Research Methodology and Scientific Writing / II2202

2010

Communication Systems, COS
Anne Håkansson
E-post: annehak@kth.se
Learning Outcomes

• The student should be able to:
  
  - explain and apply techniques for research methodology and scientific writing to prepare the writing of a scientific report.
Learning Outcomes

• The student should be able to:
  - explain and apply techniques for research methodology and scientific writing to prepare the writing of a scientific report.
  - perform investigation using methods, explain and take position on the results as well as summarize related work.
Learning Outcomes

• The student should be able to:
  - explain and apply techniques for research methodology and scientific writing to prepare the writing of a scientific report.
  - perform investigation using methods, explain and take position on the results as well as summarize related work.
  - apply the knowledge in scientific writing and research methodology and use the knowledge to write a scientific report.
The course

• **Goals:**
  - Design a project plan
  - Apply and discuss qualitative and quantitative methods
  - Perform data analysis on collected material
  - Communicate the work, in written and verbal form
  - Reason, discuss and argument for the work
Tasks

• Establish a project plan

• Method description
  – Perform data collection with one or several methods & describe the method(s)
  – Analyse collected material
  – Present data collection and data analysis

• Write report about selected topic
  - Present the work in a report
  - Discuss the scientific soundness

• Review a report and write opposition
Course outline

- 16 Lectures + 1 additional lecture
- 3 Mandatory seminars:
  - Seminar 1: Project plan
  - Seminar 2: Methods with data collection and data analysis
  - Seminar 3: Report including opposition
Research Methodology

3/9 Scientific knowledge

3/9 Hypothesis testing

8/9 Experiments

15/9 Ethics and Plagiarism
Scientific writing

31/8 Introduction to Scientific Genres - Proposal and technical reports

6/9 Effective Writing Strategies, Paragraph structure, Cohesive devices, Information structure, Conciseness

7/9 Working with Texts, Digital resources, Working with original sources, Referencing systems, Reviewing and collaboration, Learning from model texts
Scientific writing

13/9 Successful oral presentation for engineers, Content and structure, Delivery, Visual information

21/9 Research articles 1: Introduction and Methods

27/9 Research articles 2: Results, discussion, title and abstract
Quantitative and Qualitative methods

7/9 Introduction to research and data collection methods – qualitative and quantitative
10/9 Quantitative methods
16/9 Quantitative data collection methods, analysis, result
Lab - Quantitative

22/9 Qualitative methods
1/10 Qualitative data collection methods, analysis, result
Lab - Qualitative
Grading

- Assignments – handed in material:
  - Project plan for an investigation, P/F
  - Method for the investigation (discussion about choice of method, selection of participants) P/F
  - Report about the investigation (within computer science), A-F
  - Opposition, A-F

- 3 Mandatory seminars, P/F
Assignment – Investigation - Part 1

- Is performed during the course – starting Now!
- Carried out in a group of 2 students
- Choose a topic that will be evaluated
- Design and present a problem (write project plan - max 600 words)
- Choose a method
- Specify the data collection process, attendees / delegates
- *Present the result at seminar 1*
Assignment – Part 2

- Find attendees that are participating in the investigation - if personal contact - decide time and place
- Observe that the method affects the number of participants - but - the investigation must be viable during the course
- Use appropriate / useful method for the investigation
- Prepare and start the investigation
- Write method description (max 1000 words)
- Present result at seminar 2
Assignment – Part 3

- In accordance with chosen method:
  - Create questionnaire, Interview questions, Observations or other selected data collection method
- Collect data
- Perform evaluation:
  - Analyse collect material
  - Document evaluation in a report
  - Present evaluation in report – max 1200 words
- Review other student’s report (opposition) – max 600 words
- Present result and opposition at seminar 3
Systems for the course

• **Bilda**
  http://www.kth.se/student/studok/studiedokumentation-minasidor-1.1938?l=en_UK

• **Fetch material: OH, templates**
  – Hand in assignments
  – Last version of the schedule
  – Find out changes
  – Communication

Problems: Contact Bilda, see login site
Information

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Problems: Contact Bilda, see login site

- **Daisy** (http://daisy.ict.kth.se/login.jspa)
  - Select a group for labs and seminars
  - Problems: Contact Daisy group, see login site
Information

- **Bilda**
- **Fetch material: OH, templates**
  - Hand in assignments,
  - Last version of the schedule,
  - Find out changes
  - Communication

Problems: Contact Bilda, see login site

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  - Problems: Contact Daisy group, see login site

- **Homepage**: [http://www.ict.kth.se/courses/II2202/](http://www.ict.kth.se/courses/II2202/)
Course literature

Getting It Right: R&D Methods for Science and Engineering by Peter Bock
Publisher: Academic Press; 1 edition (September 13, 2001)
# ISBN-10: 0121088529
$78.28

The Craft of Research, 2nd edition (Chicago Guides to Writing, Editing, and Publishing) by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams
Publisher: University Of Chicago Press; 1 edition (March 2003)
# ISBN-10: 0226065685
$15.40
Course literature

Writing for Computer Science by Justin Zobel
Publisher: Springer; 2nd edition (April 27, 2004)
# ISBN-10: 1852338024
$26.03

Scientific Writing and Communication: Papers, Proposals, and Presentations by Angelika H. Hofmann
Publisher: Oxford University Press, USA (December 16, 2009)
# ISBN-10: 0195390059
$26.69
First assignment

Think about an area for the investigation!
Methods - Introduction

Why learn methods?
Methods - Introduction

Why learn methods?

