

Week 4 - L^AT_EX Configuration & Usage

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Week 4's seminar is partly based on Week00 of ToolsSeminar held in PKU.

1 Installation and configuration

For T_EX distribution, T_EX Live is an official comprehensive TeX distribution system, which provides system-specific supports.

For Windows and Linux, reading through installing T_EX Live over the Internet is recommended. A (non-necessary) introduction to T_EX Live on Windows is provided here. If you are going to install T_EX Live on Linux, please read this page first, which gives detailed guidance. Installing on your home directory (`/home/someone/texlive/2017` to be exact) instead of default `/usr/local/texlive/2017` is recommended in case of authority issues.

For macOS, please install MacTeX, which is specially adapted to macOS and includes T_EX Live.

Installation information can also be found in *L^AT_EX 入门*.

Note that there are also alternatives for installation, like CTeX, which is a suite specialized to Chinese and can be downloaded here. However, CTeX is somehow out-of-date now and has no advantages due to the development of XeTeX and LuaTeX. PdfTeX, XeTeX, and LuaTeX are the most widely used L^AT_EX engines, which have all been integrated into T_EX Live. The differences between them can be found in *The TeX family tree: LaTeX, pdfTeX, XeTeX, LuaTeX and ConTeXt*.

VS Code has a L^AT_EX extension called LaTeX Workshop, which is extremely powerful with lots of functions like different engines support, side view of PDF file, and snippet panel. Sublime Text also has L^AT_EX support by LaTeXTools package.

If you do not want to install L^AT_EX distributions on your computer, you can use online L^AT_EX editors like Overleaf and ShareLaTeX¹, which are very useful when you write papers or experimental reports with others. The main drawback is that their servers are mostly abroad, which leads to frequent network breakdown. Moreover, Overleaf only supports two people collaboration if you use the free version.

¹ShareLaTeX has been merged with Overleaf and becomes Overleaf v2. Our server installed the open-sourced ShareLaTeX, and you can register from the webpage.

2 Introductions and Tutorials

The book *L^AT_EX 入门* is a useful book for anyone using L^AT_EX. Not only is the book a complete tutorial, but it also works as an index to frequently used packages. Only chapter 1 is suggested for the first reading, while other chapters, which are filled with details, may be used as a manual.

The Wikibook *L^AT_EX* is featured on Wikibooks, providing a brief introduction to L^AT_EX. Overleaf's *Learn L^AT_EX in 30 Minutes* also gives basic usage of L^AT_EX, and its main page can be used for manual and guidance. 一份其实很短的 L^AT_EX 入门文档 is a very easy-to-understand tutorial of L^AT_EX in Chinese.

Note that T_EX Live itself includes a documentation system, which can be accessed by the command `texdoc <name>`.

The famous *The not so Short Introduction to L^AT_EX* is an introduction of moderate length. There is also a Chinese translation. It can be directly accessed by `texdoc lshort` and `texdoc lshort-chinese`.

By utilizing `texdoc`, one may access the document of packages and document classes. For example, executing `texdoc ctex` on a terminal, the documentation of the package `ctex` shows up.

Some other important reference can be accessed by `texdoc`. *The Comprehensive L^AT_EX Symbol List* can be accessed by `texdoc comprehensive`, which lists many symbols. *Summary of Mathematical Symbols available in L^AT_EX* can be accessed by `texdoc symbols`, which is a compact summary of L^AT_EX symbols. Further information of T_EX Live can be found by `texdoc texlive`.

For websites, TeX StackExchange is a community for T_EX and L^AT_EX users, which is very helpful for hard T_EX and L^AT_EX questions and practical tricks. Zhihu also has lots of topics on L^AT_EX, and the author of *L^AT_EX 入门* is active on it.

3 Packages and Templates

TeXLive has pre-installed most of the packages you need to use, so you only need to include them by `\usepackage{...}` in the preamble part. For templates, you can find a lot on . Or you can download the L^AT_EX templates designed by me for daily note, slide, and class reports usage. You can also find these templates in `TeXTemplate` of the seminar folder.

Once you download others' templates (`.cls` or `.sty`), you can put them in the current folder with your document and directly include them, or you can put them in the `texmf` folder to make them work globally (refer to this page).

