# How to Write your Thesis

## 1 Registration Procedure

- Please read carefully through the official guidelines by the examination office, we will not be responsible for any missed deadlines or organisational issues as they change constantly and we are not always informed.
- Your countdown until submission starts only once your supervisor has entered your topic. Please consult the examination office for details.
- Only the examination office can give you definite/official answers regarding registration procedural steps.

## 2 General Information

- You have the opportunity to work at the institute at Campus North to have a shorter distance to your supervisor and get to know the research group.
- Regardless of whether you work at the institute or at home, at-least bi-weekly meetings with your supervisor are mandatory if not agreed on differently.
- We strongly prefer if you work with LaTeX instead of any Word installation.
- If you choose LaTeX, you can find numerous tutorials online. As a LaTeX distribution, we recommend the installation of MikTeX (`https://miktex.org`, Windows only) first and then TeXnicCenter (`http://texniccenter.org`) as an editor.
- When using LaTeX, we recommend the use of the template provided by the institute, in order to align with formal requirements regarding the layout.
- English is – generally speaking – the preferred language of your thesis to increase scientific value.
- Please check with your examination rules if you need a German *Zusammenfassung* when writing in English.
- Keep your thesis short and precise. Ask your supervisor for the preferred page range.
- You must submit your thesis according to the deadline. You have to hand in one hard copy and one digital copy (e-mail) of your thesis (refer to the examination office for latest changes). If you write an empirical thesis you should also hand in your data and code, per email is sufficient.
- The correct English name is not Bachelor thesis or Master thesis, but Bachelor's thesis or Master's thesis!

# 3 Citations

- Please be careful to cite correctly otherwise it will be regarded as plagiarism (`http://en.wikipedia.org/wiki/Plagiarism`)! Plagiarism will result in failing.
- There is a difference between *direct quotations*, *citing an approach or similar directly* and *indirect quotations*. Make sure you understand the differences.
- This is an example of a direct quotation

  *This is contrary to the conventional perception that "large data sets offer a higher form of intelligence and knowledge" and possess an "aura of truth, objectivity, and accuracy" (Boyd and Crawford 2012).*
- Example of citing an approach or similar directly

  *Following Conejo et al. (2005) and Misiorek et al. (2006), we employ a naive but challenging test to verify that our proposed models are better than random guessing.*
- Example for an indirect quotation (analogous statement)

  *These are robust to errors resulting from the inclusion of predictors that do not contribute to the model by performing feature selection (Kuhn and Johnson 2013).*
- As a general recommendation, don't use direct quotations frequently, only if you want to quote one of the *big guys* or unique statements.
- When citing websites, add the date at which you retrieved the content.
- Be consistent with your citation style and your bibliography.

# 4 Literature

There are many sources of literature for your thesis. A good starting point are those listed below.

- Google Scholar
- ScienceDirect
- Webpages of journals, such as Elsevier, Springer, IEEE and ACM

You may want to use different literature depending on the reason for your reference. Below you can find a list of reasons why one would use a reference:

- Similar research
- Proof of relevance
- Proof of novelty
- Same methodology
- Links for background search
- Theories for discussion

During your research, you will presumably collect quite a large number of publications. The proper organization of your literature will therefore ease your writing and citing later on. We recommend you use software to help you with the organization, such as Citavi (you can get a licence through the university). Citavi works well together with both LATEX and Microsoft Word. If you prefer to write in Microsoft Word, you can also consider the use of its internal reference management (search for a tutorial online).

# 5 Writing your Thesis

When it comes to writing your thesis, we expect a scientific style, structure and form which is described below. Allow yourself enough time for the actual writing process and revising, since writing is not a trivial task.

