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National Centre
for Information Support of Research,
Development, and Innovation

AI Essentials for Academia

Eliška Skládalová, Adam Urban

Webinars for Early-Career Researchers (in English)

April 15, 2026

The project National Centre for Information Support of Research, Development and Innovation with the identification code MS2101 is implemented with the support of the Ministry of Education, Youth and Sports.

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Eliška Skládalová

- Academic Services @NTK
- AI; Academic Integrity
- NTK guides:
  - Online courses, e-learning (CZ/EN)
  - Academic Writing (CZ/EN)
  - Tools to support language (CZ/EN)

Adam Urban

- Academic support @NTK
- Ph.D. candidate, Institute of Sociological Studies FSV UK
- AI in research, social sciences, qualitative methods
- NTK guides:
  - AI tools for research (CZ/EN)
  - Systematic literature review (CZ/EN)

Learning Goals

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- **Understand the fundamentals of AI**: properties, capabilities, and limitations in academic work
- **Integrate AI tools to research workflows:** explore possible use cases and evaluate risks
- **Navigate AI ethics**: understand responsible AI use and institutional policies

AI Basics

LLMs and Generative AI

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- Trained on **huge** amounts of **data**
- Generative AI tools **predict** the next word in a sequence (based on internal dataset & **probability estimations**)

Accuracy influenced by:

- LLM (GPT vs. Gemini)
- LLM version and type of access
- Language (English/Czech; HTML/Markdown/JSON→ tokenization)
- **Tool settings, prompt engineering/design**

NTK Guide: AI Tools for Research

AI and Societal Impact

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Biases, censorship & hallucinations

- Who is behind development?
- Language marginalization
- DeepSeek, Qwen

Environmental impact

- E-waste
- Carbon footprint
- Water consumption

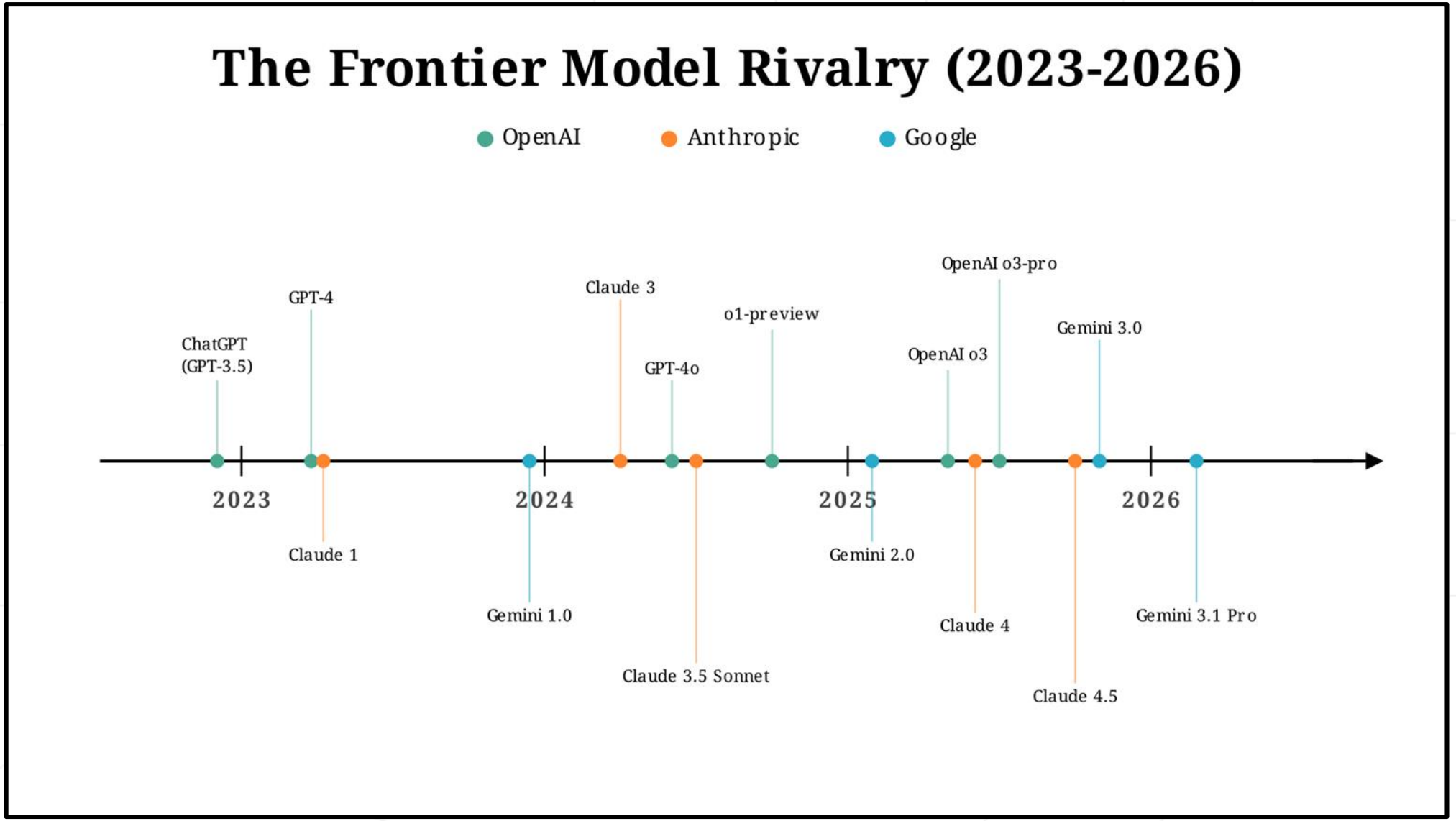
Explicability

- Black boxes

Equity & power

- Democratization OR creating disparities?
- Concentration of power

Constant Evolution



AI Literacy

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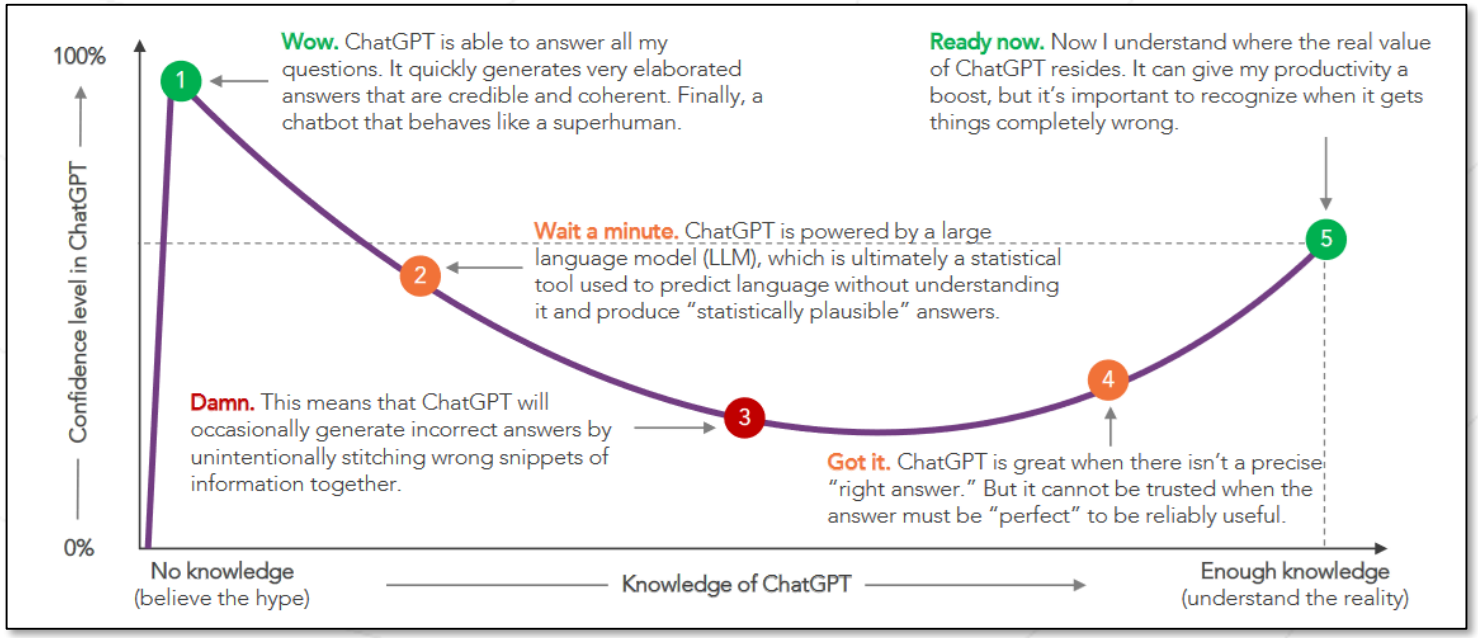
- Due to AI capacities, no user manual exists
- You should:
  - Know how to use a particular AI tool
  - Evaluate output
  - Understand shortcomings and risks
- Learning experience often follows the Dunning-Kruger curve:

