



Introduction to Scientific Writing

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Trends in Bioinformatics Seminar

Feb 7rd, 2017

Agenda

- General
- Paper Section
- Further Writing Recommendations

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General – Aims of Research

- 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

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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!*

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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

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Paper Sections – Example Structures

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

See also: IMRAD structure
(<https://en.wikipedia.org/wiki/IMRAD>)

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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)?

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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?

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Paper Sections – Related Work

■ Purposes:

- Help understanding the field and the problem
- Show that you are 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

	Approach A	Approach B	Our Approach
Criteria 1	x	x	x
Criteria 2	x	-	x
Criteria 3	x	x	x
Criteria 4	-	-	x

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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/>

- **Mutual information for feature selection with missing data.** SMART - Combinatio...

G Doquire, M Verleysen - ESANN, 2011

Abstract Feature selection is an important task for many machine learning applications; moreover missing data are encountered very often in practice. This paper proposes to adapt a nearest neighbors based mutual information estimator to handle missing data and to use it

Zitiert von: 7 Ähnliche Artikel Alle 11 Versionen Zitieren

[\[PDF\] uclouvain.be](#)

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?



Can also go in one chapter

Remember your Chemistry protocols at school!

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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...”)

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Further Writing Recommendations – Figures

- 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

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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

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].

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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,...*

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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*"

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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

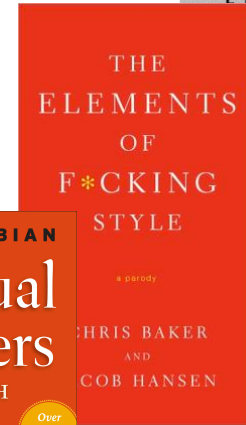
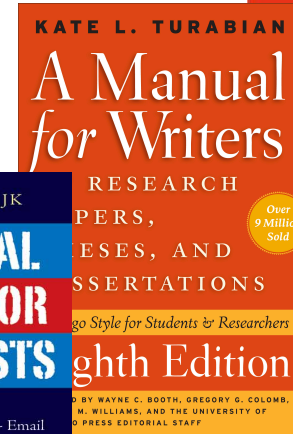
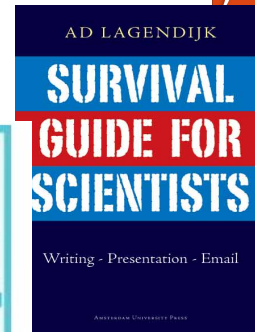
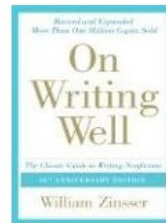
- Are headlines uniformly formatted, e.g. capitalized?
- Are proper tenses and voices used?
- Are all equations mathematically correct and explained in the text?
- Are all abbreviations explained/introduced?
- Are all figures/tables relevant and of good quality?
- Are all figures, tables, and equations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

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Further Writing Recommendations – Useful Links and Books

- Ad Lagendijk: Survival Guide for Scientists: Writing - Presentation – Email
- Academic Phrasebank: <http://www.phrasebank.manchester.ac.uk/>
- The Purdue Online Writing Lab - <http://owl.english.purdue.edu/>
- <http://www.cs.columbia.edu/~hgs/etc/writing-style.html>
- <http://www.phrasebank.manchester.ac.uk/sources.htm>
- <ftp://fast.cs.utah.edu/pub/writing-papers.ps>
- http://www.itc.nl/library/Papers/hengl_rules.pdf
- http://www-net.cs.umass.edu/kurose/talks/top_10_tips_for_writing_a_paper.ppt



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