

# MSc Thesis

**Department of Computer Science**

Marianne Graves Petersen

mgraves@cs.au.dk

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(original Anders Møller, later adopted by Gerth Stølting Brodal)

# My background

- Chair of the Education Committee, Department of Computer Science
- Research group *Ubiquitous Computing and Interaction*
- Advisor for 50+ MSc students
- Often external examiner at other Danish universities

# MSc Thesis

# 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](http://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**

# From Study Regulations

Read the study regulations for your MSc education:

<https://kursuskatalog.au.dk/en?year=2019&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-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.”

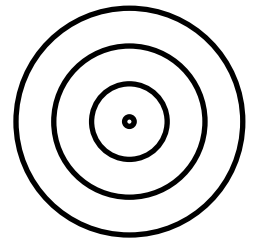
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# Selection of Advisor and Topic

- 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
  - research through design
- Many MSc projects originate from existing research projects
- 5-10% of MSc thesis lead to scientific publications

# Industry Collaboration

- Via supervisor or your own initiative
- MSc thesis focuses on an *academic* issue
- Thesis supervisor must approve the topic
- AU technology transfer office offers templates for NDAs and collaboration agreement
- Danske Bank, Grundfos, Stibo
- Previous examples: VW, Systematic, LEGO...

# 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 getting the work done and 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
- Know how to optimize your own workpractices
- Have a **work plan**, and revise whenever necessary



“

Plans are worthless, but  
planning is everything.

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Dwight D. Eisenhower, A speech  
more on [Quotes.net](https://www.quotestolive.com/quote/dwight-d-eisenhower-plans-are-worthless-but-planning-is-everything/)

# Role of your supervisor?



# 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)
  - Marianne Graves Petersen (education committee)
  - Søren Poulsen (education coordinator, IT)
  - Henrik Dalsgaard Henriksen (student counselor)
  - Andreas Birch Olsen (study environment coordinator)
- Always ready to help!

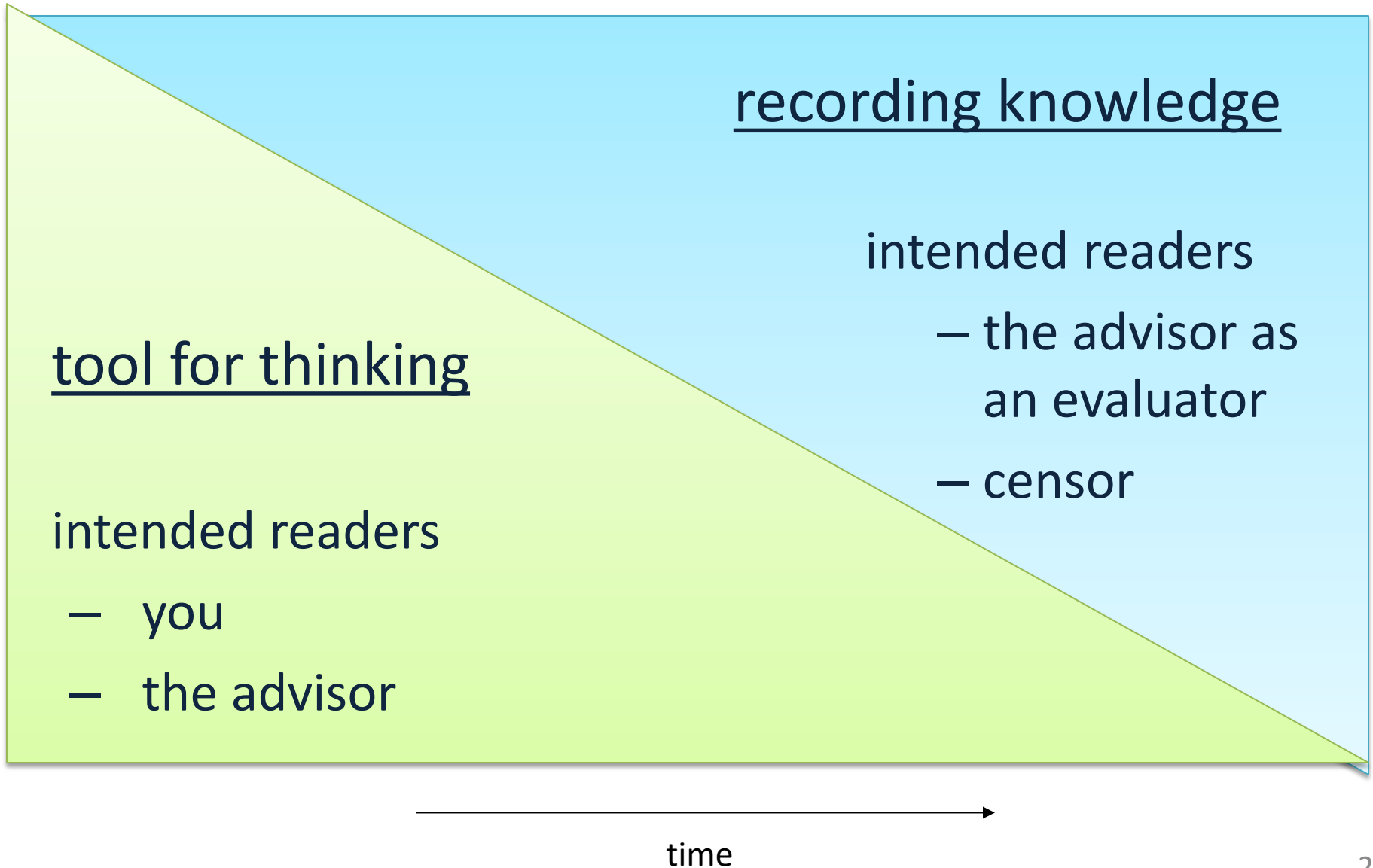
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# Ways of writing

- 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





# Typical structure of a thesis

- Introduction
  - motivation
  - problem statement / hypothesis / research question
  - overview
- Background and related work
- Methods and overview
- [Technical content / Design & rationales]
- 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 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”
- Use established terms – it is not a diary ;-)
- 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](http://arxiv.org))

- webpage

- personal communication

- Cite the most credible source !

- Layout (e.g. BibTeX)

- Curriculum for exam, possibly “secondary literature”

# 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)
  - 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](http://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](mailto:library@cs.au.dk)
  - in case you need a particular book or (old) paper not available using Google Scholar or DBLP
  - ... but Google Scholar, ACM DL, 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

- Hand-in via Digital Eksamen
- PDF to [thesis@cs.au.dk](mailto:thesis@cs.au.dk) and the advisor

# Reexam

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



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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

# Be

- Ambitious
- Curious
- Academic
- Ethical
- Considerate about how to best spend this time
- Proud

**ENJOY THE RIDE...**