

MSc Thesis

Department of Computer Science

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(original April 2014, Anders Møller)

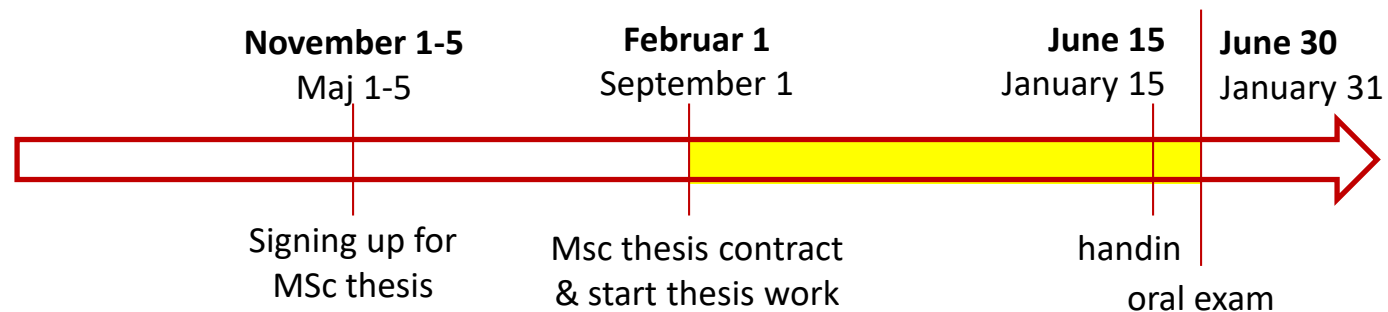
My background

- Chair of the Education Committee Department of Computer Science
- Research group *Algorithms and Data Structures*
- Advisor of 43 MSc and 14 PhD thesis
- Often external examiner at other Danish universities

Plan

- **Formalities**
- Selection of advisor and topic
- MSc process
- MSc thesis
- MSc thesis exam (oral)

“you will be registered administratively to the MSc thesis without the possibility of cancelling the registration.”



Formalities

- 5 months work, incl. oral exam ~ 30 ECTS
 - Can be up to 11 months, if courses concurrently
- Thesis written in Danish or English
- Advisor: permanent faculty at the Department of Computer Science + possible (co)advisors
- Individually or in **groups** (2-3 persons)
 - for group work the thesis must state who is responsible for the different parts of the thesis
(possibly “everybody is responsible for all of the thesis”)
 - From study environment study:
“179 out of 331 believe it will be lonely to write the thesis”
 - ***Group thesis's are strongly encouraged!***

MSc Thesis Contract

kontrakt.scitech.au.dk

- Done jointly by the student and the advisor before the thesis work starts, and together with Gudmund S. Frandsen
- States who, general title, handin date e.t.c.
- **Short project description**

Reexam

- Missed handin deadline or failed exam
 - revised contract, 3 more months, **new assignment**
- As for other exams: max 3 exam tries

From Study Regulations

Read the study regulations for your MSc education:

<https://eddiprod.au.dk/EDDI/webservices/DokOrdningService.cfc?method=visGodkendtOrdning&dokOrdningId=2043&sprog=en>

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

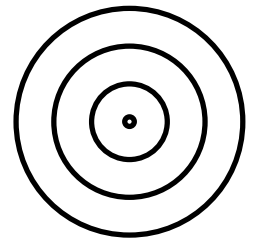
- identify, define and formulate an academic issue on a scientific basis.
- define and present testable hypotheses within a subject-related topic.
- independently plan and complete a major academic project using the subject’s scientific methodology.
- analyze, critically discuss and put into perspective 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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Selection of Advisor and Topic

- In principle it is the students job to find a project, but...
- Attend the Computer Science Day (May/June) e.t.c.
Contact potential advisors, if they have a topic ready
 - but avoid advisor-surfing and “nothing better?”
- Make the project flexible!
 - Avoid nothing-or-all (“goal is to prove [foo]”)
 - If everything goes fine, ambitions can be increased (or decreased in opposite case)



Idea Maturation

- From loose idea to concrete **problem statement** and draft of **working plan**
- Start in advance of official thesis work kick-off!
- “Individual project work” (5 or 10 ECTS) is one possible way to test out an area before the thesis

Different Thesis Types

- Popular types of thesis's:
 - experimental evaluation of theoretical result
 - new theoretical result
 - survey
 - ...
- Many MSc projects originate from existing research projects
- 5-10% of MSc thesis lead to scientific publications

Courses while thesis work?

- **The thesis deadline is fixed**, but it is completely legal to start earlier on the thesis while still having courses
- Advantage:
 - variation from the thesis project
 - longer time
- Disadvantage:
 - “the urgent kills the important”
- Requires self-disciplin!

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Challenges?

What will be the biggest challenges for you in the process of writing the necessary pages over a five month period?

