Student Guide for Reports, Theses and Presentations at MLAI

Abstract

This documents collects some guidelines for writing theses, seminar reports, and lab reports and giving accompanying presentations within the MLAI group at the University of Bonn. Generally, you should ensure that the reader always has to know what a section (subsection, paragraph) is about and how it is relevant to the overall context (**red thread**), that you explain everything in a way such that a colleague of yours would understand it (**target audience**), that you define everything properly and uniquely and do not contradict yourself (**inner logic**), that you correctly reference everything that is not your own work (**no plagiarism**), and that you motivate and explain all choices you made and point out strengths and flaws of your own work (**critical self-reflection**).

Contents

1 Initial Remarks **1**
- 1.1 Conventions Throughout this Document 1

2 Scientific writing in general **1**
- 2.1 Language 2
- 2.2 Formalia 2
- 2.3 Notation and conventions 3

3 Visual Presentation **3**
- 3.1 Text 3
- 3.2 Non-Text elements 3

4 Structure of a thesis **3**

5 Scopes and scales **4**
- 5.1 Theses 4
- 5.2 Reports 5

6 A Possible Timeline for your Thesis **5**

7 Thesis Proposal / Thesis Exposé **6**

8 Helpful Resources **6**

9 Talks and Presentations **6**
- 9.1 Structure 6
- 9.2 Slides and Presentation Style 6
- 9.3 More abstract 7

A Checklist **8**

B List of required Latex packages **9**

1 Initial Remarks

Writing is a skill that needs to be refined over time. We hope this document will give you a head start, not only by providing best practice advice, but by directing your attention to certain things that will enable you to better reflect on the quality of your document.

Disclaimer This document is meant as a guide to give you an idea of our expectations regarding written presentation of your results. It can not and does not constitute an exhaustive list of our formal requirements. Thus this document does not provide a base for arguments over grades.

1.1 Conventions Throughout this Document

This document collects hints and best practices for scientific writing in general and the various text formats that students have to hand in at our group in particular. Whenever it is necessary to specify different parameters for different text types, we use the following acronyms:

BA Bachelor's thesis

MA Master's thesis

PG Projektgruppenbericht

SR Seminar report

LR Lab report

2 Scientific writing in general

This section contains best practices, tips and tricks on good formal, scientific writing. Presenting your work in an accessible way is as much part of the scientific process as developing methods and conducting experiments. A well structured text reflects

sound methodical thinking and makes it easier for the reader to concentrate on the content of your work. [6]

2.1 Language

- Style
  - Use present tense (exception: Related Work and parts of Conclusion)
  - No contractions:

    ✘don't → ✔do not
    ✘hasn't → ✔has not
  - Use active voice
    ✘the experiments were conducted by X → ✔X conducted the experiments
  - ✘Sentences spanning multiple lines, especially those that contain many neseted sentences, multiple arguments, many examples and enummerations should be avoided as to not unnecessarily fatigue the reader such that concentrating on the content is as easy at the end of the document as it was in the beginning. → ✔Avoid sentences that span multiple lines. Convoluted sentence construction is especially tiresome in longer documents.
    It is okay to write long sentences initially just to have all your thoughts collected in the document. When subsequently improving this first draft, break down those long sentences into shorter ones so the reader does not get lost.
  - Choose between British and American English and stay consistent within it.
  - Use spell checkers
- Instead of "I" use "We", as in you, the author, walks the reader through your thinking process.