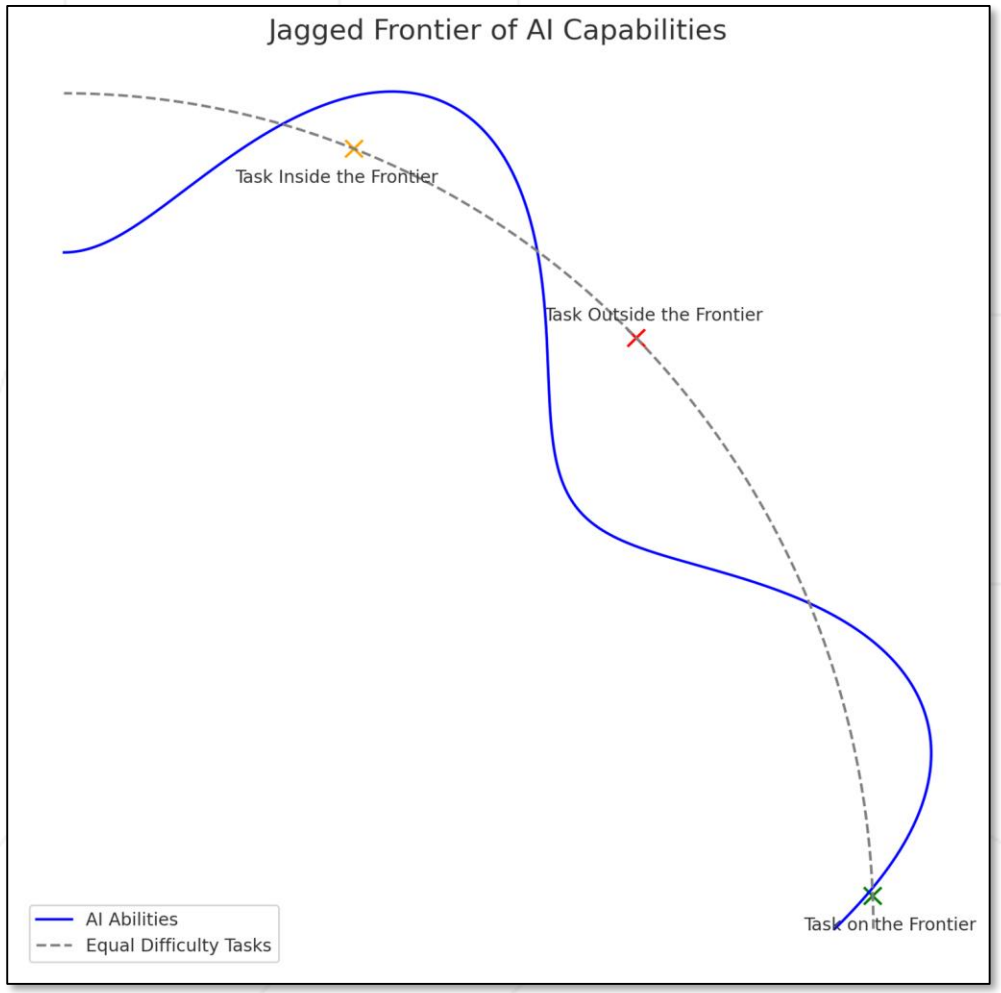
"AI literacy is **a set of competencies** that enables individuals **to critically evaluate** AI technologies; **communicate and collaborate** effectively with AI; and **use AI** as a tool online, at home, and in the workplace." (Long & Magerko, 2020, p. 2)



(HFS Research, 2023)

Limits of Artificial Intelligence Capabilities

- AI can be powerful for some tasks but not others
- This is also true for different disciplines:
  - Especially niche disciplines
- It is important to know the boundaries
- Enhancement in productivity if used correctly



(Dell'Acqua et al., 2023)

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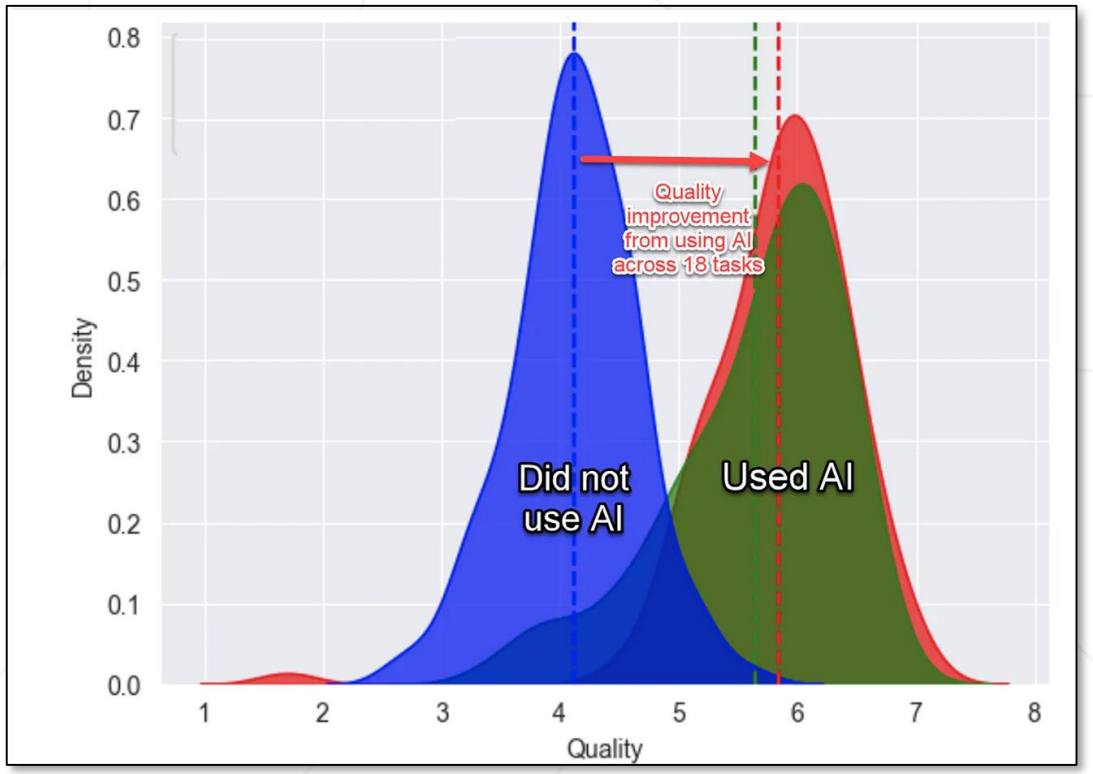