Thesis work

- Be aware of the different process phases/activities:
 - stating the problem
 - reading the literature
 - collecting data (e.g. generating test cases)
 - programming
 - performing experiments
 - **writing the report** (start as early as possible!)
 - proofreading
 - ...
- **Variation** is good for productivity
- Have a **work plan**, and revise whenever necessary
 - the work plan is not a strict plan one needs to follow, but increases awareness when one is *not* on schedule

Guidance

- Schedule weekly meetings
 - luxury compared to other departments!
- Focused feedback
 - be prepared, send questions and current thesis PDF 1-2 days ahead of meeting (including stating expected feedback)
 - *you* have the overview, not your advisor
 - in principle it is not the advisors job to ensure activity
 - *always* have a next meeting scheduled and plan until the next meeting
 - take notes at the meeting!
- Technical questions versus “meta-issues”
- Mutual expectations
 - “Is it sufficient to pass / get 7 / get 10-12?”

Procrastination and perfectionisme

- “Thesis swamp”
 - the progression reform and thesis contracts has essentially eliminated the problem
- Plan, plan, plan...
 - work plan, deadlines
 - office space – remember to apply:
<http://studerende.au.dk/studier/fagportaler/datalogi/studiemiljoe/studieomraader-og-kontorer/studenterkontorer/>
- Have realistic ambitions

“My advisor does not understand me”

- Additional contact persons:
 - Gudmund S. Frandsen (education committee)
 - Gerth Stølting Brodal (education committee)
 - Søren Poulsen (education coordinator, IT)
 - Magnus Høholt Kaspersen (student counselor)
- Always ready to help!

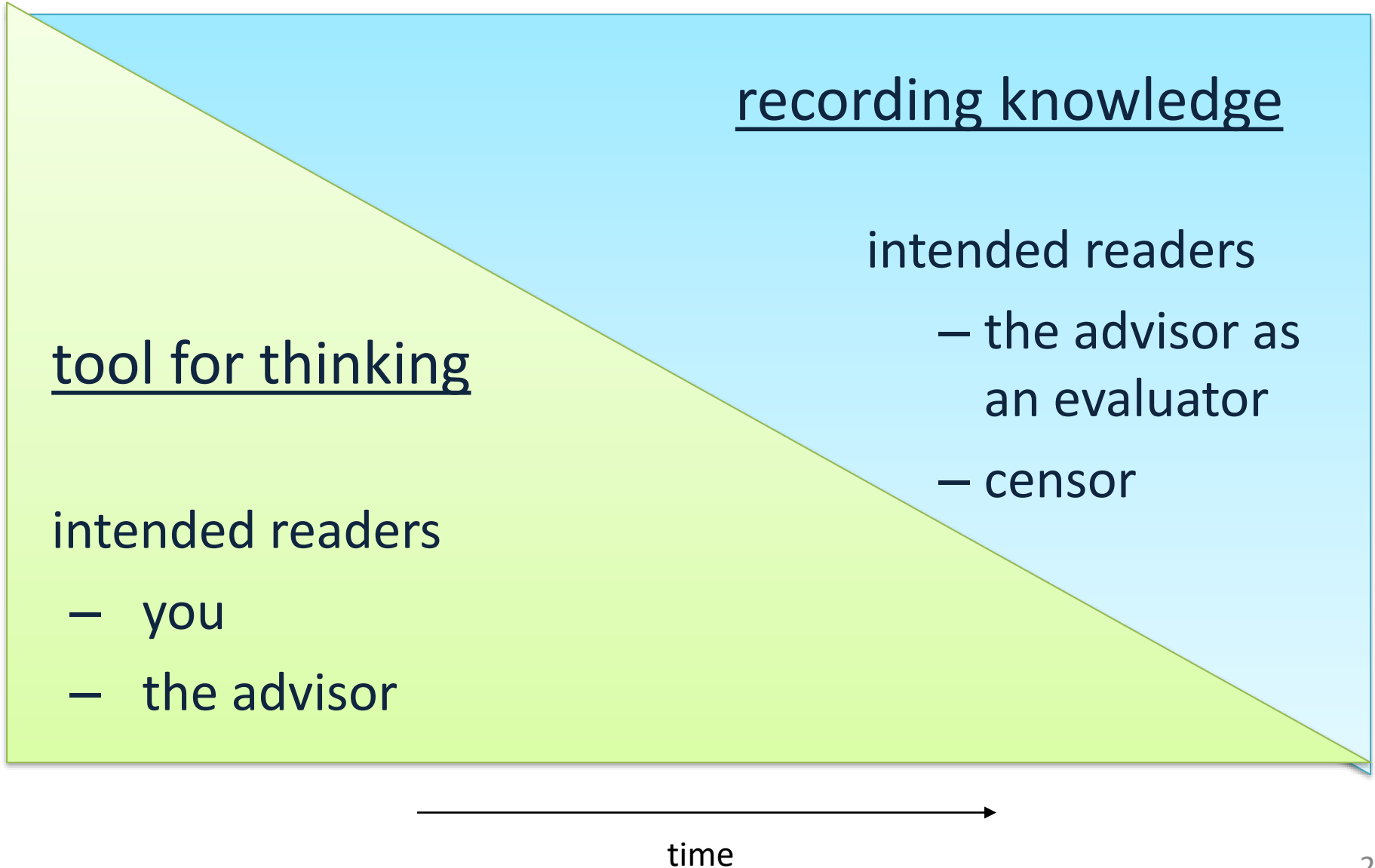
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Ways of writing

