


Art of
Reading Scientific Papers

"We are drowning in information but starved for knowledge."

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Outline

- Why read?
- Why papers not books?
- Types of scientific papers
- Paper organisation
- Reading steps



Why do we read scientific papers?

Keep updated	Write a review	Present the Paper
Add to the work	Learn how to write	

What is a scientific publication?

An academic publication describes a subfield or subfields of knowledge with an aim to distribute academic research and valid scientific findings.

- white papers?
 - are not scientific papers: marketing tool, use selected facts and logical arguments to build a case favorable to the company sponsoring the document.
- Grey literature?
 - are materials and research produced by organizations outside of the traditional commercial or academic publishing and distribution channels. E.g. technical reports, project report.

Types of scientific publications

Primary	<ul style="list-style-type: none"> • Original work, complete progress papers • Thesis • Patent
Secondary	<ul style="list-style-type: none"> • Review, survey, tutorial, etc. • Case study • Book
Tertiary	<ul style="list-style-type: none"> • Dictionary • Encyclopedia • Handbook "manual"

Choosing the Right Article

Paper organisation: "IMRAD" Format

I = Introduction	<ul style="list-style-type: none"> What problem was studied, why, who did this before, what is missing
M = Methods	<ul style="list-style-type: none"> How was the problem studied in CS and Eng, we have sys design and imp.
R = Results	<ul style="list-style-type: none"> What are the findings
A = and	
D = Discussion	<ul style="list-style-type: none"> What do these findings mean

10/10/2007 How to read scientific papers 7

Variations

- If a number of methods were used to achieve directly related results:
M + R = Experimental Section
- The results are so complex that they need to be immediately discussed:
R + D = Results and Discussion Section
- Work in progress papers may not include R + D

10/10/2007 How to read scientific papers 8

Steps in reading scientific papers

```

    graph TD
      A[Get Prepared] --> B[Decide if relevant]
      B -- not relevant --> C[Skip it]
      B -- relevant --> D[Skim the paper]
      D -- not relevant --> C
      D -- relevant --> E[Assess quality]
      E --> F[Challenge the paper]
      F --> G[File it]
      H[Summarize the paper] --> G
  
```

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Get prepared

- **Place** Quite & convenient
- **Time** Free or planned
- **Tools** Pencil, rubber, paper, highlight, sticky notes etc.

10

Steps in reading scientific papers

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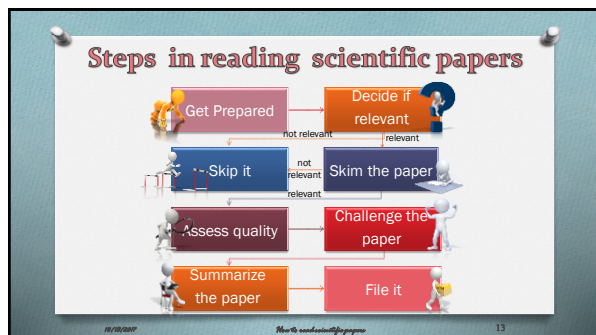
    graph TD
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```

11

Decide if relevant

- What did the author do? (abstract level)
- Read title and abstract
 - Relevant? Continue
 - Not relevant? skip

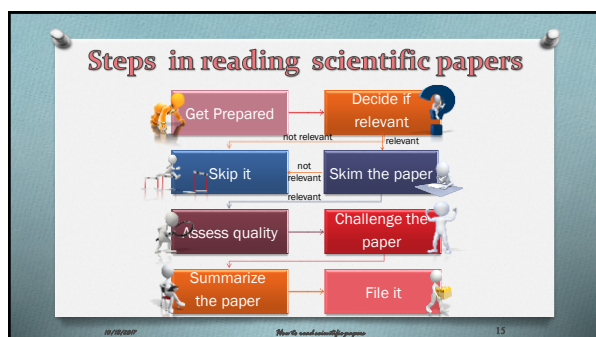
12



Skip if not relevant


- o If not relevant:
 - o Write down a note
 - o Congratulate yourself for saving the time of reading the paper in depth.

