Scientific Writing

Student Conference in Computing Science
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(based on previous versions by Jürgen Börstler and Frank Drewes)

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
Reading (2)

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**
- ...
- ...
- **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
  - 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

The “sales pitch”
The Discussion

- 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
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).
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

(Zobel, 2004, p 217)
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
Writing Guidelines (2)

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
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, ...
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)
Writing Guidelines (6)

General

- Writing supports understanding
  - “if you can't say it clearly, you don't understand it yourself” (John Searle)
- Have high demands!
  - Read what you 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)
Why using references?

- 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
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.
More on References (3)

What to Cite (1)

- Trustworthy and objective sources
  - Peer reviewed publications
  - Books
  - Technical reports
  - No sales/marketing brochures
  - Prefer primary sources
    - Be careful with secondary sources
    - Be precise about who said what
More on References (4)

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
  - 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.

- 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].
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!
• 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, ...
● **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: \texttt{\textbackslash commandname[options]{argument}}

● Check out \texttt{demo.tex} and read \texttt{demo.pdf}
\documentclass{llncs} \usepackage{…} % declares the document type % 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} }
@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} }
Running LaTeX

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


- The literature list, links, and examples on the course web
- Purdue Online Writing Lab (OWL) [http://owl.english.purdue.edu/owl/](http://owl.english.purdue.edu/owl/)
- The Writing Center (Univ. of Wisconsin-Madison) [http://www.writing.wisc.edu/](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 2\textsuperscript{nd}
• Distribute your draft at latest Mon Sep 30\textsuperscript{th} 10:00 A.M.

GOOD LUCK AND HAVE FUN!