

Seminar: Scheduling – Modern Problems in a Seemingly Solved Discipline

Guidelines for scientific writing and presentations
Sommersemester 2022

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Mai 9th, 2022



Topics and Advisors

Nr.	Topic	Presentation	Advisor	Student
1.	Metrics and Fundamentals of Scheduling	23.05.2022	Maiterth	E. Eroğlu
2.	Threads and Tasks Scheduling	23.05.2022	Arima	L. Wiemers
3.	GPU Scheduling (Warps and Compute Units)	30.05.2022	Arima	S. Hopperdietzel
4.	Process Scheduling (OS)	30.05.2022	Maiterth	M. Delic
5.	Modern Batch Scheduling by example of FLUX	13.06.2022	Comprés	L. Hacker
6.	Clouds and Container Scheduling	13.06.2022	Comprés	M. Konkov
7.	Large-Scale Cluster management by example of Borg	20.06.2022	Comprés	S. Råde
8.	Scheduling for Heterogeneous Systems	20.06.2022	Comprés	O. Thaeter
9.	Workflows and scheduling	27.06.2022	Arima	D. Ertas
10.	Co-Scheduling	27.06.2022	Arima	J. August
11.	IO-Aware Scheduling	04.07.2022	Maiterth	M. Pavel
12.	Malleability	04.07.2022	Comprés	L. Krakau
13.	Power-Aware Scheduling	11.07.2022	Arima	C. Bolea-Schaser
14.	ML-Based Scheduling	11.07.2022	Maiterth	R. Bachmann
15.	Scheduling for Quantum Systems	18.07.2022	Maiterth	N. Hohaus

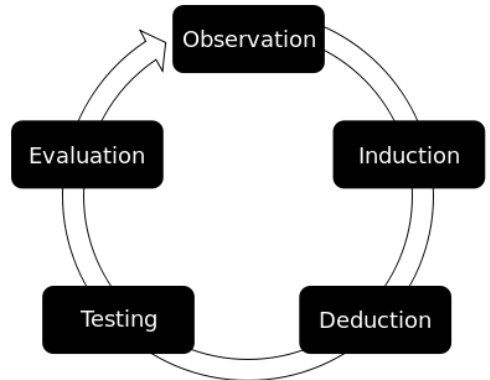
Guidelines – Outline

- Topics and Advisors
- **Basics of Scientific Work**
- Guidelines for Scientific Writing
 - Structure
 - Sources & Citing
 - Tool of choice Latex
- Guidelines for Presentations
 - Structure and Content
 - Presentation Techniques
- Grading
- Next steps

Basics of Scientific Work

Empirical and Non-Empirical Science [1]

- Empirical Method:
 - Gain knowledge by means of direct or indirect observation.
(Objective and consistent findings by evidence.)
- Non-Empirical Method:
 - Reviews (Systematic literature review or meta-analysis)
 - Personal Observation, Reflection on current events, authority or experience of the author
(e.g. Letter of the editor; Usually rejected as non-scientific)



Source: https://en.wikipedia.org/wiki/File:Empirical_Cycle.svg

Basics of Scientific Work

Scientific Writing

- Communication of the scientific results
- Audience: Peers in the domain
- Forms:
 - Books: (Monograph / Proceedings /..)
 - Papers: (Journal / Conference / Workshop /..)
- Conference / workshops papers are generally presented at conferences

Basics of Scientific Work

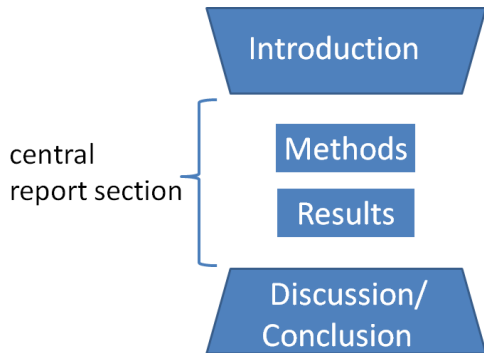
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- Forms:
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 - Papers: (Journal / Conference / Workshop /..)
- Conference / workshops papers are generally presented at conferences
- Scientific discourse via:
 - Peer-Reviews (with good scientific practice)
 - Citing previous work -> Improving upon (and/or criticizing)

Basics of Scientific Work

Structure of scientific articles

- IMRaD Structure
- Introduction, Methods, Results, and Discussion
- Follows the structure of scientific method.
- But rather strict and not directly applicable to the seminar (non-original research).