2.2 Formalia

- The document has to be a **PDF**.
- Length
  - PG, SR, LR: 8-10 pages per person required
  - BA: required are 25-50 pages (we recommend 40)
  - MA: required are 25-100 pages (we recommend 50)
  - the pagecount starts with the Introduction (first chapter) and ends with the Conclusion (last chapter).
  - The Bibliography is not part of the page count and you can have as many References as you like, without cutting into your page budget.
- Citations
  - Citations style **either (Author, year) or [num]**. We recommend the first but chose what fits your style of writing best as long as you stay consistent and don't mix both citation styles.
  - Citations are placed at the **end** of the sentence, before the dot ("silent" reference).
    ✘... by now is a well established fact. [42] → ✔... by now is a well established fact [42]. ✘... by now is a well established fact. (Adams, 1979) → ✔... by now is a well established fact (Adams, 1979).
  - Exception are "loud references", that is if the sentence is broken without using the reference explicitly: "Horváth et al. (2020) have shown ...". Note that (Author, Year) citations differ in this case:
    ✘(Welke, 2020) uses references incorrectly. → ✔Welke (2021) shows that people can learn from past mistakes.
    (Note the different placement of brackets)
  - You need to mark **everything** with a reference that is not part of the current contribution or the current result (i.e. your own work) of this particular document. In particular, referencing your own older work (e.g., a seminar report from last semester) requires a citation. This can include figures (also recreated ones), tables, algorithms, lemmata, results, arguments etc.
- Bibliography
  - Not all types of sources (web pages, proceedings, books) come with the same set of meta data (author, year, edition, date of access, link, chapter, pages) neither is necessarily all the information relevant. Present the information that is necessary for the reader to find the cited source (and perhaps the relevant section) but avoid overloading the entries with redundant or unnecessary information.
  - Scientific context/ related work: journal article > conference > workshop paper
  - Basics: textbooks
  - Misc: web pages
  - Datasets: Most are associated with a scientific publication. If they are distributed via a website this is also the place where you can usually find information on how to cite them properly.
- Different LaTeX-packages are available to handle citations and references.

  - `natbib` allows (Author, Year), as well as [num] styles. It has dedicated commands `\citep{}` for "silent" and `\citet{}` for "loud" citations.

2.3 Notation and conventions

- Adhere to field specific conventions regarding vocabulary and technical terms, variables and acronyms.
- Avoid using ambiguous words (normal, canonical ...) except when properly introduced beforehand
- Definitions should be as formal as possible, a prose explanation of something is good style but only complementary.
- Different sources can use the same variable with different meanings. When citing you can adapt those definitions as to avoid ambiguous use for the variables within your document. Stay **consistent** within your document!
- See Section 8, esp. [3, pp. 1-8]

3 Visual Presentation

In addition to a well structured content a tidy and consistent visual presentation greatly benefits readability. We highly suggest you use LaTeX.

3.1 Text

- No headline after a headline
- Use a readable font
- Font size: 10–12pt

3.2 Non-Text elements

- LaTeX: **Floats** [1]
  - $\exists \Rightarrow$ use them
  - Floats wrap around nearly everything that is non-text. They enumerate themselves automatically, can be referenced by name set in \label{...} via \ref{...} and provide a place for a \caption{...}
  - Each float needs to be referenced and explained in the text
  - Each float has a caption that gives a standalone explanation
  - Place floats close to where they are referenced to in the text
- Each axis on each plots needs to be labeled
- When citing a table from another document, do not use a screen shot bitmap, but instead rebuild the table
- Never use image files such as .png / .jpeg when avoidable. Use **vector graphics**!

[1] https://en.wikibooks.org/wiki/LaTeX/Floats,_Figures_and_Captions

4 Structure of a thesis

Most theses (and articles, for that matter), are similarly structured. A similar structure helps your more seasoned readers (think: examiners) to focus on the content (i.e., what you did). It is good to adhere to the standard, everything that distracts the reader from the content that you want to present should be avoided.

Your content and results should be creative, not your layout. We provide a LaTeX-template for theses and reports on our homepage. You may use it as you see fit and change it according to your liking for your thesis.

1. Title page
   - Title
   - Name
   - Date
   - Supervisor
   - Examiner(s)
   - *optional*: Logo of University of Bonn and the MLAI group
2. Abstract
   - BA/MA: max 1 page
   - Reports: max $\frac{1}{4}$ page
   - content: what, why, how, results
3. Acknowledgments/ inspirational quote (optional)
4. Eigenständigkeitserklärung
5. Table of content
6. Lists of Figures, Tables, Abbreviations and Variables (or after bibliography; BA: optional, MA: probably helpful)
7. Introduction
   - *Context*: Start with a general introduction of the the research field and steer towards your specific topic.
   - *Problem statement*: Roughly outline the problem that this work is concerned with. Formalize the task and mention what the goal is.
   - *Relevance*: Explain why this problem is relevant (i.e. motivate using e.g. applications) and why solving it isn't trivial.

- *Method*: Discuss how the problem is approached and finally solved. List necessary 'ingredients' that are part of the method.
- *Related work*: Very shortly mention related work concerned with the same or a closely related problem.
- *Contributions*: Summarize all main contributions and results of your work.
- *Thesis structure*: Briefly outline the structure of the remaining sections.
- Further hints:
  - It is advisable to include an easy to understand example, ideally using a visualization.
  - After reading the introduction, the reader should already have a rough idea abut all major contents of your work.
  - More detailed information on writing introductions is provided in e.g. [6].

