AI Master Class, 02/10/2023

How to write a thesis

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AI Master Class – recap

- We do computer **science**
  - Science is about method over results
  - Science is about theory over belief
- We need to
  - know what we know
  - be thorough in our approach
  - be able to argue our results
- This is what the AI Master Class is about: you doing the best possible work

Overview of the Master Class, 2023

- ~~04/09/2023 — *Introduction* and *how to do research questions*~~
- ~~18/09/2023 — *Doing structured literature reviews* and *how to read and write a research paper*~~
- 02/10/2023 — *How to write a thesis*
- 16/10/2023 — *Using HPC at NTNU* and *Reproducibility*
- 30/10/2023 — *How to do quantitative empirical research*
- 13/11/2023 — *Sustainability in AI*
- ??/??/202? — *CSSC*

Your thesis

- You might save the planet
  - However, if you do not know *how* and *why*, and can't describe it — it has little value
- What do you aim for?
  - The average student can **reproduce knowledge**
  - The above average student can **add to knowlede**
  - The good student can **reflect on said addition**
- All of this goes into your thesis!

Method is our friend

- Say this every morning when you look in the mirror: “Method is our friend!”

AI Master Class, 28/09/2021

How to write a thesis

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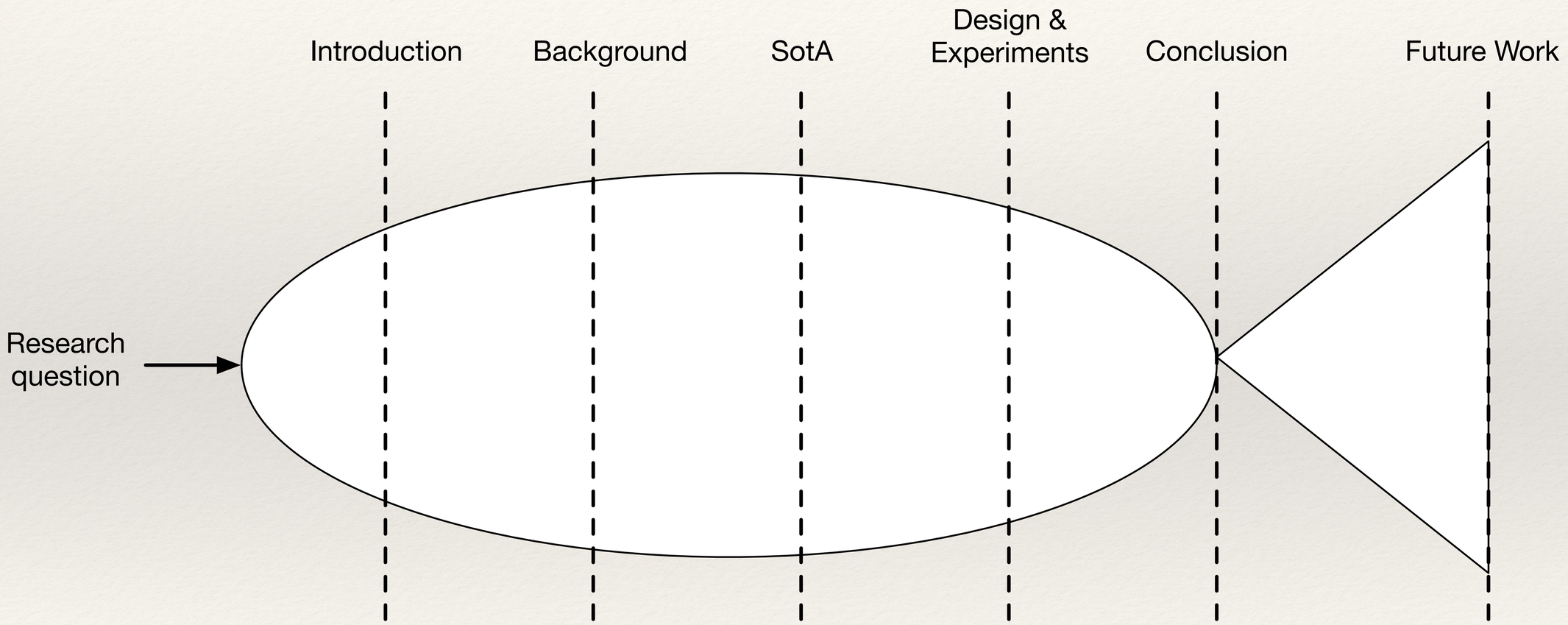
Your research box

Come, come little fishy...



