Writing your MSc Thesis
at Department of Computer Science

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Plan

- Formalities
- Choosing advisor and topic
- The process
- The master's thesis report
- The examination
you will be registered administratively to the MSc thesis without the possibility of cancelling the registration.

- **February 1**
  - September 1
  - MSc thesis contract & start thesis work

- **June 15**
  - January 15
  - handin oral exam
Formalities

• 5 month of work, incl. exam ~ 30 ECTS
• Thesis written in Danish or English
• Advisor: a member of the permanent scientific staff at Department of Computer Science (+ co-supervisors)
• Individually or in groups (2-3 persons)
  – for group projects: the thesis must show which parts of the report the different members are responsible for (possibly “everybody is responsible for all of the thesis”)
  – from a study environment survey: “179 of 331 believe it will be lonely to write the thesis”
  – group theses are strongly encouraged!
MSc thesis contract
kontrakt.scitech.au.dk

• Done jointly by the student and the advisor before the thesis work starts
• States who, general title, hand-in date, etc.
• Short project description and project plan
Read the study regulations for your MSc education: https://kursuskatalog.au.dk/en?department=15&search=thesis

“For the Master’s thesis, the student works independently on an academic issue, on completion of which the graduate can:

- identify, define and formulate an academic issue on a scientific basis
- define and present testable hypotheses/research questions within a subject area
- independently plan and complete a major academic project using the subject’s scientific methodology
- analyze, critically discuss and put into perspective an academic issue.
- assess, critically analyze and summarize the scientific literature within a defined topic area
- relay academic results objectively and concisely to a scientific audience.”
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Choosing a project

- In principle the student's responsibility, but there are ways to get inspiration...
- Attend the annual Computer Science Day
- Contact a potential advisor – we often have ideas for new projects
  - avoid advisor surfing or “do you have something better?”
- Make sure to have flexibility in your project!
  - as opposed to “all-or-nothing” projects
Maturing your idea

• From a loosely defined idea to a concrete problem statement and an outline for your work plan

• Begin early – before your official starting date!

• “Individual project work” (5 or 10 ECTS) is a possibility if you are trying to define an area of interest before your master’s thesis work
Different project types

• Experimental evaluation of theoretical result
• New theoretical result
• Survey
• ...

• Many thesis projects originate from an existing research project
• 5-10% of the thesis projects lead to scientific publications
Industry collaboration

• Via advisor or your own initiative
• MSc thesis focuses on an *academic* issue
• Thesis advisor must approve the topic
• Be aware of AU technology transfer office offers templates for NDAs and collaboration agreements
  [https://medarbejdere.au.dk/administration/forskning-talent/erhvervssamarbejde/samarbejdsaftaler/fast-track-agreements/](https://medarbejdere.au.dk/administration/forskning-talent/erhvervssamarbejde/samarbejdsaftaler/fast-track-agreements/)

• Check out [cs.au.dk/jobwall](cs.au.dk/jobwall)
• Examples and proposals after this presentation...
Courses while working on your thesis?

• Advantage:
  – variation from the thesis work

• Disadvantage:
  – “the urgent kills the important”

Requires self discipline!
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Challenges and concerns?

What will be the biggest challenges for you in the process of getting the work done and writing the necessary pages over a five-month period?
Working on your thesis

• Be aware of the different activities in the process:
  – stating the problem
  – reading literature
  – collecting data (test cases etc.)
  – implementing
  – experimenting
  – writing the report (begin writing early in the process!)
  – proofreading
  – ...

• Variation is good for productivity

• Make a work plan, and revise it as often as necessary
  – the plan is not made so that you have to follow it – but it will make you aware if you don’t follow it!
Guidance

• Weekly meetings (a luxury compared to other studies!), focused feedback
  – be prepared, you can for example email questions and the newest PDF 1-2 days before the meeting (with a description of what you would like to get feedback on!)
  – you have the overview – not your advisor
  – it is not the advisors job to ensure activity in your working process
  – always schedule time for the next meeting and make a plan for your work until the meeting
  – take notes at the meetings!

• Technical questions vs. “meta-issues”

• Mutual expectations
  – “is this good enough to pass/get 7/get 10?”
Procrastination and perfectionism

• “Thesis swamp”
  – the progression reform and thesis contracts have essentially eliminated that problem

• Planning, planning, planning...
  – work plan, deadlines
  – check availability of office spaces

• Have realistic ambitions
“My advisor doesn’t understand me”

Extra contact persons:

– Gudmund S. Frandsen (education committee)
– Marianne Graves Petersen (education committee)
– Søren Poulsen (education coordinator, IT)
– Nikolaj Beck Mikkelsen (student counselor)
– Andreas Birch Olsen (study environment coordinator)

Always ready to help! 😊
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Writing techniques

• Work **top-down**
  – make an early template (headlines, cues)
  – “stepwise refinement” (as in programming)

• Work **iteratively**
  – scientific texts are rarely formulated perfectly in the first try

• Use the report as a **working document**
  – mark ideas, to-do’s using colors, margin notes, or the like (e.g. using LaTeX macros)
Two understandings of the writing process

Writing as a tool for thinking

intended readers:
- you
- your advisor

Writing for recording knowledge

intended readers:
- the advisor as an evaluator
- the external examiner

time
Two understandings of the writing process

Use both approaches!

