How to write a scientific paper

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Overview

- Remarks on the style
- Structure of your paper
- Literature research and reading
- Citing and Plagiarism
- Reviewing papers
Style of writing (1)

- Do not publish before you know what to communicate to the reader and what not!
- Keep it as short, precise and clear as possible!
- Make your intentions clear!
- Don’t stack too much...
  - „Viele Aussagen, die man liest, sind, wenn man sie so genau, wie man es leider aus Zeitmangel zu selten – aber manchmal doch – schafft, durchdacht, einfach."
- Reread and run spell-check before submitting
Style of writing (2)

- There should be a bridging between consecutive sentences/chapters/...
  - Introduce and comment on figures, tables, quotes.
- Write self-contained papers
- Diversify words, sentences, phrases, ... without changing your style
- Avoid ambiguous meanings
  - "... der Hund des Mannes, der ... "

Wer ist gemeint? Hund oder Mann?
Style of writing (3)

- „I“ vs. „the author“, „we“ (more than one author, author & reader)
- “You” vs. “the reader”, “One”
- Passive vs. active
  - “In the following it will be proven that...”
  - “In the following we will prove that...”
- Use tenses [tempora] consistently
  - Best is to stick to e.g. present tense
- “Wicked which”
  - ... blabla, which is not important ...
  - ... blabla that defines something ...
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Manuscript Planning

- What is the essence of the paper?
  - Your thesis.

- Who is the reader?
  - Scientific background?

- How can you support your thesis?
  - Experiments, formalization & proofs, literature
  - Only present details which are necessary to understand the problem and its solution.
General outer structure

- **Title**
- **Abstract & Keywords**
  - Unless it is a “fast/short abstract” paper. Choose good keywords.
- **Introduction/ Motivation/ State of the art**
  - Why is there a problem? Do solutions exist?
- Start with main problem
- Explain your approach
- Finally summarize what was shown and discuss it.
  - Feasibility & usefulness
- **Conclusions**
- **References**
Inner structure

- Not fixed
  - differs from paper to paper and community to community.
- Adapt it for your needs.
- However, one gets a feeling for a “good” structure when writing papers.
Example inner structure – experimental paper

- Model
  - Formal model of the DuT (= assumptions!), implications from theory

- Experimental setup
  - Peculiarities of setup, measure error, ...

- Experimental Results
  - What has been measured

- Discussion of experiments
  - Statistics, interpretation, implications
Example inner structure – theoretical paper

- Informal overview
  - Of the theorem and its proof idea
- Formal Framework
  - Notations, system model (= assumptions!), formal problem statement in this system model
- Proofs of theorems
  - Lemma & proof, Theorem & proof, ...
- Discussion of results
Hints for writing

- If you think you found something interesting:
  - Sketch your thoughts on a piece of paper (proof idea, idea for experiment, new circuit,...) and discuss it with others.
  - Write down the rough (not yet definitive!) structure of your paper in chapters with short comments on what you want to tell the reader in each chapter.
  - Begin to fill the chapters iteratively
    - Start directly in medias res (inner structure topics like experimental setup/system model section) and do the outer structure (abstract, introduction, ...) when the paper is almost finished.
Title

- Read from thousands
  - Eye catching, however, not lying
- Spend some time on finding a good title
- Think of the smallest set of words, that covers your paper's topic
Abstract

- Few line version of your paper
- Self-contained
- Most readers decide if to read your paper based on the abstract!
  - Online libraries return the abstract first and the full paper only if requested
- Mention results!
Example abstracts

- **Fischer, Lynch, Paterson: Impossibility of Distributed Consensus with One Faulty Process**

  Abstract. The consensus problem involves an asynchronous system of processes, some of which may be unreliable. The problem is for the reliable processes to agree on a binary value. In this paper, it is shown that every protocol for this problem has the possibility of nontermination, even with only one faulty process. By way of contrast, solutions are known for the synchronous case, the “Byzantine Generals” problem.

- **Lamport: Time, clocks, and the ordering of events in a distributed system**

  The concept of one event happening before another in a distributed system is examined, and is shown to define a partial ordering of the events. A distributed algorithm is given for synchronizing a system of logical clocks which can be used to totally order the events. The use of the total ordering is illustrated with a method for solving synchronization problems. The algorithm is then specialized for synchronizing physical clocks, and a bound is derived on how far out of synchrony the clocks can become.
Introduction/ Motivation

- Explain the paper’s context (background, essence of the idea).
- Why is the problem attacked in this paper of (practical/theoretical) relevance?
- What are you going to solve and what not?
- What has already been said about the problem? (related work section)
- Possibly give a short outlook:
  - “In section 1, we discuss.... In section 2 we present the proofs, ...”
- ~1p of an 8p paper
Model, Formal Framework

- The reader should find all assumptions, notations and definitions used throughout the paper.

