TECHNISCHE UNIVERSITÄT DRESDEN

Academic Skills: How to read a research paper?

Recent Topics in Knowledge Graphs

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Research Publications

What is research?

An OECD publication[1] derives the following key characteristics:

Research

The activity must be:

- novel [aimed at new findings, not known yet]
- creative [based on original, non-obvious concepts/hypotheses]
- uncertain [outcome and/or successfulness unknown]
- systematic [planned and consciously managed; rigorous]
- transferable and/or reproducible [results could be reproduced].

1 Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development; doi: 10.1787/9789264239012-en

Dimensions of research

Theoretical research

1. Define objects of study
2. State a conjecture
3. Construct a proof
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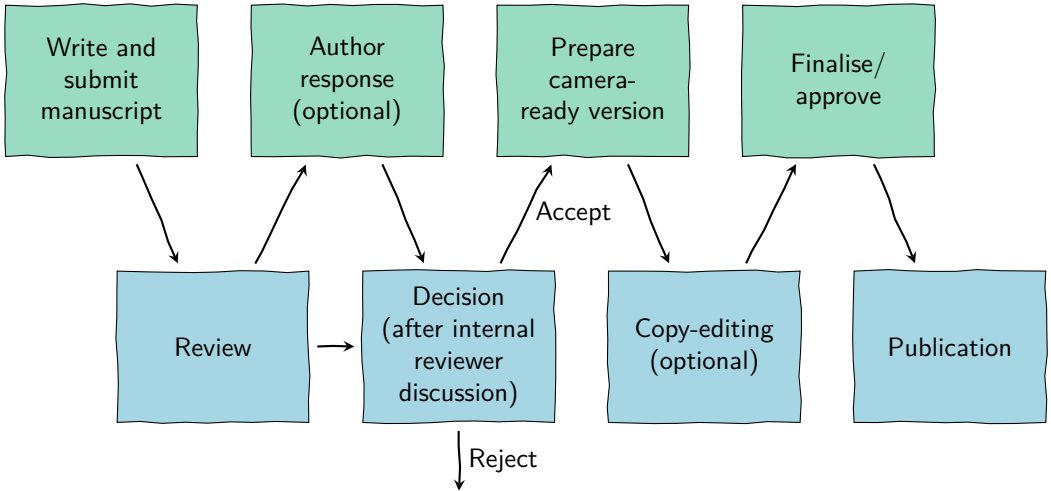
Design-oriented research

1. State or derive requirements
2. Design a system
3. Implement and evaluate the system
4. Analyse results and draw conclusions about system design

Publication Procedure (Conference)



Types of publication

The following basic types of text publications should be distinguished:

1. Formal research venues: articles in journals and proceedings of research conferences, with established academic standards and rigorous quality control
2. Informal research venues: proceedings of workshops, meeting notes, etc.
3. Monographs and collections: books, including textbooks, and edited collections of invited research articles
4. Theses: Texts written for obtaining an academic degree
5. Technical reports: self-published research papers that may not have undergone any quality control yet, but are usually archived and stable
6. Other online texts: blog posts and other web pages
7. Fake publications: Fraudulent or pseudo-scientific texts that try to look like research

Publication in Computer Science

Conference proceedings:

- Fixed timeline (paper has to be accepted before event happens)
- Length restrictions (to allow timely review)
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Workshop, posters, short papers:

- "Workshops" in computer science are often mini-conferences for preliminary works
- Emphasis of such events is on exchange; little relevance as publication venues

Evaluation Heuristics

Some questions can help to estimate quality before reading in detail:

- Where was it published?
- Who are the authors?
- When was it published?
- Are other researchers referring to it?
- What do others say about it?
- How is it presented?

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Caution

- These practically useful prejudices can help us to focus on the most promising works, but they cannot replace critical reading of the actual paper.
- Conferences and journals might actively eliminate them, e.g., via double-blind reviews.

Evaluation criteria

The evaluation of publications includes several criteria:

- Relevance: Does the contribution fit the conference/journal? Is it relevant to the research area it was submitted in?
- Significance: Are the results significant (big enough)? Does it advance our knowledge a lot?
- Originality: Is the work novel (new results, new methods, etc.)? Also compared to prior publications by the same authors.
- Correctness: Are the claims likely to be true? Are the proofs free of errors? Are the experimental designs sound? Are the conclusions valid?
- Presentation: Is the paper readable and clear?
- Related work: Does the work clarify how it compares to previous works in this area? Are all relevant references cited?

Reading

Reading with Intention

Reading a research text always has two goals:

- Learn: understand what was done and why, get new insights, find out which ideas/sources/people are important in this field
- Judge: asses the quality of the work, identify weaknesses and limitations, rate how credible/transferable/trustworthy it is

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Reading objectives

- Learn about new results and gain new insights
- Learn about useful methods and research techniques
- Learn about hot topics and active fields of research
- Discover limitations of current works and important open problems
- Find out if a work is useful/interesting/of good quality
- Understand the typical scope/form/structure of works in this area/venue

Structure of research paper

Structure of a research paper

1. **Title, authors, affiliations**
2. **Abstract**
3. **Introduction**
4. The research: details, methodology, results
5. **Conclusion**
6. **References**

This form is highly standardised and helps to read papers efficiently:

- the parts in bold are almost always there, and have a largely standardised function
- the middle part is specific to the research that was done

Reading strategies

Reading start-to-end is rarely effective. Instead, you might find the following order useful:

1. Title, authors, affiliations – interesting?
2. Abstract – what's in this work (high level)?
3. Introduction (skip motivation if you are already motivated) – what did they do?
4. Conclusion – what was achieved?
5. Main research – decide if to read further parts of the main research content

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If a paper is interesting, you will likely need to read it several times:

- Revisit single words, sentences, paragraphs, and sections to fully understand them
- First pass for overarching ideas and second pass for details
- Read with a goal/question in mind

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7. Strong points of the work?
8. Weak points of the work?
9. Where would you place this work in comparison to its area and/or your own research?
10. What did you find hard to understand? Which further information do you need?

Reading as a Process

Literature search

Search strategies:

- Citation-based: look at a paper's citations and search for papers that cite it
- Wikipedia-based: find classical key references to established fields and definitions
- Person-based: search for what a researcher has published recently
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Note

- combine techniques for best results
- interleave reading/rating and further search

Strutured literature search

A structured literature search is a process and you might find it helpful to:

- start with a concrete goal/question in mind
- read in a goal-oriented, analytical way
- take notes
- store or bookmark the actual texts so you can find them
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Note

- You can have too much or too little structure.
- You have to find your own setup!

Reading process

The review of relevant literature is a process of continued focusing and selection:

Initial search results

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Works you download/open

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Works you read in part

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Works you read in full

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Key input for your research