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Literature Search

"*Students shouldn't go into life without the ability to communicate.
Your success in life will be determined largely by...*

- your ability to speak,
- your ability to write, and
- the quality of your ideas,
  in that order."

— Prof. Patrick Winston

Goal: Find and Include Scientific Sources

- Discover relevant literature
- Read and understand state-of-the-art research
- Accurately provide references

Image source: uni-goettingen.de

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Need for Accurate Information

- "Standing on the shoulders of giants"
  - ▶ All scientific developments extend previous efforts
- Research development commonly does one or a combination of these
  - ▶ Generalize
  - ▶ Specialize
  - ▶ Correct

Strong Claims require Strong Sources

- Claims that contradict common understanding need either
  - Direct proof
  - Strong (scientific) sources
- Claims that align with common understanding need either
  - A decent reference
  - Support from an authority in that field
- Common knowledge should have a source but not required

Trustworthiness of Information
○○●

Searching Literature
○○○○○○○

Reading and Citing Papers
○○○○

Conclusion
○

Non-Scientific Sources

- (Technically) anything that is not peer-reviewed
  - ▶ Blogs
  - ▶ Articles
  - ▶ Wikipedia
  - ▶ ChatGPT and AI models
  - ▶ (Books)
  - ▶ (Pre-print papers)

Classic Approach

Goal: Find papers related to own topic

1 Identify relevant keywords

2 Search on Google Scholar

3 Focus on recent works and works with high citation counts

4 Collect papers in research manager, e.g. Zotero

5 Start reading

6 Look at papers cited in read papers

Classic Approach - Issues

- How to identify relevant keywords?
- What about semantic search?
- What about pre-prints without citation counts?
- Do I have to read all papers?
- What about automatically seeing all references?

Identifying Keywords

- Ask supervisor/expert
  - ▶ For important papers
- Ask AI
  - ▶ Prompt generative AI for keywords, e.g., ChatGPT
  - ▶ Use semantic search tools

Semantic Search

- Space is quickly evolving
  - ▶ New free tools appear and introduce pricing later on
  - ▶ Keep an eye out
- Notable options right now
  - ▶ https://elicit.com/ (Limited credits)
  - ▶ https://www.perplexity.ai/ (Limited free features)
  - ▶ https://www.openread.academy/

Problem with Pre-prints

- Pre-print papers, e.g., published on https://arxiv.org/
  - ► Publicly available
  - ► Still awaiting peer review
  - ► Technically not a scientific publication (yet)
- Peer review process is too slow in fast moving fields, e.g., AI
- Trustworthiness of pre-prints
  - ► Check major organization support, e.g., research team from Google, Microsoft, etc.
  - ► Check other publications of authors

AI Summarization of Papers

- In theory, most modern LLMs can summarize a paper
  - ▶ Papers are complex, AI might not fully understand
  - ▶ Visual understanding of graphs is relatively new
  - ▶ Modern AI may even consider multiple uploaded documents
- https://www.semanticscholar.org/ provides TLDR of papers

Automatic Snowballing

- Identify related papers from references
  - ▶ Papers cited by X
  - ▶ Papers citing X
- Notable options (all free afaik)
  - ▶ https://www.researchrabbit.ai/
  - ▶ https://inciteful.xyz/
  - ▶ https://openknowledgemaps.org/

Identifying Relevant Papers

- Consider
  - ▶ Title
  - ▶ Publication year
  - ▶ Journal
  - ▶ Related organizations
  - ▶ Citations
- Read and consider if relevant
  - ▶ Abstract
  - ▶ Introduction
  - ▶ Conclusion
- If all this passes, read/skim the entire paper

How to Read a Paper

- Start with survey paper if possible
    - ▶ Provides wide introduction to field of research
- Read the paper from front to back
    - ▶ Take notes on the significant points
    - ▶ Look up unknown words
    - ▶ Note down interesting (key) references
    - ▶ Write down your ideas
- Answer these questions:
    - ▶ Why does this matter?
    - ▶ How is this useful to me?
- In your notes, ensure you can map information to references

Reference Manager

- What does it do
  - ▶ Collect and manage scientific sources
  - ▶ Export references to document
- Personal recommendation: Zotero
  - ▶ Open source desktop app
  - ▶ Uses browser extension
  - ▶ Many plugins and integrations available

Citing with Zotero and LaTeX

- **Setup**
  - ▶ Install Zotero and browser connector
  - ▶ Install Better BibTex plugin for Zotero
- **Collect references via browser connector**
- **Export to LaTeX**
  - ▶ Right click folder in Zotero client
  - ▶ Select Export collection
  - ▶ Select format Better BibLaTeX
  - ▶ Save .ref file to disk
  - ▶ Upload file to Sharelatex and replace bib.ref
- **Use keys generated by Zotero to cite**

Closing Remarks

- You are now empowered to correctly read and cite scientific papers
- Did not cover note-taking and knowledge graphs
    - Personal recommendation: Obsidian with citations plugin
- Review these slides as needed
- Keep eyes open for new developments