- Examples:
  - Experimental paper: assumption on the process of measuring, the environmental behavior, theoretical model used, ...
  - Theoretical paper: assumptions on the system model (behavior of faulty units, the environment, algorithm executions)

- State the precise problem here.
- Do not present (theoretical/experimental) results.
- ~2p of an 8p paper
Experimental Setup & Results

- Setup description
  - Ideal: Enough to allow the reader to reproduce the experimental results.

- Presenting the data
  - This is typically the shortest part of the paper. Do not give endless tables.
  - Compact presentation, enough to support your thesis.
Theorems & Proofs

- The reader should be able to follow the proofs. So avoid:
  - “Thus it trivially follows that ...”
  - “One can easily see that ...”
  - “The proof is left as an exercise for the reader.”
- Write structured proofs with informal explanations in between.
Discussion

- quintessence of results
- Possible generalization
- Is it in concordance with or contradicting to known results?
  - If possible: Compare your results with results from related work.
- Implications (theoretical, practical)
  - Be precise!
  - Give very good reasons!
- Exceptions, missing correlations, open questions
Conclusions

- Summarize your paper (central parts).
  - What has been shown, inferred ...

- Possibly give hints what still has to be done (open questions)

- ~1/2p of 8p paper
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Where to get literature from

- **TU Bibliothek**  [www.ub.tuwien.ac.at](http://www.ub.tuwien.ac.at)
  - Printed books and journals
  - Online journals and databases

- **IEEE Xplore**  [ieeexplore.ieee.org/Xplore/DynWel.jsp](http://ieeexplore.ieee.org/Xplore/DynWel.jsp)

- **ACM Digital Library**  [portal.acm.org/dl.cfm?coll=portal&dl=ACM](http://portal.acm.org/dl.cfm?coll=portal&dl=ACM)

- **CiteSeer**  [citeseer.nj.nec.com/cs](http://citeseer.nj.nec.com/cs)

- **Google**  [scholar.google.at](http://scholar.google.at)

- **DPLP**  [dblp.uni-trier.de](http://dblp.uni-trier.de)

- **E182 Research Reports**  [www.vmars.tuwien.ac.at/papers/papers.html](http://www.vmars.tuwien.ac.at/papers/papers.html)
Filtering literature

- Think of keywords related to your topic
- Find papers
  - e.g. if you are not familiar with this subject look for recent (!) surveys/overviews first.
  - Surveys/overviews typically have a good, representative bibliography!
- Iterative search
  - paper → bibliography/citations → add/discard papers → ...
  - bibliography: backward ↔ citations: forward
- Until you think you arrived at a good coverage
Quick Reading

- Title
- Abstract (~few lines)
- Motivation/Introduction & its references (~1p)
- Conclusions (~1p)
- References
Detailed Reading

“active” vs. “passive” reading, i.e., ...

- Read with a pencil!
- Analyze the structure of the text
- read chapter and section headlines
- Look up definitions, results, ... which are important to understand the paper
- From cited papers, internet search, ...
- Mark important definitions, notations (find them easier)
- Mark important results, new ideas, errors, problematic statements, ...

How to write a scientific paper
Detailed Reading

- Use the paper margins for comments!
  - short proofs, explanations, cross-references, implications, (hidden) assumptions
- Try to think ahead of the text!
  - “We will show that...” ➔ How would you show it?
  - Technique of creating an idea, anticipating, correcting by questioning the text
- Proofs in paper:
  - Try to do them on your own (with the help of the paper). From just reading math, you will never learn math.
- Finally: Think of how you would explain someone else the things you learned from the paper.
Detailed Reading

- The most important section: System model, formalization section!!
  - Here you find the conditions under which the results of the paper hold!
    - What is assumed here?
    - Is this realistic, very strong?
    - Are all assumptions made during the proofs, experiments, ... explicit or are some implicit (unstated)?
  - A badly written system model makes the paper useless from a scientific point of view!
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Wie ist zu zitieren

- Verschiedene Stile je nach Community
  - [1]
  - (Elmenreich 2002)
  - [Elm02]
  - Mit Fuß- oder Endnote¹

- Bei Zitieren eines Sachverhalts in eigenen Worten erfolgt Zitatschlüssel am Ende des Satzes
  - …blablabla...[1]

- Wörtliche Zitate mittels Anführungszeichen und Kursivschrift speziell kennzeichnen und Seitenzahl angeben
  - "Sensor Fusion is the combining of sensory data or data derived from sensory data such that the resulting information is in some sense better than would be possible when these sources were used individually." [1, p.8]
References

- Use one citation style
- Should contain a unique identification of source.
  - author(s), editors
  - title
  - proceedings, volume, conferences
  - date of publication
- Only cite, what you refer to in the text.
  - Use “further reading” section instead
- Do not cite to show how much you read.
Examples


Citations in LaTeX & emacs
Citations in LaTeX & emacs

```latex
\documentclass[10pt,letterpaper]{article}
\usepackage{cite, url}
\usepackage{latex}\
\bibliographystyle{latex}
\begin{document}
\title{My paper}
\author{me}
\maketitle
In \cite{Lam83} it was shown that \dots.
\bibliography{lit}
\end{document}
```

My paper

me

In [1] it was shown that ....