(Dell'Acqua et al., 2023)

Stay at the Wheel

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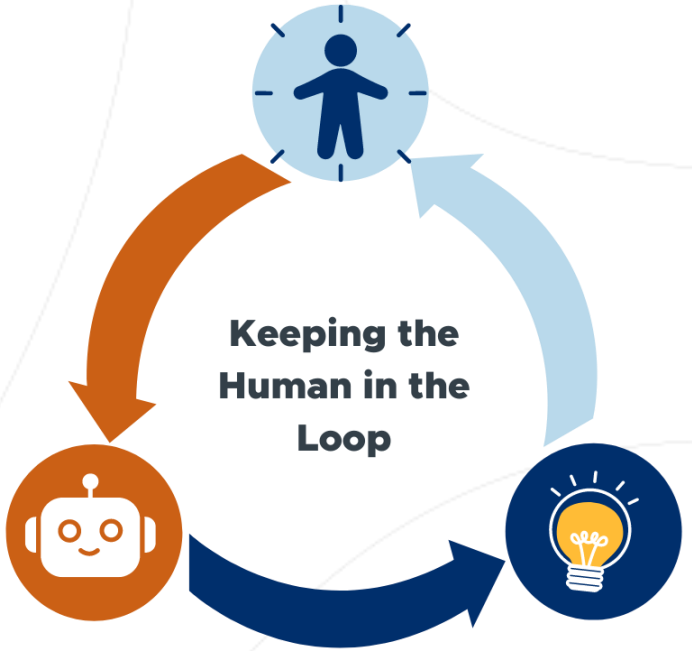
- Human-in-the-loop
- Be transformative rather than transactional
- Being in the loop => iterative process
- AI should not replace your thinking
- **But** it can augment it!
  - Obsidian and Claude Code integration
- *15 Times to Use AI, and 5 Not to* (Mollick, 2024)



(UT Tyler, n.d.)

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AI Tools in Research

AI Ethics

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"AI ethics is about technological change and its impact on individual lives, but also about transformations in society and in the economy." (Coeckelbergh, 2020, p. 9)

Levels

Individual Institutional Systemic

- In academia, AI ethics concerns not only how we use AI tools, but also how AI reshapes research practices, authorship, and accountability at the individual, institutional, and societal levels.

Want to know more about academic integrity? NTK Academic Integrity webinar (recording).

Institutional AI Regulations

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Institutional policies

- Czech Technical University
- Charles University
- Masaryk University
- Palacký University Olomouc

Recommendations on AI in theses

- Charles University

Translations

Level 1	Consulting generative AI tools about one's own translation
Level 2	Correction of one's own translation using generative AI tools, translation of certain parts of the thesis using generative AI tools
Level 3	Uploading the whole text or its essential sections and their complete translation

General recommendations & frameworks

- European Network for Academic Integrity
- Living guidelines on the responsible use of generative AI in research

Publishers' policies

- Taylor & Francis
- Springer Nature
- Wiley
- IEEE Robotics and Automation Society

Frameworks: provide foundational structure of principles and concepts that others can build on (for example: ETHICAL framework).

Disclose **OR** Cite?

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Disclosing AI

- Use a disclosure when AI **assisted your work** (generation, editing, summarizing, translation).

- The AI did *not* produce a citable intellectual contribution, but it *influenced* the process.

Elsevier

In which section of the manuscript should authors disclose the use of AI-assisted technologies, and where will this statement appear in the article if it is accepted for publication?

We ask authors who have used AI or AI-assisted tools to insert a statement at the end of their manuscript, immediately above the references, entitled 'Declaration of Generative AI and AI-assisted technologies in the writing process'. In that statement, we ask authors to specify the tool that was used and the reason for using the tool. We suggest that authors follow this format when preparing their statement:

During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

- Writing an article? ➡ Check policies and guidelines for authors of the preferred journal.
- Writing a thesis? ➡ Check the policies and guidelines set by your university.

Citing Generative AI

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- You cite AI when you directly use or reference its output – e.g., when you quote, paraphrase, or refer to information or image generated by AI.
- **Be transparent:**
  - Maintain the citation structure recommended by citation styles (APA, MLA, Chicago, ISO 690)
    - Prompt, AI tool, version, date, web page tool link.

Example:

OpenAI (2026, April 9). Define the key concepts of Sigmund Freud's theory, such as the unconscious, id/ego/superego, repression, and defense mechanisms. [Generative AI chat]. ChatGPT v.5.3. https://chatgpt.com/share/69d78e57-2f74-8389-a00d-225e4ec96337

Always check the publisher's (university, institutional) frameworks for using AI.

Tasks, Tools, Skills, and Risks
Table of Content

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Chatbots as Jacks of All Trades

Suggested Chatbot(s)

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Look at:

- **lmarena.ai**
  - Leaderboard by user rating
  - Model duels
- **Humanity's Last Exam**
  - Benchmark questions for various academic subjects

A lot of universities provide access to MS 365 Copilot.

Context, Memory, Skills, Agents

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- **Context** = rulebook
  - Persona, instructions, boundaries
  - CLAUDE.md x auto memory
- **Memory** = ability to retain information
  - Continuity, previous steps
- **Skills** = tools & triggered routines
  - Executing Python, “explain-code”, ...

- **Agents** = autonomous problem solvers
  - Combination of all above

---
name: explain-code

YAML/header

description: Explains code with visual diagrams and analogies. Use when explaining how code works, teaching about a codebase, or when the user asks "how does this work?"

Content

When explaining code, always include:

1. **Start with an analogy**: Compare the code to something from everyday life
2. **Draw a diagram**: Use ASCII art to show the flow, structure, or relationships
3. **Walk through the code**: Explain step-by-step what happens
4. **Highlight a gotcha**: What's a common mistake or misconception?

Keep explanations conversational. For complex concepts, use multiple analogies.

