Technische Hochschule Ingolstadt

Faculty of Electrical Engineering and
Information Technology

Master Thesis

in the Master's Programme AI Engineering of Autonomous Systems

Title of Your Thesis
(Not too long!)

FirstName LastName

Examiner:	Prof. Dr.-Ing. Michael Mecking
2nd Examiner:	Prof. Dr. Max Mustermann
Company Advisor:	Dr. Erika Musterfrau

Registered on:	88.88.8888
Submitted on:	99.99.9999

Affidavit

I declare that I have authored this thesis independently, that I have not used other than the declared sources/resources, that I have not presented my work elsewhere for examination purposes, and that I have explicitly indicated all material which has been quoted either literally or by consent from the sources used. I have marked verbatim and indirect quotations as such.

Ingolstadt, 99.99.9999

FirstName LastName

Confidentiality Clause

This is optional.

The thesis as presented is based on internal, confidential data and information of the company XYZ.
The thesis may only be made available to the first and second examiner as well as to authorised members of the examination boards. Publication and duplication of the thesis – including excerpts thereof – shall not be permitted.
The explicit permission of the author and the company shall be required before the thesis may be inspected by unauthorised parties.

Ingolstadt, 99.99.9999

FirstName LastName

Abstract

The abstract serves to give the reader a rough overview of the content (brief problem definition, approach, solution and possibly the key findings). Include little if any background and motivation. Be factual but comprehensive. The material in the abstract should not be repeated later word for word in the thesis. It should be about half a page in length.

Acknowledgements

This is the sentimental part where you get to thank all the persons who were a part of your thesis journey in one or the other way!

FirstName LastName
Ingolstadt, 99.99.9999

Contents

Contents **V**

List of Figures **VI**

List of Figures **VI**

List of Tables **VI**

List of Tables **VII**

Acronyms **VIII**

1 Introduction **1**

2 Main Body **2**

3 Conclusions and Further Work **3**

4 Citation **4**

5 Format and Special LaTeX Environments **5**

5.1 How to Equations 5

5.2 How to Tables 6

5.3 How to Figures 7

5.4 How to Code 7

6 Do's and Do Not's **9**

Bibliography **10**

A Name of Appendix **11**

List of Figures

5.1 This is our THI logo. 7
5.2 A simple system diagram using TikZ. 7
5.3 Neural network. 8

List of Tables

5.1 This is a table. 6

Acronyms

ML Machine Learning. 9

SNR signal–to–noise ratio. 6

1

The Long Introduction to My Thesis

The Introduction is crucially important. A casual reader will continue on if your introduction captivated them, and will set the thesis aside otherwise. According to [1], the Introduction should answer the following questions:

- What is the problem?
- Why is it interesting and important?
- Why is it hard? (E.g., why do naive approaches fail or are too complex?)
- Why hasn't it been solved before?
- What are the key components and results of the approach I am reporting on?

The second part of the introductory chapter is a rough and short overview of the content of the work. This is intended to give the reader a quick insight into the work so that they can perhaps skip a few chapters and go straight to the part that interests them.

2

Main Body

The main body of the thesis is divided into chapters, sections, and subsections which have meaningful titles. There is no guideline to the number of chapters your main body comprises. The length of each chapter should reflect its importance within the thesis. The chapters and sections discuss the main arguments in a logical and consistent order. Stay logical and focused, never lose your thread. Write for the reader!

3

Conclusions and Further Work

In the last chapter of your thesis, you should

- summarise the core statements and findings of your thesis,
- provide an outlook and state which crucial questions are still open or part of active research,
- and what approaches are promising to make further progress in the future.

4

Citation

Throughout the thesis, the reader should always be able to clearly recognise which parts are the author's thoughts, ideas or interpretations.

All citation guidelines as well as guidelines for the listing of sources in the bibliography can be found in the document "OU Harvard guide to citing references" of THI University Library [2]. Spend the effort to make all citations complete and consistent. Do not just copy random inconsistent BibTeX (or other) entries from the web and call it a day. Check over your final bibliography carefully and make sure every entry looks right. [1]

Especially for books, it is recommended that you not only provide a reference to the book (e.g., [3]) but additionally provide the specific page [4, p. 123]. All references should be placed in a section at the end of the paper, but before the appendices.

Wikipedia or Google may provide a lot of information, but they are not considered scientific and reliable sources — use them either very little or preferably not at all.

To update your references in your thesis pdf–file, you need to run `bibtex thesis` or use an appropriate command in your IDE.

