LaTeX Template for Papers of Project Module in THWS.MAI Program

Anonymous Author(s)

Abstract

This paper is a sample LaTeX document to be reused by students of the Master's in Artificial Intelligence of the THWS in preparing their final papers for the Project Module. The document covers the commonly employed parts and elements of a scientific paper and instructions how to correctly include them. There are, however, many more features in the LaTeX typesetting system than can be used when writing a paper and students are expected to explore these on their own and employ these as appropriate.

Code: http://github.com/gitname/wonderful-repo

1 Introduction

One part of the Project Module evaluation is a paper describing the results of the student's project. The paper shall be written in LaTeX to ensure high typesetting quality, correct formatting of mathematical symbols and formulas, and cross-platform compatibility. This document provides the template for the papers that students shall use when writing the papers.

This LaTeX template fixes the basic formatting requirements for the paper such as fonts, sizes, margins, spacing and the double-column format so that you do not have to worry about those. As an author you only need to follow a few basic rules explained here below and ensure that the paper does not exceed **four pages**. Acknowledgments and references do not count into this limit and can be on the fifth page. The **four pages** is a hard constraint, make sure you do not go over!

2 Title Information

The title of your work should use capital letters appropriately - https://capitalizemytitle.com/ has useful rules for capitalization. Use the `title` command to define the title of your work. Do not insert line breaks in your title.

If your title is lengthy, you must define a short version to be used in the page headers, to prevent overlapping text. The `title` command has a "short title" parameter:

```
\title[short title]{full title}
```

3 Authors and Acknowledgements

We use anonymised submissions for review, so do not include author names in your initial submission. Author names and supervisors shall be added directly in the submission system and will not be visible to the reviewers. In the submission system you shall also provide a brief description of the contribution of each author to the project and paper.

4 Generative AI and LLM

Use of generative AI tools such as large language models (LLMs) is becoming increasingly common in scientific writing and research. Authors are welcome to use any tools that can improve the quality of their work, provided that they adhere to two basic principles: authors clearly document their methodology including the use of such tools to promote scientific rigour and transparency, and authors take full responsibility for the content and the quality of their work. AI and LLMs are not eligible for authorship. Instead any use of such tools should be described in the appropriate sections of the paper, e.g. in the Experiments section if the tool was used to generate data, or for LLM-based evaluation. Use for spellchecking, grammar correction or basic programming assistance does not need to be mentioned.

5 The *Body* of The Paper

Typically, the body of a paper is organized into a hierarchical structure, with numbered or unnumbered headings for sections, subsections, sub-subsections, and possibly even smaller sections. The command `\section{}` that precedes this paragraph is part of such a hierarchy. By using the appropriate sectioning commands, you make LaTeX handle the numbering and placement of the headings for you. If you want a sub-subsection or smaller part to be unnumbered in your output, simply append an asterisk to the command name. Examples of both numbered and unnumbered headings will appear throughout this sample document.[1]

Since the entire article is contained in the **document** environment, you can indicate the start of a new paragraph with a blank line in your input file; that is why this sentence forms a separate paragraph.

5.1 Type Changes and *Special* Characters

We have already seen several typeface changes in this sample. You can indicate *italicized* words or phrases in your text with the command `\emph{}` or `\textit{}`, **boldface** text with the command `\textbf{}`, and `typewriter-style text` (e.g., for program code) with `\texttt{}`. Remember, however, that you do not have to indicate typestyle changes when such changes are part of the *structural* elements of your article; for instance, the heading of this subsection will be in boldface, but that is handled by LaTeX itself.

You can use whatever symbols, accented characters, or non-English characters you need anywhere in your document.[2] You can find a complete list of what is available in the *LaTeX User's Guide* [5].

5.2 Math Equations

You may want to display math equations in three distinct styles: inline, numbered display, or non-numbered display. Each of these styles is discussed in the next sections.

5.2.1 Inline (In-text) Equations. A formula that appears in the running text is called an inline or in-text formula. It is produced by the

[1] This is a footnote. It adds nothing in terms of content. It is meant to give you an idea of how footnotes look and work. It is a wordy footnote, so you can see how a longish one plays out.