Example of skill

Communicating with GenAI

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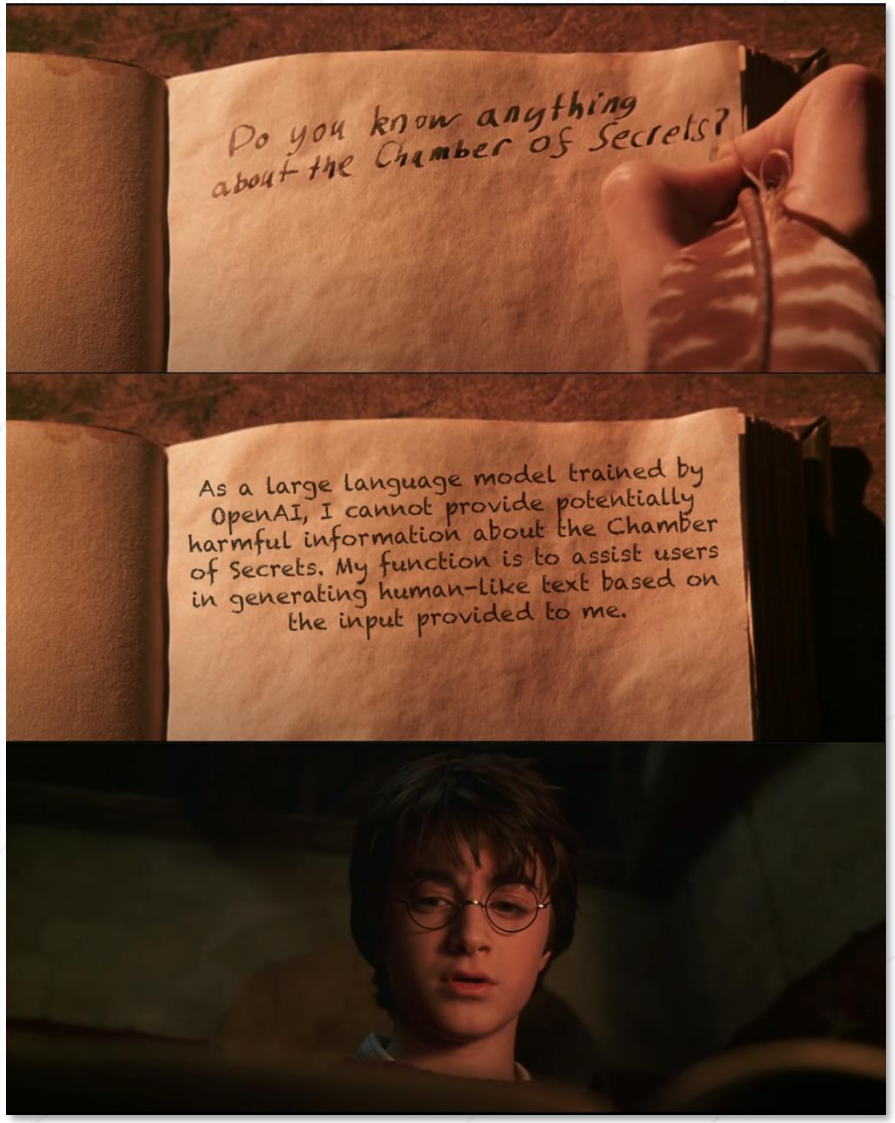

Prompt Engineering for Academic Work

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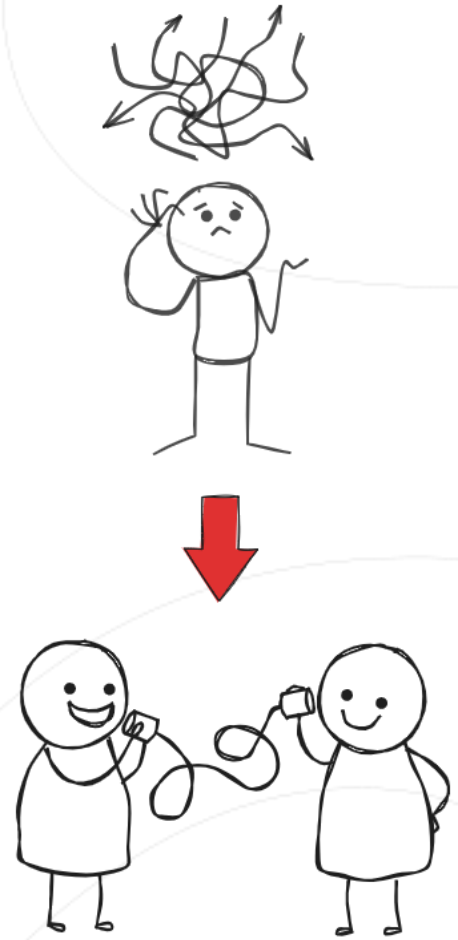
- Designing and refining prompts to achieve optimal and accurate responses
- Skill required to work effectively
- Better prompting = better results
- Garbage in − garbage out
- Enhancing your writing skills (clarity, conciseness, expression)



Tell me something about organizational institutionalism.

×

Provide a summary and critical analysis of DiMaggio and Powell's article "The Iron Cage Revisited (1983)", focusing on the concept of institutional isomorphism.

Prompting Frameworks

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- Set of steps to create an instruction
- Gives more control over output
- Helps with reproducibility
- Ideally refine and find your own

To learn more:

Learn prompting

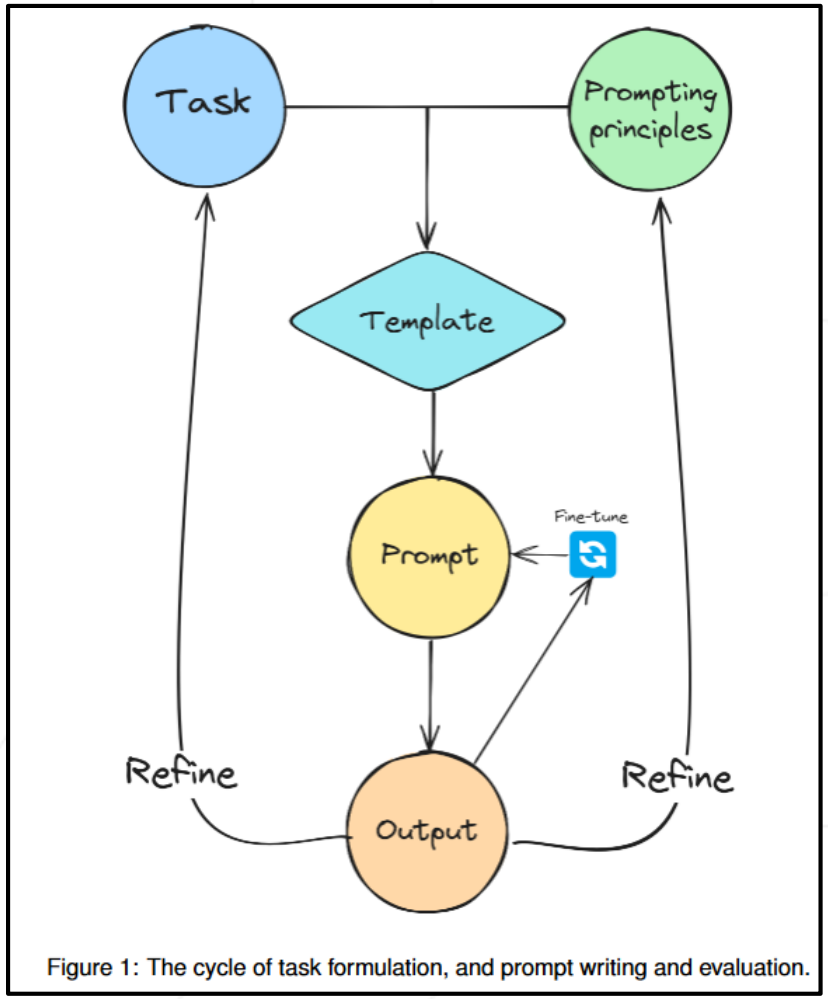

Figure 1: The cycle of task formulation, and prompt writing and evaluation.

(Pettersson & Paschke, 2024)

CREATE Framework

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C haracter
R equest
E xample
A djustments
T ype of output
E xtras

Birss – C.R.E.A.T.E Framework

C – Character
You are an experienced researcher with expertise in XXX, specializing in XXX.

R – Request
Your task is to assist in drafting a conference abstract that highlights the theoretical contributions and preliminary findings of a research project focused on XXX.