8. Related Work

9. Preliminaries

   - Formally introduce definitions, notation and concepts required to understand the remainder of the document
   - Target audience: explain everything with as much detail such that a fellow student of yours would be able to understand the document completely. If something was new to you before the thesis: explain it.
   - You can (and should) give illustrative examples using pictures/ figures to aid comprehension

10. Main section

    - This can span multiple chapters
    - start with a formal definition of your problem/ research question(s)
    - describe and motivate your solution; take your time, describe preliminary experiments and trials, visualize examples
    - how will you solve the problem
    - why did you chose to do something one way over the other (if two ways are basically equivalent, state this fact and say that you simply preferred doing it this way)

11. Experiments
    Before conduction

    - Describe datasets
    - Setup
    - What metrics will you report within one experiment (e.g. error or loss) and across experiments (e.g. standard deviation on results)
    - Baselines/ frames of reference (e.g. other algorithms)
    - (Briefly) describe all hyper-parameters (of all the methods you use) you had to chose and explain your choice
    - Explain how your solution will solve the research problem

    After conduction

    - Present the results, if possible visualize them
    - complete, extensive and objective description of results (this may feel very dry and weird to write at first)
    - interpret the results
    - point out expected/ unexpected results
    - determine whether the results constitute a success regarding the research questions

12. Conclusion and Future Work

    - Summary of thesis
    - Repeat research question(s)
    - What was your contribution to solve it
    - Result of the interpretation
    - What could be the next steps or further avenues of research from here on?

13. Bibliography

    - See Bibliography in 2.2

14. Appendix

    - Additional Figures
    - lengthy/ detailed proofs

5 Scopes and scales

5.1 Theses

Bachelor Thesis

- Independent research of literature and interpretation of results.
- Appropriate presentation as a scientific document
- Citing mostly text books and only few (proper) papers is okay

Master Thesis

- Work autonomously
- Considerable length
- Solve a significant research problem
- Presentation of the research problem and solution within the context of current research
- Reflecting knowledge on the current state of the art
- Working with primary sources: Papers and the most recent research
- Adhere to scientific principles
- Demonstrate ability to creatively apply knowledge on the problem at hand

5.2 Reports

Project Group

- See BA in 5.1 but less content and less literature research
- Work together as a group

Seminar Report

- Summarize and discuss scientific papers autonomously
- Summarize content within the context of the seminar
- Discuss, analyze and compare content with fellow students and try to see the overall direction of research

Lab Report

- MA in 5.1 but less content

6 A Possible Timeline for your Thesis

It is your task to structure your own work. Part of writing a thesis is showing us that you are able to work independently on a scientific topic. Hence, we will not force you to do anything or to adhere to any structure that we might feel suitable for a thesis. However, Figure 1 provides a generic timeline for your thesis that you might consider as a starting point for your own time table.

