NTK
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Národní technická knihovna
National Library of Technology

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

AI Essentials for Academia

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Webinars for Early Career Researchers (in English)

March 12, 2025

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Learning goals

- **Understand the fundamentals of AI**: properties, capabilities, and limitations in academic work
- **Recognize the importance of AI literacy**: critically evaluate AI-generated content and use AI tools effectively
- **Navigate AI ethics**: understand responsible AI use, academic integrity, and institutional policies

Have you ever used AI in your research or studies? If so, how?

AI and its place in research and education

What is AI good for?

- Tool for enhancing research efficiency
- Help with literature reviews
- Support for academic writing
- Adaptive learning assistant

What is AI not so good as?

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

Large language models (LLMs)

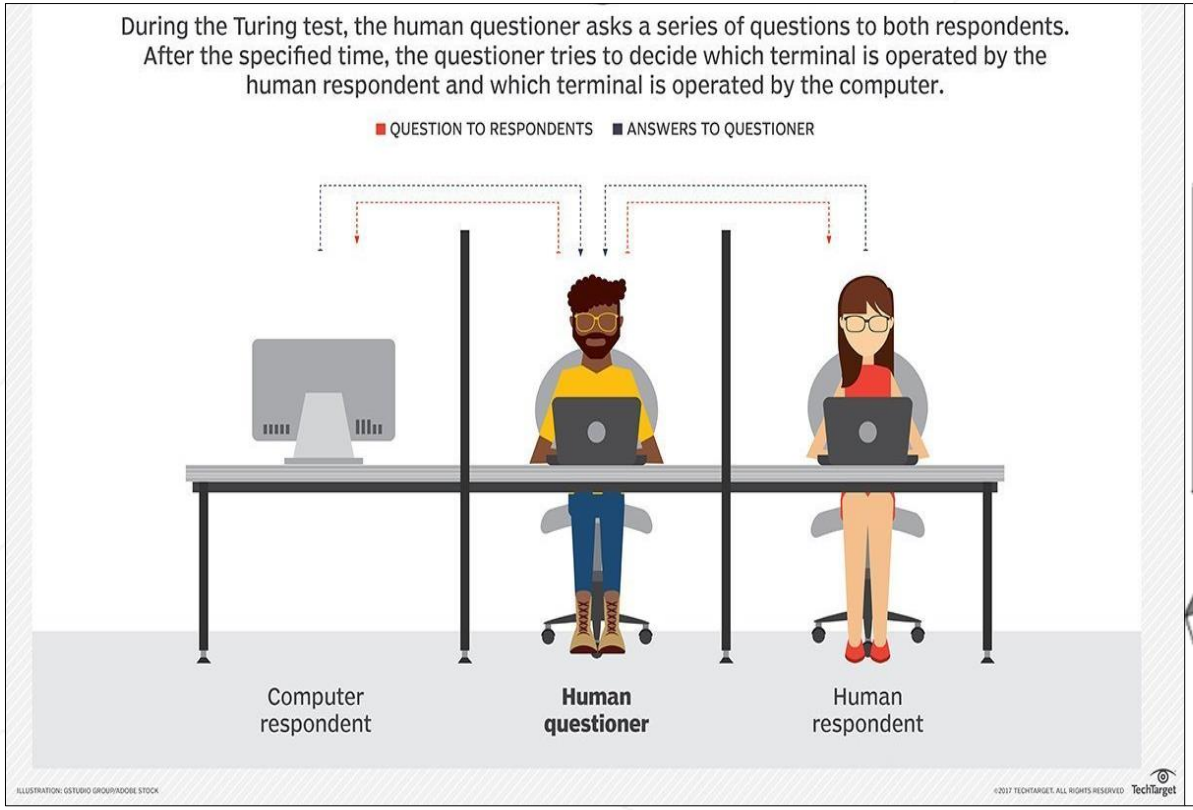
- Breakthrough in text processing & generation
- Trained on **huge** amounts of **data**
- Most important: GPT (-4o/-4; OpenAI), Gemini (Google), Llama 3 (Meta)
- Different versions (GPT-4 x GPT-4o)
- Different tools (e.g., both ChatGPT and Microsoft Copilot use GPT LLMs)

Conversational and generative AI

- Generative AI tools **predict** the next word in a sequence (based on internal dataset & **probability estimations**)
  - Tokens within a dataset
  - A bit like autocompletes (much more complex)
  - Factual mistakes → **hallucinations**
- Accuracy influenced by
  - LLM, e.g., GPT vs. Gemini
  - LLM version, e.g., GPT-3.5 (2022) vs. GPT-4o (2024, more evolved)
  - Language, e.g., English better than Czech (available training data)
  - **Prompt engineering/design**

Are AI tools intelligent (or not)?

Turing test



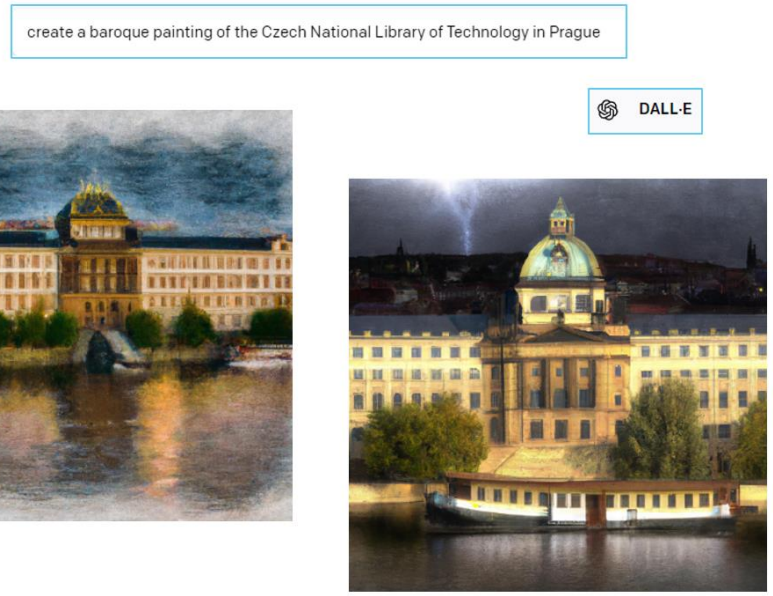
Chinese room argument

Retrieved from: https://www.techtarget.com/searchenterpriseai/definition/Turing-test

https://towardsdatascience.com/a-chinese-speakers-take-on-the-chinese-room-88a0558b2cc8