## 5.1 Style

- Check your spelling and grammar. Preferably use a software to help you with that.
- Use understandable/clean English. You might want to check for synonyms using e. g. `http://www.thesaurus.com/`. A good dictionary is `http://www.linguee.com`, which provides examples on how to use words in the right context.
- The way you write strongly affects how your text is interpreted. Therefore, we recommend you read *The Science of Writing* by George Gopen (`https://cseweb.ucsd.edu/~swanson/papers/science-of-writing.pdf`) carefully and to follow all suggestions closely.
- Read `http://www.docstyles.com/library/ascience.pdf` on how you can help readers by adding commas. Here is a rather short summary, i. e. `http://englishplus.com/grammar/00000074.htm`. In addition, we recommend that adverbs at the beginning of a sentence are followed by a comma, e. g. *Interestingly, this helps readers to understand your writing.*
- Within your document, we recommend that each section is introduced by at least a few sentences. By doing so, you avoid situations where two headlines are immediately followed by one another. Instead, add a separating sentence that introduces the topic and its context.
- Format your code using a mono-spaced font which helps readers to identify text as code. See `http://en.wikipedia.org/wiki/Monospaced_font` for an explanation. In addition to that, you might want to use a different colour scheme.
- In most cases, a footnote at the end of a sentence follows the punctuation, as this example shows.[1]
- Check the number of decimal places. A number such as 1.23456 might be correct, but given possible perturbations and errors of the original data, it is common to restrict oneself to roughly one to three decimal places (e. g. 1.23). This is achieved by rounding before copying code output into your document.
- Use capitalization in your headlines consistently. Either always use initial capital letters, such as *Table of Contents*, or always an initial capital letter followed by small ones, such as *Table of contents*.

[1] This is a footnote.

## 5.2 Structure

As a sample structure, we recommend this general layout of your thesis. Please keep in mind that you need to adapt this to your specific setting.

- **Abstract** A short summary of your topic in a nutshell. Should be not more than 150 words as a single paragraph without any references. First, describe the motivation for your topic and then name the methodology, summarize the outcome and give quantitative results.
- **Zusammenfassung** (summary in German; only if required by the examination rules),
- **Introduction** Discuss the relevance of your topic, state the problem briefly and repeat the contribution, e. g. as research questions. Give an outline of your thesis.
- **Related Work** What are the differences/similarities to the existing literature? Summarize the findings and identify differences to your own study.
- **Methods** How is the problem solved? Introduce your methodology.
- **Results** What are the findings? Find appropriate visualization (e. g. tables, charts).
- **Discussion** What does it mean? Point out limitations and e. g. managerial implications or future impact.
- **Conclusion & Outlook** Repeat the problem and its relevance, as well as the contribution (plus quantitative results). Provide an outlook for further research steps.
- **Bibliography** What research is referred to?
- **Appendices (optional)** Additional information, such as charts and tables.

Make sure you have a common thread recognizable throughout your work. If you state research questions at the beginning, make sure you answer all of them.

## 5.3 Figures and Tables

- Check your captions beneath figures. Make sure the text starts with a capital letter and the sentence is accompanied by punctuation. Correct examples are:
  Fig. 1. Some text.
  Figure 2. Some other text.
- Each figure and table must be referenced with a number in the text. Most authors spell *Figure 1*, *Table 2*, *Equation (3)* and *Section 4.1* with a capital letter when accompanied by a number.
- Highlight column names (i. e. the first row of your table) in bold.
- You should not copy output of your analysis from your program (R, Python, Matlab) directly as graphics, but add a table of your own by selecting the most relevant values (e. g. t-values, estimates or standard errors for a regression).
- Pay attention to the quality of your graphics. Make sure you use a high resolution so that graphics are not pixelated. If you make your own graphics, we recommend Microsoft Visio for procedural/flow diagrams.

### 5.4 Formulae

- Formulae are always followed by a punctuation, e. g.

$$2 + 2 = 4. \tag{1}$$

  At the same time, you do not use a colon before a formula.

- If you write with Microsoft Word, use the built-in formula editor in Word. Do not copy formulae as graphics with different layouts or of low quality. Also use the formula editor inside Word for in-text formulae or symbols, such as $a + b$, to typeset variables in italics. Try to use a recent version (2007 or later), since it comes with a new editor for typesetting formulae

- Explain all the variables (especially in formulae) you use. For example, $F = mg$, where $F$ is force, $m$ mass and $g$ the gravitational constant.

- Variables must be in italic, such as $x$ instead of x.

- Longer equations should be placed in a separate line – either aligned to the left or centred. Also consider using equation numbers.

- Use your variable names coherently, e. g. a variable $e$ cannot be used as an error term and then as a time series.

## 6 Grading

The grade for your thesis is predominantly based on your performance and complexity, but be aware that style and form also affect your grade.