[2] Th is a second footnote. Let's make it rather short to see how it looks.

math environment, which can be invoked with the usual `\begin{}`–`\end{}` construct or with the short form **$**. . .**$**. You can use any of the symbols and structures, from α to ω, available in LaTeX [5].

The inline style is not completely equivalent to the display style. For example, as we will see in the next section, the inline equation $\lim_{x\to\infty} \frac{1}{x} = 0$ looks slightly different when set in the display style.

5.2.2 Display Equations. A numbered display equation — one set off by a vertical space from the text and centered horizontally — is produced by the **equation** environment. An unnumbered display equation is produced by the **displaymath** environment.

Again, in either environment, you can use any of the symbols and constructs available in LaTeX; this section will just give a couple of examples of display equations. First, consider the equation shown as an inline equation above:

$$\lim_{x\to\infty} \frac{1}{x} = 0. \tag{1}$$

Notice that it is formatted somewhat differently in the **displaymath** environment. Now, let us enter an unnumbered equation

$$\sum_{i=1}^{\infty} \frac{1}{x^2} = \frac{\pi^2}{6}$$

followed by another numbered equation:

$$\int_0^{\pi/2} \cos x\, dx = \sin x \Big|_0^{\pi/2} = \sin \frac{\pi}{2} - \sin 0 = 1. \tag{2}$$

Next you will see an example of an unnumbered equation that is not set in the **displaymath** environment but in short form defined with **$$**. . .**$$**. When $a \neq 0$, there are two solutions to $ax^2+bx+c = 0$, and they are

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Here is an example of referencing an equation. Equation (3) shows how to write cases in LaTeX.

$$\mathrm{nr}(G_i, r) = \begin{cases} 1 & \text{if } r \text{ is played by one member of } G_i; \\ -2 & \text{if } r \text{ is not played in } G_i; \\ -p & \text{if } r \text{ is played by } p \text{ members in } G_i. \end{cases} \tag{3}$$

5.2.3 Long equations. When an equation is too long for a single column, use the **aligned** environment within the **equation** environment. To align the equation inside the **aligned** environment, use the symbol **&** as seen in Equation 4.

$$\begin{aligned} O_{\max} = w_1 \sum_{a=1}^{m} \sum_{b=a+1}^{n} (-|\mathrm{CPT}_a - \mathrm{CPT}_b|) \\ + w_2 \sum_{j=1}^{m} (\mathrm{DIF}_j) + w_3 \sum_{j=1}^{m} (\mathrm{INT}_j / \sum_{x=1}^{n} x_{ij}) \end{aligned} \tag{4}$$

5.3 Citations

Citations to articles [1, 4, 6], conference proceedings [2, 8], or books [3, 5, 7] listed in the Bibliography section of your article will probably occur throughout your text. You should use `bibtex` to produce this bibliography automatically; you simply have to insert one of several available citation commands with the key of the item cited at the proper location in the `.tex` file [5]. The key is a short reference that you invent to identify each work uniquely; in this sample document, the key is the first author's surname and a word from the title. This identifying key is included with each item in the `.bib` file for your article.

The details of how to create the `.bib` file are beyond the scope of this sample document. More information can be found in the *Author's Guide*; for exhaustive details, see the *LaTeX User's Guide* [5].

This article employs only the plainest form of citation, the one produced with the `cite{}` command. This is, in fact, the only citation style recommended by the ACM.

5.4 Tables

Since a table cannot be split across pages, we typically place it at the top of the page, close to its initial reference. To achieve a proper "floating" placement of tables, use the environment **table** to enclose the table's contents and caption. The contents of the table itself have to be put inside the **tabular** environment, which ensures a suitable alignment of rows and columns. Again, detailed instructions on **tabular** material can be found in the *LaTeX User's Guide*.

Immediately following this sentence is the point at which Table 1 is included in the input file; compare the placement of the table here with the table in the PDF output of this document.

Table 1: Frequency of Special Characters.