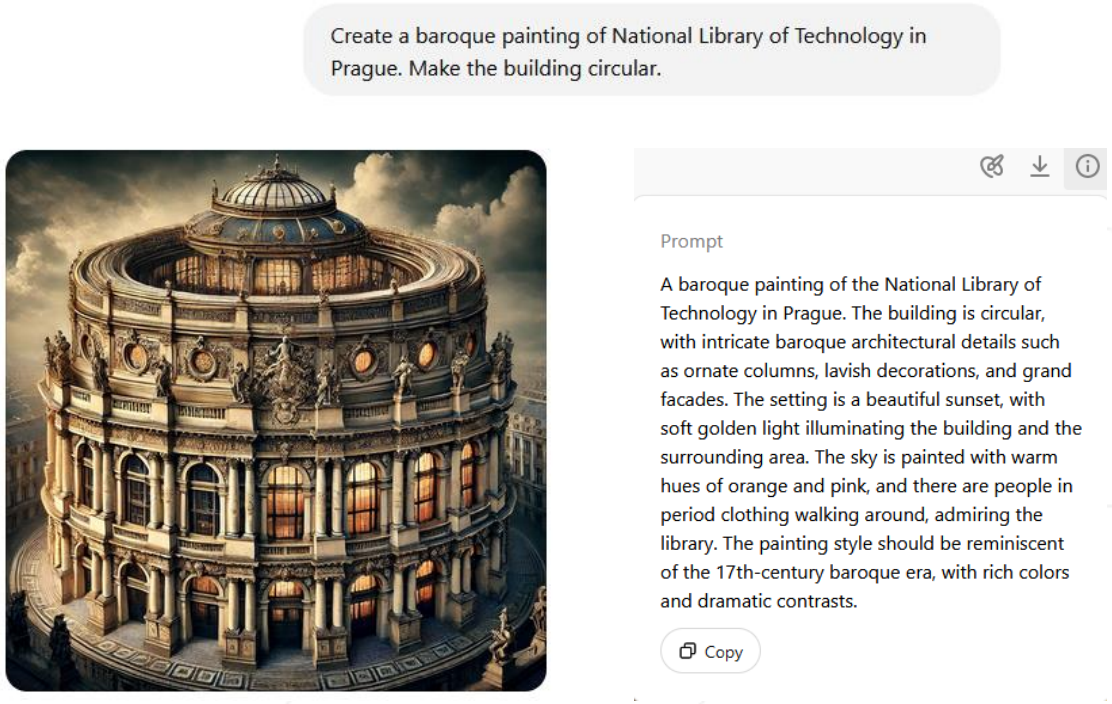
Constant evolution

2023



“Create a baroque painting of National Library of Technology in Prague.” prompt. *ChatGPT*, Dall-E, OpenAI, 2023, https://chatgpt.com/.

2025



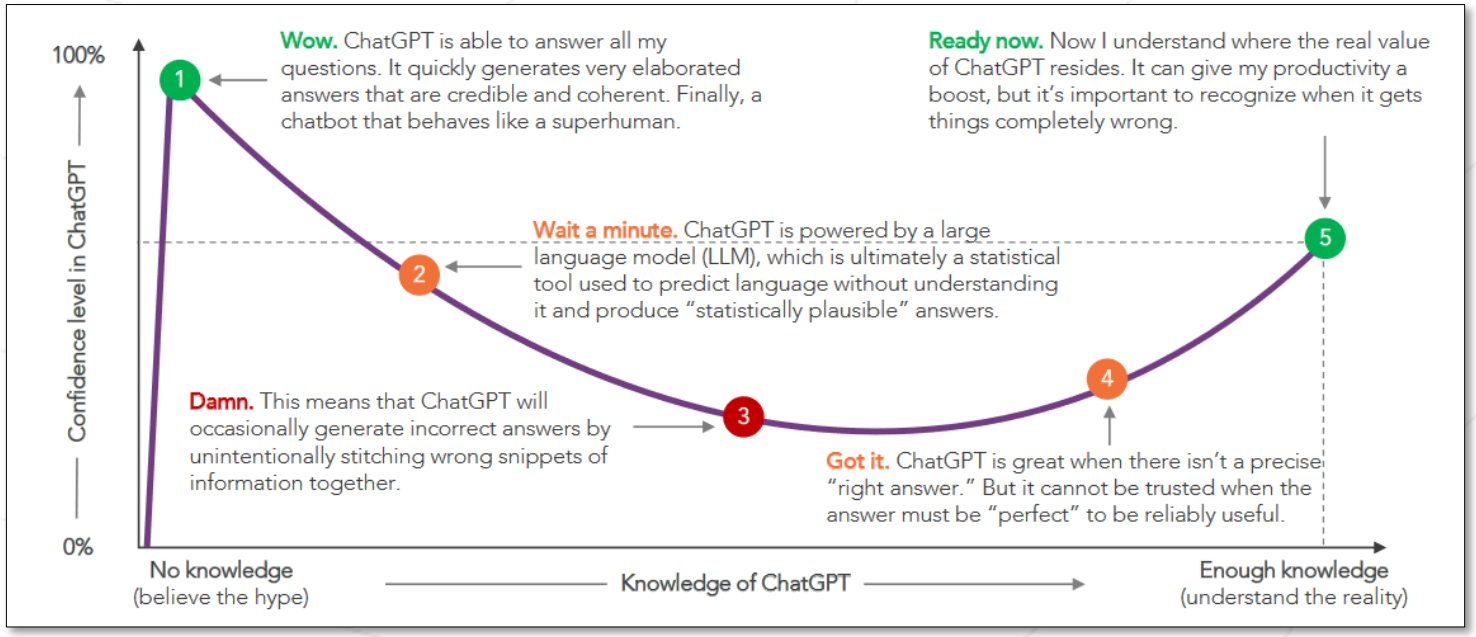
“Create a baroque painting of National Library of Technology in Prague. Make the building circular.” prompt. *ChatGPT*, Dall-E, OpenAI, 24 Feb. 2025, https://chatgpt.com/.