Beamer is the document class for making slides, you can refer to Overleaf's tutorial for more details. Default themes can be found in Beamer theme gallery and Beamer theme matrix. For

beamer templates, you can find here.

The commonly used packages are listed in the slide. For most of the packages, you can find their manuals and documentation on CTan. If you don't know how to format some paragraphs with specific styles, use Google to search for that.

4 Other Useful Things

If you carefully configure L^AT_EX environment and define macros, you can definitely use L^AT_EX to take notes at school. As an example, you can see the math notes taken by me, which are all in L^AT_EX format. About how to take L^AT_EX notes quickly, you can see this blog, the author of which use L^AT_EX and Vim to take more than 1700 pages of notes on his math courses.

Apart from the snippet panel provided by VS Code's extension, another quick page searching math functions can be found here. Once you use them frequently, you will easily remember their abbreviations and write L^AT_EX documents much faster.

Some Optical Character Recognition (OCR) techniques are used to free programmers from tedious L^AT_EX formula typing, including Mathpix and Detexify. Also, Mathematica supports direct translation from Wolfram formulas to L^AT_EX commands.

Tables Generator and Excel2LaTeX (online, macro) are used for generating tables from Excels to L^AT_EX quickly. But these tools both cannot handle complex tables with lots of merged units.

Markdown inherently supports L^AT_EX if the website has included the script of KaTeX or MathJax. You can write L^AT_EX symbols in Markdown as if in L^AT_EX editors. Inline formulas are enclosed by $\$ \dots \$$, while $\$\$ \dots \$\$$ is used for displayed ones.

Last but not least, when you are writing L^AT_EX in Chinese or English, there are lots of specifications you need to pay attention to, which can be referred by *L^AT_EX Style Guide for EE 364B*, *AMS Style Guide*, and this article in Chinese.

5 Assignment

In this week's assignment, you need to use L^AT_EX to generate two documents, one for Chinese notes, and another for English academic paper. Once you finished, the source `tex` files and the generated `pdf` files should all be pushed to Github.

5.1 Chinese Notes

You need to start from scratch and generate the note shown below, which consists of two questions and answers extracted from your math books. The pdf file is attached in `Assignments/LaTeX/exe_ch.pdf`.

数学分析与线性代数例题

佚名

2019 年 12 月 6 日

目录

1 微分中值定理及其应用

2 行列式

1 微分中值定理及其应用

定理 1 (极值的第二充分条件). 设 $f(x)$ 在 $(x_0 - \delta, x_0 + \delta)$ 可导且 $f'(x_0) = 0$, 又 $f''(x_0)$ 存在.

1) 若 $f''(x_0) < 0$, 则 $f(x_0)$ 是严格极大值;

2) 若 $f''(x_0) > 0$, 则 $f(x_0)$ 是严格极小值.

例 1. 求 $y = \frac{1}{3}x\sqrt[3]{(x-5)^2}$ 的极值点与极值¹.

解. 函数在 $(-\infty, +\infty)$ 上连续, 当 $x \neq 5$ 时有

$$y' = \frac{1}{3} \left((x-5)^{\frac{2}{3}} + \frac{2x}{3}(x-5)^{-\frac{1}{3}} \right) = \frac{5(x-3)}{9(x-5)^{1/3}}. \quad (1)$$

令 $y' = 0$ 得稳定点 $x = 3$, 现列表如下:

x	$(-\infty, 3)$	3	$(3, 5)$	5	$(5, +\infty)$
y'	+	0	-	不存在	+
y	\nearrow	$\sqrt[3]{4}$	\searrow	0	\nearrow

从表中可见 $x = 3$ 是极大值点, 极大值为 $f(3) = \sqrt[3]{4}$; $x = 5$ 为极小值点, 极小值为 $f(5) = 0$. 我们可以大致地画出函数的图形, 如图 1 所示.

¹ 原题摘自《数学分析简明教程》(上册) P142.

