

Writing and presenting degree projects in Mathematics and Mathematical statistics

Tom Britton, tom.britton@math.su.se
Stockholm University

March, 2023

General remarks

Unlike our subject (mathematics) there is no exact *right* or *wrong* in writing and presenting

The more you write/present – the better you get!

This lecture is about the "package" – not the mathematical content

The "package" is equally important for reaching out!

The lecture is **not** about software (LaTeX or similar – there are templates on home page)

Before starting to write

Procedure: Preparation – writing – revision

Things to consider when preparing:

- Who is the typical reader? Should be student colleagues
- What are the main messages? (Not too few or worse, too many) Write them down!
- What is good notation to be used?

The "decreasing rule"

Keep in mind the decreasing or "half-time" rule:

Out of all people that read the title

- 50% read the abstract
- 25% read the introduction
- Half of readership is lost with each section
- < 1% read the appendices

I think these numbers are **very optimistic** ...

Consequences

The title is very important: to deliver the main message AND to attract the reader

The abstract is very important: should contain the main messages and a bit about methodology

The introduction is very important: I think it should contain a very short background, a statement of the problem(s) treated, a presentation of the results and description of the rest of the paper

Have the "decreasing rule" in mind: someone who reads 1-2 pages should benefit from this!

More things before getting started

Who should be author? Nearly always only one author in degree projects

Who/what should be acknowledged?? Supervisor, others who have contributed, **ChatGPT** if used (and how)!, ...

English or Swedish – you decide (usually also abstract in “opposite” language)

Getting started

The first thing to do: write a **skeleton** (\approx list of contents)

The skeleton should contain the different (sub-)sections

The skeleton should also contain a description of what parts come in the different (sub-)sections (relating to the "main messages")

A common structure of a mathematical paper

- Title, authors and abstract
- Introduction (possibly also containing main results)
- The model/problem (+ what have others done – references)
- one or more sections of theory
- illustration/application/numerics
- Discussion/conclusion: What has been done, possible alternative routes and extensions, why are the results interesting and **possible improvements and open problems**
- Appendix (sometimes placed after references)
- Reference list

Writing the main text

It's ok to leave out some technical bits at first to keep *logical line* in writing procedure

Minor comments

- Don't use complicated/specialised language
- Equations are part of sentences!!!
- Use, but don't over-use, bold face and italics
- Don't start sentence with mathematical symbol
- Avoid abbreviations
- Number only equations that are referred to
- Try to make the text "flow": leave less relevant technicalities to appendices (or technical sections)
- Admit or give reference where logical steps are left out
- Don't use phrases like: "it easily follows that ..." better with: "standard but tedious calculations reveal that ..."

More minor comments

- Avoid too **much** mathematical notation
- Mathematical notation should be logic and easy to remember
- Use words rather than math-symbols in running text: "Pick an element x in X " rather than "Pick $x \in X$ "
- Lemma – Theorem/Proposition – Corollary
- Use "I" or "we" in text? I prefer "we" even if only one author:
We = I and the reader
- Use figures, tables etcetera – it makes the text look more varying
(beside explaining/illustrating something)
- All figures/tables and similar must be referred to in text

More minor comments

- Use capital letters when referring to figures, theorems, and similar: "... as shown in Figure 3 ..."
- Use spell- and grammar-check
- Use active (not passive) form in sentences

Specific remarks: Title and abstract

- Should be written "afterwards"
- **Title**: spend time deciding this! It is very important
- **Title**: should be informative, "catchy" and short (hard ...)
- **Abstract**: should both give the main result and attract the reader
- The abstract is not part of the paper: something defined in the abstract must also be defined in the main text

Specific remarks: Introduction

Introduction

- Readers who only read introduction should benefit from this
- Should explain the question studied with a minor background
- I think the main results should also be stated here
- Unless given elsewhere, the introduction should end by describing the structure of the rest of the report
- It should also try to catch the interest of the reader

Specific remarks: Citations and references

- Different ways to refer and writing reference list. Be consistent
- All items in reference list must be cited in text
- Give background reference covering "your" area
- Avoid citing unpublished work and give page reference when citing books
- If you have not written part of the text this **must** be acknowledged:
 - from other literature: quote and give reference,
 - if helped: mention in acknowledgement what,
 - **ChatGTP**: mention in acknowledgement how.

See "Vägledning om användning av AI-drivna chattbotar vid utbildning och forskning" on SU web for more details

- **If not you are making a misconduct!!!!!!**

Specific remarks: Discussion/Conclusion section

- Should summarize main results (repeat the important!)
- Mention the strength of the results
- Mention also what can be done better, extensions and open questions

Specific remarks: Appendix (and technical sections)

- Here you can be more technical/advanced
- Should contain material that is not central and would stop the "flow" in the main text
- Each appendix should start with what it is about
- Each appendix should end with the result that is referred to in main text

After the first draft written

- Leave the manuscript for a few days (otherwise you are "blind")
- Then go through it:
 - First look at the general structure: is everything there?, adequate level of detail?, easy to follow the logical line?, can something be removed?
 - Then go through the manuscript in detail
 - Pretend you are a typical reader of the journal in question
 - Change whole paragraphs rather than sentences
 - Focus more on removing than adding things!
- If several authors: read and comment each others' contributions
- Repeat everything above (at least) once more **Date versions!**

After the second and third drafts are written

- Have someone else read and comment the manuscript (supervisor, student colleague, ...)
- Preferably someone being the intended "typical reader"
- Adjust according to suggestions: if they didn't understand something, the same probably holds for others

Oral presentation degree project

- Many similarities with writing
- **Main difference:** Impossible to cover everything. Be simple!!
- Who are you talking to? Students! should affect presentation
- Remember: audience is not specialist and have not read the thesis
- Try to catch the listeners interest
- Be very simple in beginning and possibly a bit more technical towards the end
- Consider how much time you have when preparing talk
- Give the talk loud for yourself when preparing – takes longer time
- **Never** talk too long. Shorter is fine
- Some slides towards the end should be possible to skip

Oral presentation: details

- Don't use complete sentences in slides
- At most one slide per minute
- Try to catch eye contact with people in the audience – not always the same person(s)
- Speak loud!
- Talk only about the important parts of the work
- Only important references at end (if any)
- Most important that listeners understand the problem you are addressing (if they don't, they surely will not understand how you solved it!)
- Attend other presentations and read other reports to learn good and bad things!

Oral presentation: details

Each slide

- Informative title/heading
- use symbol ".", "-", ... to visualize list
- not too much information on one slide
- leave out details
- should only contain information you talk about
- large enough font

Oral presentation: details

- Talk about a special case rather than most general situation
- You may have notes on the side for your memory
- Unexperienced speakers are recommended to learn 1-2 sentences at the start by heart
- Don't speak too fast
- Make a slightly longer stop after saying important results
- Avoid repetitive "hang-ups"

After talk: try to get feedback from supervisor/student colleagues
– learning to give talks is a process