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## Research Planning, 3p (4,5hp)

[www.mrtc.mdh.se/han/FoPlan/](http://www.mrtc.mdh.se/han/FoPlan/)

Hans Hansson  
Mälardalen University

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## RPC Lecture 1 (ws1)

- *Welcome*
- *Presentation of participants*
- *Planning the course (scheduling)*
- *Intro to course*
- *Guest lecture by Ivica Crnkovic*
- *Presentations (assignment 1)*
- *What is a research plan?*
- *Assignment 2 (presentation/discussion)*

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## Presentation of participants

1. Stephan Baumgart
2. Göran Bertheau
3. Kivanc Dogany
4. Mathias Ekman
5. Daniel Hallmans
6. Marcus Jägemar
7. Daniel Kade
8. Tomas Olsson
9. David Rylander
10. Gaetana Sapienza
11. Kristian Wiklund

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## Planning the course

- Workshop 1
  - Today (full day)
- Workshop 2
  - Wednesday December 14 (full day)
- Workshop 3
  - Tuesday February 7 (full day)

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## Research planning

- Is not a course about scientific methods
- Is not a course about a specific scientific/engineering topic
- ... and a few other "Is not a"
- ... It may not even be a course;-)

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## Research planning

- Is an exercise in formulating a research plan
- Intended as "kick-start" for PhD-studies
- **Shared experiences are multiplied experiences!**
- Will give perspectives (by realizing that there are substantial **differences and similarities** between studies of different students)

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## Research planning

- It is up to you!
- Active participation required!
- Will provide an important part of your thesis (but not your main contributions;-)
- If you haven't done this already:
  - ask your supervisor for 10 theses in relevant areas
  - Identify the different elements of the theses
  - Is there a common pattern?
  - This should have been assignment 0
    - You should do this before completing the course

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## A PhD/Lic thesis



- Generic structure (not always in this order and structuring into sections/chapters varies)
  - Motivation (why?)
  - Problem definition (what?)
  - Contributions (what's new?)
  - Related work (what's already done?)
  - Approach/Methodology (how?)
  - Organization of thesis (how presented?)
  - YOUR WORK (← this is why you need at least 4 years)
  - -Discussion
  - Conclusions (this is what I think I've done)
  - Future work (this is what I didn't have time to do)

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# Overview of course

## 1. Assignment 1

- You know all about it; presentations and discussions expected.

## 2. Assignment 2

- Research area overview (state of art and practice).
- Report + review of reports

## 3. Assignment 3

- Research overview and plan
- Report + review of reports

## 4. Guest lectures

- My experiences (a former PhD give his/her story)
- My research (a senior researcher presents a research area)
- Specific topics (if needed; any suggestions?)

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# Research Method



- Ad hoc homebrew not enough
- Must be based on and related existing knowledge
- Different approaches:
  - Deductive methods.
  - Inductive methods.
  - Building models. Simulation.
  - Qualitative Methods



*Positivistic (facts)*

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## “Science or Interpretation”

- “Science” (*naturvetenskaplig* approach)
  - Theory
  - Derive a hypothesis (from theory)
  - Formulate experiment to test hypothesis
  - Perform experiment (test hypothesis)
  - Evaluate results => positive/negative evidence
  - If contradiction: modify theory

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## “Science or Interpretation”

- “Interpretation” (social sciences)
  - Perform investigation (collect data)
  - Develop model (theory) that explains
  - Integrated development of theory and data collection
- Social scientists are explorers!
- Scientists are “looking for oil”!

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# Research Results



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- What is a result?
  - Knowledge!!! E.g. negative results (publications)
  - algorithms and methods
- Experimental results/evaluations
  - not always proper set-up (see what happened when we tested X)
  - exhaustive experiments and comparisons important
  - evaluation methodology (statistical methods)
  - reproducibility (often forgotten in CS)

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# Deductive methods



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- Theoretic methodology:
  - Def. - Theorem - Proof
- Theoretical Computer Science

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## Inductive methods

- Experimental methods:
  - » Hypothesis
  - » Experiment/Evaluation => +/- evidence
- “Science”

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## Building Models; Simulation

- Build a model
- Validate that the model faithfully captures the relevant aspects of the modelled system
- Treat simulation model as “reality”
  - » Hypothesis
  - » Experiment/Evaluation => +/- evidence
- Generalize the results to the real system

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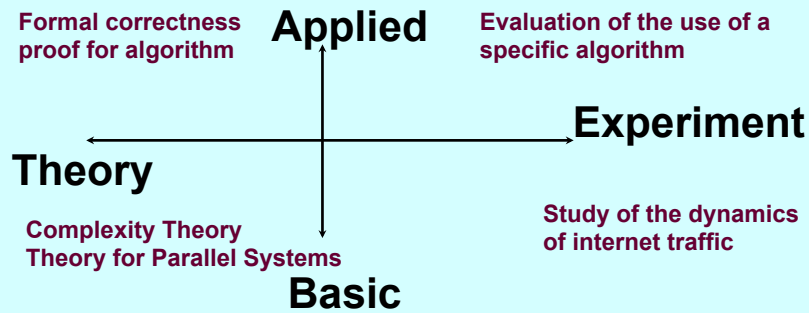
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## Computer Science Research Approaches