14



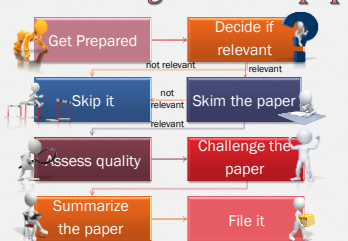
Skim the paper

- What did the author do? (more detailed level)
 - Read introduction, section headings, tables, graphs and conclusions
 - Relevant? Continue
 - Not relevant? skip



16

Steps in reading scientific papers




```

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```

17

Assess credibility -1



```

    graph LR
      A[Authors] --> B[Publisher]
      B --> C[Date]
      C --> D[References]
    
```

18

Assess credibility -2

- Who wrote it?
 - Are they well-known?
 - Where do they work? What biases might they have as a result of their employer?
- What is the journal/conference quality?
 - Where was the article published?
 - What is the reputation of the publisher? Was the publication refereed?

18/10/2017 How to read scientific papers 19

Assess credibility -3

- When was it written? Might it be outdated or superseded?
- Skim the bibliography/references:
 - How extensive is it?
 - Are the authors aware of current work?
 - Does it reference classic papers in this field?
 - Have you read any of the papers that are referred to?
 - Do you know relevant research that isn't cited?

18/10/2017 How to read scientific papers 20

Steps in reading scientific papers

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```

18/10/2017 How to read scientific papers 21

Challenge the paper -1

Methods Assumptions Statistics

Conclusions

18/10/2017 How to conduct a literature review 22

Challenge the paper -2

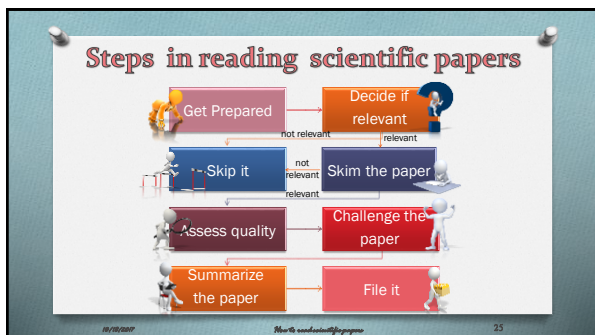
- **Examine the assumptions**
 - Do their results rely on any assumptions about trends or environments?
 - Are these assumptions reasonable?
- **Examine the methods**
 - Did they measure what they claim?
 - Can they explain what they observed?
 - Did they have adequate controls?
 - Were tests carried out in a standard way?

18/10/2017 How to conduct a literature review 23

Challenge the paper -3

- **Examine the statistics**
 - Were appropriate statistical tests applied properly?
 - Did they do proper error analysis?
 - Are the results statistically significant?
- **Examine the conclusions**
 - Do the conclusions follow logically from the observations?
 - What other explanations are there for the observed effects?
 - What other conclusions or correlations are there in the data that they did not point out?

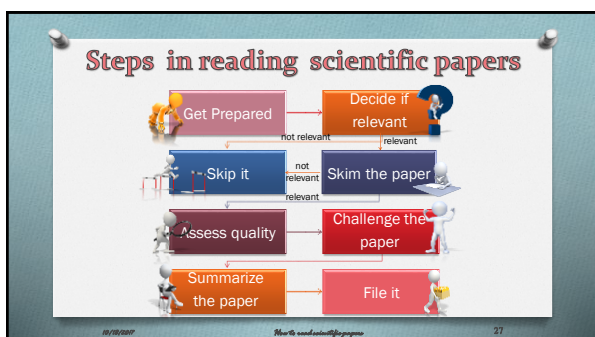
18/10/2017 How to conduct a literature review 24



Summarizes the paper


- o Take notes and highlight major points as you read
- o After finishing, write a short summary in your own words,
 - o What you learned?
 - o What were the main points?
 - o How do you feel about the paper?
 - o -ves & +ves .

18/10/2007 How to read scientific papers 26



File / Review it

- ◊ Keep the summary with the article for future reference.
- ◊ If review is required then if it is a structured review then fill the review form based else rewrite your summary as points that help to improve the paper



10/10/2007 *How to conduct a literature review* 28

References & further reading

- ◊ <http://www.cs.columbia.edu/~hgs/netbib/efficientReading.pdf>
- ◊ http://www.sciencebuddies.org/science-fair-projects/top_science-fair_how_to_read_a_scientific_paper.shtml
- ◊ <http://www.monash.edu.au/lls/llonline/quickrefs/12-reading-strategies.pdf>

10/10/2007 *How to conduct a literature review* 29