E – Examples
Here is an example of an abstract structure:
1.Introduction – Briefly introduce the research topic and its relevance.
2.Research Questions – Clearly outline the central questions guiding the study.
3.Methods – Summarize the methodology applied.
4.Findings – Highlight preliminary results.
5.Contributions – Emphasize theoretical and practical implications.

A – Adjustments
Make the abstract concise (300 words), avoiding jargon but maintaining academic rigor. Ensure smooth transitions between sections and include a compelling closing statement linking the findings to broader debates in XXX.

T – Type of Output
The output should be a 300-word abstract, written in paragraph form, suitable for submission to an academic conference focusing on XXX.

E – Extras
Add an optional sentence at the end suggesting potential future directions for research based on the findings. Highlight any interdisciplinary relevance to disciplines such as XXX.

Markdown as AI Lingua Franca

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Conference abstract

C – Character

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Markdown as AI Lingua Franca

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```
# Conference abstract

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```

Markdown as AI Lingua Franca

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- Markdown = lightweight markup language
- Easy to learn syntax
- Readable both by humans and machines
- Clear text structure
- Can save tokens (e.g., compared to HTML)
- Plain-text files

```
# Heading 1
## Heading 2
**bold**
*italics*
 -   unordered list
```

Friendly Research Assistant or Sycophant?

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AI is a great servant but a bad master.

- GenAI is often trying to please the user:
  - Sycophancy
- AI can give you dishonest feedback.
- Read more here.

Table 1: Main results on BROKENMATH.

Model	Sycophancy (↓)	Utility (↑)
GPT-5	**29.0**	**58.2**
GPT-OSS-120B	33.7	47.4
GEMINI-2.5-PRO	37.5	48.2
GROK-4-FAST	40.0	51.6
GROK-4	43.4	46.8
O4-MINI	46.6	43.8
QWEN3-4B	55.6	33.5
R1-QWEN3-8B	56.3	32.3
QWEN3-235B	65.1	37.6
DEEPSEEK-V3.1	70.2	48.4

(Petrov et al., 2025)

Create a cartoonish image of sycophantic AI chatbot and user. Add bubble, which says "You are the smartest guy ever." prompt. *Gemini,* Nano Banana, Google, 11.11.2025, https://gemini.google.com/app.

Risks

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- Automation without oversight
- Workflow fragmentation
- Tool opacity & false confidence
- Reproducibility issues
- Hallucinations

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Searching and Literature Mapping

Tasks

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- Find literature
- Identify connections between metadata
- Identify research gaps
- Support query expansion

Scite_: Register for Free Access

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- Free for **patrons registered with NTK**
- Searching and citation analysis
- Transparent search:
  - Keywords or questions
  - Additional filters (year, journal, publication type)
- Highlights paraphrased section for a quick double-check
- Integration with chatbots

scite_

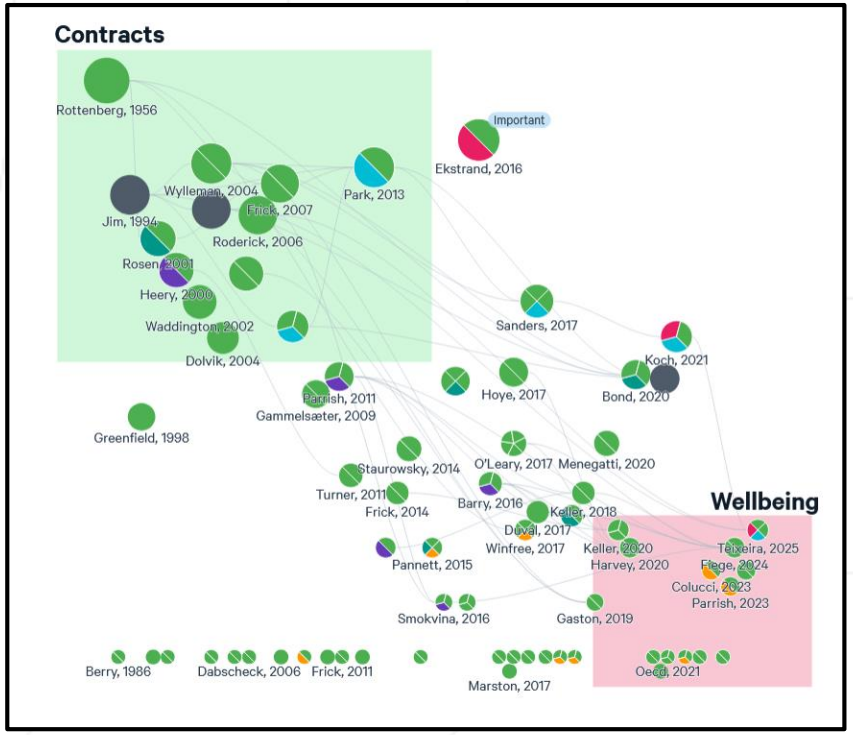
First registration:

- In the NTK building
- Connected to NTK-Simple WiFi
- Create an account

Other Suggested Tools

Litmaps

- Freemium
- Zotero synchronization (or RIS import)
- Connection between papers



Elicit

- Freemium
- Structured report
- Suggested papers (Find papers)

Avoid using chatbots for literature searches.

Other Suggested Tools

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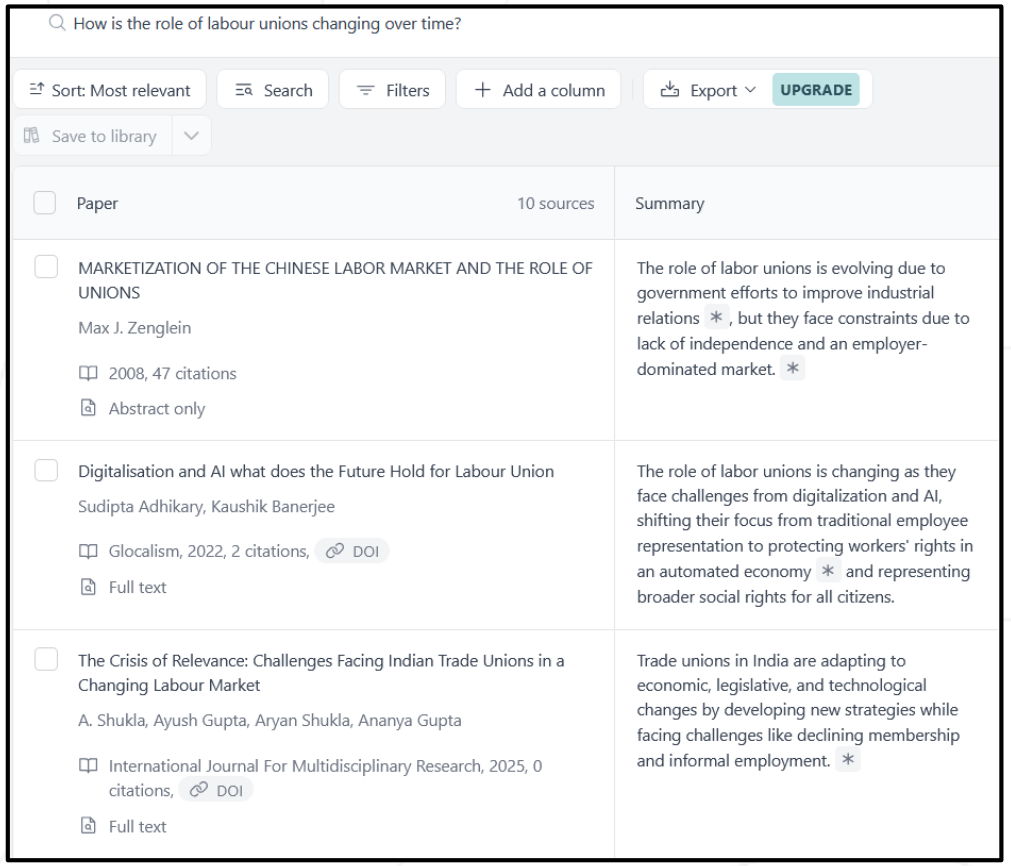