- Classification:



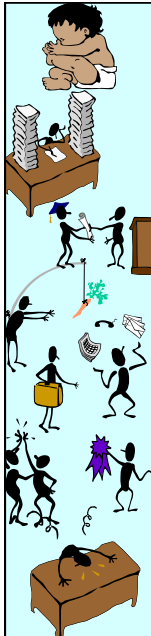
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## The academic Career

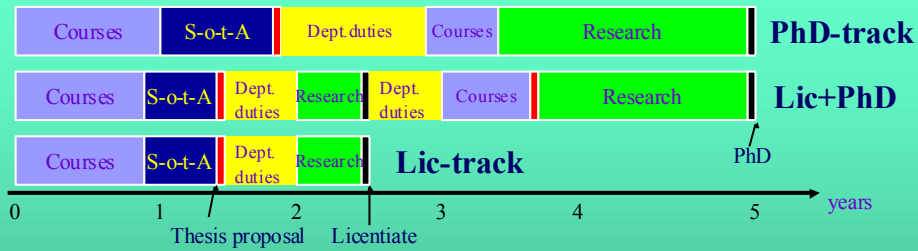


- Undergraduate exam
- Graduate education => Lic and/ or PhD
- PostDoc.
- Lecturer (Teacher/Researcher)
- Docent
- Professor
- Professor emeritus

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# Guidelines for Graduate Education



## ● General:

- research plan before admission
- publication plan
  - one conference paper/yr from yr. 2
  - journal paper on PhD-topic
- TA-duties and co-advisor to MSc-students
- conference trips and summer schools
- int'l visits: 2-3 weeks (lic); 2-3 months (PhD)



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## Student presentations

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2. Göran Bertheau
3. Kivanc Dogany
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5. Daniel Hallmans
6. Marcus Jägemar
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## What is a research plan?

- From dictionary:  
PLAN = *"A scheme, program, or method worked out beforehand for the accomplishment of an objective"*
- There are many ways of writing a plan
- This course provides one example  
*[which I think provides a good introduction to what research is all about and helps you focus on the objective: writing a thesis]*
- The plan may even save you a year or so!

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## But remember

- A plan is just a plan...
- The only thing you know is that you will not follow the plan (at least not in detail)
- The nice thing is that you can always revise the plan ;-)

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# So.....

## A PhD/Lic thesis

• Generic structure (not always in this order and structuring into sections/chapters varies)

- Motivation (why?)
- Problem definition (what?)
- Contributions (what's new?)
- Related work (what's already done?)
- Approach/Methodology (how?)
- Organization of thesis (how presented?)
- YOUR WORK
- Conclusions (this is what I think I've done)
- Future work (this is what I didn't have time to do)
- References

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- What is a research plan in this course?
  - Research problem
  - The platform on which you build your research
    - State of the art (results, publications)
    - Research community (conferences, researchers)
  - Your plan of activities
    - From now to completion of thesis
    - Activities and milestones
    - Time plan

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## Only one thing remains after the course

- To execute the plan....

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## Assignment 2

- Updated version of assignment 1 (considering today's discussions etc.)
- Research overview
  - Current research issues and hot topics
  - State of practice (key industrial players, type of "technology" available, etc.)
  - State of art (central literature, including seminal papers)
  - The research community (key conferences and leading research groups)
  - Relation to and relevance for own research
  - References

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## Assignment 2

- How do you find
  - Current research issues and hot topics
  - State of practice (key industrial players, type of "technology" available, etc.)
  - Central literature, including seminal papers
  - Key conferences and leading research groups
  - Relation to and relevance for own research
  - References ?
- With a little help from your friends
  - Supervisor(s)
  - Fellow students
  - Colleges
  - Literature and web
  - (some of you have already written state-of-art overviews; reuse is fine, but spend an extra effort on the weak parts, possibly contacting leading researchers, industry, etc.)

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## Questions/Discussion

- About assignment(s)
- About course
- Special requests
  - Lectures by guests etc.

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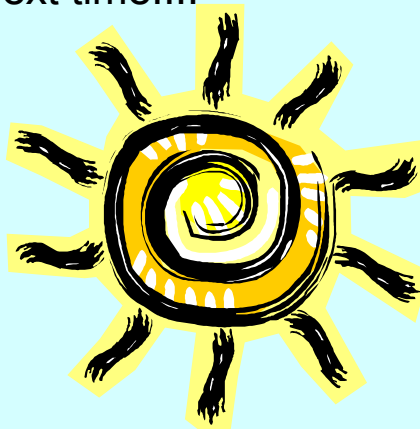
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## Thank you!

- See you next time....



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