Source: https://commons.wikimedia.org/wiki/File:Wineglass_model_for_IMRaD_structure..png

Aim of this Seminar

- Write a seminar paper in the form of a review of your topic / assigned papers.
- Apply the concepts of scientific work and scientific writing.
- Outcome: Communication of systematic review of the perspective you gained of the topic.
- Slight mismatch between original research paper, systematic-review paper and your task!
- Goal: Apply and best match the concepts, to learn scientific work, with interesting outcome for you and the participants.

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Structure of a scientific paper

Adapting IMRaD

IMRaD-Structure

- Abstract
- Introduction
- (Background / Related Work)
- Method
- Results
- Discussion
- Conclusion

Seminar-paper (Adaptation)

- Abstract
- Introduction
- Background (needed?)
- Core Content (Choose approp. name, Systematic Overview / Results?)
- Discussion
- Conclusion

Abstract Structure

- One sentences providing an introduction to the topic.
- (Two, if a bit more detail is needed to introduce the problem (next sentence!).)
- One sentence on the problem dealt with at hand.
- One sentence on the result of the paper (e.g. "This paper presents ...").
- Two or three sentences on how this main result is achieved.
- One sentence on the main contribution or setting the result into a general context.



N-body methods simulate the evolution of systems of particles (or bodies). They are critical for scientific research in fields as diverse as molecular dynamics, astrophysics, and material science. Most load balancing techniques for N-body methods use particle count to approximate computational work. This approximation is inaccurate, especially for systems with high density variation, because



work in an N-body simulation is proportional to the particle density, not the particle count. In this paper, we demonstrate that existing



techniques do not perform well at scale when particle density is highly non-uniform, and we propose a load balance technique that efficiently assigns load in terms of interactions instead of particles.



We use adaptive sampling to create an even work distribution more amenable to partitioning, and to reduce partitioning overhead. We implement and evaluate our approach on a Barnes-Hut algorithm and a large-scale dislocation dynamics application, ParaDiS. Our method achieves up to 26% improvement in overall performance of Barnes-Hut and 18% in ParaDiS.



Abstract from: Pearce, et.al.,
"Load balancing n-body simulations with highly non-uniform density",
ICS '14, <https://doi.org/10.1145/2597652.2597659>

Introduction

Structure

1. Provide (general) background and motivation
 - Technology trends?
 - Recent developments?
 - Show why the work is of importance
2. Provide a summary and outline
 - Summary of highlights
 - What to find where in the paper

Background Structure

- Does the audience have all the necessary (technical) background?
- This section should bring everyone to the same starting point.
- May be especially critical in cross-discipline papers.
- May be skipped if background is covered in the Introduction
- Careful:
 - Is this original work and should therefor be part of the next section?
 - Can this be covered in the Introduction?
 - Good, if an explicit clarification of terms, etc. is necessary.

Core Content Structure

- Identify first what you will have as a core content, what you evaluated and want to contribute.
- Structure what you could extract from your reading material
- Have a golden thread! (Roter Faden)
- Introduce Methods, Concepts and Mechanisms
- Break this up into functional sub-sections
- Potentially supplement this by figures (clearer than a textual description).

Core Content

Your task for the seminar / contribution

- Overview of the subject
- Current State of the Art
 - Relevant Theory
 - Practical Methods
- Current Challenges
- (Potentially discuss this with your mentor/advisor)

Identify what to exclude and what to include, based on your goal!

Core Content

Structure - Original Research

In case you have original content:

- You need a methodic approach! And need to describe it! (IMRaD)
- You may need an analysis or proof of correctness (qualitative or quantitative)

If you have Simulation or Experiment:

- You need to explain your setup!
- Software used (Versions, Compilers, Libraries)
- System used (Architecture, Drivers?, OS?,...)
- Reproducibility!

