Umeå University
**Department of
Computing Science**

Scientific Writing

Student Conference in Computing Science

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(based on previous versions by
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http://www8.cs.umu.se/kurser/5DV144/HT13/

Overview

- How to do research (!)
- Searching for literature
- Reading the literature
- Structure of a research paper
- Referring to others work
- Writing guidelines
- Latex overview
- What do do now!

How to Do Research

- Define a specific research question (topic selection)
- Identify prior work, find relevant literature
- Make a research plan with concrete sub goals
  - Read and think
  - Implement, develop, prove, evaluate, do experiments, conduct user tests, draw conclusions, …
  - Write
- Execute the plan
  - Not always linearly
  - Modify the plan if necessary
  - There is no recipe before the first time!
- Finalize your paper, publish results
- Discuss and exchange ideas (conferences!)

Why?

- Research builds on earlier work!
  - *"Standing on the shoulders of giants"*
- To learn about an area
  - What is interesting and important (for others!)
  - What has/has not been tried?
  - What is suggested to be tried?
- To learn an area!

Topic selection!

To be able to create!
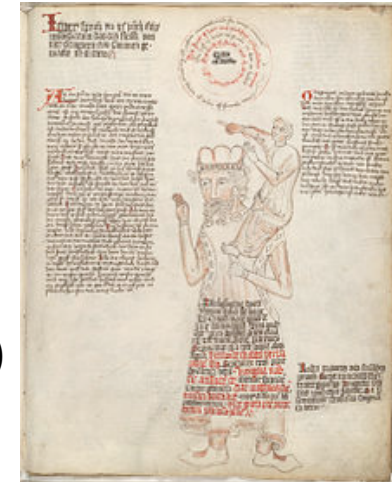
Searching for Literature (2)

Where?

- Search engines (Google, etc.)
- Specific literature databases or search engines
  - **Google Scholar**, Scirus from Elsevier, **CiteSeerX**, getCITED, INSPEC
  - Check out www.ub.umu.se
- Physical library (not everything is available online!)

How?

- Search for topics, keywords, authors, …
- Focus on publications (.pdf)
- Browse the publications
  - Introduction, abstract
  - Look in the reference section
- Surveys (recent!) can be excellent
- Identify key authors in the area - Google for more info

Avoid "Blind" Trust

- Critically evaluate your sources
- Try to see the difference between
    - Facts & interpretations of facts
    - Original work & (mis)interpretations
        - Check primary sources if possible, avoid secondary (and higher order) sources
    - Seriousness (high quality) & sloppiness (low quality)
    - Science & pseudoscience
➡ Prefer resources that apply a peer review system
    ➡ Home pages, company web sites, on-line magazines, Wikipedia, etc. are not trustworthy
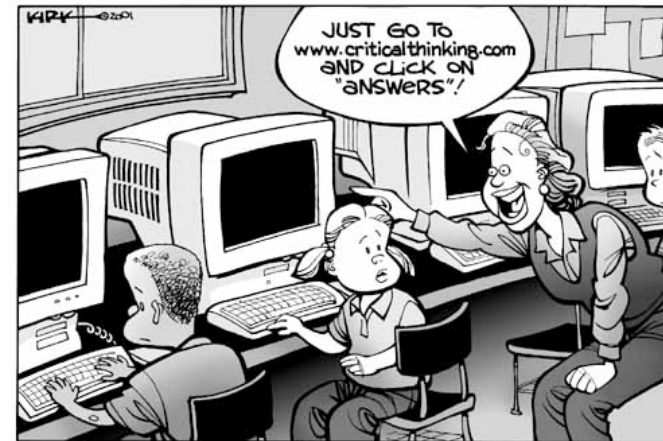
- The purpose of searching!
- Reading and literature searching is intertwined
  - References lead you further
- You can't read everything
  - Try to spend your time on relevant and good papers (hard to know in the beginning …)
- Make notes using your own words
  - What is interesting and important?
  - What has/has not been tried/examined?
  - What is suggested to be tried/examined?
  - Your own ideas
  - Critical comments and explanations
  - Relate to other information
  - ➡ This results in the annotated bibliography

Bibliography:

A set of publications related to a given subject

To annotate:

To add comments (annotations) or explanations

- Annotated bibliography = commented reference section: *year, author, title, publisher, comments*
- Comments ≠ Abstract
- Useful for keeping track of your readings and comments/thoughts
- Useful for your writing

Typical Structure of a Paper

- Title and author
- Abstract – summarizes the paper
- **Introduction**
- …
- …

MAIN SECTIONS
headings and subheadings
must fit YOUR TOPIC.

