

Hands on Buzzers: An Empirical Study of LLM Math Reasoning Ability Under Resource Constraints

Anonymous ACL submission

Abstract

This document is a supplement to the general instructions for *ACL authors. It contains instructions for using the \LaTeX style files for ACL conferences. The document itself conforms to its own specifications, and is therefore an example of what your manuscript should look like. These instructions should be used both for papers submitted for review and for final versions of accepted papers.

1 Introduction

LLMs are getting more and more powerful. And they are also a powerful tool for solving math problems.

CoT, prompt engineering, and few-shot learning are the most popular methods to improve LLM math reasoning.

In the last few months, we have seen a lot of progress in the performance of LLM reasoning ability, especially test time scaling, which improves the performance of LLM reasoning through spending more computing time and resource, such as sequential multiple CoT and parallel CoT and then verification.

However, under resource constraints, the performance of LLM math reasoning is limited. In real life, we cannot always spend unlimited computing time and resource to solve a math problem. For example, in autonomous driving, the car needs to make a decision in real time.

2 Related Work

3 Methodology

Which prompts are chosen?

Which models are chosen?

Which datasets are chosen?

How to crop CoT and let LLMs conduct inference?

4 Evaluation

Here we should analyze our experiment results and list several findings.

- there is quite room for time-constrained reasoning for released models
- different sizes within the same model series
- whether fine tuning using o1-like method can help when under resource constraints
- whether math domain specific models can help when under resource constraints
- whether prompt engineering can help when under resource constraints
- there is no snake oil for any model on any device

5 Introduction

These instructions are for authors submitting papers to *ACL conferences using \LaTeX . They are not self-contained. All authors must follow the general instructions for *ACL proceedings,¹ and this document contains additional instructions for the \LaTeX style files.

The templates include the \LaTeX source of this document (`acl_latex.tex`), the \LaTeX style file used to format it (`acl.sty`), an ACL bibliography style (`acl_natbib.bst`), an example bibliography (`custom.bib`), and the bibliography for the ACL Anthology (`anthology.bib`).

6 Engines

To produce a PDF file, pdf \LaTeX is strongly recommended (over original \LaTeX plus `dvips+ps2pdf` or `dvipdf`). Xe \LaTeX also produces PDF files, and is especially suitable for text in non-Latin scripts.

¹<http://acl-org.github.io/ACLPUb/formatting.html>

070 **7 Preamble**

071 The first line of the file must be

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

073 To load the style file in the review version:

074 `\usepackage[review]{acl}`

075 For the final version, omit the review option:

076 `\usepackage{acl}`

077 To use Times Roman, put the following in the
078 preamble:

079 `\usepackage{times}`

080 (Alternatives like txfonts or newtx are also accept-
081 able.)

082 Please see the L^AT_EX source of this document for
083 comments on other packages that may be useful.

084 Set the title and author using `\title` and
085 `\author`. Within the author list, format multiple
086 authors using `\and` and `\And` and `\AND`; please see
087 the L^AT_EX source for examples.

088 By default, the box containing the title and au-
089 thor names is set to the minimum of 5 cm. If
090 you need more space, include the following in the
091 preamble:

092 `\setlength\titlebox{<dim>}`

093 where <dim> is replaced with a length. Do not set
094 this length smaller than 5 cm.

095 **8 Document Body**

096 **8.1 Footnotes**

097 Footnotes are inserted with the `\footnote` com-
098 mand.²

099 **8.2 Tables and figures**

100 See Table 1 for an example of a table and its caption.
101 **Do not override the default caption sizes.**

102 As much as possible, fonts in figures should
103 conform to the document fonts. See Figure 1 for
104 an example of a figure and its caption.

105 Using the `graphicx` package `graphics` files
106 can be included within figure environment at
107 an appropriate point within the text. The
108 `graphicx` package supports various optional ar-
109 guments to control the appearance of the fig-
110 ure. You must include it explicitly in the
111 L^AT_EX preamble (after the `\documentclass` de-
112 clarations and before `\begin{document}`) using
113 `\usepackage{graphicx}`.