Discussion Structure

- Discussing the material presented in the core content! (in IMRaD: Results)
- Discussion of Pros of the approach
- Discussion of Cons of the approach
- In Reviews: Waging the different works against each other

Conclusion Structure

- In fact similar to (a heavily shortened) abstract!
- Stating what was presented in the paper
- Highlighting the main results
- and potentially highlighting the main takeaways from the discussion.
- Only new content:

Providing an outlook and eventually future work.

Sources [6,7]

Select by Relevance and Quality!

1. Primary Literature:

- Original research
- Immediate results of research
- Peer-Reviewed (Papers and pot. Thesis)

2. Secondary Literature (Review Articles/Books):

- Summary and synthesizes of primary literature
- Books, Monographs, Treatises, Manuals
- Not necessarily Peer-Reviewed!

3. Tertiary Literature (Textbooks/Encyclopedia):

- Summaries and reduced versions of
- Usually with reference to primary and secondary sources
- Good for overview and lookup, not as direct source.

• Where to find them:

- Library (ub.tum.de)
- electronic Library (eaccess.ub.tum.de)
- ACM digital library (dl.acm.org/)
- IEEEExplore (ieeexplore.ieee.org)
TUM has access to these!
- Google Scholar / Microsoft Academics
- computer science bibliography (dblp.uni-trier.de/)

Citing [7]

- Everything you incorporate verbatim or content-wise from an external source must be cited!
- It is always assumed that scientific findings which appear without a citation
 1. come from the author,
 2. are new,
 3. are published for the first time and
 4. are correct and complete (see. U.S. Department of Health and Human Services, 2013)
- It is also necessary to cite your own work if any of the above does not hold!

References

- The paper itself should be self-contained.
- That means:
 - Figures, Graphs and Tables should not appear by themselves.
 - Always refer to them in the text and actively use them!
- When referring to parts/sections of the paper set clear references.

Tool of choice – L^AT_EX

- Best tool for scientific writing!
 - Clear typesetting
 - Scientific notation
 - Citing & References
 - Bibliography, and many more. This tool is unmatched.
- Getting Started: <https://www.tug.org/texlive/>
- GUIs for Platforms:
 - Linux: Texmaker / TexStudio
 - Mac: MacTeX
 - Win: TeXnicCenter
- Online: Overleaf (TUM instance: <https://latex.tum.de>)
- Simplest: Texlive + Editor

Examples

example.tex

```
\documentclass[a4paper]{article}
\title{Example document}
\date{\today}
\begin{document}
  \maketitle
  This is an example.
\end{document}
```

Run:

```
> latexmk -pdf example.tex
```

IEEEtran and Latex

- Get: `https://www.ieee.org/conferences/publishing/templates.html`
- Unzip the directory
- Make a copy of the tex template file for your paper.
- Run:
 `> latexmk -pdf YourPaperFile.tex`
- For a guide to the \LaTeX -typesetting system, see:

`https://en.wikibooks.org/wiki/LaTeX`

When writing: Notes on style

- Be precise and accurate
- Be objective
- Stay focused on the topic and remove unnecessary content
- Verbose and wordy descriptions should be avoided
- Are all prerequisites covered? (Know your audience!)
- Forward references should be avoided
- Active Voice (We) or passive voice
 - Active Voice is more engaging, encouraged. (“We” generally means the authors.)
 - Passive is common in German-speaking scientific community

“The first draft of everything is shit.”

Ernst Hemmingway

“It is not about writing, it is about rewriting.”

Ann Lamott

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Guidelines for Presentations

Initial considerations

- Who is your audience?
- What should their takeaway be?
- What are the core statements of the talk?
- What is the time? (Use the given time effectively!)

To consider:

- How many slides for the duration?
- (I personally need ~ 2 min / per slide with content!)

Guidelines for Presentations

How to structure?

Slides:

- First Slide
- Outline
- Content
- Last Slide
- Further Slides?

Contents:

- Motivation
- Background
- Key Concepts
- Evaluation (of concept or experiments)
- Summary/Conclusion
- Outlook

First Slide

- Use the style provided by your institution!
- Change Title / Venue / Date!
- This slide is often overloaded!
- Check the footer for the remaining slides, as well!