- **Discussion**/Summary/Conclusion (choose what fits best)
- **References**

Start writing an outline

Writing the Outline

- Make sure you know what you are going to do
  - Summarize relevant background and context
  - Refine your question/hypothesis/statement
- Write section- and subsection headers
- Write some raw text for each section and subsection
- Add "reminders" for the things you plan to write (e.g., in bullet list form)
- Add appropriate citations and references
- The intermediate result will be presented and discussed at the peer review meetings

➡ Read and use the LaTeX template (demo.tex) on the homepage

The Introduction

- Should present
  - The problem investigated:
    - What, Why ← The "sales pitch"
  - Review of relevant earlier work
  - Your chosen approach/technique
    - What, Why
  - Major results and conclusions!
    - "Reading a scientific article isn't the same as reading a detective story. We want to know from the start that the butler did it" (Ratnoff, 1981)
- Start writing the Introduction while work is still in full progress [1]
  - You have it all fresh in your mind
  - The writing may reveal inconsistencies in your work

- Main components (also see [1])
  - Discuss (do not repeat) main results
  - Point out exceptions where the results don't apply
  - Show how results match previously published work
    (can also be in the introduction)
  - Discuss the consequences of the results
  - State and motivate your conclusions as clearly as possible
- Often the hardest section to write

- The better results, the easier to write
  - Avoid the Squid technique (Doug Savile, 1972):
    "The author is doubtful about his facts or his
    reasoning and retreats behind a protective
    cloud of ink"

Referring to Others Work (1)

References

- The list of other work, placed at the end of the paper (the Reference section):
  - *year, author, title, publisher, comments*

Citations

- Abbreviations that refers to entries in the Reference section

Examples:

"A comparison of similar methods can be found in Ref. [3]. Johns et al. [7] refer to SPVS as one of the best methods."

References

[3] J. Dogherty. Solving image problems using invariant features. In: Proceedings of the Image Understanding Workshop (IUW), 2010, pp. 1181–1192.

[7] D. Johns, M. Brown, P. Blue, T. Lee. Computers in Sight, Prentice Hall, Englewood Cliffs, NJ, 1992.

Referring to Others Work (2)

Quoting (1)

*Referring to other's work by **including** (parts of) it*

- We normally use our own words when citing other work:

  Research in cognitive science shows the importance of detailed and situated narratives (Carroll et al., 1994).

- Quotations are used if the wording itself is of particular interest or if you want to present a position you will argue or comment on.

- The original text must be repeated exactly as in the source:

  "Recent theory and methodology in cognitive science clearly reflects a growing and broadening awareness of the importance of detailed and situated narratives" (Carroll et al., 1994, p 245).

Referring to Others Work (3)

Quoting (2)

- Quoting figures, tables, video, audio, etc. in your material requires permission from the copyright holder
- A reference alone will not do
- This also holds for your own publications (self-plagiarism)
- Even public domain material (e.g., under Creative Commons) requires creator, source, and type of license to be pointed out
- Anything else is **plagiarism** and/or copyright infringement

THIS IS A SERIOUS WARNING!

Referring to Others Work (4)

Plagiarism

> "... re-use in one paper of material that has appeared in another, without appropriate acknowledgement."

Can be anything; book, journal, web page, etc.

Can be anything; ideas, phrases, illustrations, etc.

- Possible reasons
  - Misjudgment (by an inexperienced researcher)
  - Carelessness
  - Deliberate theft

➡ **The reason is irrelevant**

➡ Also applies to your previous publications!

➡ Ask supervisors and check homepage for examples

Writing Guidelines (1)

Structure the information

- Use a **simple and logical** organization of the paper
- Omit unnecessary information/details
- Say things once – at the right place
- One topic per section
- One idea per paragraph
- Logical and verbal bridges between sentences

Write clearly

- Describe **everything** such that a non-expert reader has a chance to understand!
- **Motivate** and **explain** (why, what, how)
- Be **specific and clear**, not vague and hand waving
- If you cannot say it clearly, think it over again
- Define all terms and acronyms, and use them consistently

Writing Guidelines (3)

Integrity

- Carefully distinguish between
  - your own original ideas and those of others
  - what you have done and others have done
  - facts and interpretations of facts
- Do not exaggerate - abandon "commercials"
- Critically discuss your own work and assumptions

➡ In short, be honest and serious

Integrity

Doing what is right even when it is difficult.