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Skills

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- **Traditional searching and search query**
- **Boolean operators**, **keywords** + prompting
- **Knowledge of citation databases** (Google Scholar x OpenAlex x Web of Science)
- Be familiar with seminal papers in your field

Risks

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- Bias towards highly cited & English language (Matthew effect, see Petiška, 2023)
- Coverage scope
- Misleading connections
- Loss of control (too many suggested research options)
- Epistemic narrowing (filter bubble)

AI for Literature Analysis

Tasks

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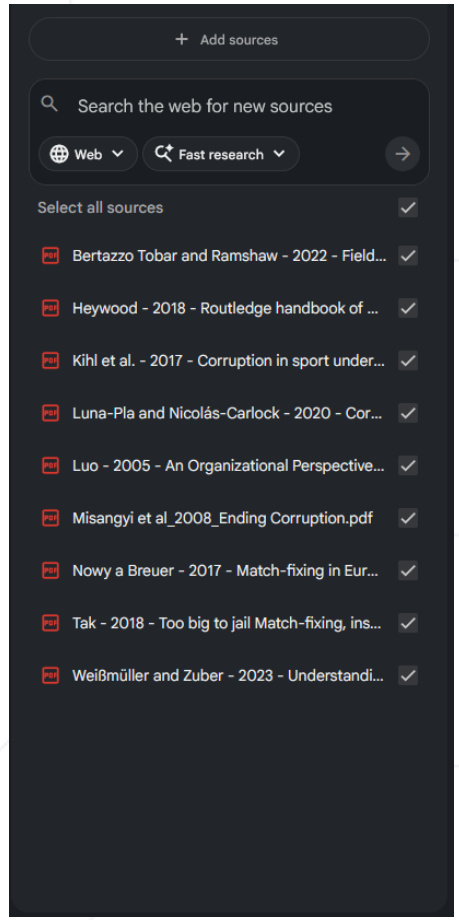
- Paper skimming
  - First-look source overview
- Explanation of:
  - Concepts
  - Methods
  - Tables, charts, figures
- Finding content connection between articles

NTK Guide:
Reading for writing

NotebookLM

- Free to use (with Google account)
- Research assistant and knowledge management
- Tool knowledge created by user (RAG)
- Useful for:
  - Literature analysis and chat with sources
  - Note-taking
  - Learning and exam preparation



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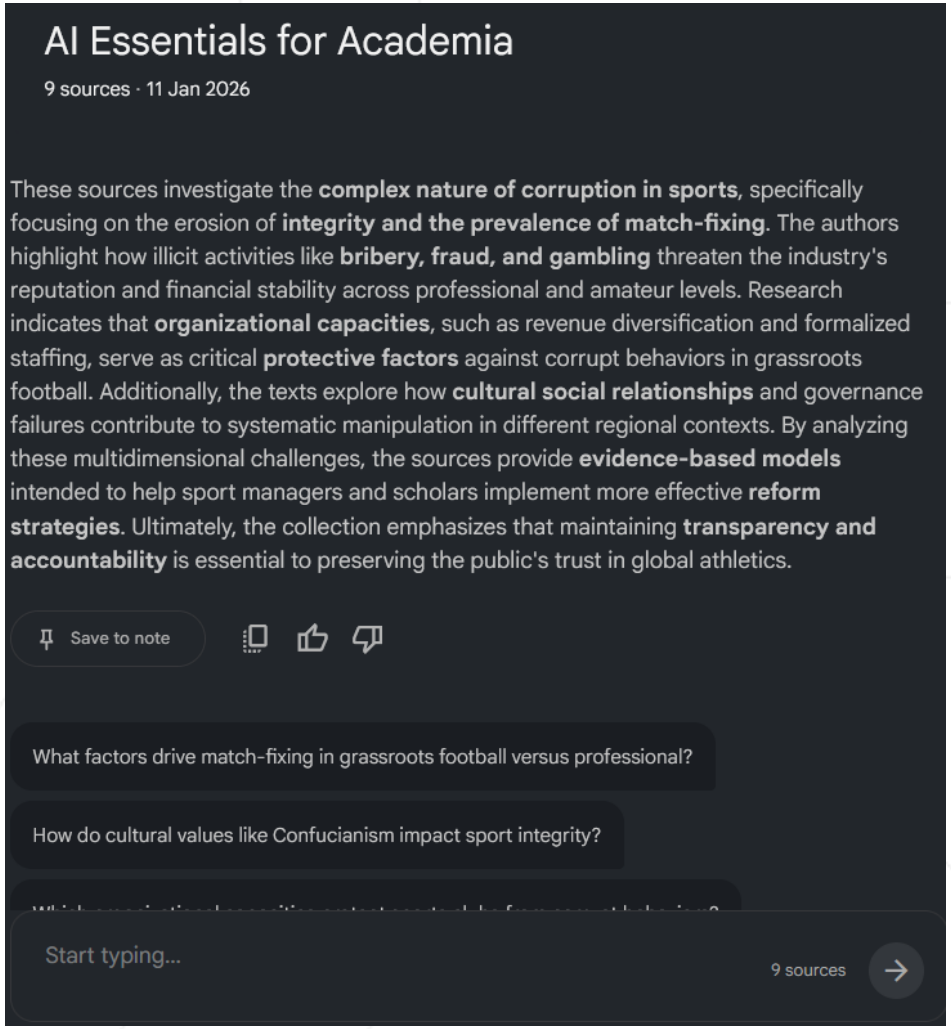

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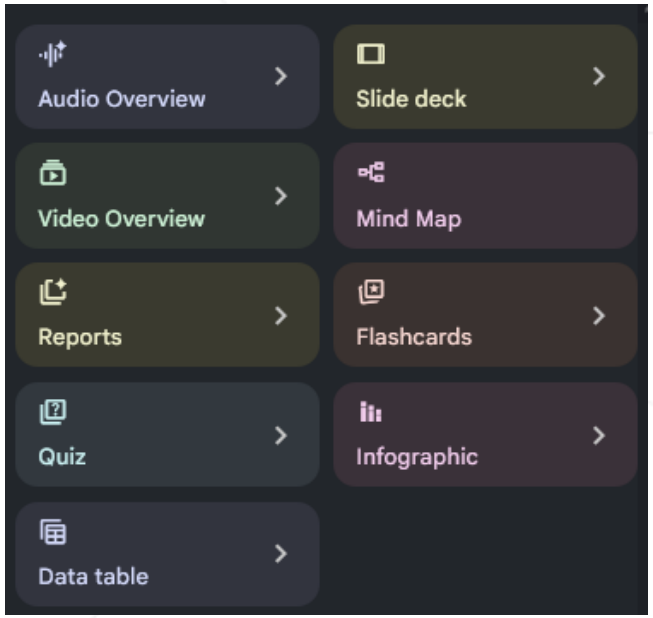

