How to Read Scientific Papers Effectively?

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Research Methodology

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Why Do You Read Papers?

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- Trying to build an extensive literature review.
- Looking for ideas around a particular topic.
- Looking for a methodology for testing a possible idea.
- You are asked to review it.

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Knowing other works in the area helps you to determine which sort of contribution a paper is actually making..!!

Motivation for Learning How to Efficiently Read a paper

Typical Approach of a Graduate Student

- Learn on their own using trial and error.
- May waste much effort in the process.
- Frequently driven to frustration.

Organization of A Scientific Paper

1. Title
2. Abstract
3. Introduction

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4. Methods
5. Results
6. Discussions

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8. References
9. Appendix

Where the Difficulty Arise?

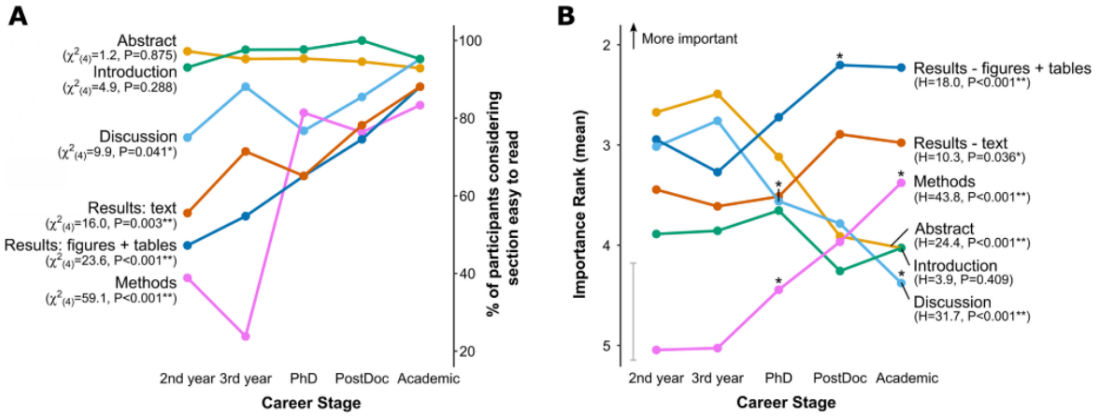

Figure: Different sections of scientific papers are considered easy to read and important at different stages of academic careers (Hubbard and Dunbar).

Organization of A Mathematical Paper

1. Title
2. Abstract
3. Introduction

Organization of A Mathematical Paper

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6. Formal Proof (With Lemmas, Propositions, Corollaries)

Organization of A Mathematical Paper

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5. Main Result
6. Formal Proof (With Lemmas, Propositions, Corollaries)
7. Conclusion
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The Three Pass Approach

Motivated by S. Keshav, "How to Read a Paper"

The First Pass

Objective: Gives you general idea of the paper

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- Carefully read the title, abstract, keywords.
- Read the introduction.
- Read section, sub-section headings (ignore details).
- Read conclusion.
- Glance over the references (ticking off the known ones).

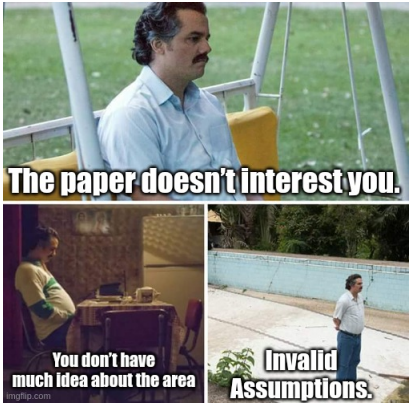
Expectation

Understand the five 'C':

- Category
- Context
- Correctness
- Contribution
- Clarity

The Next Step

Should I proceed further? No, in the following cases.



The Second Pass

Objective: Grasp the content of the paper

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- Read with greater care.
- Look at all the figures, diagrams, tables etc.
- Go through the proof idea, but ignore the proofs.
- Jot down the key points.
- Mark relevant unread references for furher reading.

Expectation

- Summarize the main thrust
- Understand the significance of the work
- Appreciate the proof idea

The Next Step

You may not proceed further with the following:

The Third Pass

Objective: Understand in-depth

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- Find out hidden failings and assumptions.
- Understand the significance and technical soundness.

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Objective: Understand in-depth

- Understand the difficulties, innovations.
- Find out hidden failings and assumptions.
- Understand the significance and technical soundness.
- Try to re-create the work (compare how you could have presented the work, proofs, techniques).
- Jot down ideas for future work.

List of Questions to Guide You

Can you answer these:

- What previous research and ideas were cited that this paper is building off of?
- Was there reasoning for performing this research?
- What are the main findings?
- What are the tools, statistical tests used?
- What key non-trivial findings in the paper?
- What are your thoughts on the results?

Literature Reviews

Proper Literature Review

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- Find the cited papers in the work.
- Identify repeated author names, find their key papers and researches in this area.
- Use academic search engines such as Google Scholar, arXiv, PubMed, CiteSeer, ePrint to find recent papers.
- Identify top conferences in the domain and scan recent high quality related papers.

Thank You..!!!