations
- ▶ Long and complex documents can be created easily
- ▶ Free!

Why LATEX?

... It looks great.



Why not \LaTeX ?

- ▶ Can't easily see how document looks as we write it
- ▶ Need to learn \LaTeX before you can create anything
- ▶ Lose some control over formatting and layout
- ▶ \LaTeX is not the prettiest or simplest language out there

Where do we get \LaTeX ?

\LaTeX is freely available from a number of different sources. There are many different implementations and collections of packages online.

Windows proTeXt is a good solution for Windows, providing MiKTeX.

Mac OSX MacTeX provides TeXLive.

Linux Most distributions will come with \LaTeX ready installed but if not you can install TeXLive.

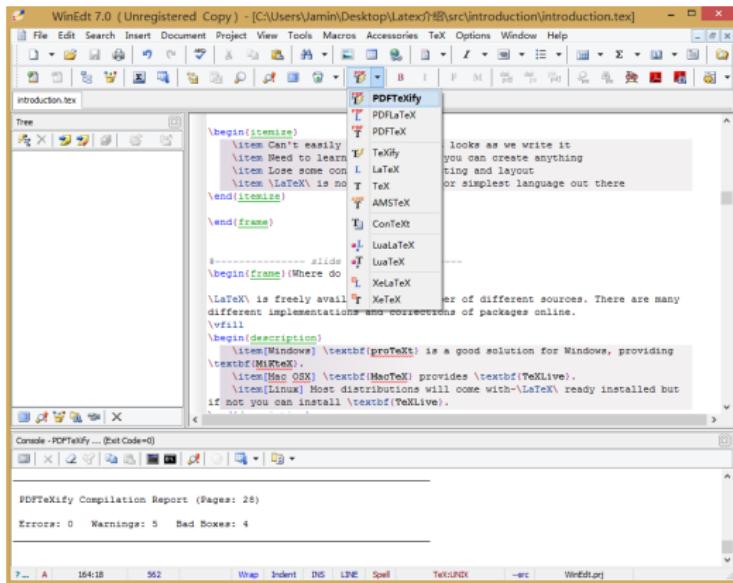
Some websites like Overleaf provide online platforms for "Real-time Collaborative Writing and Publishing".

CTeX (Chinese TeX) is a nice choice for Chinese users.

How do we use LATEX?

Creating documents with LATEX is simple:

1. Write our document as plain text in a '.tex' file, using LATEX commands to structure and format it
2. Compile our '.tex' file to produce the output



First (basic) L^AT_EX Example

```
\documentclass{article}  
\begin{document}  
    Hello World!  
\end{document}
```

Hello World!

Writing L^AT_EX (Basics) – Space, Reserved Characters

Whitespace (spaces or tabs) are all seen as a ‘space’ by L^AT_EX. Several concurrent spaces are all seen as one space only.

If I add multiple spaces between words L^AT_EX will treat them as one space.

If I add multiple spaces between words L^AT_EX will treat them as one space.

L^AT_EX uses a number of characters that have a special meaning as part of the language.

\$ ^ & _ { } ~ \%

\# \\$ ^ \& _ { } ~ \textbackslash %

Writing L^AT_EX (Basics) – Commands, Comments

L^AT_EX commands have an effect on the text in the document. Some commands have additional arguments or optional parameters. The general syntax for a L^AT_EX command is:

```
\commandname[opt1, opt2, ...]\{arg1\}\{arg2\}...
```

The '%' character is used to create comments in L^AT_EX. When L^AT_EX is processing your .tex file and it comes across a '%', it ignores the rest of the line.

```
%This is a comment and will not be shown.
```

```
Here is some text in our file that will be shown. %but the rest  
of the line will not be.
```

Here is some text in our file that will be shown.

Document Structure

Every \LaTeX document must have a certain structure:

```
\documentclass{...}
\usepackage{...}
\begin{document}
...
\end{document}
```

The `\documentclass{...}` command tells \LaTeX which type of document we are creating, and how it should be set up and formatted.

Often, the default set of commands available to \LaTeX cannot solve all of our problems alone. You will need `\documentclass{...}` command to include extra packages.

Documents can be divided into different parts, chapters or sections.

Document Structure Example

L^AT_EX Template for IEEEtran Journals

The screenshot shows the Overleaf web interface. The left panel displays the LaTeX source code for a journal article using the IEEEtran class. The right panel shows the generated PDF preview.

