Introduction to Scientific Writing

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Trends in Bioinformatics Seminar
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Agenda

- General
- Paper Section
- Further Writing Recommendations
Extend knowledge of mankind
- Identify a problem that has not been solved yet
- Formulate the problem or a question
- Solve the problem/answer the question

Have an overview of existing approaches, literature, and related issues

Organize your arguments and results to be
- Short,
- Profound, and
- Expressive
General –
Types of Scientific Publications

- Methodical paper: New algorithms, systems, etc.
- Review / survey paper: Status quo / current status of a research area
- Concepts paper: New ideas or theories without concrete realization
- Evaluation paper: Quantitative comparison of different approaches
- Technical Report: Notification of current status of an approach within organization, usually no review

*The most typical scientific publication!*
General – Writing Procedure

- Every paper *tells a story*
  - What: What you want to find, the problem being solved
  - Why: Purpose and rationale
  - How: Your approach

- **Write for the reader, not for yourself!**

- Plan your document structure: Create an outline, discuss with others
Paper Sections – Example Structures

- Title
- Abstract
- Introduction
- (Background)
- Related Work
- Main Part
- Conclusion
- References

See also: IMRAD structure

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Paper Sections – Abstract

- Usually about 140-200 words
- Reflects the main story of the research paper
- **Calls attention** – make the reader curious about the content!
- Short and concise sentences
- Always follows a particular structure
  - Scope – What is the general context?
  - Problem – What is the specific problem?
  - Significance – Why is it a problem?
  - Solution – How do you solve it?
  - Results/Evaluation – Does your solution fulfill expectations (very short)?
Paper Sections – Introduction and Background

- Structure of abstract also applicable here, but in more detail

- Particular tasks:
  - Introduce the topic and define the terminology
  - Indicate the focus of the paper and research objectives
  - Last paragraph outlines the structure of the paper

- First paragraph important: Reader decides here to continue reading!

- Do not present your results here

**What is the problem you specifically consider?**
Paper Sections – Related Work

■ Purposes:
  □ Help understanding the field and the problem
  □ Show that you aware of what is outside and appreciate the work of your colleagues
  □ Compare and differentiate your work with the state of the art

■ Content:
  □ Strategies of the different approaches, strengths/weaknesses
  □ How do we address potential shortcomings? (Contribution!)

■ Useful instrument: Comparison table with your important criteria

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Approach A</th>
<th>Approach B</th>
<th>Our Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criteria 1</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Criteria 2</td>
<td>x</td>
<td>-</td>
<td>x</td>
</tr>
<tr>
<td>Criteria 3</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Criteria 4</td>
<td>-</td>
<td>-</td>
<td>x</td>
</tr>
</tbody>
</table>
General –
Hints for Literature Review

- Search for publications in online archives
  - IEEE: http://www.computer.org
  - ACM: http://www.acm.org
  - Google Scholar: http://scholar.google.com
  - Citeseer: http://citeseer.ist.psu.edu/
  - Uni Potsdam Library: http://info.ub.uni-potsdam.de/
Paper Sections – Main Part

- Conceptual part – Particular algorithm in genera

- Implementation part – Architectural aspects of your prototype and/or experimental setup
  
- Results – What did we observe in which experiment?

- Evaluation – What are the reasons for our observations?

- Discussion – What do these findings mean for our approach?
Paper Sections – Conclusion

- **NOT a summary**: Sum up your findings, not what you have done
- Answer research questions/objectives
- State the importance of discovery and future implications
- Strong statements should be made (avoid “it may be concluded...”)
Good figures can make a paper come alive

Good figures communicate ideas or patterns in the data much better than big tables of numbers

Choose reasonable captions

Be aware of printing resolutions (300 dpi for colored images, 600 dpi for black/white)

Prefer shadings over colors – documents are usually printed in b/w mode

Some journals expect you to be aware of color blindness
Further Writing Recommendations – Tables

- Captions should not be too long, but also not “architecture of ...”

- Same with figures: Choose reasonable captions

- Explain content in more detail in the text

- If something is not worth explaining it in text → do not put it in the table

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Further Writing Recommendations – Footnotes

- NOT for parenthetical comments – important things must be in the text

- Footnotes should be used for things the typical reader can genuinely skip

- Websites etc. also do not belong into footnotes, list them as reference

→ Footnotes stop readers, so better try to avoid

- In general: Follow instructions on journal/conference website!
Further Writing Recommendations – Citing

- Direct speech
  - "With method ... we achieve ..."
  - X claims he "... has developed a methodology ..."

- Indirect speech – rather name system instead of authors
  - X has developed a method ...

- Reference is not a subject of sentence – list it at the end of sentence
  - X has developed a method ... [1].
Further Writing Recommendations – General Hints

- Use active and present tense – do not switch tenses

- Keep sentences short and precise (German problem...)

- In the first sentence of a paragraph, sum up the content that follows (only if it is divided into multiple subsections)

- Do not use abbreviations in headlines

- Avoid (self) assessments - groundbreaking, good,...

- Avoid vague statements - possibly/probably, could/would/should,...
Further Writing Recommendations – General Hints

- Be aware of the difference between *such as* and *like*
  - *like* applies for closed bodies, i.e. you list all existing examples
  - *such as* applies for open d., i.e. there still exist other examples
  - “Ice cream *like vanilla*” vs. “Ice cream, *such as vanilla*”

- Check correct reference of your verbs if you have multiple objects
  - “This results in incomplete patient records which eventually ...”

- Check your formulations for correct meaningfulness and reference
  - “a method called HMW question” vs. “a method called formulation of HMW question”

- Use uniform phrasing in listings
  - “*I like eating and to run*” vs. “*I like eating and running*”
Further Writing Recommendations – General Hints

- Do not describe circumstances - "after eight hours we realized ..."

- That and which: If you can put a comma before it, use which

- Choose the way of your parenthesis according to importance
  - Important: Comma
  - Good to know: Hyphen
  - Actually not important at all: Braces (avoid these! ;)

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Further Writing Recommendations – General Hints

■ Absolute statements: Always relate to units

■ Consistency throughout the text - spelling, formatting, etc.

■ Think about what to highlight: no exclamation marks, use italic

■ Do not continuously refer to earlier or later pages

■ Add paragraphs between section headline and first subsection
Further Writing Recommendations – Before Submitting Any Paper

- Are headlines uniformly formatted, e.g. capitalized?
- Are proper tenses and voices used?
- Are all equations mathematically correct and explained in the text?
- Are all abbreviations explained/introduced?
- Are all figures/tables relevant and of good quality?
- Are all figures, tables, and equations listed and mentioned in the text?
- Are all references relevant, up to date and accessible?
- Are the references structured in a uniform format?
Further Writing Recommendations – Useful Links and Books

- Ad Lagendijk: Survival Guide for Scientists: Writing – Presentation – Email
- Academic Phrasebank: [http://www.phrasebank.manchester.ac.uk/](http://www.phrasebank.manchester.ac.uk/)
- The Purdue Online Writing Lab - [http://owl.english.purdue.edu/](http://owl.english.purdue.edu/)
- [http://www.phrasebank.manchester.ac.uk/sources.htm](http://www.phrasebank.manchester.ac.uk/sources.htm)
- ftp://fast.cs.utah.edu/pub/writing-papers.ps
- [http://www-net.cs.umass.edu/kurose/talks/top_10_tips_for_writing_a_paper.ppt](http://www-net.cs.umass.edu/kurose/talks/top_10_tips_for_writing_a_paper.ppt)