Plagiarism will affect the grade and, depending on the amount of copying, may lead to failure. Undeclared use of automatically generated text, e.g., using ChatGPT, is considered plagiarism. Students reference automatically generated text like any other source, marking it as a citation (use quotation marks if copied without editing). Students are responsible for the quality of the generated text.

5

Format and Special LaTeX Environments

You must write your thesis using a (scientific) word processing programme. LaTeX is strongly recommended. A style file will be provided to fulfil formatting requirements. [5] provides a great overview of the LaTeX package, integrated development environments (IDE), cheat sheets, and supplementary software for the LaTeX novice. A very good (and free!) overview of LaTeX is provided in [6].

If you wish to use a different word processing programme, please use Arial (font size 11 pt) or Times New Roman (font size 12 pt) as font. Please ensure that you use the same font throughout the document (header, footer, page numbers, and text). Use a line spacing of 1.3 for the general text. The margins should be about 2.5 cm. The text should be formatted as justified text with hyphenation. The length of the thesis is expected to be about 40–60 pages (Bachelor thesis) or 60–80 pages (Master thesis) excluding table of contents, references, and appendices. Multilevel numbered chapters/sections are to be used with a maximum depth of 3. Footnotes[1] can give more substantive information, but as a general rule, you should keep footnotes to a minimum.

5.1 How to Equations

LaTeX is outstanding for mathematical typesetting and used extensively in the scientific research community. You can write simple equations in line $a^2 + b^2 = c^2$. Alternatively, you may write an equation as paragraph

$$C = W \log_2 \left(1 + \frac{P}{N_0 W}\right). \tag{5.1}$$

You may also write an equation in a new line without numbering

$$a^2 + b^2 = c^2,$$

or alternatively mark the environment with a *

$$\sum_{k=1}^{n} k = \frac{n\,(n+1)}{2}.$$

[1] This is a footnote.

Table 5.1: This is a table.

Value 1 α	**Value 2** β	**Value 3** γ	**new column**
1	10	long	
2	20	short	
3	30	wide	

However, a number is great because you can reference to it once you provide a label, e.g., Equation (5.1) depicts the famous channel capacity C derived by Claude Shannon in [7]. It highlights the dependence of channel capacity C on the signal–to–noise ratio (SNR) (don't forget to run `makeglossaries thesis` to update the glossary and acronyms). It is also possible to nicely set aligned systems of equations:

$$x + y = 5 \tag{5.2}$$
$$y = 1. \tag{5.3}$$

Text within formulae (above all, formulae only consisting of text!) should be avoided and the formula should rather be explained in the main text. If it is absolutely unavoidable, text should be used as

```
\text{text within an equation environment.}
```

Spacing within formulas can be adapted with commands such as

```
\quad or \,
```

The following Equation (5.4) shows the impact of `\quad`, `\,`, and `\text{abc}`:

$$\forall x \in \{z \in \mathbb{C} \,|\, z = a + j\,b,\ a \in \mathbb{R},\ \text{and}\ b = 0\}: \quad x \in \mathbb{R}. \tag{5.4}$$

Please check [5, 6] for much more on mathematical typesetting in LaTeX as well as helpful cheat sheets.

5.2 How to Tables

Table 5.1 is also easily created. Make sure that the same font as in the main text is also used within the tables. Each table must be referenced in the text (on the same or the following page). Tables are typically placed on top of a page. The caption goes at the top.

Figure 5.1: This is our THI logo.

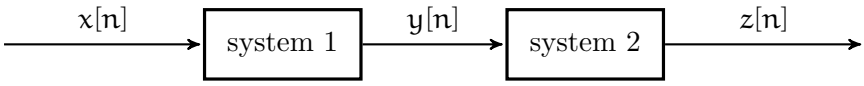

Figure 5.2: A simple system diagram using TikZ.

5.3 How to Figures

Images/Figures are also easily placed in LaTeX. In Figure 5.1 the logo of THI is depicted. Place figures at the top of the page, unless it is very small and fits into the flow of the paper. The caption goes below the figure. Each figure must be referenced in the main text. Do not forget to properly cite the source if you have copied the figure. You need not state, however, that the figure has been created by yourself.

Fonts in figures should be (approximately) the same size as used for the text in the body of the paper. Figures need to be of camera–ready quality. As a general rule, use jpg format for photos and png format for images with text and lines that you could not vectorise. You should always think about not copying but redrawing a figure.

TikZ

A very powerful extension to LaTeX is the TikZ environment which allows to create simple (and very complex!) graphic elements. A brief example can be seen in Figure 5.2. Figure 5.3 depicts a neural network with three layers of nodes.

5.4 How to Code

It is also easy to add code in your paper as seen in Listing 5.1 – although it is hardly ever required and beneficial. The perfect place for your code is either github or the Appendix.