Source:

```
1 \documentclass[journal]{IEEEtran}
2 %\usepackage{cite}
3 %\usepackage{amsmath}
4 %\usepackage{amssymb}
5 %\usepackage{graphicx}
6 %\hyphenation{op-tical net-works semi-conduc-tor}
7
8 \begin{document}
9
10 \title[Bare Demo of IEEEtran.cls for Journals]
11
12 \author{Michael Shell,~\IEEEmembership{Member,~IEEE,}
13        and Jane Doe,~\IEEEmembership{Life Fellow,~IEEE}}
14        and Jane Doe,~\IEEEmembership{Life Fellow,~IEEE} % <this % stops a space
15 \thanks{M. Shell is with the Department
16        of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta,
17        GA 30332 USA (e-mail: [see e-mail address]). (see also \url{http://www.michaelshell.org/contact.html}). % <this % stops a space
18 \charname{.} Doe and J. Doe are with Anonymous University. % <this % stops a space
19 \charname{.} Manuscript received April 19, 2005; revised December 27, 2012.}
20
21 % The paper headers
22 \markright[Journal of \LaTeX Class Files, Vol. 11, No. 4, December 2012]{}
23 \renewcommand{\texttt}[1]{\texttt{\small #1}} % Bare demo case
24
25 % make the title area
26 \maketitle
27
28 \begin{abstract}
29 \TheAbstractGoesHere
30 \end{abstract}
31
32 % Note that keywords are not normally used for peerreview papers.
33 %\begin{keywords}
34 %  IEEEtran, journal, \LaTeX, paper, template.
35 %\end{keywords}
36
37 \IEEEpeerreviewmaketitle
38
39 \section{Introduction}
40
41 \IEEEstart{[This] demo file is intended to serve as a ``starter file''}
42 for IEEE journal papers produced under \LaTeX\ using
43 IEEEtran.cls version 1.8 and later.
44
45 I wish you the best of success.
46
47 \hfills
48
49 \hfills December 27, 2012
50
51 \subsection{subsection heading here}
52 subsection text here.
53
54
55 \subsubsection{Subsubsection Heading Here}
```

Preview:

JOURNAL OF L^AT_EX CLASS FILES, VOL. 11, NO. 4, DECEMBER 2012

Bare Demo of IEEEtran.cls for Journals

Michael Shell, Member, IEEE, John Doe, Fellow, OSA, and Jane Doe, Life Fellow, IEEE

Abstract—The abstract goes here.

Index Terms—IEEEtran, journal, L^AT_EX, paper, template.

I. INTRODUCTION

THIS demo file is intended to serve as a “starter file” for IEEE journal papers produced under L^AT_EX using IEEEtran.cls version 1.8 and later.

I wish you the best of success.

mds
December 27, 2012

A. Subsection Heading Here
Subsection text here.
1) Subsubsection Heading Here: Subsubsection text here.

II. CONCLUSION

The conclusion goes here.

APPENDIX A
PROOF OF THE FIRST ZONKLAR EQUATION
Appendix one text goes here.

APPENDIX B
Appendix two text goes here.

ACKNOWLEDGMENT

The authors would like to thank... [1]

REFERENCES

Elements – Text Formatting

\LaTeX has many text formatting options included by default that allow you to change text size, style and spacing.

This text is large

This text is tiny

```
{\Large This text is large} \\ {\tiny This text is tiny}
```

Sans Serif font

Teletype font

Italic

Small Capitals

Bold

Roman font

```
\textsf{Sans Serif font} \\ \texttt{Teletype font} \\ \textit{Italic} \\ \textsc{Small Capitals} \\ \textbf{Bold} \\ \textrm{Roman font}
```

We can *emphasise* a word in the sentence.

We can $\text{\emph{emphasise}}$ a word in the sentence.

Elements – Lists

\LaTeX provides three different environments for defining lists:

itemize For basic bulleted lists

enumerate For numbered lists

description For lists with a label for each item

itemize, enumerate, description

- ▶ the first item
- ▶ the second item
- ▶ the third item

```
\begin{itemize}
  \item the first item
  \item the second item
  \item the third item
\end{itemize}
```

1. the first item
2. the second item
3. the third item

```
\begin{enumerate}
  \item the first item
  \item the second item
  \item the third item
\end{enumerate}
```

- First the first item
Second the second item
Third the third item

```
\begin{description}
  \item[First] the first item
  \item[Second] the second
    item
  \item[Third] the third item
\end{description}
```

Elements – Tables

The `tabular` environment allows us to create tables within our `LATEX` documents.

Table Example:

```
\begin{tabular}{ | l || c || r | }
    \hline
    some text & some text & this text \\
    a text & other text & more text \\
    another text & some text & some other text \\
    \hline
\end{tabular}
```

some text	some text	this text
a text	other text	more text
another text	some text	some other text

Elements – Graphics, Images & Figures in L^AT_EX

Including graphics in our L^AT_EX document is relatively simple.