²This is a footnote.

Command	Output	Command	Output
<code>{\`a}</code>	ä	<code>{\c c}</code>	ç
<code>{\^e}</code>	ê	<code>{\u g}</code>	ğ
<code>{\`i}</code>	ì	<code>{\l}</code>	ł
<code>{\.I}</code>	İ	<code>{\~n}</code>	ñ
<code>{\o}</code>	ø	<code>{\H o}</code>	ő
<code>{\'u}</code>	ú	<code>{\v r}</code>	ř
<code>{\aa}</code>	å	<code>{\ss}</code>	ß

Table 1: Example commands for accented characters, to be used in, e.g., Bib_TE_X entries.

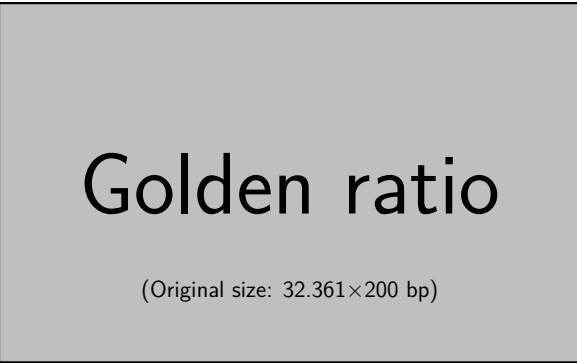


Figure 1: A figure with a caption that runs for more than one line. Example image is usually available through the `mwe` package without even mentioning it in the preamble.

114 **8.3 Hyperlinks**

115 Users of older versions of L^AT_EX may encounter the
116 following error during compilation:

117 `\pdfendlink ended up in different nest-`
118 `ing level than \pdfstartlink.`

119 This happens when pdf_LA_TE_X is used and a citation
120 splits across a page boundary. The best way to fix
121 this is to upgrade L^AT_EX to 2018-12-01 or later.

122 **8.4 Citations**

123 Table 2 shows the syntax supported by the style
124 files. We encourage you to use the natbib styles.
125 You can use the command `\citete` (cite in text)
126 to get “author (year)” citations, like this citation
127 to a paper by Gusfield (1997). You can use the
128 command `\citep` (cite in parentheses) to get “(au-
129 thor, year)” citations (Gusfield, 1997). You can use
130 the command `\citealp` (alternative cite without
131 parentheses) to get “author, year” citations, which
132 is useful for using citations within parentheses (e.g.
133 Gusfield, 1997).