References

References to Web pages

- Problem:
  - Die meisten web pages sind nicht „reviewed“! (z.B. Wikipedia)

- Konkreten Artikel zitieren, nicht nur die Seite

- Angabe von Titel, Autor und/oder Firma, etc. notwendig.

- Webseiten haben leider oft keine langfristige Persistenz, daher muss man auch das Bezugsdatum angeben.
Bibliography don‘ts !!


Generally: prefer citing papers/journals where the idea was first mentioned to text books, survey papers, ...

[1] Angaben zu Art der Veröffentlichung fehlen !!

[2,3] Quellen minderer Qualität (Web-Page)
[2] Zuwenig Daten

What to cite?

- Fremde Ideen ab einer gewissen Schöpfungshöhe
- Eigene und fremde Arbeiten auf die man aufbaut
- Zu jedem Zitat eine überprüfbare Referenz
- Auch übersetzte Texte
- Bildzitate: auf Copyright achten, eventuell neu zeichnen und ein Zitat ..nach [2] darunterstellen

Figure 2. Muller C-Element [2]
Plagiarismus

Fünf Stufen von Plagiarismus [IEEE]:

1. Wörtliches Kopieren eines kompletten Papers ohne Quellverweis.
2. Wörtliches Kopieren eines großen Teils eines Papers ohne Quellverweis.
3. Wörtliches Kopieren individueller Elemente wie Sätze, Absätze oder Abbildungen ohne Quellverweis.
5. Wörtliches Kopieren wesentlicher Teile mit Quellverweis, ohne abzugrenzen, wer was geschrieben hat.

Fließender Übergang von Schlamperei zu Betrug...
Konsequenzen

- Im Beruf (Richtlinien der IEEE)
  - Vorübergehendes Publikationsverbot für bis zu 5 Jahre \([1,2]\)
  - Eintrag der Verletzung in Datenbank \([1,2,(3)]\)
  - Notwendige schriftliche Entschuldigung beim Autor \([3,4,5]\)
  - Korrektur des Dokumentes \([5]\)

- In der LVA je nach Schwere
  - Negative Beurteilung der LVA
  - Schlechtere Note
Reales Beispiel für Plagiarismus

Tatbestand:

- Student hatte im Rahmen eines Seminars eine Arbeit geschrieben, welche im Internet veröffentlicht wurde (WS 2003)
- Im Nov. 2005 kam Beschwerde, dass diese Arbeit folgende Formen von Plagiarismus aufweise:
  - Grafik nachgemalt, ohne Ref. (Stufe [3])
  - Teile von Absätzen kopiert, ohne Ref. (Stufe [3])
  - Teile von Absätzen mit großer Ähnlichkeit, ohne Ref. (Stufe [4])
  - Obwohl Student nicht vorsätzlich gehandelt hatte, war dieser Tatbestand eine Verletzung gegen das Copyright des ursprünglichen Autors.
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Reviewed Conferences, Journals

Authors:
- Get call for papers
- Submit paper
- Get (conditional) accept/reject and feedback

Program committee:
- Assign papers
- Decide on accept/reject

Reviewers:
- Read and comment on papers.
- Give recommendation

Journals often have several review-adapt iterations.
Reviewing

- Scientific Community relies on reviewing for quality assurance
- Mostly: anonymous reviewer, known author
- When reviewing:
  - Try to really understand the paper and do not only read the introduction and conclusion!
  - Try to find good & weak points of the paper.
  - Dare to criticise, but give good reasons!
  - Don’t be insulting!
  - Be open for new ideas!
Reviewform (1)

Titel: 
Autor: 
Autor-Email: 
-----------------------------------------

NUMERISCHE BEURTEILUNG:

Bitte beurteilen Sie anhand der folgenden Kriterien mit 1-4 Punkten: (1..ungenügend, 2..verbesserungswürdig, 3..gut, 4..sehr gut)

Themenentsprechung (Arbeit entspricht dem vorgegebenen Thema): 
Aufbau (Die Arbeit ist klar strukturiert): 
Technische Klarheit: 
Inhalt (Inhalt entspricht den Erwartungen): 
Referenzen (Referenzen sind in "genügender" Anzahl vorhanden und eindeutig): 
Abgeschlossenheit (Arbeit in sich abgeschlossen; Arbeit baut auf Grundwissen auf):

Gesamtnote:
Reviewform (2)

DETAILKOMMENTARE:

Zusammenfassung des Artikels in eigenen Worten (drei bis fünf Zeilen):

Stärken des Artikels (sollte die numerische Beurteilung unterstützen):

Schwächen des Artikels (sollte die numerischen Beurteilung unterstützen):

Verbesserungsvorschläge (Kritik):
Further literature on reviewing...

Enjoy writing your first paper!