- Work **top-down**
 - early on make a skeleton (titles, keywords, ...)
 - “stepwise refinement” (like programming)
- Work **iteratively**
 - scientific text is rarely perfect on the first writing
- Use the report as a **working document**
 - mark ideas, keywords, to-do’s using colors, margin notes, etc. (e.g. using LaTeX macros)

Two understandings of the writing process



Two understandings of the writing process

Use both !

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*

- enforce terms never used without prior definition, polish text
- adjust text and examples to intended reader
- can be done throughout the writing process
(should not be postponed to last minute!)

Typical structure of a thesis

- Abstract
- Introduction
 - problem statement / hypothesis
 - methods and overview
- Background, previous work and related work
- [Technical content...]
- Implementation and experiments
- Conclusion (relative to the introduction) and possible future work (documents you know the context)
- References
- (Appendix with technical details, experimental results not in the main part of the thesis, ...)
- (Webpage with programs and data)

← ← **IMPORTANT !!!**

About the abstract

- An English abstract is mandatory
- An abstract in Danish (“resume”) is only required if the thesis is in Danish

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, that will be used in the analysis of Y in chapter Z”
- Try to use a clear language (avoid cryptic sentences and words not generally known)

Using references

- Credibility of sources ?

- book (monograph)

- PhD thesis

- journal paper

...I have read it on the internet

- conference paper

...it is stated in the paper [foo]

- workshop paper

- MSc / BSc thesis

...[authors] state in [reference] published in [journal name] that...

- Technical report (e.g. arxiv.org)

- webpage

- personal communication

- Cite the most credible source !

- Layout (e.g. BibTeX)

- Curriculum for exam, possibly “secondary literature”

Literature search

- **DBLP** dblp.uni-trier.de
 - online database based on publishers publication lists, +4 M entries
 - from au.dk network (possibly using VPN) full access to most papers
- **Google Scholar** scholar.google.com
 - comprehensive and updated
 - states number of *citations* as a measure of impact
 - good for finding other papers citing a given paper
- **The library (Nygaard 1)** library@cs.au.dk
 - in case you need a particular book or (old) paper not available using Google Scholar or DBLP
 - ... but Google Scholar and DBLP will likely cover 99% of your literature


Thesis front page

Must include

- Study id number(s)
- Name(s)
- Thesis title
- Name(s) of thesis advisor(s)
- Month and year
- The text “Master’s Thesis”

[LaTeX template](#)

Handin of thesis report

- Upload final thesis to eksamen.au.dk before the deadline (note you can only upload once )
- Handin 1 unbound paper copy for the library
 - information office (Ada-116)
 - this is not mandatory, but encouraged
 - if thesis is confidential, never handin for the library

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MSc thesis exam

- Question
 - given to the student one week before the exam
 - typically stated so that the student has the possibility to shine
- Presentation (30 min)
 - starting point is the question given one week earlier
- Examination (30 min)
 - pleasant discussion (well, mostly...)

MSc thesis exam

- Preparation:
 - read the question given (!)
 - read the thesis (!)
 - read the curriculum (= references)
 - test talk
 - feedback from advisor on drafts of slides, structure of presentation,

MSc thesis exam

The advisor's change of role:

- “why did you not state this earlier?”
- probably the first time the advisor has seen the complete report
- focused guidance meetings are the key to avoid surprises

Grading

- In principle the grade is given relatively to the learning goals in the study regulations (see slide 7)
- Reality:
 - **results** according to the problem statement
 - **ambition level** in problem statement
 - **readability** of the thesis
 - **coherence** between problem statement, selected methods, content, and conclusion (“the red thread”)
 - description of **related and future work**
 - **the presentation**
 - **the examination**
- Program code counts 0 % - but is a prerequisite for writing a good report

Some statistics...

- 68 graduated MSc's during Oct. 2011 - Sept. 2013 (CS + IT Product Development)
- 25 % did group theses (most frequently 2 persons)
 - lowest grade 7
 - average 10,18
 - everybody passed 1st exam
- 75% did individual theses
 - lowest grade 02
 - average 9,06
 - 90,2% passed 1st exam with an average of 9,35