134 A possessive citation can be made with the com-
135 mand `\citeposs`. This is not a standard natbib

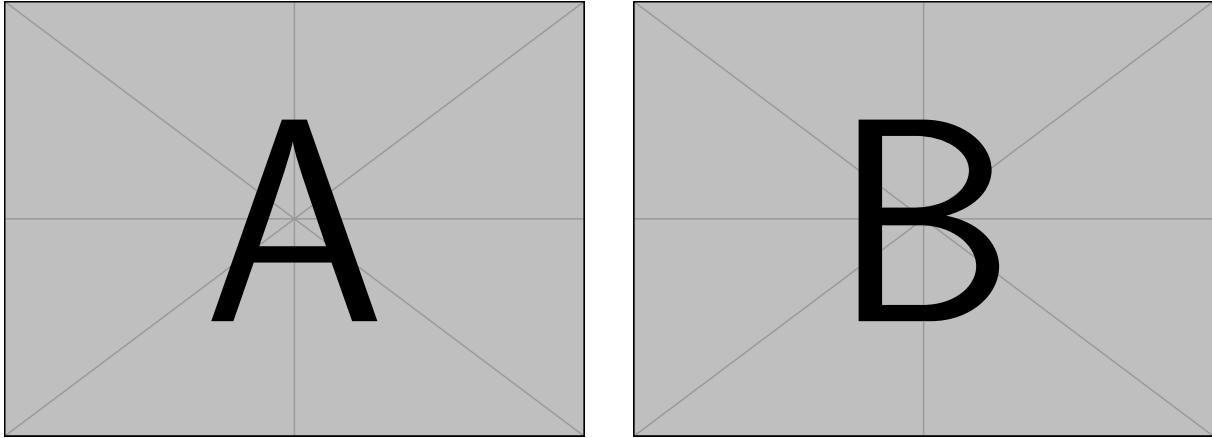


Figure 2: A minimal working example to demonstrate how to place two images side-by-side.

Output	natbib command	ACL only command
(Gusfield, 1997)	<code>\citep</code>	
Gusfield, 1997	<code>\citealp</code>	
Gusfield (1997)	<code>\citet</code>	
(1997)	<code>\citeyearpar</code>	
Gusfield’s (1997)		<code>\citeposs</code>

Table 2: Citation commands supported by the style file. The style is based on the natbib package and supports all natbib citation commands. It also supports commands defined in previous ACL style files for compatibility.

command, so it is generally not compatible with other style files.

8.5 References

The L^AT_EX and BibT_EX style files provided roughly follow the American Psychological Association format. If your own bib file is named custom.bib, then placing the following before any appendices in your L^AT_EX file will generate the references section for you:

```
\bibliography{custom}
```

You can obtain the complete ACL Anthology as a BibT_EX file from <https://aclweb.org/anthology/anthology.bib.gz>. To include both the Anthology and your own .bib file, use the following instead of the above.

```
\bibliography{anthology,custom}
```

Please see Section 9 for information on preparing BibT_EX files.

8.6 Equations

An example equation is shown below:

$$A = \pi r^2 \quad (1)$$

Labels for equation numbers, sections, subsections, figures and tables are all defined with the `\label{label}` command and cross references to them are made with the `\ref{label}` command.

This an example cross-reference to Equation 1.

8.7 Appendices

Use `\appendix` before any appendix section to switch the section numbering over to letters. See Appendix A for an example.

9 BibT_EX Files

Unicode cannot be used in BibT_EX entries, and some ways of typing special characters can disrupt BibT_EX’s alphabetization. The recommended way of typing special characters is shown in Table 1.

Please ensure that BibT_EX records contain DOIs or URLs when possible, and for all the ACL materials that you reference. Use the doi field for DOIs and the url field for URLs. If a BibT_EX entry has a URL or DOI field, the paper title in the references section will appear as a hyperlink to the paper, using the hyperref L^AT_EX package.

Limitations

Since December 2023, a "Limitations" section has been required for all papers submitted to ACL

Rolling Review (ARR). This section should be placed at the end of the paper, before the references. The "Limitations" section (along with, optionally, a section for ethical considerations) may be up to one page and will not count toward the final page limit. Note that these files may be used by venues that do not rely on ARR so it is recommended to verify the requirement of a "Limitations" section and other criteria with the venue in question.

Acknowledgments

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References

- Rie Kubota Ando and Tong Zhang. 2005. A framework for learning predictive structures from multiple tasks and unlabeled data. *Journal of Machine Learning Research*, 6:1817–1853.
- Galen Andrew and Jianfeng Gao. 2007. Scalable training of L1-regularized log-linear models. In *Proceedings of the 24th International Conference on Machine Learning*, pages 33–40.
- Dan Gusfield. 1997. *Algorithms on Strings, Trees and Sequences*. Cambridge University Press, Cambridge, UK.
- Mohammad Sadegh Rasooli and Joel R. Tetreault. 2015. *Yara parser: A fast and accurate dependency parser*. *Computing Research Repository*, arXiv:1503.06733. Version 2.

A Example Appendix

This is an appendix.