Technical University of Applied Sciences Würzburg-Schweinfurt (THWS)
Faculty of Computer Science and Business Information Systems

Great Research About My Favourite Topic

A thesis submitted in partial satisfaction of the requirements for the degree

Master of Science

in

Artificial Intelligence

Your Name

Submitted on: January 11, 2025

Supervisor: Prof. Dr. A B
Second Examiner: Prof. Dr. C D

Abstract (en)

A single paragraph summarizing the most important points of your thesis. This can be more than one paragraph but should not be too long. You usually write this as the very last thing of your thesis.

Abstract (de)

We are in germany so include a translation.

Acknowledgment

Here you can thank your friends who helped you throughout the studies, your parents for supporting you generally, if you wish your supervisor or any other profs and generally everybody you value.

Contents

1 Introduction

This LaTeX template provides a basic structure plus some tips about writing your master's thesis manuscript. You shall not to keep the structure as is here, you shall change it as appropriate for your thesis. You can even change the LaTeX formatting and the whole thesis style if you wish. The title-page shall, nevertheless, contain the information as provided in this template. In particular, you shall decide:

- on the structure of the thesis, the chapters and their content
- inclusion of list of figures, list of tables, index, etc.
- reasonable math notation and stick to it throughout the thesis

1.1 Organization of template

This template make great use of the `\input` commands to input files containing parts of the text. This is generally recommended for longer texts as it helps you to organize your work better and allows for easier re-usability, e.g. of the preamble. You can also easily change the order of the chapters or comment out complete chapters if not relevant. Nevertheless, you do not have to stick to this practice if you do not find it convenient for your work.

Though the template provides some examples for standard formatting and for including classical elements into your text, such as figures or tables, it expects sufficient knowledge of LaTeX from your side. There is plenty of material about TeX and LaTeX available on line. A classical book is for example Oetiker et al., 2023. There are many more things you can do to make your text look professionally and spending some time on polishing it so is strongly recommended. An example of advanced tool you may want to explore on your own is the PGF/TikZ package for creating graphics.

For longer and more complicated documents it is recommended to install LaTex locally on your computer and use some of the dedicated LaTex editors such as Texstudio or standard code editors and their extensions such as VS Code and Latex Workshop. In-browser editing via tools such as Overleaf is discouraged as it does not provide sufficient flexibility for organizing your manuscript files. Moreover, the free version does not

have any versioning capability which is critical for keeping in control of your writing. Remember to back-up and version your writing for example through GitHub or the faculty Bitbucket to be sure not to accidentally lose your work.

1.2 Writing thesis

When writing the thesis manuscript keep in mind that it is the most important part of your master thesis work. It is "the" document that will be read and evaluated and will remain even after you have left the school. It shall explain well what, why and how have you done.

Follow the basic principles of good writing. Always keep the reader in the center of your attention and make sure that your text is well structured, easy to follow and possible to comprehend even for someone who has not been involved in developing the thesis. Focus on the main points and do not get distracted by minor technical details. If some detail might be useful or interesting, you can include them into the the appendix.

Remember that in scientific texts all claims have to be supported by evidence. Such evidence can come from some previous work you cite, such as a text book, e.g. Bishop, 2006, or it shall be directly provided by you, e.g. by results of experiments, mathematical proofs, etc. There are many more good practices for writing which I am not going to explain here.

2 Formatting

This chapter gives examples of some standard formatting commands and environments you may want to use. This is far from exhaustive, there are many more things you can achieve with LaTeX.

2.1 Math Equations

You may want to display math equations in three distinct styles: inline, numbered display, or non-numbered display.

A formula that appears in the running text is called an inline or in-text formula. It is produced by the **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.

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

$$\lim_{x\to\infty} \frac{1}{x} = 0 \ . \tag{2.1}$$

Here an example of an un-numbered equation

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

You can use use un-numbered equations when you will not to refer to them later. The the first equation I can refer by its number as equation (2.1). Note the use of `\eqref` instead of `\ref` here and the use of `\enspace` at the end of the equation before the dot.

For a more complex equation you can use the **eqnarray** environment

$$\begin{aligned} \int_0^{\pi/2} \cos x \, dx &= \sin x \Big|_0^{\pi/2} \\ &= \sin \frac{\pi}{2} - \sin 0 = 1 \ . \end{aligned} \tag{2.2}$$

2.2 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.

