



Degree Project in Technology

Second Cycle, 30 credits

Template

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Title Page Photo Dummy

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Sammanfattning


Svensk version av abstract – samma titel på svenska som på engelska.

Skriv samma abstract på svenska. Introducera ämnet för projektet och beskriv problemen som löses i materialet.

Förlåt, jag är inte en infödd svensktalande, så den svenska sammanfattningen är lite konstig...

Nyckelord

Första nyckelordet, Andra nyckelordet, Tredje nyckelordet, Fjärde nyckelordet, Femte nyckelordet

Master of Science Thesis TRITA-ITM-EX 2023:XXX		
 KTH <Industrial Engineering and Management>	The title the subtitle	
	The author	
Approved 2023-month-day	Examiner The Professor	Supervisor The Supervisor
	Commissioner The Commissioner	Contact person The Contact Person

Abstract

This is a template for writing thesis reports for the ITM school at KTH. I do not own any of the images provided in the template and this can only be used to submit thesis work for KTH.

The report needs to be compiled using XeLaTeX as different fonts are needed for the project to look like the original report. You might have to change this manually in overleaf.

An abstract that allows an "informed reader" to grasp the contents of the report. This abstract should be 100% finished at the 80%-draft of the report.

This template was created by NIU Xuezhi <n7729697@gmail.com or xuezhin@kth.se> from the template provided by KTH and template created by Hannes Rabo. You can send me an email if you need help in making it work for you.

Keywords:

First Keyword, Second Keyword, Third Keyword, Fourth Keyword, Fifth Keyword

Acknowledgements

Write a short acknowledgements. Don't forget to give some credit to the examiner and supervisor.

Dedicated to all hard-working students at KTH Royal Institute of Technology

The Author
Stockholm, October 2023 ☺

Nomenclature

Abbreviations

CPU Central Processing Unit

GPU Graphics Processing Unit

Number sets

\mathbb{C} Complex numbers

\mathbb{H} Quaternions

\mathbb{R} Real numbers

Other symbols

ρ Friction index

V Constant volume

Physics constants

c Speed of light in a vacuum

G Gravitational constant

h Planck constant

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Chapter 1

Introduction

In this chapter, provide a general introduction to the area for the degree project. Use references! Formulated research questions are listed together with methodologies. In addition, the limitations and delimitation to this thesis are discussed, as well as the ethics and sustainability analysis.

Link things together with references. This is a reference to a section: 1.1.

1.1 Background

Present the background for the area. Give the context by explaining the parts that are needed to understand the degree project and thesis. (Still, keep in mind that this is an introductory part, which does not require too detailed description).

Use references¹

Detailed description of the area should be moved to Chapter 2, where detailed information about background is given together with related work.

This background presents background to writing a report in latex.

Example citation [1] or for two authors: [1, 2]

Look at sample table 1.1.1 for a table sample.

Table 1.1.1: Sample table. Make sure the column with adds up to 0.94 for a nice look.

SAMPLE	TABLE
One	Stuff 1
Two	Stuff 2
Three	Stuff 3

Boxes can be used to organize content

¹You can also add footnotes if you want to clarify the content on the same page.

Development environment for prototype

Operating systems

computer: Linux - kernel 4.18.5-arch1-1-ARCH

android phone: 8.1.0

Build tools

exp (build tool): version 55.0.4

...

1.2 Problem

Present the problems found in the area. Preferable use and end this section with a question as a problem statement.

Use references Preferable, state the problem, to be solved, as a question. Do not use a question that can be answered with yes and/or no.

1.3 Purpose

The purpose of the degree project/thesis is the purpose of the written material, i.e., the thesis. The thesis presents the work / discusses / illustrates and so on.

It is not “The project is about” even though this can be included in the purpose. If so, state the purpose of the project after purpose of the thesis).

1.4 Goal

The goal means the goal of the degree project. Present following: the goal(s), deliverables and results of the project.

1.5 Benefits, Ethics and Sustainability

Describe who will benefit from the degree project, the ethical issues (what ethical problems can arise) and the sustainability aspects of the project.

Use references!

1.6 Methodology

Introduce, theoretically, the methodologies and methods that can be used in a project and, then, select and introduce the methodologies and methods that are used in the degree project. Must be described on the level that is enough to understand the contents of the thesis.

Use references!

Preferably, the philosophical assumptions, research methods, and research approaches are presented here. Write quantitative / qualitative, deductive / inductive / abductive. Start with theory about methods, choose the methods that are used in the thesis and apply.