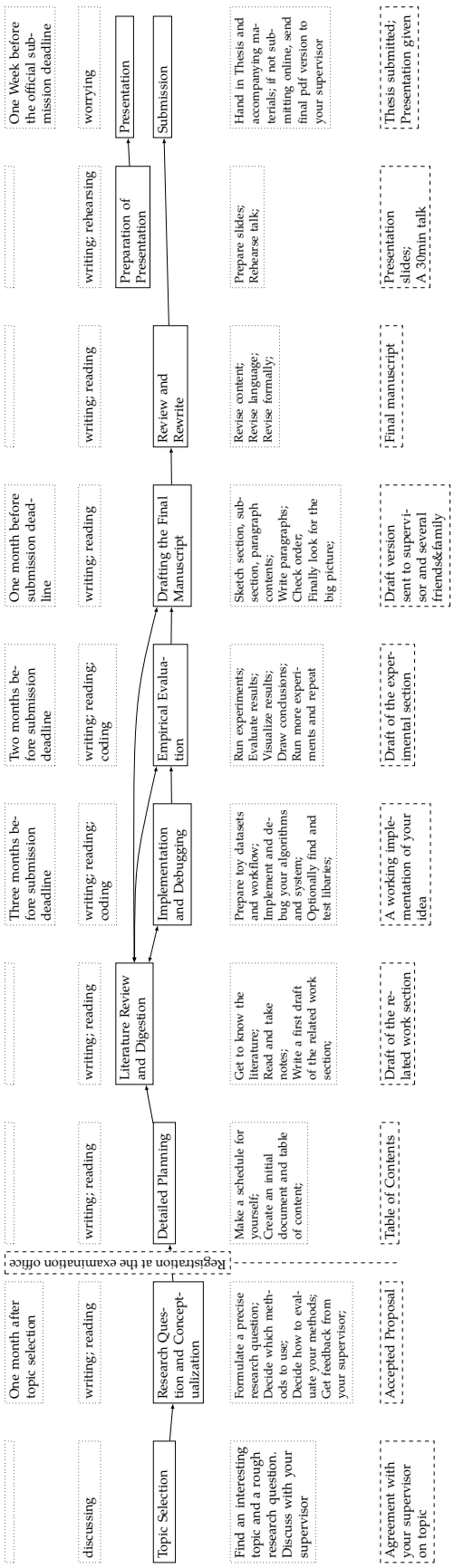

Figure 1: A possible timeline of your thesis.

7 Thesis Proposal / Thesis Exposé

Before you formally register your thesis at the examination office we expect you to have a written exposé ready. This piece of writing has to be agreed upon by yourself and your supervisor. You can see it as an agreement on the scope of your thesis. It should be 1–3 pages and contain

- your detailed research question(s),
- an initial (brief) review of relevant related work,
- a short overview of methods and experiments that you want to apply to answer your question(s), and
- an outline of the structure of your thesis.

Your exposé can ideally serve as the basis of your actual thesis.

8 Helpful Resources

Many smart people have written on writing. Here are a few references that extend (and probably partially contradict) this compact document. Feel free to have a look!

- "How to Read a Paper" by Keshav [2]
- *Writing for Computer Science* by Zobel [6]
- *Mathematical writing* by Knuth, Larrabee, and Roberts [3]
- *How To Speak by Patrick Winston* by Winston [5]
- *The elements of style* by Strunk and White [4]

9 Talks and Presentations

As important as written communication is in science, it is not the only means by which you have to be able to present your work. Giving talks and presentations is equally important. As with writing, talking about your work (or any other topic) is a skill that can be trained and refined over time.

Some people like to put lots of pictures on their slides, some like their slides slim and clean; some people like constant interaction with the audience, some people prefer to have a long discussion after the talk instead, others do both. We want to encourage you to experiment with your presentation style. Try to find out what suits you best, what you feel comfortable with and how you can make the presentation fun, not only for your audience but also for yourself. However, despite all the creative freedom presentations offer, there are some things that can make or break a presentation and this is what we want to address in this section.

Disclaimer: Before really getting into this section we need to stress the one formal requirement for presentations at the university: When grading your talk we need to take into account whether or not you managed to **stay within the time limit**.

9.1 Structure

On a fundamental level a good presentation and a well written text are very similar – after all both have the goal to convey certain information to an audience. This means when developing a presentation one again needs to pay close attention to the overall structure, inner logic and the target audience.

A very general outline for a presentation in the Labs/ PGs/ theses would be:

- Title - topic, name(s), date
- Motivation of the Problem
- Background knowledge necessary to understand the talk
- Your work
- Summary & Future Work

To attract the attention of your audience, introduce your topic with an illustrative example, a story or an anecdote. It can serve as a point of reference throughout the whole presentation that you can connect back to. Further, we recommend to add transition slides between main parts of the presentation, signaling the shift to a new topic. They serve as a break for you and the audience. Keep in mind your time limit when planning the structure of your presentation. If you cannot estimate how long you will need for your presentation, practice it beforehand. Do not forget to account for time for audience questions in your time budget. Exceeding your time limit can be seen as an insult, showing that you value your time more than your audience's time.

9.2 Slides and Presentation Style

We can see that the proposed outline is indeed very similar to how a report or thesis is structured but the formal presentation differs greatly.

Depending on the target audience, context of the talk and time constraints, one may have to make trade-offs between all of those points. Most of the time the bigger picture is more important than finer details. A very simple, but helpful guiding question is: What is the most important thing that you want the audience to remember from your talk?

It is also beneficial to think about: Why do you give this presentation? Why is the audience attending the presentation? (The trivial answer "We have to give/ attend the presentation" is of course correct, but misses the point here).

