

HOCHSCHULE MÜNCHEN
FAKULTÄT FÜR INFORMATIK UND MATHEMATIK



Bachelor Thesis / Master Thesis in Informatik

– Title – ~~LaTeX~~Template for Final
Thesis

vorgelegt von

Vorname Nachname

Gutachter: Prof. Dr. Markus Endres
Zweitgutachter: 2. Examiner
Betreuer: Prof. Dr. Markus Endres
Datum: 1. August 2023

Inhaltsverzeichnis

Abbildungsverzeichnis	iv
Tabellenverzeichnis	v
1 Introduction	1
1.1 Important	1
1.1.1 Declaration of Academic Integrity	1
1.1.2 Thesis Document Structure	1
1.1.3 General requirements	1
1.1.4 L ^A T _E X and Biber Compilation	2
1.2 Introduction and Motivation	2
1.3 Research Questions	2
1.4 Structure of the Thesis	2
1.5 Example Citation & Symbol Reference	2
1.6 Example Image	2
1.7 Example Table	3
2 Background	4
2.1 Used Technology	4
2.1.1 A Subsection	4
2.1.1.1 A Subsubsection	4
3 Methods	5
4 Results	6
5 Discussion	7
6 Conclusion and Future Work	8
A Thesis Guide	9
A.1 Managing Your Thesis	9
A.1.1 Goal Definition/Research Questions	9
A.1.2 Related Work	9
A.1.3 Implementation	9
A.1.4 Evaluation	10
A.2 How to Conduct a Good Scientific Thesis	10
A.2.1 Motivation	11
A.2.2 Reading	11
A.2.3 Writing	11

A.2.4	Presentations	12
B	Code	13
C	Math	14
D	Dataset	15
E	Content of the CD/USB-Stick	16

Abstract

Please write a short abstract summarizing your work.

Acknowledgments

I would first like to thank . . .

Abbildungsverzeichnis

1.1	Meaningful caption for this image, e.g., Logo of the University of Applied Sciences Munich	2
-----	------------------------------------------------------------------------------------------------------	---

Tabellenverzeichnis

1.1	Meaningful caption for this table, e.g., Sample dataset.	3
-----	------------------------------------------------------------------	---

1 Introduction

1.1 Important

1.1.1 Declaration of Academic Integrity

Don't forget to sign the Declaration of Academic Integrity / Eidesstattliche Erklärung at the end of the thesis document. The LaTeX file can be found in `included/declaration.tex`, where the name (Firstname Lastname) should be adjusted to your name! It is necessary to sign the German and English version due to the German law.

Please, also fill out and sign the document about the exploitation rights / Verwertungsrechte to be found in the folder `Exploitation_Rights` and send the original to Prof. Dr. Markus Endres. It is necessary to sign the German and English version due to the German law.

1.1.2 Thesis Document Structure

`„thesis.tex“` is the main LaTeX document. Do not modify the style, the title page or any other format of the template.

It includes some `„input“` files based on the chapter structure of the thesis. You can add as many additional chapters as you need.

Also feel free to add any LaTeX packages necessary for your thesis.

If you want to write your thesis in German, than delete all occurrence of `„english“` in `thesis.tex` to use a German `„Contents“` / `„Inhaltsverzeichnis“` and document structure. Also adjust `„finalthesis.sty“` to the `„German“` content.

1.1.3 General requirements

- About 30–40 pages plus appendix, references, etc. for a Bachelor thesis
- About 60 pages plus appendix, references, etc. for a Master thesis
- Proper scientific writing and references, e.g., this is a literature reference [KEW11].
- Images should be readable and in proper size



Abbildung 1.1: Meaningful caption for this image, e.g., Logo of the University of Applied Sciences Munich

1.1.4 \LaTeX and Biber Compilation

User Biber for literature references instead of bibtex.

To compile the \LaTeX document use **pdflatex** and **Biber**:

- **pdflatex thesis.tex**
- **biber thesis.bcf**
- **pdflatex thesis.tex**

1.2 Introduction and Motivation

Your thesis should be motivated in this chapter. Also outline the research gap to existing work.

1.3 Research Questions

Write down and explain your research questions

1.4 Structure of the Thesis

Explain the structure of your thesis.

1.5 Example Citation & Symbol Reference

For symbols look at [Pak17].

1.6 Example Image

Example figure reference: Look at Figure 1.1 to see an image. Please use **pdf** images.

Make	Color
VW	black
BMW	silver

Tabelle 1.1: Meaningful caption for this table, e.g., Sample dataset.

1.7 Example Table

Table 1.1 shows a simple table¹

¹Check <https://en.wikibooks.org/wiki/LaTeX/Tables> on syntax

2 Background

Introduce the related state-of-the-art and background information in order to understand the method developed in the thesis.

