Scientific Writing I

Proseminar | Thomas Thüm | March 28, 2022

Software Engineering
Programming Languages

universität ulm

Prerequisites

Prerequisites

- You can read and write (in English)
- You want to learn scientific writing

Out of Scope

- Searching for literature
- Proper citing of other work
- Using LaTeX
- Giving scientific presentations

Lecture Overview

Scientific Writing

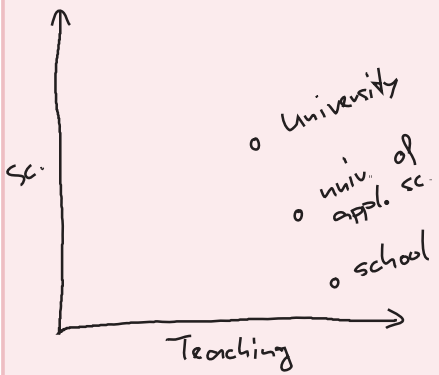
Structuring Your Proseminar Paper

Peer Review

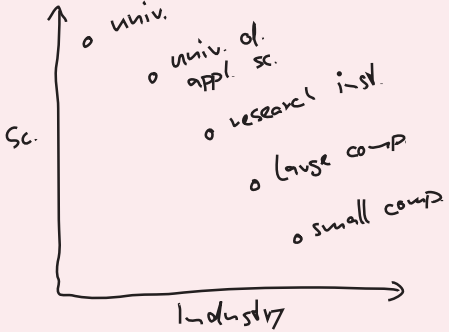
Part 1: Scientific Writing

Scientific Writing: Why Science?

Science vs Teaching



Science vs Industry



Scientific Writing: Why Writing?

Research vs Writing

- research gives new insights
- insights need to be documented
- communication to achieve impact, get feedback, to initiate collaborations, get recognized
- research is never finished until it is published
- publication is the core process and ultimate result of scientific research

Does It Need to Be Writing?

- Talking? Singing?
- Drawing? Showing?
- Presenting?
- Dancing?
- ...
- Influence of COVID-19?

Why Should You Learn Writing?

- changes and improves your thinking (similar to programming)
- learn to value, understand, perform research

Types of Scientific Contributions

Scientific Contributions (Wissenschaftliche Beiträge)

1. theory: mathematical or machine-checked proofs
2. conceptual contribution: algorithms, applications of algorithms, methodologies
3. artifact: prototypical tool support, data/benchmark, challenges
4. empirical evaluation: experiments, hypothesis testing
5. survey: literature overview, identification of gaps, research roadmap

Your Journey of Scientific Writing

Scientific Writing in Your Bachelor

Proseminar
- first contact with scientific work
- typically only survey of existing work

Bachelor's Seminar
- improve your skills in reading and writing
- often more literature, better paragraphs

Bachelor's Thesis
- larger project (6 months part time)
- often scientific contributions beyond surveys

Scientific Writing in Your Master

Master's Seminar
- more challenging topics (e.g., cutting edge research)
- clarity in writing, great paragraphs

Master's Thesis
- largest project (6 months full time)
- (significant) scientific contributions

Part 1: Scientific Writing

Lessons Learned

- The need for scientific writing
- Types of scientific contributions
- Scientific writing in your studies

Practice

See Moodle

Part 2: Structuring Your Proseminar Paper

The Need for Structure

Motivation

How to encode a web of related thoughts and ideas as a linear stream of text?

How to help readers to navigate in that text and read relevant parts?

Hints

research process $\neq$ paper organization

thoughts are typically not linear
(for reader and writer)

Structure of a Master's Thesis

A Master's Thesis [Knüppel 2016]

A Master's Thesis [Knüppel 2016]

Typical Structure of a Survey Paper

Typical Structure of a Survey Paper

- Title and Authors
- Abstract
- Introduction
- Background / Motivating Example
- Problem Statement (optional)
- State-of-the-Art (your contribution)
- Future Challenges (your contribution)
- Conclusion
- References

Comments

- choose one of Background section and Motivating Example section
- use problem statement if the problem is not well established
- own contribution may be split into separate sections

The Purpose of Each Section

Title and Abstract (Titel und Inhaltsangabe)

What is the survey about?

Introduction (Einleitung)

What is the motivation of the survey?