- ▶ Insertion

The `\includegraphics` command is used to insert an image file into your L^AT_EX document.

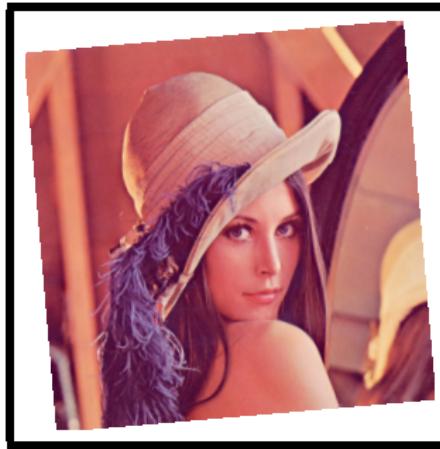
```
\includegraphics[opt1=val1, ..., ]{imagefile}
```

- ▶ Options

<code>width=xx</code>	Specify the preferred width of the image
<code>height=xx</code>	Specify the preferred height of the image
<code>scale=xx</code>	Scale the image by the given factor
<code>angle=xx</code>	Rotate the image by the given number of degrees
<code>page=x</code>	Select a particular page from a .pdf file

\includegraphics – example

```
\begin{center}
    \setlength\fboxrule{2pt}
    \fbox{\includegraphics[width=0.3\textwidth, angle=5]{img/background}}
\end{center}
```



Elements – Maths

Typesetting maths is one of the major strengths of \LaTeX , and one of the main reasons for its popularity within the scientific community.

The `amsmath` package is frequently used to add to the built in maths typesetting capabilities of \LaTeX – all the discussion here will assume it has been used.

Besides, there are many more packages that can be useful for this type of scientific work. Just some are: `IEEEtran``tools`, `mathtools`, `mchem`.

Maths Examples

Inline maths

Inline maths is displayed within our text, such as $a^3 + 6b$.

Inline maths is displayed within our text, such as \begin{math} a^3 + 6b \end{math}.

displaymath (without numbering)

Display maths is displayed separately from the text.

$$a^3 + 6b$$

Display maths is displayed separately from the text.
\begin{displaymath}
a^3 + 6b
\end{displaymath}

equation (with numbering)

Equation - separate, with numbering.

$$a^3 + 6b \quad (1)$$

Equation - separate, with numbering.
\begin{equation}
a^3 + 6b
\end{equation}

Special Documents

- ▶ Presentation
- ▶ Poster
- ▶ CV and cover letter
- ▶ Teaching stuff

John Smith
Curriculum Vitae

WORK EXPERIENCE

CURRENT, FROM JAN 2009

Trader at Enzo s.p.a., Milan
Physical Natural Gas Trading

Provided analysis of spreads, in particular time and location spreads, with emphasis on trading opportunities on the curve, also taking into account the availability of storage facilities. Became familiar with logistic implications of physical gas trading and developed knowledge of continental virtual hubs for gas exchange.

JULY 2008 – OCT 2008
1st year Analyst at LEHMAN BROTHERS, London
Commodities Structured Trading

Developed spreadsheets for risk analysis on exotic derivatives on a wide array of commodities (ags, oils, precious and base metals), managed blotter and secondary trades on structured zones, listed with Middle Office, Sales and Structuring for bookkeeping.

SUMMER 2007
Summer Intern at LEHMAN BROTHERS

Capital Markets

Received pre-placed offer from the Eastics Trading Desk as a result of my prior review. Rated "truly distinctive" for Analytical Skills and Teamwork.

CURRENT, FROM JAN 2009

Trader at Enzo s.p.a., Milan
Physical Natural Gas Trading

Provided analysis of spreads, in particular time and location spreads, with emphasis on trading opportunities on the curve, also taking into account the availability of storage facilities. Became familiar with logistic implications of physical gas trading and developed knowledge of continental virtual hubs for gas exchange.

JULY 2008 – OCT 2008
1st year Analyst at LEHMAN BROTHERS, London
Commodities Structured Trading

Developed spreadsheets for risk analysis on exotic derivatives on a wide array of commodities (ags, oils, precious and base metals), managed blotter and secondary trades on structured zones, listed with Middle Office, Sales and Structuring for bookkeeping.