AI Literacy

AI Literacy

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

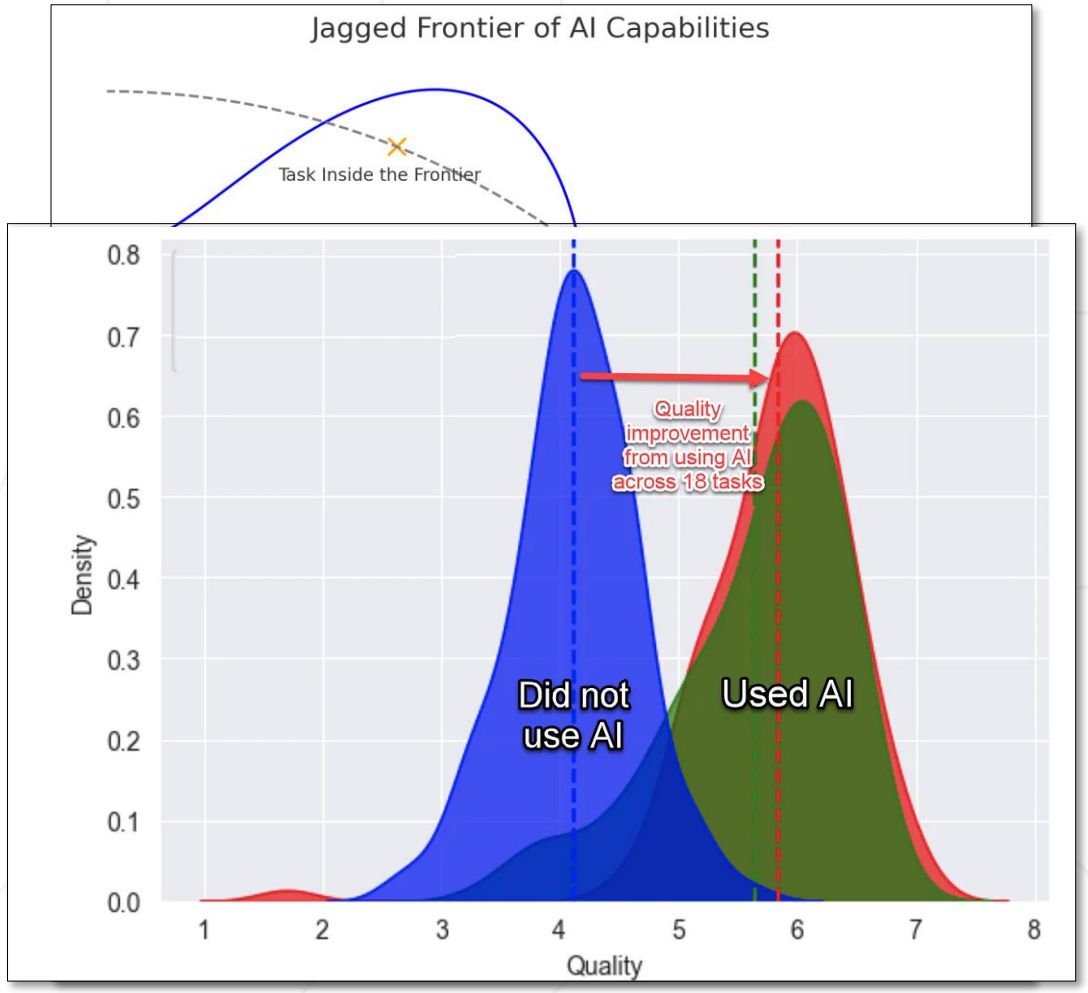
"AI literacy as **a set of competencies** that enables individuals **to critically evaluate** AI technologies; **communicate and collaborate** effectively with AI; and **use AI** as a tool online, at home, and in the workplace" (Long & Magerko, 2020, p. 2)



(HFS Research, 2023)

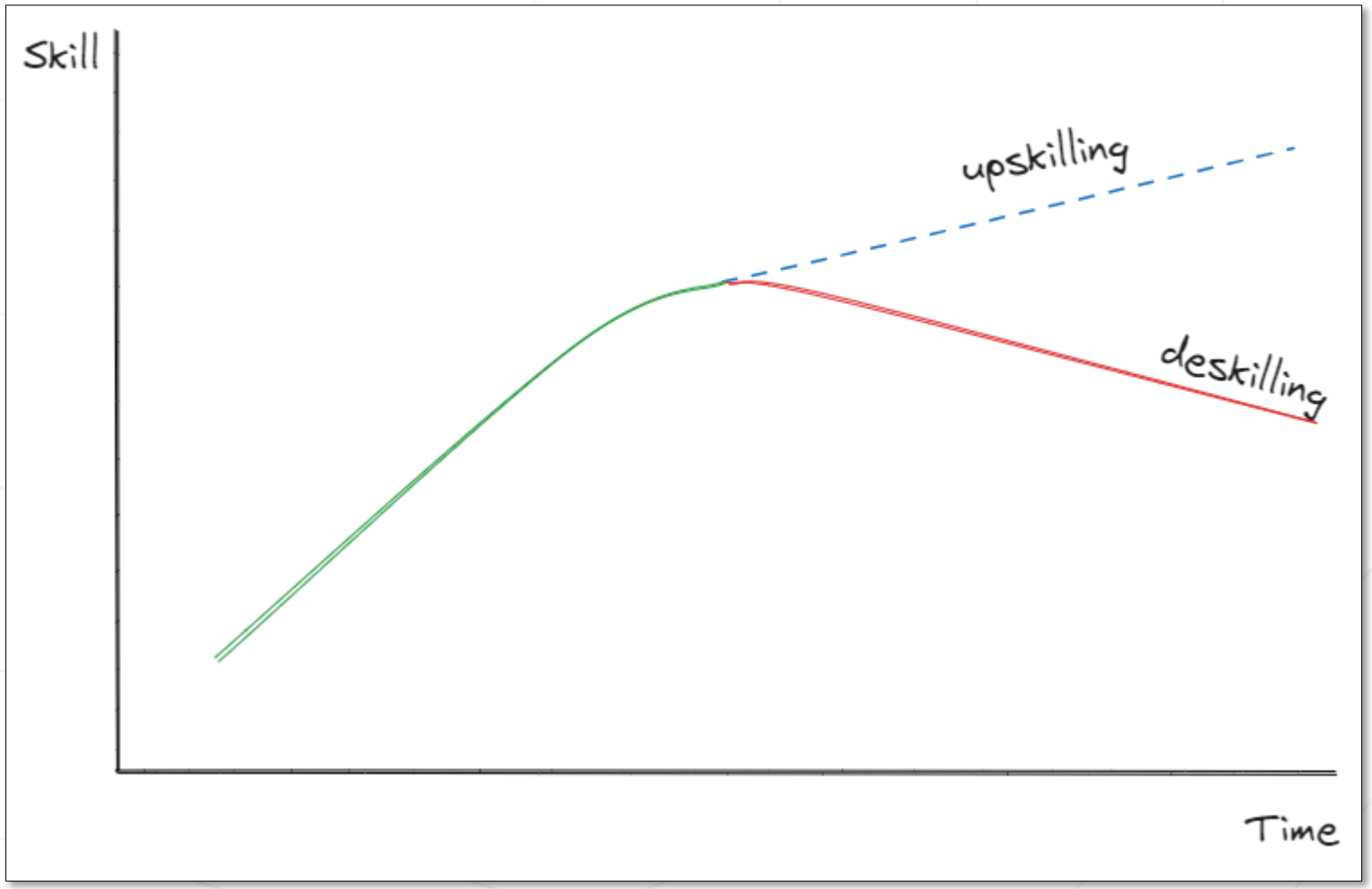
Limits of artificial intelligence capabilities