Writing Guidelines (4)

Choose your words carefully

- Do not try to sound elaborate
  - "A considerable amount" ➔ "much"
  - "A majority of" ➔ "most"
  - "An example of this fact is" ➔ "for example"
  - "of great theoretical and practical importance" ➔ "useful"
- Avoid buzzwords and jargon
- Ban conversational phrases like *Well*, *You see*, *Bored to death*…
- Avoid short verb forms, like *we're*, *can't, it's*, …
- Avoid emotional expression such as *gigantic*, *ridiculous*, *funny*, *super*,…
- Be careful with culturally or geographically localized concepts, such as times, dates, seasons, school grades, currencies, …

Writing Guidelines (5)

The use of personal pronouns

- Avoid excessive use of personal pronouns
- "We" to refer to author(s) or author(s)+reader is most common
- Do not address readers with "you"
- No first person singular (as it sounds subjective)

It's not about you!

General

- Writing supports understanding
  - "if you can't say it clearly, you don't understand it yourself" (John Searle)
- Have high demands!
  - Read what your have written and edit
  - Do not hesitate to rewrite even big parts completely
- Do not postpone writing until the end
- Discuss your work
  - Peer review group meetings
- Overall productivity is **much** lower than you may expect (maybe 1–2 pages a week)

IT'S LIKE AN ABBREVIATED DIARY — WHAT'S IMPORTANT, THOUGH, IS TO WRITE A LITTLE EVERY DAY.
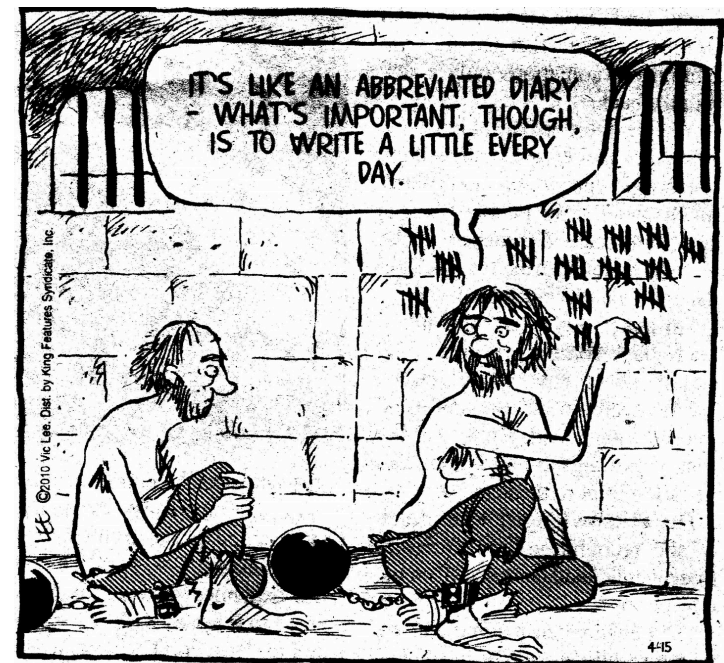
Why using references?

they

- Give evidence for your claims
- Distinguish between yours and others ideas
- Give other authors credit for their work
- Direct the reader to relevant sources of information
- Show that you know the area of research

More on References (2)

The Reference Section

- Citation marks are "pointers" to entries in the reference section[*] of your paper
- The reference section must contain a list of all references you cite in your text (and only those)
- Sources must be accessible to others
  - Public
  - Stable over time

[*] *In some research areas references are put in footnotes.*

What to Cite (1)

- Trustworthy and objective sources
    - Peer reviewed publications $\longrightarrow$ Journals
    - Books
    - Technical reports
    - **No** sales/marketing brochures
    - Prefer primary sources
        - Be careful with secondary sources
        - Be precise about who said what

Journals
Magazines
Conferences
Workshops

What to Cite (2)

- Do not rely on Wikipedia, web pages, etc.
  - They can be very good starting points but are definitely not reliable scientific references
  - Mention them in footnotes rather than in the reference section

- However, remember not to equate "scientific" with "on paper"
  - there are high quality electronic scientific journals
  - there is a lot of rubbish printed on paper

How to Cite (1)

- There are many common formats for citation marks
  - Number styles:
    - [1], [2–4], or the like ← We will use this style
  - Harvard style:
    - (Björk, Knight & Wikborg, 1988), (Carroll et al., 1994; Holtom & Fischer, 1999; Zobel, 1997), …
  - "Abbreviation" style:
    - [BKW 88], [Car+ 94, HoFi 99, Zob 97], …
  - APA style, MLA style, …
- Depends on the journal, conference, etc.
- BIBTeX does the formatting for you.

How to Cite (2)

- Citation marks are placed inside the sentence, as

We use Parikh's Theorem [12] to prove the result.

We use Parikh's Theorem to prove the result [12].