An interesting example of Tikz implementation in figure 1.6.1

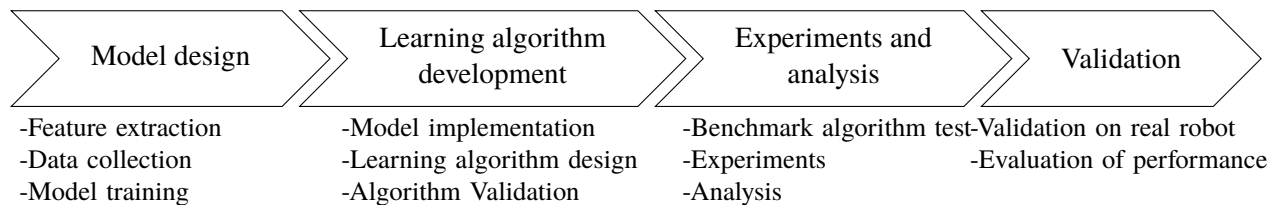


Figure 1.6.1: Overview of the methods in this thesis

Detailed description of these methodologies and methods should be presented in Chapter 3. In chapter 3, the focus could be research strategies, data collection, data analysis, and quality assurance.

1.7 Stakeholders

Present the stakeholders for the degree project.

1.8 Delimitations

Explain the delimitations. These are all the things that could affect the study if they were examined and included in the degree project. Use references!

1.9 Outline

In text, describe what is presented in Chapters 2 and forward. Exclude the first chapter and references as well as appendix.

Chapter 2

<Theoretical Background>

This chapter presents a comprehensive review of the literature, evaluating the current advances in the fields and identifying research gaps in the fields.

Explain what and how prior work / prior research will be applied on or used in the degree project /work (described in this thesis). Explain why and what is not used in the degree project and give valid reasons for rejecting the work/research.

Use references!

2.1 Related Work / Theoretical Background / Theoretical Framework

It is necessary to describe the relevant, scientific background knowledge concerning the area in which you will perform your thesis work. One goal of this section is to analyse the literature reviewed and thus specify the direction of your project work. The main goal is for you to build on and expand your existing knowledge to assist you in dealing with the task at hand. This section is ideally structured as describing related work (scientific papers that perform variants of the same investigation as you do), as a theoretical background (scientific papers that deal with the same problem area as you do), or as a theoretical framework (scientific papers that you use to create a theoretical model for explaining your results).

2.2 Use headings to break the text

Do not use subtitles after each other without text in between the sections.

2.2.1 Related Work

You should probably keep a heading about the related work here even though the entire chapter basically only contains related work.

2.3 Introduction

Your introduction goes here! Simply start writing your document and use the Recompile button to view the updated PDF preview. Examples of commonly used commands and features are listed below, to help you get started.

Once you're familiar with the editor, you can find various project settings in the Overleaf menu, accessed via the button in the very top left of the editor. To view tutorials, user guides, and further documentation, please visit our help library, or head to our plans page to choose your plan.

2.4 Some examples to get started

2.4.1 How to create Sections and Subsections

Simply use the section and subsection commands, as in this example document! With Overleaf, all the formatting and numbering is handled automatically according to the template you've chosen. If you're using the Visual Editor, you can also create new section and subsections via the buttons in the editor toolbar.

2.4.2 How to include Figures

First you have to upload the image file from your computer using the upload link in the file-tree menu. Then use the `includegraphics` command to include it in your document. Use the figure environment and the caption command to add a number and a caption to your figure. See the code for Figure 2.4.1 in this section for an example.

Note that your figure will automatically be placed in the most appropriate place for it, given the surrounding text and taking into account other figures or tables that may be close by. You can find out more about adding images to your documents in this help article on including images on Overleaf.

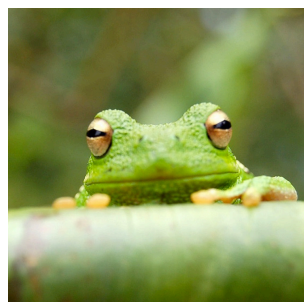


Figure 2.4.1: This frog was uploaded via the file-tree menu.

Item	Quantity
Widgets	42
Gadgets	13

Table 2.4.1: An example table.

2.4.3 How to add Tables

Use the table and tabular environments for basic tables — see Table 2.4.1, for example. For more information, please see this help article on tables.

2.4.4 How to add Comments and Track Changes

Comments can be added to your project by highlighting some text and clicking “Add comment” in the top right of the editor pane. To view existing comments, click on the Review menu in the toolbar above. To reply to a comment, click on the Reply button in the lower right corner of the comment. You can close the Review pane by clicking its name on the toolbar when you’re done reviewing for the time being.

Track changes are available on all our premium plans, and can be toggled on or off using the option at the top of the Review pane. Track changes allow you to keep track of every change made to the document, along with the person making the change.

2.4.5 How to add Lists

You can make lists with automatic numbering ...

1. Like this,
2. and like this.

...or bullet points ...

- Like this,
- and like this.

2.4.6 How to write Mathematics

\LaTeX is great at typesetting mathematics. Let X_1, X_2, \dots, X_n be a sequence of independent and identically distributed random variables with $E[X_i] = \mu$ and $\text{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \dots + X_n}{n} = \frac{1}{n} \sum_i^n X_i$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.

2.4.7 How to change the margins and paper size

Usually the template you're using will have the page margins and paper size set correctly for that use-case. For example, if you're using a journal article template provided by the journal publisher, that template will be formatted according to their requirements. In these cases, it's best not to alter the margins directly.

