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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

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- (Technically) anything that is not peer-reviewed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/>
- ▶ <https://openalex.org/>

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://openknowledge maps.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