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Outline

- Structure your talk!
- Is an outline-slide needed?
- < 4 slides most likely not
- At least say what you're going to cover!
- (For this an outline slide may come in handy already!)

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Content

Guidelines

- 5x5 Five Bullets / five Words
- Clarity and Precision is key
- Simplification by reduction
- Every talk has a storyline
- Diagrams beat text slides!

Last Slide

- Is this a good last slide? \Rightarrow
- Should have:
 - Key Takeaways!(/Summary?)
 - Call to Action!
 - Name of the Author!
 - (and how to reach them)
- Unless this space can be used more effectively!

TUM

Next Steps:

- Tasks:
 - Mandatory Reading & research your topic
 - Get templates: Presentation and Paper
 - Make an outline for both your talk and paper!
- Next Session: Guidelines for:
 - Scientific writing
 - Presentations
- First Student Presentation: 23.05.2022 (Topics 1. & 2.)

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Further Slides?

- No “Thank you” or “Questions?” slide!
- Backup slides may be handy:
 - Details that do not fit into the main talk (For questions only!)
 - Don't add new or more content!
 - References! (Do not put them in the main talk, but for questions or, when sending the slides out!)
 - Links for further reading? (Mostly only relevant for lecture slides)
- When a slide is discussed in questions come back to your “last slide”!

Presentation Techniques

- Try to speak freely!
- Make a dry-run! (With peers / mentor? /the mirror(at normal presentation volume!))
- Speak to the audience!
- Practice makes perfect!

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Grading

Paper:

- Content: Clarity, structure, correctness
- Language: Style, correctness
- Formalities: References, sources, citation, specifications (usage of template, total length)

Presentation:

- Content selection
 - Motivation
 - Structure
 - Clarity
 - Appropriate reduction
- Visualization
- Presentation
- Time (+-30sec no more, no less!)

Review: (Part of your grade!)

- Own summary (1-2 sentences)
- General Comments:
 - Highlighting positives and negatives
 - Applicability of review-hints
 - Language and clarity

Next Steps:

- Tasks:
 - Start writing an abstract
and set the structure of the paper
 - Reach out to your advisor:
 1. Regarding the focus of your seminar paper
 2. At least a week before your presentation date!
- Next Session:
No Session on the 16.05.2022,
use this time for research,
preparation and writing!
- First Student Presentation:
23.05.2022 (Topics 1. & 2.)

—— Backup ——

Links

Presentations:

- How to Speak, Patrick Winston (MIT OpenCourseWare)

<https://www.youtube.com/watch?v=Unzc731iCUY>

Writing:

- Wikibook on Latex Typesetting: <https://en.wikibooks.org/wiki/LaTeX/>
- General Reading on writing: (There are several of these and its good to be aware)

- How to Write a Technical Paper

<https://core.ac.uk/reader/213421769>

- How to Write a Good Technical Paper

<https://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.68.8133>

Reviews:

- On reviewing academic papers

<https://github.com/jtleek/reviews/blob/master/README.md>

Sources

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<https://doi.org/10.1002/9781118901731.iecrm0083>
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<http://www.nm.ifi.lmu.de/teaching/Seminare/2017ss/Wiss/,> 2017
- [3] Werner Sesink, Einführung in das wissenschaftliche Arbeiten, 2012 Martin Böttcher,
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- [4] Grundlagen Wissenschaftliches Arbeiten, <https://cs.uni-paderborn.de/fileadmin/informatik/Lernzentrum/Wissenschaftlichesarbeiten.pdf>
- [5] Christina Huber, Gregor Imhof, Nicole Müller, Einführung in das wissenschaftliche Arbeiten,
http://www.bildung-z.ch/sites/default/files/Atelier%204_Einf%C3%BChrung%20ins%20wissenschaftliche%20Arbeiten_Huber%2C%20Imhof%2C%20M%C3%BCller.pdf
- [6] Primary, Secondary, and Tertiary Literature
<https://library.onu.edu/c.php?g=357773&p=2720217>
- [7] TUM Citation guide https://www.wi.tum.de/wp-content/uploads/2016/09/TUM_Citation_Guide.pdf