-> Because it is necessary to interpret / understand:
   - result of investigation/research/study
   - affects of a study
   - problems with investigations
Methods - Introduction

• Researchers have developed an algorithm that controls the data on the Internet for data centres where electricity costs are currently lower. This can reduce electricity costs by as much as 40 percent.

[CS 20090825]
Methods - Introduction

• This means that data-intensive companies like Amazon, Microsoft and Google could save millions of dollars annually in electricity costs.
Methods - Introduction

• The Study:

The researchers, who are active at MIT, Carnegie Mellon University and Akamai network company, in their study calculates that the cost of electricity could decrease by as much as 40 percent.
Methods - Introduction

The algorithm does not necessarily mean that the electricity consumption, by itself decreases, which means that it does not, automatically decreases the companies environmental impact. According to the researchers the algorithm can be adapted to be used even for this purpose, by passing traffic to environmentally friendly data centre.
Methods - Introduction

The algorithm does *not necessary* mean that the electricity consumption, by itself decreases, which means that it *does not, automatically* decreases the companies environmental impact. According to the researchers the algorithm *can be adapted* to be used even for this purpose, by passing traffic to environmentally friendly data centre.

-> Is the algorithm useful or not?
Methods - Introduction

Why learn methods?
Who can you trust?
Methods - Introduction

Synovates väljarbarometer tabell - riksdagsvalet 2006 och framåt:
Klicka på datumet för att öppna den skriftliga rapporten

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### Väljarbarometer - alla institut

För Synovates mätningar kan du klicka på datumet för att öppna en utförlig rapport

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Methods - Introduction

• The Synovate barometer of voters for June 2009 shows that the changes are small. The distance between blocks is increasing within the error tolerances of 2.0 percentage points.

[Synovate Temo, 20100818]
Methods - Introduction

- The collective support for the alliance parties fall by 1.3 percentage point from 46.6 to 45.3 percent. It’s total support for, and the Green Party is basically unchanged (+0.1 percentage point) and ends up at 47.3 percent. The distance between blocks is 2.0 percentage points and is too small to say which blocks that have the strongest support.
Methods - Introduction

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• -> Is the study significant or not?
Sales of mobile broadband in Sweden turned strongly upward during the second quarter, following a dip of early years.

[Nytt24, 20090211]
Methods - Introduction

During the second quarter 2009, 162 790 new mobile broadband modem was sold in Sweden. It is a *distinguishable rise* compared with both last year and this years first quarter.
Methods - Introduction

The Study:

• Sales are up, almost, 20 percent higher than in the first quarter of 2009, when it sold 136,780 broadband modem in Sweden. Compared to corresponding period last year sales are 4 percent higher.
Methods - Introduction

The Study:

The figures come from the analyst David Larsson at IT Research and is built on statistics from the *major telecommunication operators*.
Methods - Introduction

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The figures come from the analyst David Larsson at IT Research and is built on statistics from the major telecommunication operators.

-> What if the modems were bought from the small companies?
Methods - Introduction

Contents in articles, see:

- I do not even read the quotes after an interview. I do not care if I get misquoted in the newspaper, said Tännsjö, adding that he has no problem with someone making changes in his books and give them out again in his name.

[CS 20100828]
Methods - Introduction

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[CS 20100828]

-> Can we trust articles and books?
Methods - Introduction

Why a Method-course?
Who can you trust?
-> Learn about methods to
  - avoid being “errant” (or misled)
  - not “mislead” others
Quantitative methods

- Emphasize numbers -> represents figures/numbers/values, levels on theoretic notions

- Strong evidence for how a phenomenon works, requires a large number of samples, generalising

- Study large sized populations / environments
- Study a subject/problem for a large set of people/organisations
- What can be done in computer systems?
Qualitative methods

• Understand people - what they say / what they do / Why they do something in a certain manner

• Context dependent-> understand context for decisions, acts and motivations / explain reasons

• Study social and cultural phenomena, study one subject/problem in depth

• What can be done in computer systems?
Triangulation

- Combine a quantitative method with a qualitative method
- Study same subject/area for different perspectives - gives “a complete picture”
- What can be done in computer systems?
To discuss

Which quantitative methods exist?
Which qualitative methods exist?
Which situations requires either a quantitative method or a qualitative method?
-> Relate to your own experience
To consider

Take a magazine
Locate a study in the magazine

-> Think about how well the study is substantiated (performed and result reflects the study)