

# Proposed structure for a graduation thesis

*Even though this document was made in MS Word, we strongly advise you to write your thesis completely in LaTeX. It will produce a document of significant higher quality of layout, and you can easily base yourself on a template of students who made their thesis last year.*

## ABSTRACT

Your thesis typically starts with a 1-page abstract of the thesis: it provides a general motivation, a description of the problem you are addressing, a brief sketch of your solution to that problem, and finally it highlights the main results and contributions of the work.

## ACKNOWLEDGMENTS

You can put here all acknowledgements of people that supported you directly or indirectly in this graduation thesis (or in your studies). If you want to give a funny twist to this section, that's okay.

## INTRODUCTION

The introduction states the problem of the thesis and is typically subdivided in the following short sections:

**Context:** Sketch the context and domain of the work.

**Problem:** Describe and define the problem that will be tackled in this thesis.

**Motivation:** Motivate why this problem is a relevant one. Why is this problem important, complex, not yet solved, what are the shortcomings today. Optionally add a motivation why you have chosen this particular thesis topic or why this topic was proposed.

**Objectives:** Highlight the intended objectives of your thesis. What is the goal of this work? (In the conclusion chapter you will come back to these objectives and discuss to what extent you managed to achieve those objectives.)

**Approach:** Without going in full detail, present in general terms how you will solve the problem and achieve the objectives.

**Contributions:** Explicitly highlight the major and minor research contributions of your work. These can be of various kinds but it is important to stress the *novel* aspect; e.g.:

- identification or specification of a new relevant problem;
- proposal of a novel solution to an existing problem;
- new mathematical formalisms, definitions, theorems or proofs;
- design of a novel framework, system, language, ...;
- a comparison (or survey) of existing theories, models, designs, systems or implementations in a novel way;
- first implementation of a designed system (or significantly improved implementation of an existing system);

nificantly improved implementation of an existing system);

- an empirical analysis, for example a study of the performance of an implemented system;
- confirming or validation of the correctness of someone else's work (for the first time or in a novel way).

**Roadmap:** Finish this section by announcing how the remainder of your thesis document is structured, e.g.:

“The remainder of this document is structured as follows: the next two chapters provide the necessary background material and report on related work. Then, the proposed solution to the problem is introduced, motivated, defined and worked out. The software architecture supporting the implementation of that solution is then explained, and exemplified. An experiment/validation/case study is then conducted in order to validate the solution. Finally, a conclusion delivers the main contributions of this research and we present some avenues of future work.”

Hint: Try to phrase that roadmap paragraph in concrete terms dedicated to your concrete problem and solution. If someone else can just copy paste it and put it in his graduation thesis, then you are probably not concrete enough.

## BACKGROUND MATERIAL

In this section, introduce the background material needed for the reader to understand the core chapters of your thesis. This includes all relevant material to make the thesis “self-contained” so that reader can understand the entire thesis without having to consult other sources. For example if you use a certain algorithm, or if you target a certain platform, or if you rely on a certain mathematical theory, it may be useful to summarize the essence of that material here, so that the user can fall back on it if needed. Users that already know this material should be able to safely skip this section. Do not forget to explain clearly to the reader why this material is relevant in the context of this thesis, so that he doesn't get bored by all this extra stuff, which is only background material but not part of the essence of the thesis. Don't exaggerate with this section. Only put what is really necessary to understand what comes later. Some theses don't need a background section at all.

## RELATED WORK

In this section you should list relevant related work existing today: what other solutions are provided today to address the problem that you stated in the introduction. You could: provide a summary of some articles that you have read, make a comparison table between solutions that you found relevant for the problem, analyze existing solutions, discuss advantages and shortcomings of some selected solutions, discuss in details the limitations of existing practice. The

main point of the related work is to put in perspective your work, which will build upon or be complementary to that related work.

## **PROBLEM STATEMENT**

Now that you have introduced the necessary background material and related work, you can explain in more detail the research problem that you want to address in this thesis, why it is a relevant problem and how your solution would advance the state of the art in this research area (by positioning it in terms of the related work discussed in the previous chapter).

## **RUNNING EXAMPLE [optional]**

When explaining your solution in the next section, it is often helpful to do that through a running example. That running example can be introduced here. It should be well chosen so that it is not too complex yet illustrates the problem well. Note that this running example does not have to be a full-fledged case study – that would be part of the validation chapter – but can be smaller. Alternatively, it could be a subpart of such a larger case study.

## **SOLUTION**

In this chapter (or chapters), you describe in detail the solution you have developed to address the problem. This chapter may be decomposed in several chapters describing different aspects of your solution. For example, one chapter introducing a new formalism you developed, another describing a novel algorithm you propose based on that formalism, and finally a chapter discussing a prototype implementation of that algorithm.

What is most important to make clear in these chapters is the conceptual ideas behind the solution. Try to describe the essence of your solution so that any reader can understand it, even though you can add some more detailed sections that dive into the technical intricacies of the solution as well. A reader who is only interested in the big picture should be able to skip those more detailed sections and still understand what your solution is about. A reader who wants to understand your solution in full detail can decide to read them.

Where necessary, provide schemas or pictures illustrating how your solution works. A (good) picture often tells more than a thousand words. Throughout this chapter, illustrate the different aspects of your solution on the running example. At the end of the chapter, don't forget to position your particular solution to the related work discussed in a previous chapter.

## **VALIDATION**

In this chapter, describe the experiment, benchmarks, case study or other means of validation, which you conducted to prove that your solution attains the objectives put forward in the introduction.

## **Method**

Describe the details and approach of how you conducted

your validation experiment(s).

## **Results**

Present the brute results obtained after having conducted the experiment, but don't draw any conclusions yet.

## **Analysis/discussion**

Analyse the obtained results and discuss what conclusions you can draw from these results. If possible include statistical tests, charts, graphs to support your analysis.

## **Threats to validity**

Discuss all factors that may have negatively or positively influenced your results or that may cause the experiment to be difficult to replicate by others.

## **CONCLUSION**

Summarize the main findings of your work: what did you do, what was not covered, advantages, shortcomings, possible future work. Did you attain the initial objectives of the thesis?

Make sure to revisit the initial problem statement and to point out explicitly how your solution addresses it. Also repeat the achieved contributions.

## **FUTURE WORK**

Discuss possible paths of future work here. A good idea is to fill in this section throughout the entire year you work on this thesis. Whenever you have a cool idea, put it here. If you don't have time to develop it, it becomes future work.

## **REFERENCES**

A section with all references to books, articles and websites you refer to in the thesis. Make sure that your references are as complete and detailed as possible and let BibTeX take care of the formatting for you.