If however you're using a more general template, such as this one, and would like to alter the margins, a common way to do so is via the geometry package. You can find the geometry package loaded in the preamble at the top of this example file, and if you'd like to learn more about how to adjust the settings, please visit this help article on page size and margins.

2.4.8 How to change the document language and spell check settings

Overleaf supports many different languages, including multiple different languages within one document.

To configure the document language, simply edit the option provided to the babel package in the preamble at the top of this example project. To learn more about the different options, please visit this help article on international language support.

To change the spell check language, simply open the Overleaf menu at the top left of the editor window, scroll down to the spell check setting, and adjust accordingly.

2.4.9 How to add Citations and a References List

You can simply upload a `.bib` file containing your BibTeX entries, created with a tool such as JabRef. You can then cite entries from it, like this: [2]. Just remember to specify a bibliography style, as well as the filename of the `.bib`. You can find a video tutorial here to learn more about BibTeX.

If you have an upgraded account, you can also import your Mendeley or Zotero library directly as a `.bib` file, via the upload menu in the file-tree.

2.4.10 Good luck!

We hope you find Overleaf useful, and do take a look at our help library for more tutorials and user guides! Please also let us know if you have any feedback using the Contact Us link at the bottom of the Overleaf menu — or use the contact form at <https://www.overleaf.com/contact>.

Chapter 3

<Engineering-related content, Methodologies and Methods>

This chapter motivates the methodologies to address the research questions while incorporating engineering subject matter, such as models, hardware platforms, and software environments pertinent to this degree project.

3.1 Methodology

Describe the scientific methodology that you have used in your investigation, using an appropriate scientific textbook as a reference. You have been introduced to case studies and experiments in the research methodology course, but you can use other methodologies if you can motivate it.

For a case study this section includes a detailed description of your chosen case(s). An experimental study can provide hypotheses here, or in Section B (whichever is most easily read). This section also includes a description of the choices you have made to support the internal validity, external validity and reliability of your investigation.

Note that methodologies can be described as being quantitative or qualitative, but these two words do not describe any specific methodology by themselves.

Chapter 4

<The work>

This chapter comprehensively described the work done.

Describe the degree project. What did you actually do? This is the practical description of how the method was applied.

Chapter 5

<Result and Analysis>

This chapter presents the results of the experiments and evaluations conducted in this research.

5.1 Result/Analysis

Describe the results of the degree project.

Present the results from your study. If appropriate for readability, this section can succinctly compare your empirical results with existing theory in the field and/or your hypotheses. This interpretation/analysis should then be directly related to the papers described in Section B.

Chapter 6

<Discussions and Conclusions>

This chapter summarizes the key findings and contributions of this thesis, providing insights into the achievements and implications of the research conducted. It also outlines the limitations of this thesis and suggests potential avenues for future research.

6.1 Discussion

In this section you discuss your findings. This discussion should answer your research questions in relation to the papers described in Section B, and possibly other relevant papers. In other words, this section should put your results into perspective considering the results from other studies, the wider discussion in your problem area and/or considering the theoretical models you have used.

Note that this can include an evaluation of your results to highlight e.g., performance improvements of a solution you have investigated, but that this is not enough on its own – all improvements must be put into perspective considering relevant aspects of the discussion in associated papers.

This section can also include a “limitations” subsection, which describes limitations to your findings - such as when it is not appropriate to trust them.

This section should also include a discussion of your results and investigation in relation to ethical, social or sustainability issues.

6.2 Conclusions

Concise discussion and critical evaluation of the obtained results with respect to the original goals. Discussion of the results into a more general context within the research field. Discussion of the possibilities and limitations of the applied experimental techniques. Formulation of new hypotheses, outlook for future work.

Future Work

Describe the conclusions of your work and give recommendations on how to proceed with the work.

Bibliography

- [1] Ji, Qinglei, Fu, Shuo, Tan, Kaige, Thorapalli Muralidharan, Seshagopalan, Lagrelius, Karin, Danelia, David, Andrikopoulos, Georgios, Wang, Xi Vincent, Wang, Lihui, and Feng, Lei. “Synthesizing the optimal gait of a quadruped robot with soft actuators using deep reinforcement learning”. In: *Robotics and Computer-Integrated Manufacturing* 78 (Dec. 2022), p. 102382. ISSN: 0736-5845.
- [2] EGENÄS, Carl, EKMAN, Felix, MA, Chenqi, NASER, Tim, NIU, Xuezhi, SERNELIN, Axel, STENOW, Samuel, and STRÖM, Benjamin. *Electronically Vacuum Regulated Shut-off Valve for Milking System*. 2023.

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Chapter A

Appendix A

A.1 Appendices

Important, but complementary material/results can be placed in appendices. This includes details of any implementation (practical work stages, etc.), large data sets, etc.”

Chapter B

Appendix B

This is only slightly related to the rest of the report, this is the information