Non-English or Math	Frequency	Comments
Ø	1 in 1,000	Swedish names
π	1 in 5	In math
$	4 in 5	In business
Ψ_1^2	1 in 40,000	Unexplained

To set a wider table (one that takes up the whole width of the page's live area), use the environment **table***. As with a single-column table, this wide table will "float" to a location deemed more desirable. Immediately following this sentence is the point at which Table 2 is included in the input file; again, it is instructive to compare the placement of the table here with the table in the PDF output of this document.

5.5 Figures

Like tables, figures cannot be split across pages; the best placement for them is typically the top or the bottom of the page, close to their initial reference[3]. To ensure a proper "floating" placement of figures, use the environment **figure** to enclose the figure and its caption.

Figure 1 displays an image in the PDF format. Figure 2 shows a PNG image.

As with tables, you may sometimes want a figure to span over two columns. To achieve this, while still ensuring a proper "floating" placement, use the environment **figure***. An example can be seen in Figure 3.

[3]The fourth, and last, footnote.

Table 2: Some Typical Commands.

Command	A Number	Comments
`\imagespath`	200	To provide the directory of included images
`\table`	300	For tables
`\table*`	400	For wider tables

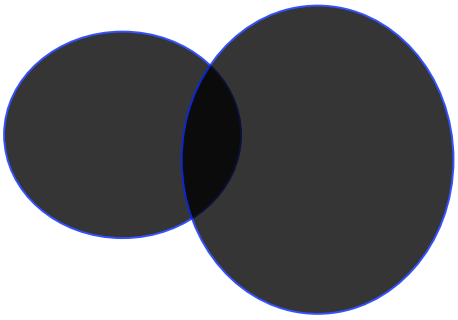

Figure 1: A sample circles graphic (PDF format).

Figure 2: A sample star graphic (PNG format).

5.6 Lists

In some cases, you might want to present your ideas using lists. Lists are created with the **itemize** environment. In the next example, you can see how lists are created and used:

- First item,
- second item, and
- third item.

Sometimes, authors want to reference certain list items in the subsequent text. For that purpose, you can use the **enumerate** environment. Following is an example of a numbered list:

(1) First point,
(2) second point,
(3) ...

Item 2 tells us what to do once we check off the preceding item.

5.7 Algorithms

To display algorithms in your document, employ the **algorithm** environment. Algorithms can be referenced in the same way as tables and figures (e.g., Algorithm 1).

Data: this text
Result: how to write an algorithm with LaTeX
1 initialization;
`/* this is a comment to tell you that we will now really start the code */`
2 **while** *not at end of this document* **do**
3 read the current section;
4 **if** *understand* **then**
5 go to the next section;
6 this section becomes the current section;
7 **else**
8 go back to the beginning of the current section;
9 **end**
10 **end**

Algorithm 1: How to write algorithms.

You can reference any line of your algorithm: an example of the while loop can be seen in line 2. For more details on the **algorithm** environment, see the http://tug.ctan.org/macros/latex/contrib/algorithm2e/doc/algorithm2e.pdf document. It is recommended to link the full code repository in the `Code` line at the beginning of the paper.

6 Conclusions

This paragraph will end the body of this sample document. There are two more things that follow: the bibliography and appendices. The bibliography list is produced automatically using the `bibtex` command from the `.bib` file and the citations in your text. You can use the appendices for additional material which does not belong or fit the main text. To conclude, let us make a disclaimer regarding the bibliography in this sample paper: with the exception of the reference to the LaTeX book, the citations in this paper refer to works that have nothing to do with the present subject and are used as examples only.

References

[1] Johannes Braams. 1991. Babel, a Multilingual Style-Option System for Use with LaTeX's Standard Document Styles. *TUGboat* 12, 2 (June 1991), 291–301.
[2] Malcolm Clark. 1991. Post Congress Tristesse. In *TeX90 Conference Proceedings*. TeX Users Group, 84–89.
[3] Iztok Fister, Iztok Fister Jr, and Dušan Fister. 2019. *Computational intelligence in sports*. Springer.
[4] Maurice Herlihy. 1993. A Methodology for Implementing Highly Concurrent Data Objects. *ACM Trans. Program. Lang. Syst.* 15, 5 (November 1993), 745–770.