Background (Grundlagen)

What knowledge is required to understand the survey and not known by virtually all readers?

Motivating Example (Motivierendes Beispiel)

What is an example that motivates this work?

Problem Statement (Problemstellung)

What is the problem addressed and why should readers care?

State-of-the-Art (Stand der Technik)

Which existing approaches and evaluations exist? What are their commonalities and differences?

Future Challenges (Zukünftige Herausforderungen)

Which future challenges are known in the literature? Could you identify any new research gaps?

Conclusion (Fazit)

What are the main insights of the survey?

References (Literatur)

Where to find the referenced literature?

Why Is Writing So Hard?

1. Obstacle

there are tasks that are more fun to do
(e.g., programming assignments)

Hint

reward yourself after writing sessions

2. Obstacle

there are more urgent things to do

Hint

time management: plan your week and stick to it

Why Is Writing So Hard?

3. Obstacle

failure to distinguish urgency and importance

Hint

work on important task before they are urgent

4. Obstacle

you forgot what you have read

Hint

print out papers and take notes during reading

Why Is Writing So Hard?

5. Obstacle

interruptions make you very unproductive

Hint

reserve at least 2–3 hours for writing and turn of all notifications

6. Obstacle

it is hard to concentrate on the writing

Hint

brainstorming: write down ideas and thoughts that come to your mind

Why Is Writing So Hard?

7. Obstacle (empty-sheet-of-paper problem)

how to start the writing?

Hint

use bullet points, rearrange them across sections and paragraphs until they fit

8. Obstacle

hard to find a reference for a given claim

Hint

take notes on claims and respective references already during the reading

Part 2: Structuring Your Proseminar Paper

Lessons Learned

- Motivation for structure
- Typical structure of a Proseminar paper
- Common obstacles and hints for writing

Practice

See Moodle

Part 3: Peer Review

Scientific Writing

Structuring Your Proseminar Paper

Peer Review

- Scientific Peer Review
- Structure of Peer Reviews
- Example Review (in German)
- Evaluation Criteria and Scoring
- Hints for Reviews
- Lessons Learned

Scientific Peer Review

What is Peer Review?

- central element in the scientific process
- acceptance/rejection based on reviews
- review: critical read and frank comments on your work
- peers: 3–4 external, independent researchers/experts (e.g., PhD students, PostDocs, professors)
- peer review: aim is objective evaluation and constructive feedback

How to Achieve Objectivity?

- single-blind review: anonymous reviewers
- double-blind review: anonymous reviewers and anonymous authors

Why Peer Review?

- quality control: publishers, conferences, journals
- quality assessment: job offers, fund raising
- alternative: technical report without peer review + metrics on impact (only measurable after years)

Structure of Peer Reviews

Summary

- 1 paragraph with 3–5 sentences
- use your own words to describe the contribution
- avoid assessments at all

Pros and Cons

- 4–7 key points in favor (prefix $+$) and against (prefix $-$) acceptance
- use as few words as possible
- group by $+/-$
- sort by severity (start with most severe)

Major Comments

- 3–5 paragraphs
- first: paragraph describing all pros
- then: dedicated paragraph for each con
- use same order as in key points
- give evidence for each claim
- try to give constructive feedback
- for example: point to missing references

Minor Comments

- bullet points, sentences where needed
- typically in order of occurance in the paper
- detailed feedback that is not major enough to deserve a key point
- for example: colors are hard to distinguish for readers with red-green color blindness

Example Review (in German)

Summary

Die Einreichung behandelt Knowledge Compilation für Feature-Modelle. Ein besonderer Focus liegt dabei auf der d-DNNF und wie diese Normalform für verschiedene Analysen von Feature-Modellen benutzt werden kann. Es wird die Überführung von Feature-Modellen zu d-DNNFs detailiert erläutert und andiskutiert wie das Zählen von gültigen Konfigurationen auf d-DNNFs funktioniert.

Pros and Cons

+ Aufteilung in Abschnitte
+ Gute Beispiele

− Nicht vollständig
− Schwer verständlich
− Fachliche Fehler
− Wortwahl

Example Review (in German)

Major Comments I

Die Struktur ist gut gelungen, da sie von den Grundlagen von Feature-Modellen zu d-DNNF zu Erstellung von d-DNNFs zu Anwendungsfällen geht. Dies erhöht die allgemeine Verständlichkeit. Die wichtigsten theoretischen Konstrukte wurden mit Beispielen dargestellt. Somit erhöht auch das die Verständlichkeit. Dass ein Running Example verwendet wird ist super.

