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
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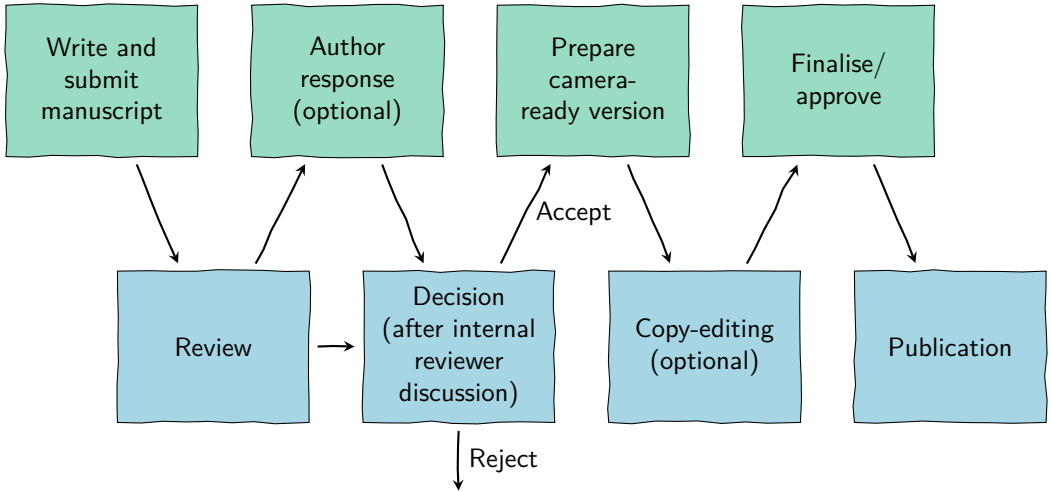
**Design-oriented research**

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
- Venue-based: browse recent editions of a relevant conference or journal

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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
- organise and relate papers/researchers/venues/topics/ideas as you read

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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