2.1 Used Technology

For example, explain the used technology

2.1.1 A Subsection

A subsection.

2.1.1.1 A Subsubsection

A subsubsection.

3 Methods

Describe the method/software/tool/algorithm you have developed here.

4 Results

Describe the experimental setup, the used datasets/parameters and the experimental results achieved.

5 Discussion

Discuss the results. What is the outcome of your experiments?

6 Conclusion and Future Work

Summarize the thesis and provide a outlook on future work.

Literatur

- [KEW11] W. Kießling, M. Endres und F. Wenzel. „The Preference SQL System - An Overview“. In: *Bulletin of the Technical Committee on Data Engineering* 34.2 (2011), S. 11–18.
- [Pak17] Scott Pakin. *The Comprehensive Latex Symbol List*. 2017. URL: <http://mirrors.ctan.org/info/symbols/comprehensive/symbols-a4.pdf> (besucht am 24. 11. 2017).

A Thesis Guide

This short guide is intended to give you a brief guideline on how to organise and conduct your thesis. This guide covers both, a master and a bachelor thesis. The thesis guide was mainly written by Michael Granitzer and slightly modified by me.

A.1 Managing Your Thesis

A thesis is a complex task, similar to a software project has to be managed properly. It can be seen to have the following stages, which are iterated several times.

A.1.1 Goal Definition/Research Questions

Define the goal of your thesis together with your supervisor. Write them down as bullet point list. This list should have 3-5 points. If there are more points, you have to aggregate them and if you can not aggregate them, then you have set yourself too many goals. Note that goals are not tasks. Goals determine what you want to find out with your thesis and form the basis of the research questions. Most likely you will refine your goals throughout the thesis. That is OK because your knowledge on the domain gets better and therewith you are able to write down more accurate questions.

A.1.2 Related Work

It is often underestimated, but very important to search what others did. Most likely others worked on similar topics and so you have to set out searching for what they did. Use search engines like Google Scholar or grab a recent Book on the topic of your thesis and start your literature research from there. A in depth research allows you to avoid the unpleasant surprise that after 6 months of work one identifies the same solution made by somebody others. Moreover, it builds up your background knowledge in the domain. Only with sufficient background knowledge you are able to take the correct decisions.

A.1.3 Implementation

Good implementation starts with a workplan that has tasks, milestone (i.e. what to achieve when) and thoughts on how to get there. You do not have to create a full fledged Gantt and Pert Chart, a simple task list might be sufficient to structure your work. Use a issue tracking system or something similar, because it also helps you to keep track of things you already tried (and it gives a good feeling when closing open issues).

A.1.4 Evaluation

This is the most important part, which is often overlooked. You have invested a most time in implementing/realising your goals, and so it seems that evaluation is annoying and time consuming. However, it is the evaluation of your system that answers your research questions or let you judge whether you achieved your goals or not. So plan your evaluation before the implementation by writing down a coarse-grained evaluation plan, and, reserve enough time for it.

Note that this is not a linear, but a iterative process. In your evaluation you discover the something does not work out and so you have to adapt your evaluation or even your goals. But that is pretty fine since you learn as you go. If you already would know it from the beginning, there is no need for research.

A.2 How to Conduct a Good Scientific Thesis

Regardless whether you are a Bachelor, Master or PhD Student (or later on a researcher), there is always the central question on how to conduct a good thesis. Sadly, there are no strict “rules” for doing so and it requires a lot of expertise. Fortunately, some simple tips allow you to bootstrap the quality of writings, presentations and your thesis in general and enable you to develop a critical thinking, but open mind – the most important tool for any future career.

In this article I want to give you some tips on how to bootstrapp your scientific skills. So what are scientific skills? Science is about discovering stuff nobody has known before and to explain your discovery to other people. Explaining your discovery is important, since it

- allows others to validate your work
- helps yourself in gaining a deeper understanding
- enable future discovery based on what you have found out.

That is not only true for research, but for nearly any industry jobs for academically educated presons. How to convince your boss that your solution for a particular project is the best one? How to argue that the current roadmap does not make sense? How to convince your team members to invest time in a particular functionality? How to judge the validity of your own decisions?

Conducting a good scientific thesis requires you to do a decent job and communicate the results. Hence it involves

- Motivation
- Reading Skills
- Writing Skill
- Presentation Skills
- Discussions
- Critical Thinking and self-reflexion

A.2.1 Motivation

One of the most important skills is motivation. Once upon a time a student asked the teacher how to learn uninteresting stuff efficiently. The short answer is you can't, at least not for beyond the exam. So the key insight to motivation is in choosing stuff you really like to do. Often students make the mistake in going the easy way, taking courses where exams are "easy going". That is a waste of time since it is by far harder to learn boring stuff, the really interesting stuff. Think of it when you have watched a really entertaining movie. You can remember nearly all details and you had a good feeling after watching it. How do you feel after a bad movie?