- Wording is important. Compare
  - *According to [5], design should follow function.*
  - *In [5], it is claimed that design should follow function.*
  - *Design should follow function [5].*

Paper Evaluation Criteria

Your work must indicate competence/ability to …

- analyse some relevant aspect(s) in depth
- analyse and synthesize arguments/resources
- back-up claims and facts by well-developed arguments, discussions and/or references
- tell apart relevant from irrelevant material, facts, and details
- make use of references in a correct way
- use a scientific style of writing
- manage the mechanics of writing; follow formatting/style guidelines

All cases of suspected plagiarism will be forwarded to the disciplinary board – no exception!

LaTeX

- Typesetting system to create good looking text
- You write your paper as unformatted text in a text editor, and LaTex generates a pdf file
- Quite the opposite of WYSIWYG!
- Powerful support for layout, formulas, tables, bibliography, …

LaTeX

- **From now on, everything else** must be prepared with LaTeX

- Template, format, and guidelines from course web pages must be used

- Your source files will finally be to put together the conference proceedings

- Running text gets automatically formatted

- A lot of commands to control the layout

- General syntax: \commandname[options]{argument}

- Check out **demo.tex** and read **demo.pdf**

An Example LaTeX Source File

```
\documentclass{llncs}          % declares the document type
\usepackage{…}                 % imports special purpose packages

\begin{document}
\title{The title}              % defines the title of your paper
\author{John Doe}
\institute{…}
\maketitle
```

The text of the paper

```
\bibliographystyle{plain}      % declares the bibliography formatting style
\bibliography{demo}            % refers to external bibliography file demo.bib
\end{document}
```

```
@article{beck:1993,
    Author = {Beck, Kent},
    Title = {{CRC}: Finding objects the easy way},
    Journal = {Object Magazine},
    Volume = {3},
    Number = {4},
    Pages = {42--44},
    Year = {1993} }

@book{bellin:1997,
    Author = {Bellin, David and Suchman Simone, Susan},
    Title = {The {CRC} Card Book},
    Publisher = {Addison-Wesley},
    Address = {Reading, MA},
    Year = {1997},
    Annote= {Blah blah blah} }
```

An Example Bibliography File demo.bib

```
@article{beck:1993,                                    Type and key
   Author = {Beck, Kent},                              required field
   Title = {{CRC}: Finding objects the easy way},
   Journal = {Object Magazine},
   Volume = {3},                                        optional field
   Number = {4},
   Pages = {42--44},
   Year = {1993} }

@book{bellin:1997,
   Author = {Bellin, David and Suchman Simone, Susan},
   Title = {The {CRC} Card Book},
   Publisher = {Addison-Wesley},
   Address = {Reading, MA},
   Year = {1997},
   Annote= {Blah blah blah} }                           normally ignored field
```

To convert the .tex file to a pdf file

From the command prompt:

1. *pdflatex mypaper* reads *mypaper.tex* and creates
   - *mypaper.pdf* (the typeset paper) and
   - *mypaper.aux* (info about citations, references, etc)
2. *bibtex mypaper* reads *mypaper.aux* and creates reference section (*mypaper.bbl*) from BIBTeX file.
3. *pdflatex mypaper* (again!)
   - updates *mypaper.pdf* with info collected in 1 and 2.

If you get "Undefined references found" and "References may have changed", re-run bibtex and pdflatex once or twice.

Useful Tools and Stuff

- Reference management
  - Zotero
    - Firefox extension for handling references
    - Export to BibTeX format (among others)
  - Other choices: Mendeley, EndNote
  - Be careful with BibTeX imports from Google Scholar, ACM, DiVA, etc. They may be incorrect and/or incomplete.
- Many LaTeX typesetting environments on different platforms, but an ordinary text editor and the command line work well. Feel free to choose.

References and Resources

[1] Day, R.: How to write and publish a scientific paper. Phoenix: Oryx Press (2006).

[2] Lamport, L.: *LaTeX: A Document Preparation System*, 2nd edition. Addison-Wesley, Reading, MA (2004)

[3] Zobel, J.: *Writing for Computer Science*, 2nd edition. Springer, London (2004)

- The literature list, links, and examples on the course web
- Purdue Online Writing Lab (OWL)
  http://owl.english.purdue.edu/owl/

- The Writing Center (Univ. of Wisconsin-Madison)
  http://www.writing.wisc.edu/

What to do now!

- If you really want to improve
  - Re-read the slides, internalize and contemplate
  - Do this also later during the course

- Start writing your outline and annotated bibliography

- Intensify your literature research

Next step:
- Obligatory peer review meeting on Wed Oct 2nd
- Distribute your draft at latest Mon Sep 30th 10:00 A.M.

GOOD LUCK AND HAVE FUN!