While there is no right or wrong for how your slides should look, there are of course some best practices we recommend:

- do not put entire sentences on the slides, note down keywords
- take your time to explain your math (at least conceptually)
- use illustrative images to underline your messages
- graphs: explain units, axes, methodology and take away messages
- illustrate short algorithms with pseudocode, longer algorithms with examples/ animations
- achieve clear arrangements by using white space

Also:

- check your tools and technologies in advance
- speak rather too slow than too fast
- keep eye contact with your audience
- do not simply read the contents of your slides
- clearly establish the rules for your talk in the beginning (e.g. is it okay to interrupt you at any point or just ask questions later?)

9.3 More abstract

To not limit your creativity with more guidelines, we want to instead prompt you with questions that *the audience* of a talk should be able to answer positively:

- Big Picture
  - Does the presentation follow a clear outline? Did you feel lost at any point?
  - Do the acoustic and visual channels complement each other?
  - Do you feel like you have an idea what the central question of the thesis is about?
- Visual Channel
  - Did each slide have a clear focal point?
  - Do you notice anything about the body language of the presenter?
- Acoustic Channel
  - Is the speed of the speech appropriate and is the pronunciation clear (enough)?
  - Does the presenter explain the content in an accessible and simple way?

Since it is hard to give illustrative examples of good talks within a text document, what better place to watch and learn more about giving a great presentation than a talk series on giving a great presentation [1]. We also recommend to go to your preferred streaming platform, look for a presentation on a topic of choice and try to analyze it with the questions above in mind.

References

[1] *5 TED Talks Full of Tips on How to Make a Great Presentation*. TED. URL: https://www.ted.com/playlists/574/how_to_make_a_great_presentation (visited on 04/27/2021).

[2] S. Keshav. "How to Read a Paper". In: *SIGCOMM Comput. Commun. Rev.* 37.3 (July 2007), 83–84. ISSN: 0146-4833. DOI: 10.1145/1273445.1273458. URL: https://doi.org/10.1145/1273445.1273458.

[3] Donald E. Knuth, Tracy L. Larrabee, and Paul M Roberts. *Mathematical writing*. Vol. 14. Mathematical Association of America, Washington, DC, 1989.

[4] William Strunk and E. B. White. *The elements of style*. 4th edition. Pearson, 2000.

[5] Patrick Winston. *How To Speak by Patrick Winston*. MIT OpenCourseWare. 2019. URL: https://www.youtube.com/watch?v=Unzc731iCUY (visited on 09/24/2020).

[6] Justin Zobel. *Writing for Computer Science*. 3rd ed. London: Springer-Verlag, 2014. ISBN: 978-1-4471-6638-2. DOI: 10.1007/978-1-4471-6639-9. URL: https://www.springer.com/gp/book/9781447166382 (visited on 08/17/2020).

A Checklist

Scientific Writing	ToDo	Done
Work is in present tense (except for Related Work and parts of Conclusion	☐	☐
Active voice	☐	☐
No contractions in the work	☐	☐
No sentences spanning multiple-lines	☐	☐
The text is consistent, British or American English	☐	☐
The text is spell-checked	☐	☐
The length of the work matches the requirements	☐	☐
The citation style is consistent and correct	☐	☐
The bibliography is correct and complete	☐	☐
Every result which is not from this particular document is referenced	☐	☐
There is no use ambiguous words	☐	☐
The definitions are formally given	☐	☐
The notation is consistent	☐	☐

Visual Presentation	ToDo	Done
There is no headline after a headline	☐	☐
The font is readable with font size 10-12pt	☐	☐
All floats have a caption, reference and standalone explanation	☐	☐
All plot axes have labels	☐	☐
There is no screenshot of a table	☐	☐
All graphics are vector graphics or tizpictures	☐	☐

Structure	ToDo	Done
The work is structured properly, according to Section 4	☐	☐

B List of required Latex packages

In this sections you can find a list of the packages used for the different templates.

- Preable:
  - polyglossia
  - algorithm
  - algpseudocode
  - enumitem
  - csquotes
  - metalogo
  - fancyvrb
  - varioref
  - hyperref
  - cleveref
  - biblatex
- Report and Thesis:
  - geometry
  - translations
  - xcolor
  - graphicx
  - booktabs
  - mathtools
  - ntheorem
  - iftex
  - inputenc
  - fontenc
  - textcomp
  - tgpagella
  - fontspec
- Thesis:
  - fmtcount
  - emptypage
  - subcaption
  - caption