Die Abgabe ist eindeutig nicht fertig geworden. Die zahlreichen offenen Todos sprechen da für sich.

(continued on right side)

Major Comments II

(continued from left side)

Zudem ist der Text oft schwer zu lesen/zu verstehen. Dies liegt (abgesehen von der Unvollständigkeit) an mangelnder Detailliertheit oder Präzision ($\rightarrow$ z.B. ist oft die Rede von d-DNNF compilern aber es bleibt unklar, was bei d-DNNFs eigentlich kompiliert wird). Teilweise werden Dinge erwähnt und erst ein paar Absätze später erklärt (z.B. DPLL). Ich würde empfehlen, nochmal in Ruhe über deine Abgabe zu lesen und mit Strg+F nach den wichtigsten Begriffen zu suchen. Fachbegriffe sollten immer eingeführt werden, bevor sie benutzt werden.

[...]

Example Review (in German)

Minor Comments

* "number of valid products"(Introduction) → product =/= configuration
* Alternative Group in Table 1 (not C_i or NOT C_j) → das not fehlt vor C_j
* "it makes sense to use solvers" (Section 3) → ob XYZ Sinn macht darf allein der Leser entscheiden

Complete Review

Die Einreichung behandelt Knowledge Compilation für Feature-Modelle. Ein besonderer Focus liegt dabei auf der d-DNNF und wie diese Normalform für verschiedene Analysen von Feature-Modellen benutzt werden kann. Es wird die Überführung von Feature-Modellen zu d-DNNFs detailiert erläutert und andiskutiert wie das Zählen von gültigen Konfigurationen auf d-DNNFs funktioniert.

\+ Aufteilung in Abschnitte
\+ Gute Beispiele

— Nicht vollständig
— Schwer verständlich
— Fachliche Fehler
— Wortwahl

Die Struktur ist gut gelungen, da sie von den Grundlagen von Feature-Modellen zu d-DNNF zu Erstellung von d-DNNFs zu Anwendungsfällen geht. Dies erhöht die allgemeine Verständlichkeit. Die wichtigsten theoretischen Konstrukte wurden mit Beispielen dargestellt. Somit erhöht auch das die Verständlichkeit. Dass ein Running Example verwendet wird ist super.

Die Abgabe ist eindeutig nicht fertig geworden. Die zahlreichen offenen Todos sprechen da für sich.

Zudem ist der Text oft schwer zu lesen/zu verstehen. Dies liegt [...]

[...]

Weitere Anmerkungen

* "number of valid products"(Introduction) → product =/= configuration
* Alternative Group in Table 1 (not C_i or NOT C_j) → das not fehlt vor C_j
* "it makes sense to use solvers" (Section 3) → ob XYZ Sinn macht darf allein der Leser entscheiden

Evaluation Criteria and Scoring

Review Criteria

- significance: does the research address a relevant problem?
- clarity: is the paper well-written and structured?
- novelty: is the contribution over the state-of-the-art clear?
- correctness: are claims supported by proofs, tools, examples, experiments?
- reproducibility (same results with same data) and replicability (same res. with new data)
- more: soundness, illustration, presentation, self-containedness

Scoring in Reviews

- score for conferences: strong accept, (accept,) weak accept, (borderline,) weak reject, (reject,) strong reject
- score for journals: accept as is, minor revision, major revision, reject
- confidence: 5 (expert), 4 (high), 3 (medium), 2 (low), 1 (none)

Exception: desk reject (score by program chairs, no detailed review)

Hints for Reviews

Typical Problems

1. key points or summary missing
2. mixture of minor (e.g., typo) and major (e.g., misleading structure) feedback
3. mixture of positive and negative feedback

Hints for Your First Review

1. follow the above structure
2. separate positive from negative and major from minor comments
3. start with major and positive comments

Part 3: Peer Review

Lessons Learned

- Motivation for peer review
- Structure of peer reviews
- Evaluation criteria
- Common problems and hints for your review

Practice

See Moodle