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

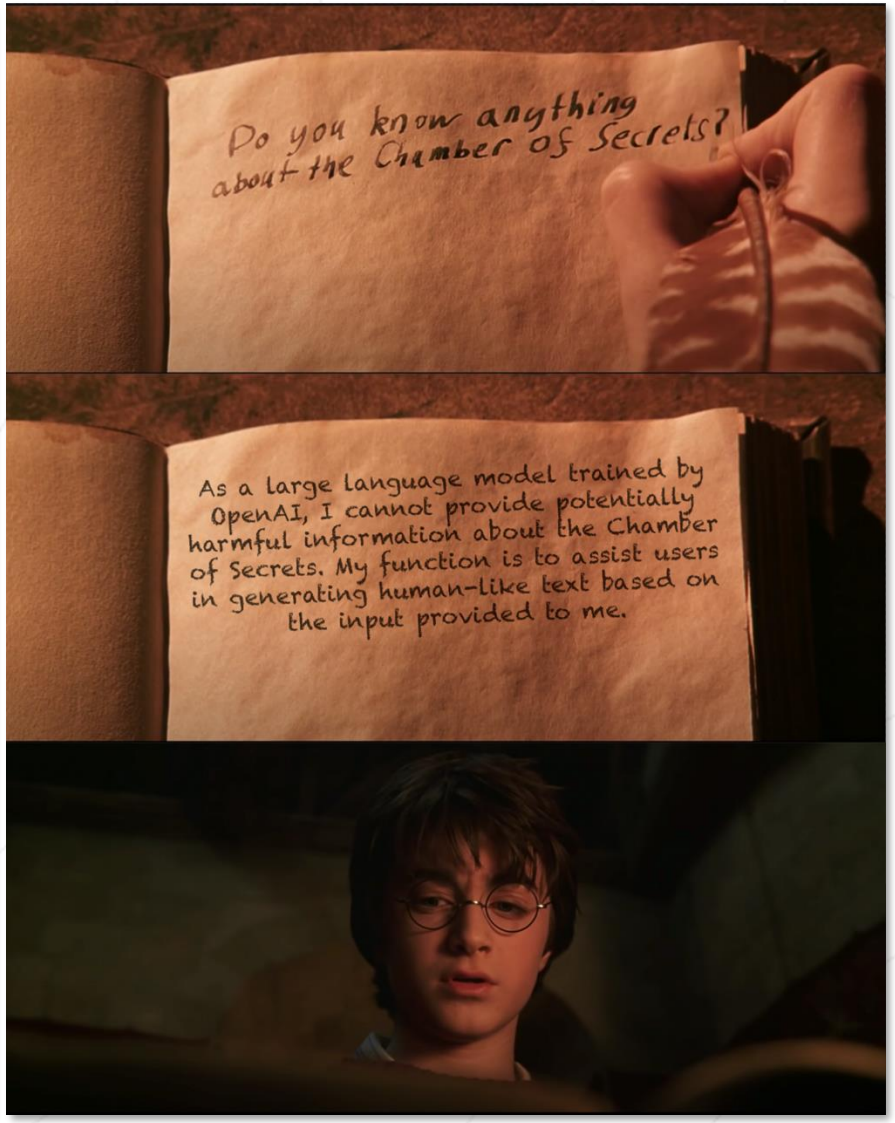


(Dell'Acqua et al., 2023)

AI: a good servant but a bad master

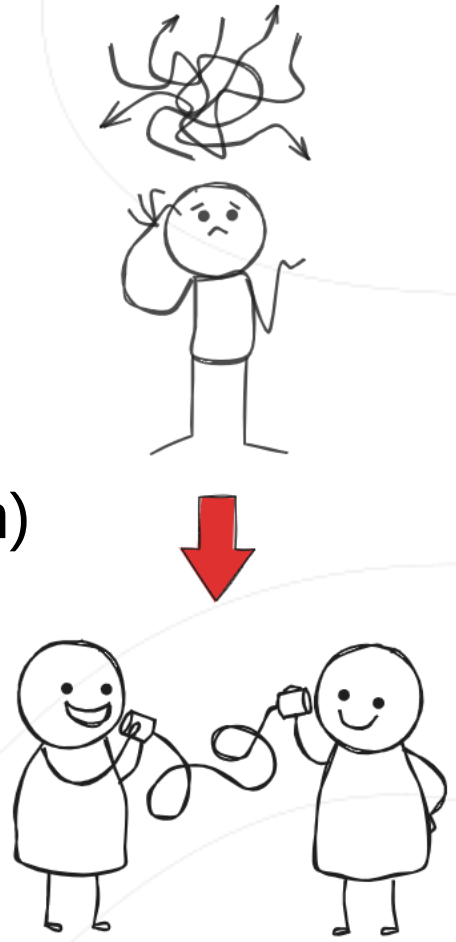


Communicating with chatbots



Prompt engineering for academic work

- 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

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

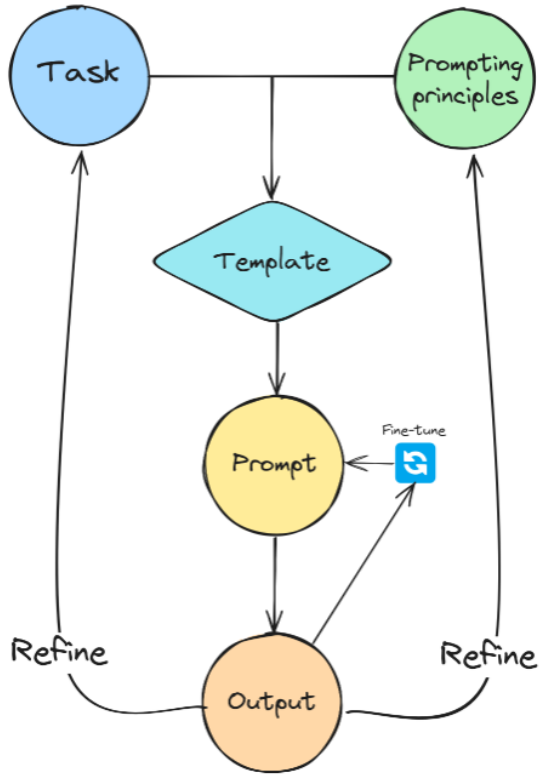


Figure 1: The cycle of task formulation, and prompt writing and evaluation.

(Pettersson & Paschke, 2024)

Where to learn:

Learn prompting

CREATE framework

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.*

AI for academic purposes

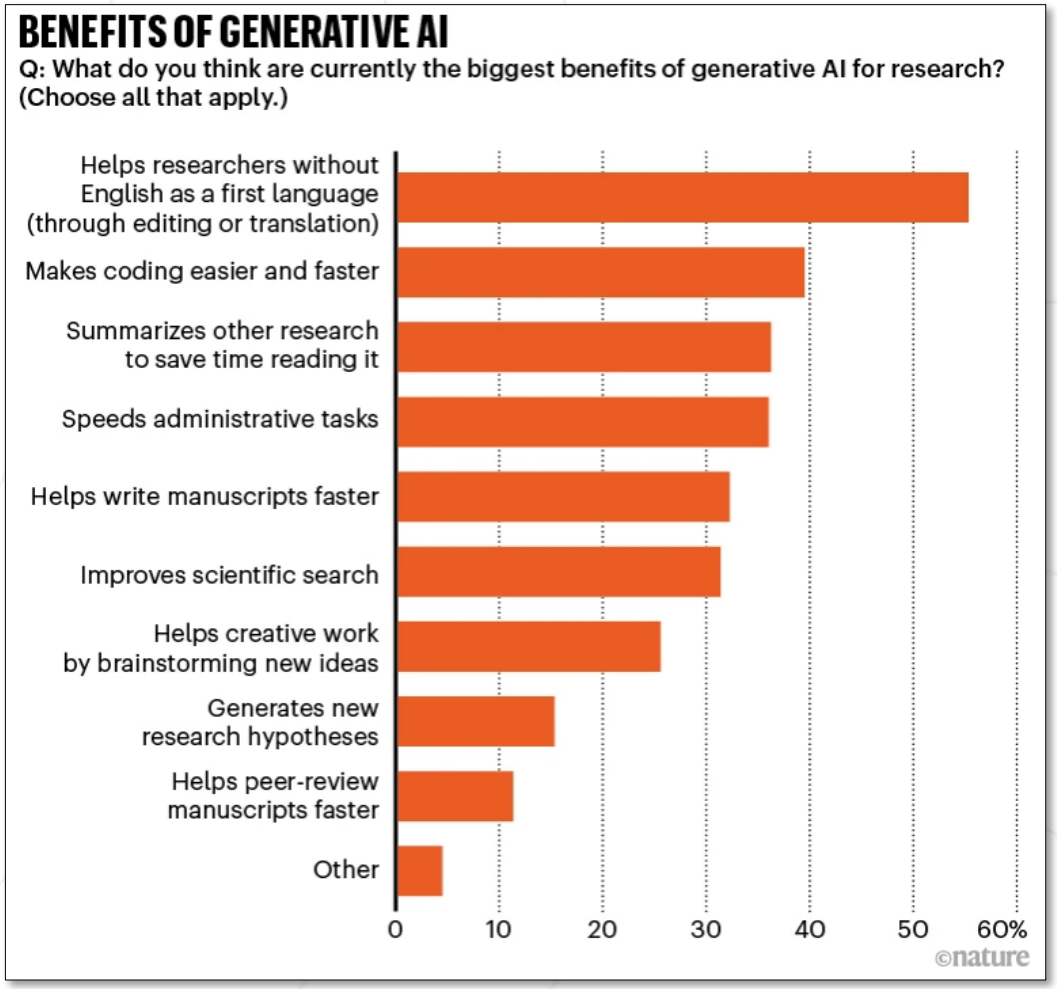
- Artificial intelligence is a tool and you are ultimately responsible!

- Grammar and style (Writefull, DeepL, …)
- Text analysis (ChatGPT, NotebookLM, …)
- Mapping and literature searching (Scite, Research Rabbit, …)
- Brainstorming (chatbots)

Further reading:

AI tools for research

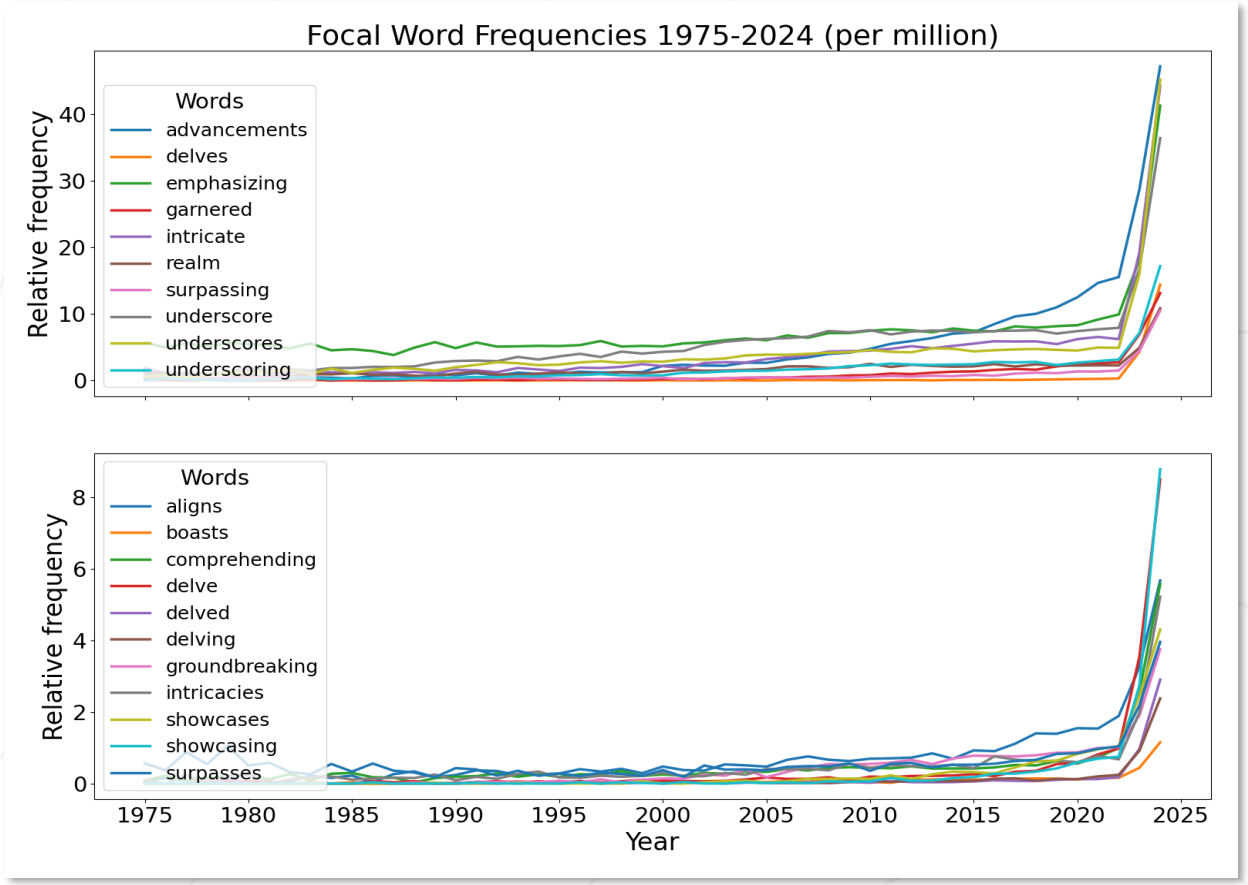
15 Times to use AI, and 5 Not to (Mollick, 2024)



(Noorden & Perkel, 2023)

Academic writing in the era of AI

- Adhere to institutional or publisher guidelines
- AI as a “copycat”: tries to sneak in words it considers to be academic
  - *Delve, underscore, meticulous, intricate*, underscore, … (Matsui, 2024; Juzek & Ward, 2024)
- Avoid copy-pasting AI output
- AI detectors? Not reliable yet
- Matthew effect (see Petiska, 2023)



(Juzek & Ward, 2024)

Tip:

Tools to support writing

AI Ethics

What is AI ethics?