EDUCATION

2011 - PRESENT Doctor of Philosophy
Computer Sciences
The University of California

2000 Master of Science
Computer Science
Computer Science
The University of California

2009 Postgraduate Diploma

Dissertation
COMPUTER SCIENCE

The University of California

2006 – 2008 Bachelor of Business Studies

COMMERCE
The University of California

2006 – 2008 Bachelor of Business Studies

COMMERCE
The University of California

2010 Faculty of Science Masters Scholarship
The University of California

2008 Top Achiever Award – Commerce
Business Association of California

COMPUTER SKILLS

Basic Knowledge JAVA, Adobe Illustrator

Intermediate Knowledge PYTHON, HTML, MySQL,

OpenOffice, Linux,

Microsoft Windows

Computer Hardware &

Support

COMMUNICATION SKILLS

CONFERENCES Oral Presentation at the California Computer Science Conference – 2010

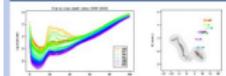
POSTERS Poster at the Annual Programming Conference in Oregon – 2009



Rob J Hyndman

Research publications (2008–2010)

Forecasting functional data



Hyndman, R. J. and D. Booth (2008). Stochastic processes forecasts using functional data models for mortality, fertility and migration. *International Journal of Forecasting* 24(4), 323–340.

Hyndman, R. J. and Y. L. Shang (2008). Forecasting functional time series. *Statistica Neerlandica* 62(1), 13–27. DOI: 10.1111/j.1467-9574.2007.00383.x

Shang, H. L. and R. J. Hyndman (2008). Nonparametric time series forecasting using local linear regression: density estimation, bandwidth selection, local likelihood and local Bayesian methods. *Computational Statistics & Data Analysis* 52(11), 3729–3738.

Ehna, B., M. Akram, D. M. Gang, D. English, J. L. Hoppe, A. M. Kangangi, and R. J. Hyndman (2010). Using functional data analysis and time series methods to predict rates of specific breast cancer mortality for the United States and England/Wales. *Journal of Epidemiology* 20(2), 155–165.

Hyndman, R. J. and I. Shang (2008). Robust point, envelope and band forecasts for the exponential smoothing state space model. *Journal of Computational & Graphical Statistics* 19(1), 28–40.

Tourism forecasting

Athanasopoulos, G. and R. J. Hyndman (2004). Modelling and forecasting Australian domestic tourism. *Tourism management* 25(1), 19–31.

Athanasopoulos, G., R. A. Ahmed, and R. J. Hyndman (2009). Hierarchical forecasts for Australian domestic tourism. *International Journal of Forecasting* 25(1), 146–160.

Other time series & forecasting

Hyndman, R. J. and V. Shahzad (2009). Automatic time series forecasting: the forecast package for R. *Journal of Statistical Software* 36(3).

Magnusson, L., J. W. Boland, and R. J. Hyndman (2008). Generation of synthetic sequences of highly temporally correlated time series. *Computometrics* 10(1), 1–16.

Wang, X. K. A., S. Mathas, and R. J. Hyndman (2009). Rule induction for forecasting method selection: meta learning the characteristics of ensemble time series. *Neurocomputing* 72, 2070–2076.

Verbeek, J. R. J., R. J. Hyndman, G. Nisenbaum, and D. S. Sosik (2010). Detecting and summarising changes in satellite imagery. *Remote Sensing of Environment* 114(1), 106–115.



Exponential smoothing



Hyndman, R. J., A. B. Koehler, R. D. Snyder, and R. D. Grose (2002). Forecasting with exponential smoothing: the state space approach. Berlin: Springer-Verlag.
www.exponentialsmoothing.net.

Gould, P., A. B. Koehler, F. Valderrama, R. D. Snyder, J. K. Ord, and R. J. Hyndman (2008). Forecasting time series with multiple seasonal patterns. *European Journal of Operational Research* 193(1), 205–220.

Hyndman, R. J., M. A. Akram, and B. C. Athabula (2008). The admissible parameter space for exponential smoothing methods. *Advances in Statistical Mathematics* 2008, 401–406.

Ahmed, M. R., R. J. Hyndman, and J. K. Ord (2008). Exponential smoothing and non-negative data. *Australian & New Zealand Journal of Statistics* 49(4), 415–432.

Ord, J. K., A. B. Koehler, R. D. Snyder, and R. J. Hyndman (2009). A multivariate innovation state space Bayesian model. *International Journal of Forecasting* 25(2), 533–535.

de Silva, A., R. J. Hyndman, and R. D. Snyder (2010). A sector innovations structural time series framework: a simple approach to multivariate forecasting. *Statistical modelling to appear*.

Electricity demand forecasting



Hyndman, R. J. and S. Fan (2008). Density forecasting for long-term electricity demand. *IEEE Transactions on Power Systems* to appear.

Other applied statistics

Vlahogi, I., P. Faloutsos, D. Carter, J. Pol, R. J. Hyndman, and K. Southgate (2010). Forecasting of inventory decision process optimisation using a multiobjective PSO and multiresponse MARS modeling. In: Proceedings 2010 IEEE congress on evolutionary computation, July 2010, Barcelona, Spain.

Questions?