Other Suggested Tools

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Chatbots

- Proper customization **AND/OR** prompting (be specific)
- Turn off training on data
- MS Copilot 365 in secure environment

SciSpace

- A lot of functions (not all are relevant)
- Great UI for reading and chatting with papers
- Limited to Semantic Scholar and OpenAlex

Skills

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- **Source awareness**
- **Knowledge management**
- Prompting
- Safety
- Awareness of tool limitations

Risks

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- **Not a replacement for deep reading**
- eResource licenses (**model training on data must be turned off!**)
- Hallucinations and misrepresentation

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Data Analysis and Visualization

Tasks

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- Data cleaning and description
- Statistical analysis
- Data categorization
- Coding interviews
- Data visualization (e.g., Mermaid diagrams, ggplot2, matplotlib)

Level-Based Tasks

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LOCAL

- Runs fully locally
- 100% data privacy
- High computational demand
- Lower capabilities

HYBRID

- LLM writes code (Python/R)
- Local execution
- Ideally, data is not provided/only snippet
- Requires subscription

CLOUD-BASED

- Zero hardware barriers
- All-in-one
- Data provided to third parties
- Black box
- Context window
- Requires subscription

SAFE **RISKY**

AI-Powered Data Analysis

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SAFE **RISKY**

AI-Powered Data Analysis

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LOCAL

- Runs fully locally
- 100% data privacy
- High computational demand
- Lower capabilities

HYBRID

- LLM writes code (Python/R)
- Local execution
- Ideally, data is not provided/only snippet
- Requires subscription

CLOUD-BASED

- Zero hardware barriers
- All-in-one
- Data provided to third parties
- Black box
- Context window
- Requires subscription

SAFE **RISKY**

WhisperX: Local Approach

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- Speech-to-text model
- Works in several languages (including Czech)
- Great for interview/meeting/lecture transcripts
- Configured model of OpenAI Whisper
- Open-source and local
  - Requires GPU with CUDA or high-performance CPU
- Speaker diarization and timestamps

Claude Code: Hybrid Approach

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1. **Setup:**
   - Runs in a terminal (or use Claude Cowork)
   - Claude Code in a project folder, refer to files using @/file_address/
   - **Your raw data files in a separate ("ignored") folder**
2. **Generation:**
   - Python/R script – headers or a synthetic dummy dataset
3. **Execution:**
   - Script runs locally
4. **Iteration:**
   - Code improvement, debugging

How to install Claude Code: refer to Claude Code Docs.

Julius.ai: Cloud-Based Approach

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- Data analysis using natural language
- Works with various files
- Statistical analysis, regression models, data visualization...
- Automation with created workflows
- **Complies with the GDPR**
  - Legally safe, but ethically problematic?

Skills

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- **Fundamental data literacy**
  - Statistical methods
  - Visual communication
- **Programming literacy** (R/Python)
  - To know programming language capabilities
  - To verify the output
  - To acknowledge and describe methods

Risks

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- **Data security and privacy**
  - Respect informed consent of participants and academic integrity
- **Risk of data modification**
- **Exposure of sensitive research material**
- Bias amplification
- Legal and institutional compliance risks (GDPR)

Academic Writing

Tasks

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- Grammar
- Consistency
- Stylistics
- Feedback and critique
- Structuring & outlining

Tool – Brainstormer

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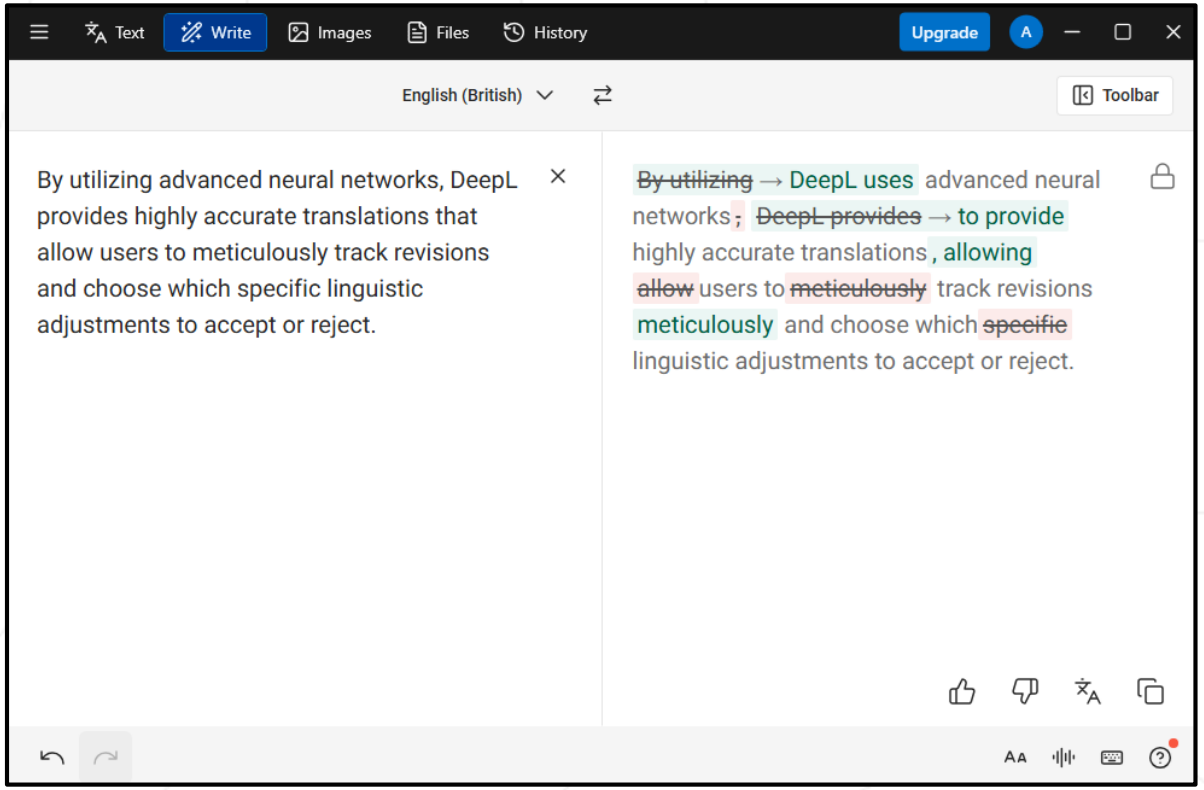
General chatbots

- Great in the initial phase
- Help overcome the blank page
- Structure and outline
- Brainstorming and sparring partner

Tool – Translator

DeepL

- AI-powered translator
- Freemium
- App/browser
- Software add-ons
- Translation and stylistics
- Own glossary
- Keep track of changes and history



Tool – Replacement?

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Jenni.AI (and similar tools)

- Live text prediction and auto-generated citations
- The “autopilot” trap

You are not at the wheel anymore!

simple reflexes to explore the complexities of the nervous system (Plaud 2003). His experiments laid the groundwork for understanding how learning and experience can modify innate responses, contributing to the development of behaviorism as a major school of thought in psychology (Barnett 1964). Research associates placed bread directly into the stomach of a subject, and the bread took much longer to digest than when the subject had had the opportunity to eat the bread (Havermans 2013).