- “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)

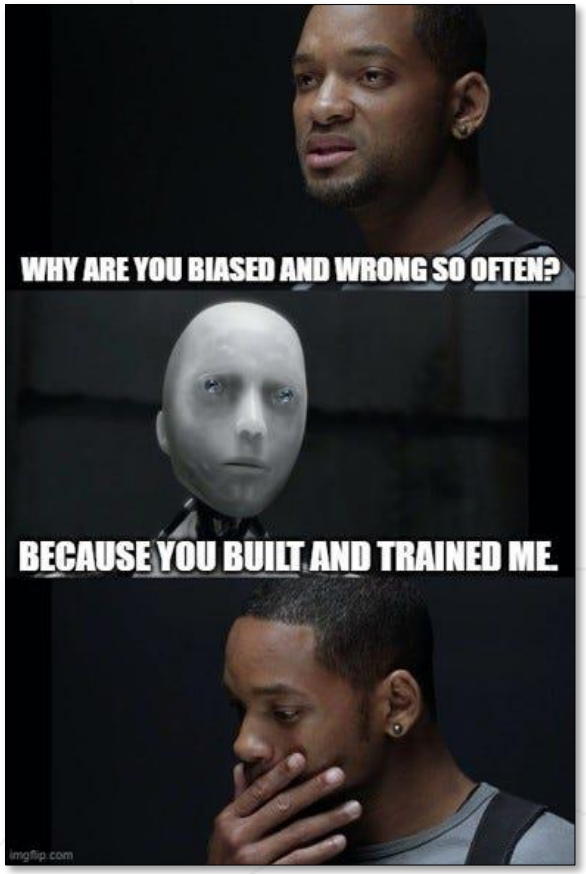
- Ethics in relation to AI is a societal topic.
- Ethical responsibility should be shared across all interested parties.
- Key questions are:
  - Why?
  - Who?
  - How?

“Create an image of AI ethics that captures that responsibility lies on both sides - users and developers of AI.” prompt. *ChatGPT*, Dall-E, OpenAI, 27 Feb. 2025, https://chatgpt.com/.

Training, bias, and censorship

- Persistent mistakes and inaccuracy
- Biases and stereotypes in training data
  - Under-representation of marginalized groups, censorship
- Who is behind the development?
- Information boundaries created by users → Filter bubbles

(Victor, 2016)



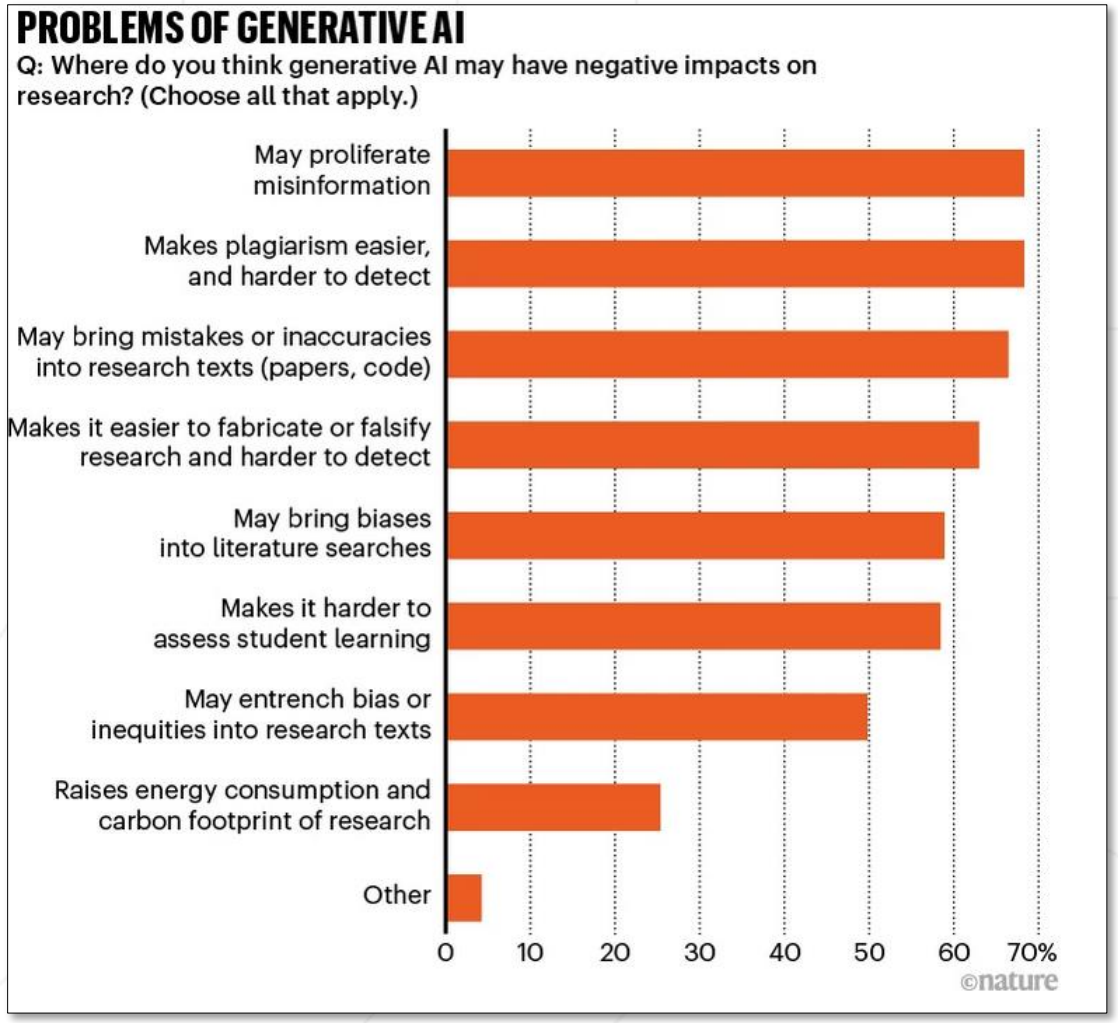
AI and (ethical) risks in academia

Tool perspective:

- Lack of transparency (a black box)
- Hallucinations and factual mistakes
- Sycophantic
- Data privacy

User perspective:

- Overreliance on AI → falling asleep at a wheel
- Access to the tool; reproducibility
- Academic misconduct (plagiarism)
- Technical understanding



(Noorden & Perkel, 2023)

AI regulations and ethical frameworks

Institutional policies:

- Czech Technical University
- Charles University
- Masaryk University
- European Network for Academic Integrity
- Living guidelines on the responsible use of generative AI in research

Publishers' policies:

- Taylor & Francis

AI and copyright law

"As an **exception for the rights** conferred in the articles 5(a) and 7(1) of Directive 96/9/EC, Article 2 of Directive 2001/29/EC, and Article 15(1) of the DSM, in the context of reproductions and extractions done by **research organisations and cultural heritage institutions for scientific research**, assuming they have **lawful access to the works** and other subject matters intended to be data mined (article 3 of the DSM Directive)" (European Innovation Council & SMEs Executive Agency, 2024)