Listing 5.1: Insert code directly in your document.

```
1    from brg.datastructures import Mesh
2    mesh = Mesh.from_obj('faces.obj')
3    mesh.draw()
```

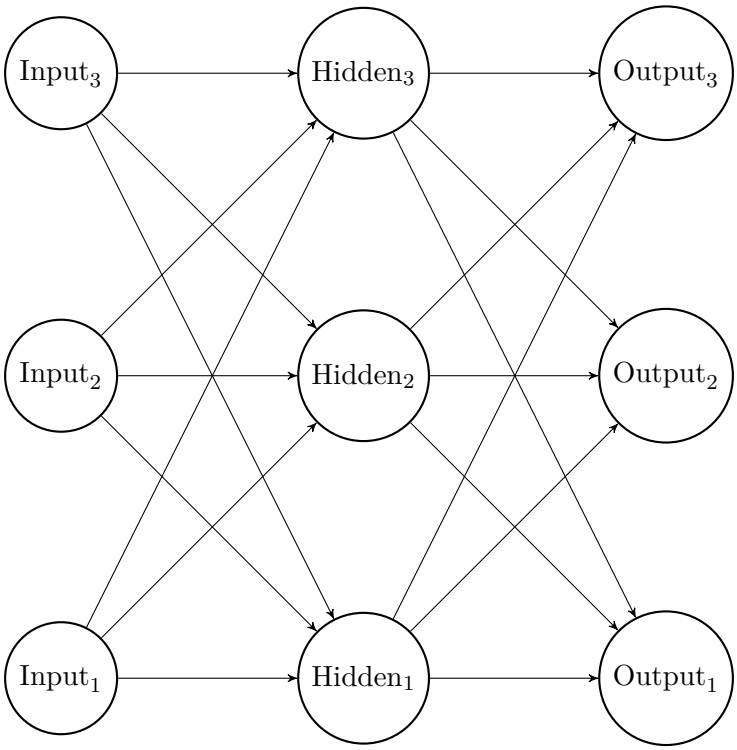

Figure 5.3: Neural network.

6

Do's and Do Not's

- Always run a spell checker on your thesis. There are no excuses! Is is not the task of your supervisor to mark spelling mistakes, and work which clearly violates this requirement will be rejected.
- English is (most likely) not the native language of the writer. There are helpful guidelines for the use of English grammar and scientific writing which are beneficial to apply and will improve any thesis: see, e.g., [8, 9] as well as the classic book [10].
- Please choose whether you would like to write your thesis in British or American English. Do not mix the two languages.
- Abbreviations should be initially introduced once (!) in the text, e.g., Machine Learning (ML). Later on, only the abbreviation ML should be reused.

Bibliography

[1] J. Widom. (2006) Tips for writing technical papers. [Online]. Available: https://cs.stanford.edu/people/widom/paper-writing.html#appendices

[2] THI Library. (2023) Citing rules according to "OU Harvard Guide to Citing References". [Online]. Available: https://moodle.thi.de/mod/resource/view.php?id=126058

[3] D. P. Bertsekas and R. G. Gallager, *Data Networks*, 2nd ed. Prentice-Hall, Englewood Cliffs, 1992.

[4] T. M. Cover and J. A. Thomas, *Elements of Information Theory.* John Wiley & Sons, 2012.

[5] TEX Users Group. (2024) TEX resources on the web. [Online]. Available: https://tug.org/interest.html

[6] T. Oetiker *et al.* (2023) The not so short introduction to LATEX. [Online]. Available: https://tobi.oetiker.ch/lshort/lshort.pdf

[7] C. E. Shannon, "A mathematical theory of communication," *The Bell System Technical Journal*, vol. 27, pp. 379–423, 1948.

[8] IEEE Publishing Operations. (2024) IEEE editorial style manual for authors. [Online]. Available: http://journals.ieeeauthorcenter.ieee.org/wp-content/uploads/sites/7/IEEE-Editorial-Style-Manual-for-Authors.pdf

[9] R. Goldbort, *Writing for Science.* Yale University Press, 2006.

[10] W. Stunk. (2012) The elements of style. [Online]. Available: https://www.gutenberg.org/ebooks/37134

A

Name of Appendix

According to [1], "appendices should contain algorithms, detailed proofs, or derivations only. Appendices can be crucial for overlength papers, but are still useful otherwise. Think of appendices as random–access substantiation of underlying gory details."

As a rule of thumb [1]:

- Appendices should not contain any material necessary for understanding the contributions of the thesis.
- Appendices should contain all material that most readers would not be interested in.