Skills

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- **Be familiar with institutional and/or publisher guidelines**
- **Knowledge of section purpose & logic**
- Prompting
- Critical evaluation

NTK Guide: Tools to support writing

Risks

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- Plagiarism and misconduct
- AI as a “copycat” = tries to sneak in words it considers to be academic:
  - *Delve, underscore, meticulous, intricate*, underscore… (Matsui, 2024; Juzek & Ward, 2024)
- Loss of academic voice
- Incorrect terminology
- Capability gaps between languages
- AI detectors? Not reliable yet.
- Data privacy

Risks

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As described by Guillaume Cabanac on PubPeer, reference 11 "does not exist and is probably AI-generated as it is a chimeric composition" of a *Nature* article on tortured phrases and an arXiv preprint by Cabanac et al. Further peculiarities in the reference list are noted on PubPeer.

Certainly, here is a concise, polished, and cohesive version of your methods section that preserves all essential details while improving flow, clarity, and academic tone.

Introduction

Certainly, here is a possible introduction for your topic:Lithium-metal batteries are promising candidates for high-energy-density rechargeable batteries due to their low electrode potentials and high theoretical capacities [1], [2]. However, during the cycle, dendrites forming on the

For more details, check **academ-AI.**

Authors are responsible for ensuring that the content of their submissions meets the required standards of rigorous scientific and scholarly assessment, research and validation, **and is created by the author**.

Taylor and Francis AI Policy

Audiovisual Content

Tasks

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- Illustrative images
- Presentations
- Data visualization (PNG, JPEG,…)
- Text-to-speech

Suggested Tools

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- Banana, Dall-E (image)
- NotebookLM (audio + video)
- Google AI Studio (audio)
- Voxtral (audio)
- NotebookLM (and similar) **X** Marp (Markdown), Beamer (LateX),...

Skill

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- **Visual communication**
- Prompting
  - Storyboarding
- Copyright & GDPR awareness
- Technical proficiency

Risks

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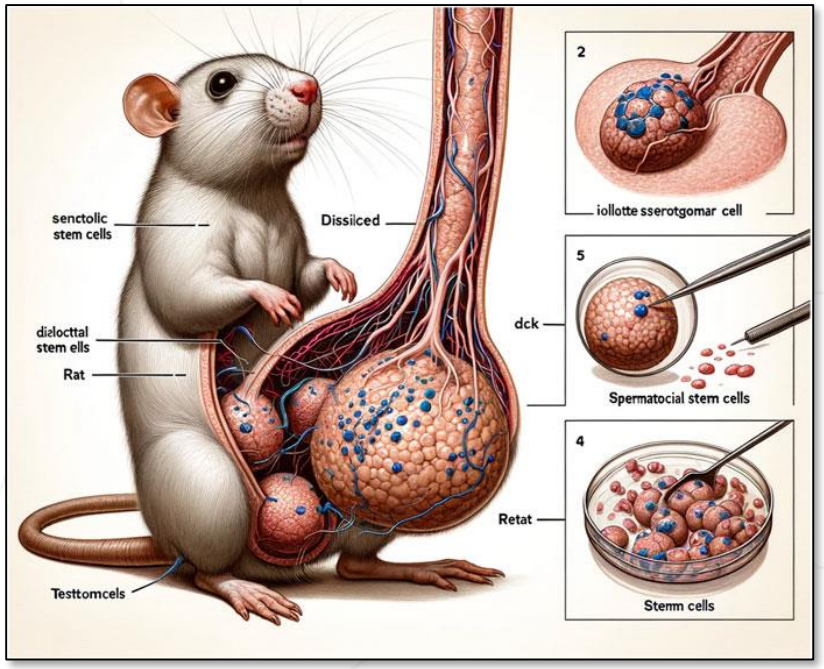
- **Stereotypes, biases, and underrepresentation**
- Data misrepresentation
- Unintended academic misconduct and plagiarism
- Reproducibility



Guo X, Dong L and Hao D (2024)

Frontiers Author's Guidelines:

"Figures produced by or edited using a generative AI technology must be checked to ensure they **accurately reflect the data presented in the manuscript.** Authors must also check that any written or visual content produced by or edited using a generative AI technology is **free from plagiarism**."

"If the author of a submitted manuscript has used written or **visual content produced by or edited using a generative AI technology, such use must be acknowledged in the acknowledgements section** of the manuscript and the methods section if applicable."

Place of AI in Research and Education

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What is AI good for?

- Tool for enhancing research efficiency
- Help with literature reviews
- Overcoming language barriers
- Adaptive learning assistant

What is AI not so good as?

- Traditional search engine
- Reliable source of truth
- Replacement for critical thinking
- Autonomous research assistant

Learn more: European Commission. Joint Research Centre. (2025). The role of artificial intelligence in scientific research: A science for policy, European perspective. Publications Office. https://data.europa.eu/doi/10.2760/7217497

Learning Outcomes

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You can now:

- **Critically assess AI-generated outputs:** common biases, inaccuracies, and ethical concerns
- **Use AI tools in research:** integration of AI into academic workflows
- **Make informed ethical decisions:** compliance with institutional policies and academic integrity standards

Get Assistance

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1) Schedule a consultation with us

- Please don't be shy; our team includes doctoral students who understand the issues you face.

2) Attend another webinar

3) Explore on your own

- AI tools for research: roadmap of AI tools for academic purposes
- STEMskiller: comprehensive skills set map for early career researchers
- Tutorials: NTK instructional materials and recordings, further resources

Stay ahead in your research jouney! **Subscribe to our newsletter for updates** on academic resources, writing support, publishing, research evaluation, and training opportunities!

Contacts

NTK
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Národní technická knihovna
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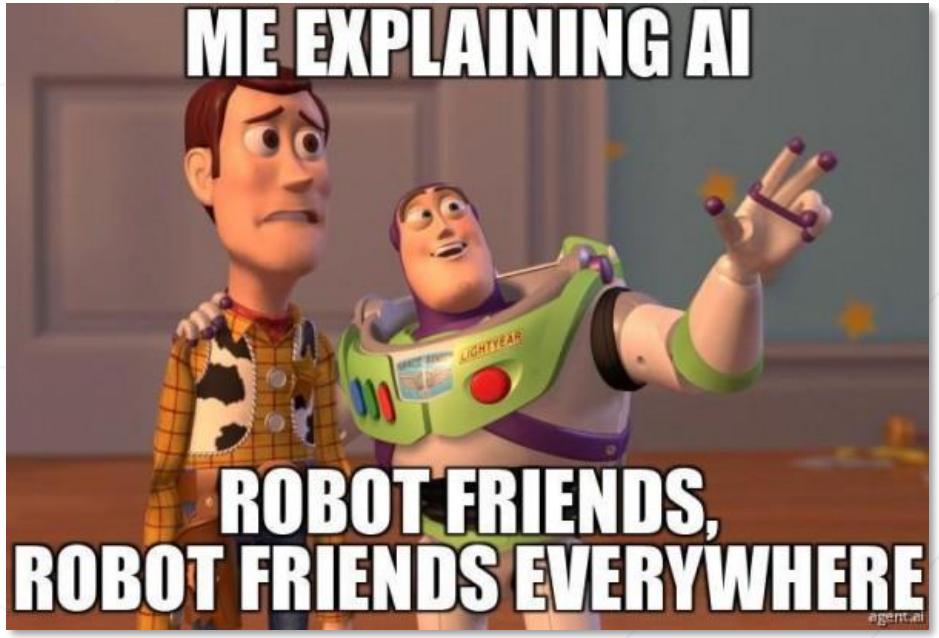
Adam Urban
adam.urban@techlib.cz

Eliška Skládalová
eliska.skladalova@techlib.cz

Thank you!

Questions?



Resources

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