Often just write your ideas down: recording thoughts
- new ideas might arise
- feeling of progress
- avoid only writing ”final text” since this can result in a writer’s block

Go over all text again from the beginning: product phase
- rewrite, add examples etc., to make the understandable by the intended readers
- can be done throughout the writing process when ideas and results have settled (should not be postponed to last minute!)
Typical structure of a thesis

• Introduction
  – Motivation
  – Problem statement / hypothesis / research questions
  – Method and overview

• Background and related work

• [The technical content...]

• Implementation, experiments

• Conclusion (connected to the introduction), possibly ideas for further work

• References

• (Appendices with technical details)

• (Web page with programs and data)
About the introduction

• *What is the goal?*
  – background and topic (general introduction)
  – specific problem and hypothesis
  – definition of key concepts

• *Why is this important?*
  – motivation
  – relevance

• *How do you address the problem?*
  – the theory
  – methods (proofs / experiments / case studies / …)
  – outline of the structure of the thesis
Readability

Have particular attention to:

• Introduction
• Main arguments of the paper
• Meta-communication (continuously guide the reader through the text)
  – ”In this chapter we analyze X, which will be used in the analysis of Y in chapter Z”
• Use a clear language (avoid cryptic sentences and words not generally known)
Use of references

• Credibility of your sources? (the most credible from the top)
  – book (monograph)
  – dissertation
  – article from a journal
  – article from a conference
  – article from a workshop
  – master’s thesis
  – technical report
  – homepage
  – personal communication

• Refer to the most credible source you have!

• Layout (for example BibTeX)

• Curriculum for exam, possibly separate “secondary literature”
Avoid (self-)plagiarism!

• Always properly cite material you use
  – including your own material
    (from course projects, BSc thesis, etc.)

• Useful resources:
  – undgaasnyd.au.dk
  – studypedia.au.dk/en/literature-referencing/reference-management
  – studypedia.au.dk/en/formal-requirements/references-and-bibliography
  – library.au.dk/en/students/plagiarism

• If in doubt, ask!
Literature search

- **ACM digital library** [acm.org/dl](http://acm.org/dl)
  - online database
  - from au.dk network (possibly using VPN), full access to most papers

- **DBLP** [dblp.uni-trier.de](http://dblp.uni-trier.de)
  - based on the publishers’ publication overview
  - covers practically all Computer Science journals, conferences, etc.

- **Google Scholar** [scholar.google.com](http://scholar.google.com)
  - number of *citations* gives an indication of impact
  - useful for finding relevant articles (“who is referring to this article?”)

- **The library (Nygaard 1)** [library@cs.au.dk](http://library@cs.au.dk)
  - if you need a certain book or old article you cannot find elsewhere
  - ... but ACM DL, Google Scholar, DBLP will likely cover 99% of your literature
Thesis front page

Must contain:

– Student ID number(s)
– Name(s)
– Thesis title
– Name of the advisor(s)
– Month and year
– The text: “Master’s Thesis”

LaTeX template
Handing in the report

via Digital Exam
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MSc thesis exam

• Missed hand-in deadline or failed exam
  – revised contract, 3 more months, new assignment

• As for other exams: max 3 exam tries
MSc thesis exam

• Exam question
  – is given a week before the exam
  – is typically chosen to give the student the possibility to shine

• Presentation (30 min.)
  – with the exam question as a starting point

• Examination (30 min.)
  – pleasant conversation in a friendly atmosphere (well, usually...)
MSc thesis exam

Preparation:

– read the exam questions (!)
– read your thesis (!!!!)
– read the curriculum (=the references in your thesis)
– rehearse your presentation
– possibly get feedback from advisor on drafts of slides, structure of presentation, etc.
MSc thesis exam

The advisor’s change of role:

– “why didn’t you say this earlier?”
– probably the first time the advisor has seen the complete thesis report
– focused guidance meetings are the key to avoid surprises
Grading

• In principle the grade is given relative to the learning goals in the study regulations (see slide 6)

• In reality:
  – **results** according to the problem statement
  – **ambition level** of the problem statement
  – **readability** of the thesis
  – **coherence** between problem statement, methods, content and conclusion ("the red thread")
  – the description of **related and future work**
  – **the presentation**
  – **the examination**

• Program code counts 0% - but is often a prerequisite for writing a good report
QUESTIONS