You should make your generated contents *as similar as* those in `exe_ch.pdf`. Some hints:

1. Use `\documentclass[UTF8,11pt]{ctexart}`.
2. Include the following packages:

- `amsthm` for theorem environment.
 - `amsfonts` for bold math symbols.
 - `amsmath` for matrix environment.
 - `graphicx` for figure environment.
 - `geometry` for page size, and put `\geometry{scale=0.8}` in preamble.
3. Insert whitespaces between Chinese and formulas, but no spaces between Chinese and punctuation marks are needed.
 4. Even in Chinese article, you should use `.` as period.
 5. Use sth. like `\ref{fig:1}` to cross reference (including figures, equations, and tables). Avoid directly writing 图 1.
 6. Figures commonly use `[htbp]` to align, meaning try putting `here` first, then `top`, `bottom`, and next `page`. For more about alignment of floating environments, you can refer to MIT FigTab or TeX Stackexchange.
 7. If the equations have numbering at the right, use `equation` environment. Otherwise, you can directly use `\[...\]` for display.
 8. Commonly, vectors use bold notation like \mathbf{x} (`\mathbf{...}`) and sets use blackboard bold typeface like \mathbb{R} (`\mathbb{...}`). Math operations are in straight font like \log (`\log`) not *log* (`\log`) in Italic font.
 9. Using `\left(...\right)` can make the parenthesis larger.
 10. The figure needed inserting is provided in `Assignments/LaTeX/fig/function.pdf`.
 11. Be careful about whether the symbols are in displayed mode.
 12. If you do not know how to type some specific symbols, please find here.

5.2 English Academic Paper

You need to use the ACM conference template to generate a short academic paper shown below. The pdf file is attached in `Assignments/LaTeX/exe_en.pdf`.

Some hints:

1. The template file `acmart.cls` is provided, or you can directly use `\documentclass[sigconf]{acmart}` if you have installed the TeXLive distribution.
2. `sample-sigconf.tex` is an official sample provided by ACM. You can follow this sample to generate the corresponding pdf.

A Short English Academic Paper

Your Name
Your Affiliation
your.name@email.com

ABSTRACT

This article illustrates the common usage of L^AT_EX commands for English academic papers. ACM conference format is used to style the document.

ACM Reference format:

Your Name. 2019. A Short English Academic Paper. In *Proceedings of ACM Conference*, Washington, DC, USA, July 2017 (Conference '17), 1 pages. <https://doi.org/10.1145/nmmmmn.mmmmm>

1 INTRODUCTION

This is the Introduction part. Be careful of the indentation of English articles. The sentence following the section title has no indentation. See! There is an indentation from the second paragraph.

2 RELATED WORKS

Once you mention others' methods, conclusions, experiments, etc., you should cite their works. For example, AI [1–4] and graph [5–8] are two hot topics nowadays.

3 BACKGROUND

Here gives the background.

4 METHODOLOGIES

Commonly, we use *italic* fonts instead of **bold** fonts to emphasize something in English articles.

4.1 Methodology 1

We do not directly list source codes in the paper, but use pseudocode like Alg. 1 to demonstrate our algorithms.

Algorithm 1 Count # of ones

```
Require: array  $a$ , size  $n$ 
1: Initialize  $cnt = 0$ 
2: for  $i = 0$  to  $n - 1$  do
3:   if  $a[i]$  is 1 then
4:      $cnt \leftarrow cnt + 1$ 
5:   end if
6: end for
7: return  $cnt$ 
```

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<https://doi.org/10.1145/nmmmmn.mmmmm>

4.2 Methodology 2

More methodologies here.

5 EXPERIMENTS

This section firstly introduces the experimental settings and then presents the experimental results.

5.1 Experimental Settings

We use the `acmart` L^AT_EX template to format this article.

5.2 Experimental Results

Some experimental results are shown in Table 1.

Table 1: A table example

Col 1	Col 2	Col 3
Line 1		

6 CONCLUSIONS

This article gives a basic structure of English academic paper and the usage of `acmart` template.

ACKNOWLEDGEMENT

This section can be omitted. But you should make sure the contents have filled the whole pages.

REFERENCES

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3. `algorithm` and `algorithmic` packages are used for generating pseudocode. Their usage can be found in Overleaf or Wikibooks.
4. Use your `bib` file in Week 2 to generate cites and references, and the `bibliographystyle` should be set to `unsrt` making sure the cites are in order.
5. Your `bib` file should at least include `title`, `booktitle`, `author`, and `year` keys for each item. And all these items should use `@inproceedings` format. Otherwise, your generated file will be different from the provided pdf.
6. All the citations and reference of tables, algorithms, figures, etc., should use cross reference, i.e. `\cite{...}` and `\ref{...}`.