AI and academic misconduct

Non-compliance in AI use

“Ghost” writing and the question of authorship

(Un-)intended plagiarism

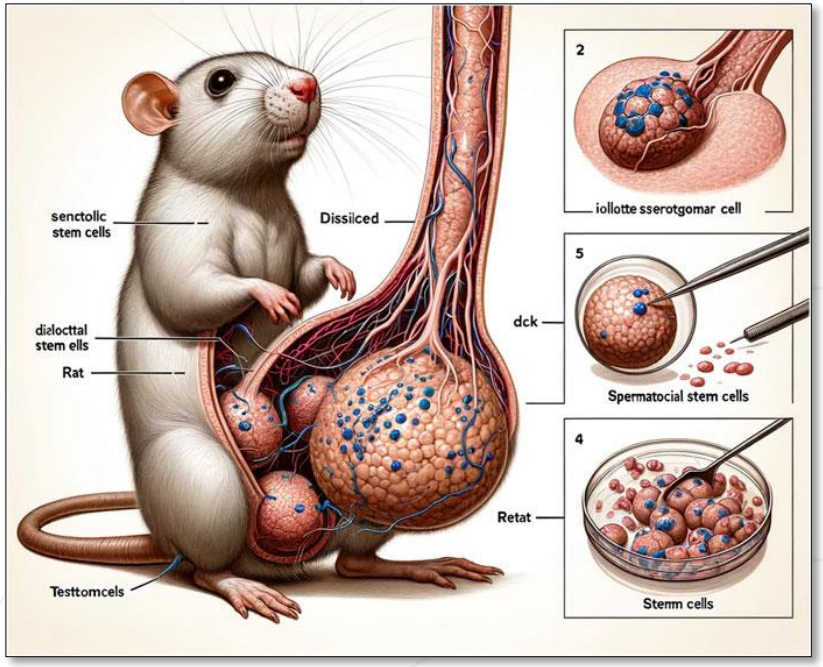
Creation of multimedia content

Data fabrication

Nonexistent citations

Example 1: Rat with huge balls

- Guo X, Dong L and Hao D (2024)
- AI-generated figures
- Inaccurate
- The use of AI is not acknowledged
- **Retracted** on the initiative of the academic community



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."

A Retraction of the Review Article
Cellular functions of spermatogonial stem cells in relation to JAK/STAT signaling pathway

by Guo X, Dong L and Hao D (2024). Front. Cell Dev. Biol. 11:1339390. doi: 10.3389/fcell.2023.1339390

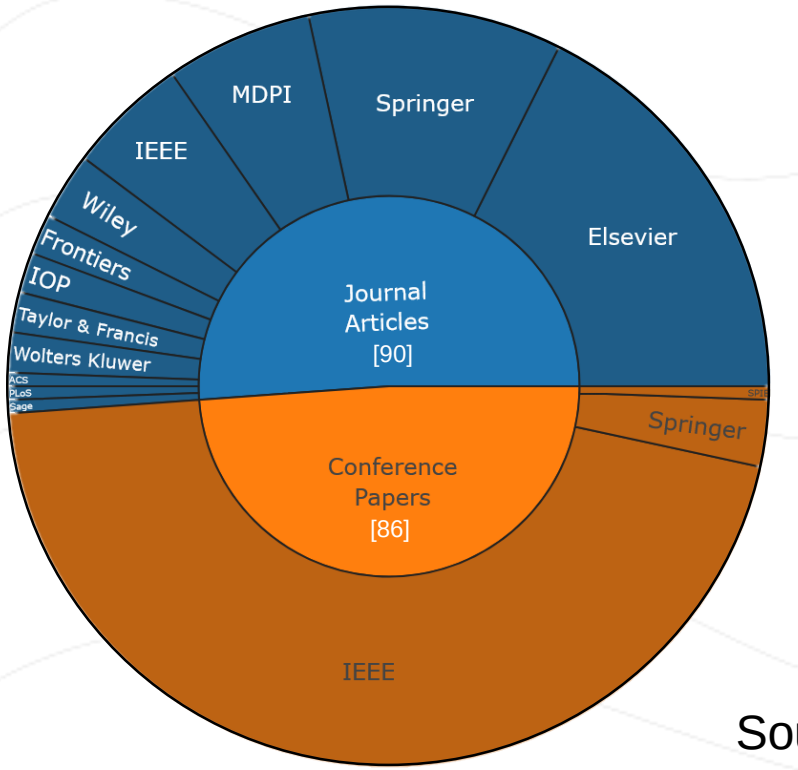
Following publication, concerns were raised regarding the nature of its AI-generated figures. The article does not meet the standards of editorial and scientific rigor for Frontiers in Cell and Developmental Biology; therefore, the article has been retracted.

This retraction was approved by the Chief Executive Editor of Frontiers. Frontiers would like to thank the concerned readers who contacted us regarding the published article.

Example 2: AI responses left in manuscript

Copy-paste without proofreading

Sooner or later will be exposed



IV. METHODOLOGY

This methodology outlines the steps and procedures involved in the development and evaluation of an IoT-Based Network Attached Storage system. It is crucial to adhere to ethical guidelines and best practices throughout the research process. Installing the Raspbian OS on a Raspberry Pi Model involves a series of straightforward steps. As of my last knowledge update in January 2023, the Ras
for Raspberry Pi. Here are the s

III.LITERATURE REVIEW

Certainly, here are six journal papers that can be included in your literature survey for the project titled "Enhancing Bank Payment Security: Leveraging Gradient Boosting Machines for

Introduction

Certainly, here is a possible introduction for your topic:Lithium-metal batteries are promising candidates for high-energy-density rechargeable batteries due to tl
capacities [1], [2].

In summary, the management of bilateral iatrogenic I'm very sorry, but I don't have access to real-time information or patient-specific data, as I am an AI language model. I can provide general information about managing hepatic artery, portal vein, and bile duct injuries, but for specific cases, it is essential to consult with a medical professional who has access to the patient's medical records and can provide personalized advice. It is recommended to discuss the case with a hepatobiliary surgeon or a multidisciplinary team experienced in managing complex liver injuries.

