

Handout for writing a thesis

WG Data Science in Biomedicine

June 16, 2023

1 Introduction

The scope of the thesis is accurate documentation of the work performed during the final phase. It should enable the reader to understand each step and reproduce it. Even if the reader is not a specialist in the subject, it should be possible to comprehend the work based on the information in the thesis.

2 Structure of the Thesis

The structure of a thesis is essentially always the same:

- Cover Page
- Acknowledgement (optional)
- Declaration of Independence
- Abstract
- Zusammenfassung (depending on exam regulation, a German and English abstract may be mandatory)
- Table of Contents
- List of Abbreviations (optional)
- List of Figures (optional)
- List of Tables (optional)
- List of Listings (optional)
- → Contents of the thesis
- Appendix (optional)
- Bibliography

2.1 Cover Page

The cover page should contain the following information:

- Full name of the student
- Matriculation number
- Title of the thesis
- Supervisor
- 2nd examiner (if known)
- Date of submission
- Department
- "To obtain the academic degree of Bachelor/Master of Science"

2.2 Declaration of Independence

The declaration of independence is an assurance that the work was done independently and only with the help of the specified aids. Often the department provides a prefabricated wording of the declaration, which must be integrated into the work and signed by the student.

2.3 Zusammenfassung and Abstract

A complete summary of the work has to be included at the beginning of the thesis. It has to be written in German (Zusammenfassung) and English (Abstract). The abstract describes the relevance of the task, the implementation, and essential aspects of the results.

2.4 Table of Contents

The table of contents provides an overview of the chapters and subchapters of the thesis and the corresponding page number. Likewise, all indexes and the appendix are listed in the table of contents with the corresponding page. Usually, the actual content of the thesis is numbered with Arabic numerals and everything else with Roman numerals.

2.5 List of Abbreviations/ Figures/ Tables/ Listings

The figures, tables, source code, or abbreviations used in the thesis should be listed in an index to give a better overview. The Table of figures, tables, and source code has a similar structure to the list of content, while the list of abbreviations is structured as a table without page numbers.

2.6 Appendix

In rare cases, an appendix is necessary. If possible, everything should be incorporated into the actual content of the thesis.

2.7 Bibliography

The bibliography lists all sources used. Further information on how to cite correctly and how to cite sources is provided in section 4.

3 Contents of the thesis

Each thesis should be organized with the following chapter headings:

1. Introduction
2. Background
3. Material and Methods / Implementation
4. Results
5. Discussion
6. Future Perspectives
7. Conclusion

You can freely select the subheadings according to the topic of your thesis. Tables and figures often make it easier to explain a particular issue, so you should use them extensively. **Tables** always have **headings** and **figures** always have **subheadings** with a description. Both tables and figures must be numbered (separately from each other). The same applies to formulas. Figures, tables, and formulas should be referred to and explained in the text with the appropriate numbering.

3.1 Introduction

The introduction should answer the following questions:

- Why is the topic relevant?
- What is the current state of the science on this topic?
- What exactly is the task or research question?
- How exactly do you attempt to answer the task or question?

3.2 Background

This section transports all relevant background information. The later used methods, all formulas applied in the thesis, and the biological background are explained. This part should contain the basic knowledge the reader needs to understand in the following sections.

3.3 Materials and Methods / Implementation

This chapter should be divided into two subsections:

- Material
- Methods

3.3.1 Material

It is advisable to list all used materials in tabular form, i.e., software, packages (with version number), databases or existing data sets, and, if necessary, hardware components. Nevertheless, the table should also be explained in the continuous text.

3.3.2 Methods

The methods section of the thesis should accurately describe the following:

- What was done?
- How was proceeded to work on the task?/ How was a certain software implemented? (How is it structured?)
- Which tools were used to calculate what?
- Which software packages were used where?

The reader should be able to reproduce the work in exactly the same way according to the methods section.

3.4 Results

In this section, the results are presented but not yet interpreted. The results should be described as detailed as possible in the text, using tables and figures.

3.5 Discussion

In this part, the results are discussed and interpreted. The following questions should be answered:

- Do the results meet the expectations?
 - If yes: substantiate with literature!
 - If not: also substantiates with literature that contradicts it and finds a possible explanation!
- How are the results to be interpreted?
- Can conclusions be drawn from the results, and if so, which ones?

3.6 Future Perspectives

The results may have raised new questions that need to be answered in the future. It is possible that the results do not quite meet expectations, so these questions need to be investigated using other methods.

3.7 Conclusion

Here, the core statements of the work are summarized once again and assessed in the conclusion.

4 Use of Reference

Statements which has not been worked out by the student should be supported by a reference. Figures and tables that have not been created independently or have been redrawn must be referenced accordingly. Scientific publications and textbooks are valid references, while lecture notes and Wikipedia are not citable. Websites are only conditionally acceptable as sources. The source must be indicated in the text as follows [1]. The word right before the reference and the reference can not be separated by a line break.

In the bibliography, the references are listed as follows (italics are to be replaced accordingly):

- books:
name [no.] *author, title, edition, place of publication, publisher, year, number of pages.*
- Paper:
[no.] *author, title, journal, year, journal number, pages.*

- Online articles (Attention, not always citable!):
 . [No.] *author, title* [Online]. Available: *URL* (retrieval date: *date*).

References can be numbered and listed according to the order used in the thesis or alphabetically by the last name of the first author.

5 Additional Notes

- The thesis can be written in German or in English after consultation with the supervisor.
- Everything that needs to be in the thesis should be in it, in conclusion, it is not possible to specify an exact number of pages in advance.
- The thesis should be written in a scientific writing style.
- There must be a protected space between numerical values and their units (i.e. number and unit must not be separated by a line break).
 e.g. **10 km**
- The first line of a paragraph should not start on the previous page, and the last line of a paragraph should not stand alone on the next page.
- Spelling errors should not be present.
- The text should be written in a legible font, with appropriate font size (serif, 11 pt).
- Do not jump between times!
- Give the text to your supervisor for proofreading early on!