So when you are choosing a topic for a scientific thesis, take one that makes you feel every day like you have watched the best movie ever. Most supervisors give you the freedom to adjust a particular topic of a thesis so that it fits the motivation of the student better. So engage a critical discussion with your supervisor and what you want to do and what not. Of course this requires you to go deeper on potential topics and to explore what best fits your interest. But especially when you are studying computer science, you should have a natural habit on being attracted by strange, nerdy stuff.

Key lesson: Learn to motivate yourself and take topics that you are excited about it.

A.2.2 Reading

- Read with a purpose (start with questions to the article. The more specific, the better)
- Discuss what you read with others
- Write a short summary of your key findings. either do it graphically (Mindmaps, Rhino Maps) or textually.

A.2.3 Writing

Write often; write concise. Writing requires you in expressing your (parallel, mostly non-linear) thoughts on a linear medium. And this is very difficult. But the medium forces you to express your thoughts in a clear manner and connecting each thought with each other (the so called flow or read thread in German). That is difficult and learning good writing techniques covers whole courses and books. However, for getting started there are five simple rules:

1. Write down the 3-5 most important questions you want to answer. Two sentences per question maximum
2. Write down the motivation, why those questions are important
3. Give an example for every question
4. Write down how you will answer the questions
5. Write down the answer to the questions
6. If 2. and 3. do have nothing in common, you have put the wrong questions together in the same box.

A.2.4 Presentations

Presentations follow the same rules as writing, with the exception that oral presentations do not allow you to present all your details. So avoid explaining every little detail, because you will lose the audience. In general your talk should be structured similar to your written thesis

- Motivation: Why is your talk relevant. Give an example.
- State-of-the-Art: What did others do in the context of your talk?
- Questions: What questions will you answer in this talk?
- Methodology: How will you answer the questions?
- Experiments: How did you implement the methodology?
- Evaluation: What is the answer to every question? What did you learn?
- Future Work: What are the loose ends of your work (a work without loose ends is most often not very helpful)
- Keep that simple structure and use the question to guide the audience through your thoughts and findings. Stick to the KISS principle (Keep it short and simple). Your audience will appreciate it.

B Code

Things, which have no place in the main content should be in the Appendix.

C Math

D Dataset

E Content of the CD/USB-Stick

- This work as PDF file – in the folder *PDF*
- The source code of the implementation – in the folder *SRC*
- The implementation as a runnable .jar file – in the folder *JAR*
- The \LaTeX source code – in the folder *LATEX*

Declaration of Academic Integrity / Eidesstattliche Erklärung

Ich erkläre, dass ich die vorliegende Arbeit selbständig, ohne fremde Hilfe und ohne Benutzung anderer als der angegebenen Quellen und Hilfsmittel verfasst habe und dass alle Ausführungen, die wörtlich oder sinngemäß übernommen wurden, als solche gekennzeichnet sind. Mit der aktuell geltenden Fassung der Satzung der Hochschule München zur Sicherung guter wissenschaftlicher Praxis und für den Umgang mit wissenschaftlichem Fehlverhalten bin ich vertraut. Ich erkläre mich einverstanden mit einer Überprüfung der Arbeit unter Zuhilfenahme von Dienstleistungen Dritter (z.B. Anti-Plagiatssoftware) zur Gewährleistung der einwandfreien Kennzeichnung übernommener Ausführungen ohne Verletzung geistigen Eigentums an einem von anderen geschaffenen urheberrechtlich geschützten Werk oder von anderen stammenden wesentlichen wissenschaftlichen Erkenntnissen, Hypothesen, Lehren oder Forschungsansätzen.

München, 1. August 2023

Vorname Nachname

I hereby confirm that I have composed this scientific work independently without anybody else's assistance and utilising no sources or resources other than those specified. I certify that any content adopted literally or in substance has been properly identified. I have familiarised myself with the most recent Guidelines for Good Scientific Practice and Scientific Misconduct Ramifications of the University of Applied Sciences Munich. I declare my consent to the use of third-party services (e.g., anti-plagiarism software) for the examination of my work to verify the absence of impermissible representation of adopted content without adequate designation violating the intellectual property rights of others by claiming ownership of somebody else's work, scientific findings, hypotheses, teachings or research approaches.

München, 1. August 2023

Firstname Lastname