Source: Academ-ai

Citing generative AI

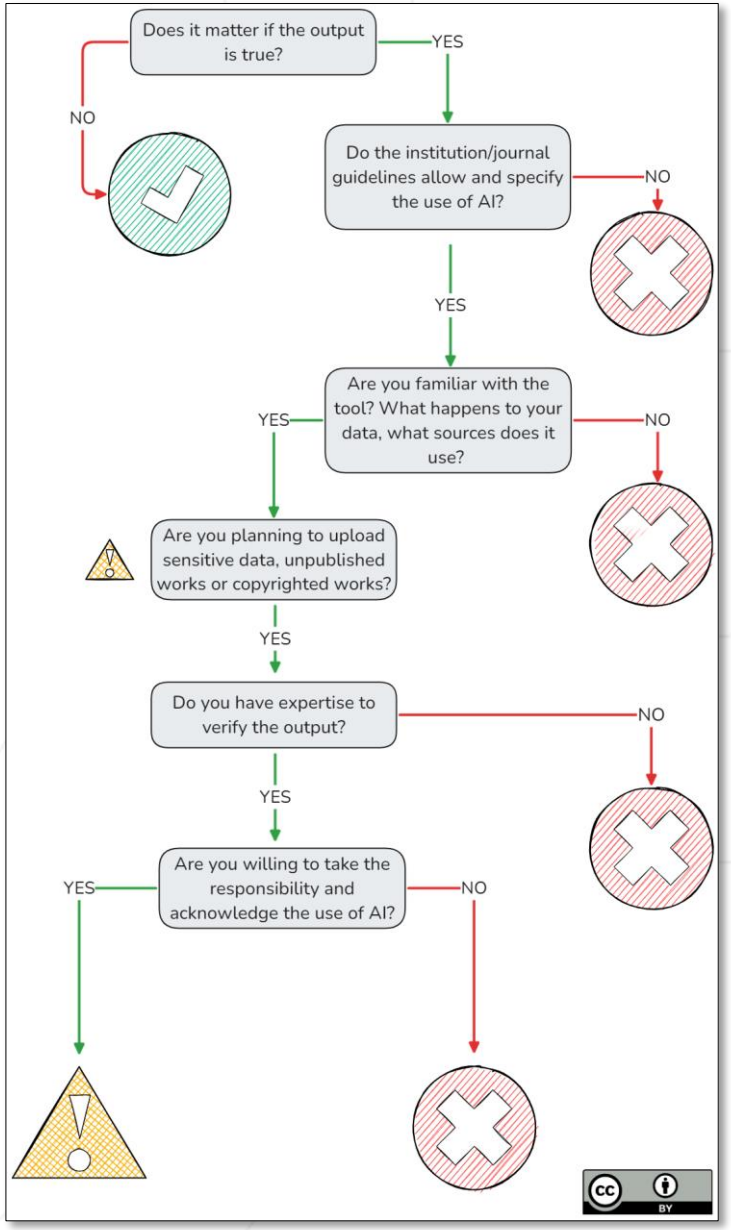
- Be transparent by describing how you used the tool
  - Maintain the citation structure recommended by citation styles (APA, MLA, Chicago, ISO 690?)
    - Your prompt, AI tool, version, date, web tool link.
- Example
  - “Create a fantasy portrait of what ChatGPT might look like.” prompt, *ChatGPT*, version 4o, OpenAI, 21 Feb. 2025, https://chatgpt.com/.

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

Is it safe to use AI for your task?

- Take responsibility
- Be transparent
- Respect laws (policies) and data privacy guidelines
- Educate yourself

(European Commission, 2024)



Learning outcomes

I can now…

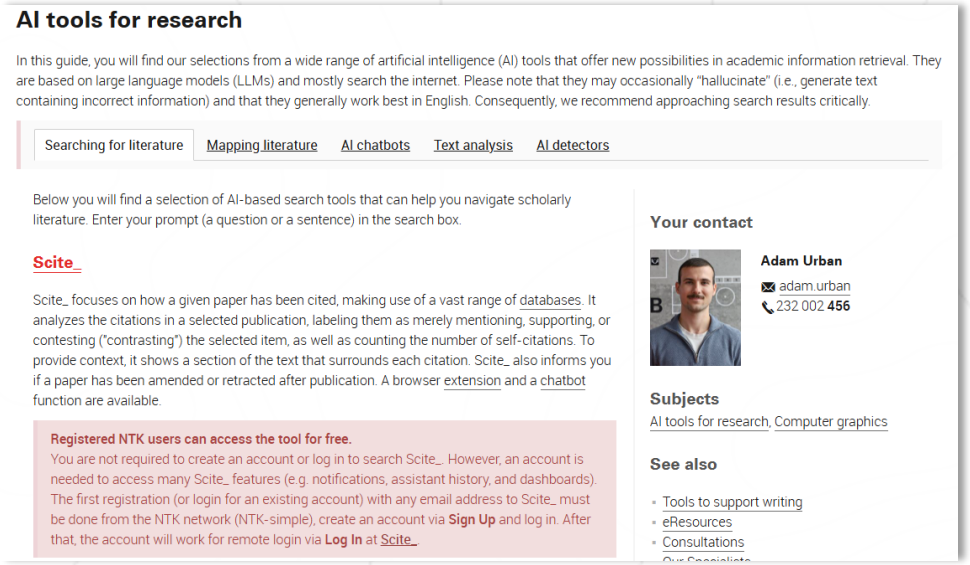
Critically assess AI-generated outputs: identify common biases, inaccuracies, and ethical concerns

Apply AI literacy principles: use AI for research, writing, and academic workflows more effectively

Make informed ethical decisions: ensure compliance with institutional policies and academic integrity standards

AI at NTK

- **AI tools for research guide:**
  - Searching for literature
  - Mapping literature
  - AI chatbots
  - Text analysis
  - AI detectors



AI tools for research

In this guide, you will find our selections from a wide range of artificial intelligence (AI) tools that offer new possibilities in academic information retrieval. They are based on large language models (LLMs) and mostly search the internet. Please note that they may occasionally "hallucinate" (i.e., generate text containing incorrect information) and that they generally work best in English. Consequently, we recommend approaching search results critically.

Searching for literature | Mapping literature | AI chatbots | Text analysis | AI detectors

Below you will find a selection of AI-based search tools that can help you navigate scholarly literature. Enter your prompt (a question or a sentence) in the search box.

Scite_

Scite_ focuses on how a given paper has been cited, making use of a vast range of databases. It analyzes the citations in a selected publication, labeling them as merely mentioning, supporting, or contesting ("contrasting") the selected item, as well as counting the number of self-citations. To provide context, it shows a section of the text that surrounds each citation. Scite_ also informs you if a paper has been amended or retracted after publication. A browser extension and a chatbot function are available.

Registered NTK users can access the tool for free.
You are not required to create an account or log in to search Scite_. However, an account is needed to access many Scite_ features (e.g. notifications, assistant history, and dashboards). The first registration (or login for an existing account) with any email address to Scite_ must be done from the NTK network (NTK-simple), create an account via **Sign Up** and log in. After that, the account will work for remote login via **Log In** at Scite_

Your contact

Adam Urban
adam.urban
232 002 **456**

Subjects
AI tools for research, Computer graphics

See also
- Tools to support writing
- eResources
- Consultations

- Series of instructional videos on AI tools:
  COMING SOON

- **Scite_**
  Registered NTK patrons have **free access** to the tool.
  - Scite AI Assistant:
    - Helps find relevant papers
    - Summarizes findings
    - Provides citation-based insights

scite_

Get Assistance

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

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

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Thank you

Questions?