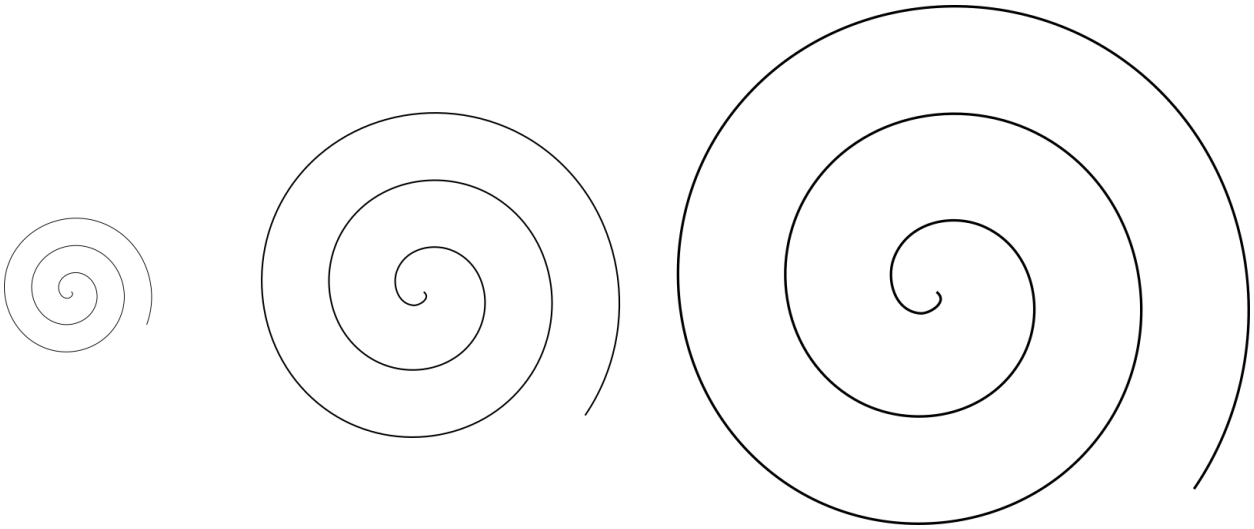

Figure 3: A sample spin graphic with a span.

[5] Leslie Lamport. 1986. *LaTeX User's Guide and Document Reference Manual.* Addison-Wesley Publishing Company, Reading, Massachusetts.

[6] Yann LeCun, Yoshua Bengio, and Geoffrey Hinton. 2015. Deep learning. *Nature* 521, 7553 (2015), 436–444.

[7] S.L. Salas and Einar Hille. 1978. *Calculus: One and Several Variable.* John Wiley and Sons, New York.

[8] Grega Vrbančič, Milan Zorman, and Vili Podgorelec. 2019. Transfer learning tuning utilizing grey wolf optimizer for identification of brain hemorrhage from head ct images. In *StuCoSReC: proceedings of the 2019 6th Student Computer Science Research Conference.* 61–66.

A Appendices

Remember that your paper shall not exceed **four pages** (references can be on the fifth page). If you need more space to present additional figures or tables, that are impossible to fit into the main text, you can use the appendix. However, do not use the appendix to extend the length of your paper beyond the 4 page limit. The appendix can be skipped when reading and evaluating your paper. Your paper shall be self-contained and completely understandable without the appendix.

Start the appendix with the "`\appendix`" command and note that in the appendix sections are lettered, not numbered. This document has two appendices, demonstrating the section and subsection identification method.

B Second Section in Appendix

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Morbi malesuada, quam in pulvinar varius, metus nunc fermentum urna, id sollicitudin purus odio sit amet enim. Aliquam ullamcorper eu ipsum vel mollis. Curabitur quis dictum nisl. Phasellus vel semper risus, et lacinia dolor. Integer ultricies commodo sem nec semper.

B.1 Some Subsection

Etiam commodo feugiat nisl pulvinar pellentesque. Etiam auctor sodales ligula, non varius nibh pulvinar semper. Suspendisse nec lectus non ipsum convallis congue hendrerit vitae sapien. Donec at laoreet eros. Vivamus non purus placerat, scelerisque diam eu, cursus ante. Etiam aliquam tortor auctor efficitur mattis.