Thesis structure

- Abstract
- Introduction
- Background Theory and Motivation
- Architecture/Model
- Experiments and Results
- Evaluation and Conclusion
- Bibliography and Appendices

Abstract

The abstract is your sales pitch which encourages people to read your work but unlike sales it should be realistic with respect to the contributions of the work. It should include:

- the field of research,
- a brief motivation for the work,
- what the research topic is,
- the research approach(es) applied, and
- contributions (results)

Remember what we did when searching for literature

Introduction

- Background and Motivation
- Goals and Research Questions
- Research Method
- Contributions
- Thesis Structure

Background & theory

This introduction to background and motivation should state where this project is situated in the field and what the key driving forces motivating this research are.

Goals and research questions

- Your goal/objective should be described in a single sentence.
- The goal of your work is what you are trying to achieve.
- This can either be the goal of your actual project or can be a broader goal that you have taken steps towards achieving.
- Such steps should be expressed in the research questions.
- Note that the goal is seldom to build a system.
- Each research question provides a sub-goal and these should be precise and clearly stated enabling the reader to match your results to the original goals.

Research methods

- What methodology will you apply to address the goals:
- theoretic/analytic,
- model/abstraction, or
- design/experiment?
- This section will describe the research methodology applied and the reason for this choice of research methodology.

Contribution an thesis structure

- Contributions just provides a brief summary of the main contributions of the work.
- Thesis structure provides the reader with an overview of what is coming in the next chapters.
  - You want to say more than what is explicit in the chapter name, if possible, but still keep the description short and to the point.

Background theory and motivation

- Background Theory
- Structured Literature Review Protocol (or other approach)
- Motivation

Background theory

- The depth and breadth is what is needed to understand your project in the different disciplines that your project crosses.
- The theory is here to help the reader that does not know the theoretical basis of your work to gain sufficient understanding to understand your contributions.
- It introduces terminology that can later be used

Literature review

- We know how to do this, right?
- Or do we?
  - This is not a listing of every single piece of literature that made it through the filter
  - It is a coherent text that sums up State of the Art!

Motivation

- You are either
  - Application-driven, or
  - Method/technology-driven
- Why are your goals and research questions important to address?
- Your literate review is presented
- Present an overview of the motivating elements of the work going on in your field and how these relate to your proposal

Architecture / model

- What is the architecture or model?
- Here all the theory and motivation come together.

Experiments & results

- Experimental Plan
- Experimental Setup
- Experimental Results

Plan & setup

- What experiments are to be done?
- What questions do these experiments answer?
- What research questions are they answering?
- Each experiment is described in so many details that I can reproduce them!

Results

- What are your results?
- Select your results with care – not to skew the conclusion but to underline an arguments
- Raw data might go in appendix or online
- Statistics is our friend!

Evaluation & conclusion

- Evaluation
- Discussion
- Contributions
- Future Work

Evaluation & discussion

- What can you conclude?
- Don’t overdue it
- Did the results produce new questions?
- Can you extrapolate
- Any threats to validity?
- This is not only the good stuff, but also the bad stuff.

Conclusion

- What are the main conclusions?
- Are they significant?

Future work

- How would you like to extend your work?
- Are there any suggested solutions to the limitations?
- Of all the things you said no to, are there any that should be pursued?

Bibliography & appendices

- Cite people and their work
- Use natbib full citation
- Bobsen and Katesen [2000]
- [Bobsen and Katesen, 2000]
- Include (possible in an online repository)
- Code
- Protocols
- Raw data
- …
- ..
-

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