Immediately following this sentence is the point at which Table 2.1 is included in the input file; compare the placement of the table here with the table in the PDF output of this document.

Table 2.1: 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

2.2.1 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[1]. To ensure a proper "floating" placement of figures, use the environment **figure** to enclose the figure and its caption.

Figure 2.1 displays an image in the PDF format. Figure 2.2 shows a PNG image.

[1]The fourth, and last, footnote.

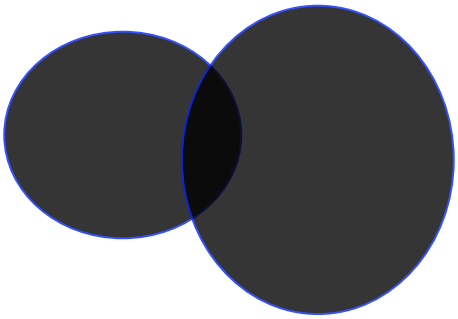

Figure 2.1: A sample circles graphic (PDF format).

Figure 2.2: A sample star graphic (PNG format).

(a) $y = x$ (b) $y = 3 \sin x$

Figure 2.3: Example of subfigre

2.2.2 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.

3 Literature review

You shall review the state of the art relevant for your thesis. You may dedicate a chapter to it or include it somewhere where you discuss your method. When discussing literature you shall always make clear how does it relate to your work: Do you build on it and use some parts of it? Do you improve on them and od something else? Do you take inspiration and develop their ideas further? Etc?

4 Method

Here you describe what you actually did. What method you used, how and why? Give sufficient detail and be technically correct and precise. This is where you may need to use quite a bit of math to make clear what you are doing. You shall also use appropriate imagery (diagrams, etc.) to help the reader. Remember a picture is worth a thousand words. Spend some time thinking about how to support your text through suitable illustrations.

5 Results

This chapter together with chapter 4 about the method is the most important of your thesis. Here you shall present the results of your experiments. The results shall be summarized in suitable tables and graphs. Make sure these are well formatted, easy to understand and read. Highlight results which are important in tables, use clear colors in graphs, make annotation sufficiently big to be readable.

The presentation of your results, however, does not finish by summarizing them in tables and graphs. Equally if not even more important is the interpretation of the results presented in tables and graphs. Guide the reader through these by explaining what to look at, where to focus on, what to take away from it. You shall never present a table or a graph without a reason - explain the reasons clearly.

Students often underestimate the importance of explaining the results in the tables and graphs. This is one of the most important steps of presenting results and shows that you understand the results well.

6 Conclusions

In the last chapter you shall conclude with summarizing the main points of the thesis and what has been achieved. You shall take a bit of step back here and look at the thesis more objectively. Be open about the limitations of your work and take these as a starting point for possible future work which you shall outline.

6.1 Personal takeaways

You shall include a short section about personal takeaways from writing the thesis. This is typically not included in other types of scientific texts but a master thesis is rather specific and you are still learning. The hope therefore is that you will have learned something through developing the thesis. These might be technical skills as well as more soft skills such as time planning etc. You may also mention here what from your point of view went well and what less well and what you take away as lessons learned.

Bibliography

Bishop, Christopher M. (2006). *Pattern Recognition and Machine Learning*. Information Science and Statistics. New York: Springer. 738 pp.

Oetiker, Tobias, Marcin Serwin, Hubert Partl, Irene Hyna, and Elisabeth Schlegl (2023). "The Not So Short Introduction to LaTeX". In.

List of Figures

Appendix

Great table.

Headline 1	**Headline 2**
Titel 1	Description 1
Titel 2	Description 2

Table 1: Overview in a great table.

Declaration on oath

I hereby certify that I have written my master thesis independently and have not yet submitted it for examination purposes elsewhere. All sources and aids used are listed, literal and meaningful quotations have been marked as such.

January 11, 2025, Your Name

Consent to plagiarism check

I hereby agree that my submitted work may be sent to PlagAware (https://my.plagaware.com/) in digital form for the purpose of checking for plagiarism and that it may be temporarily (max. 5 years) stored in the database maintained by PlagScan as well as personal data which are part of this work may be stored there.

Consent is voluntary. Without this consent, the plagiarism check cannot be prevented by removing all personal data and protecting the copyright requirements. Consent to the storage and use of personal data may be revoked at any time by notifying the faculty.

January 11, 2025, Your Name