

AI Essentials for Academia

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Webinars for Early Career Researchers (in English)

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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)

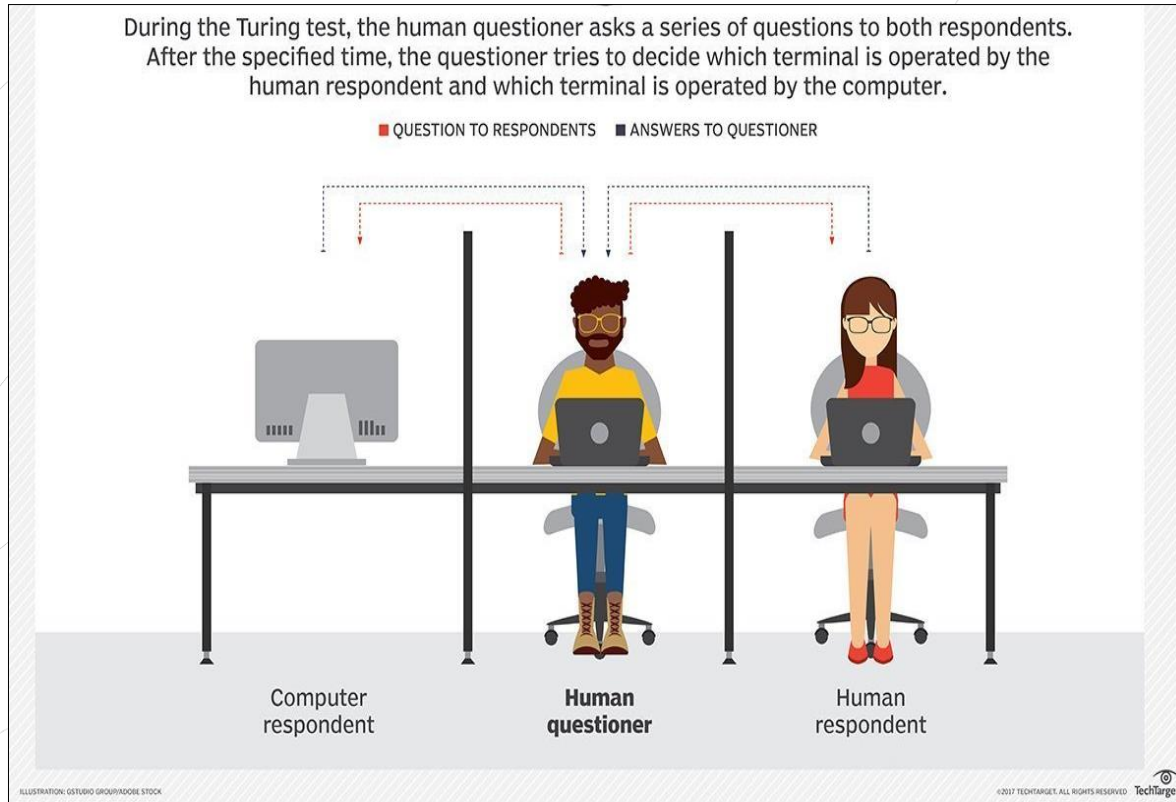
- Breakthrough in text processing & generation
- Trained on **huge** amounts of **data**
- Most important: GPT (-4o/-4; OpenAI), Gemini (Google), Llama 3 (Meta)
- Different versions (GPT-4 x GPT-4o)
- Different tools (e.g., both ChatGPT and Microsoft Copilot use GPT LLMs)

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



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

Chinese room argument



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

Constant evolution

2023

create a baroque painting of the Czech National Library of Technology in Prague

DALL-E



“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

A baroque painting of the National Library of Technology in Prague. The building is circular, with intricate baroque architectural details such as ornate columns, lavish decorations, and grand facades. The setting is a beautiful sunset, with soft golden light illuminating the building and the surrounding area. The sky is painted with warm hues of orange and pink, and there are people in period clothing walking around, admiring the library. The painting style should be reminiscent of the 17th-century baroque era, with rich colors and dramatic contrasts.

Copy

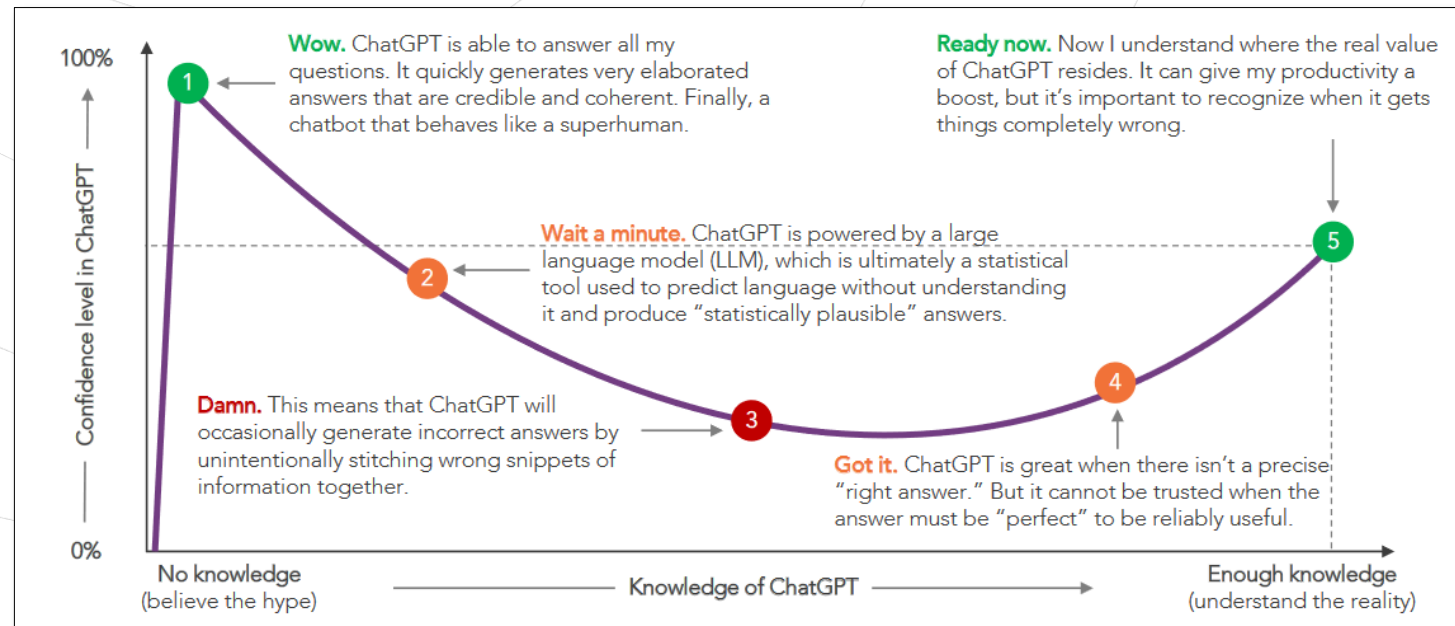
“Create a baroque painting of National Library of Technology in Prague. Make the building circular.” prompt. *ChatGPT*, Dall-E, OpenAI, 24 Feb. 2025, <https://chatgpt.com/>.

AI Literacy

AI Literacy

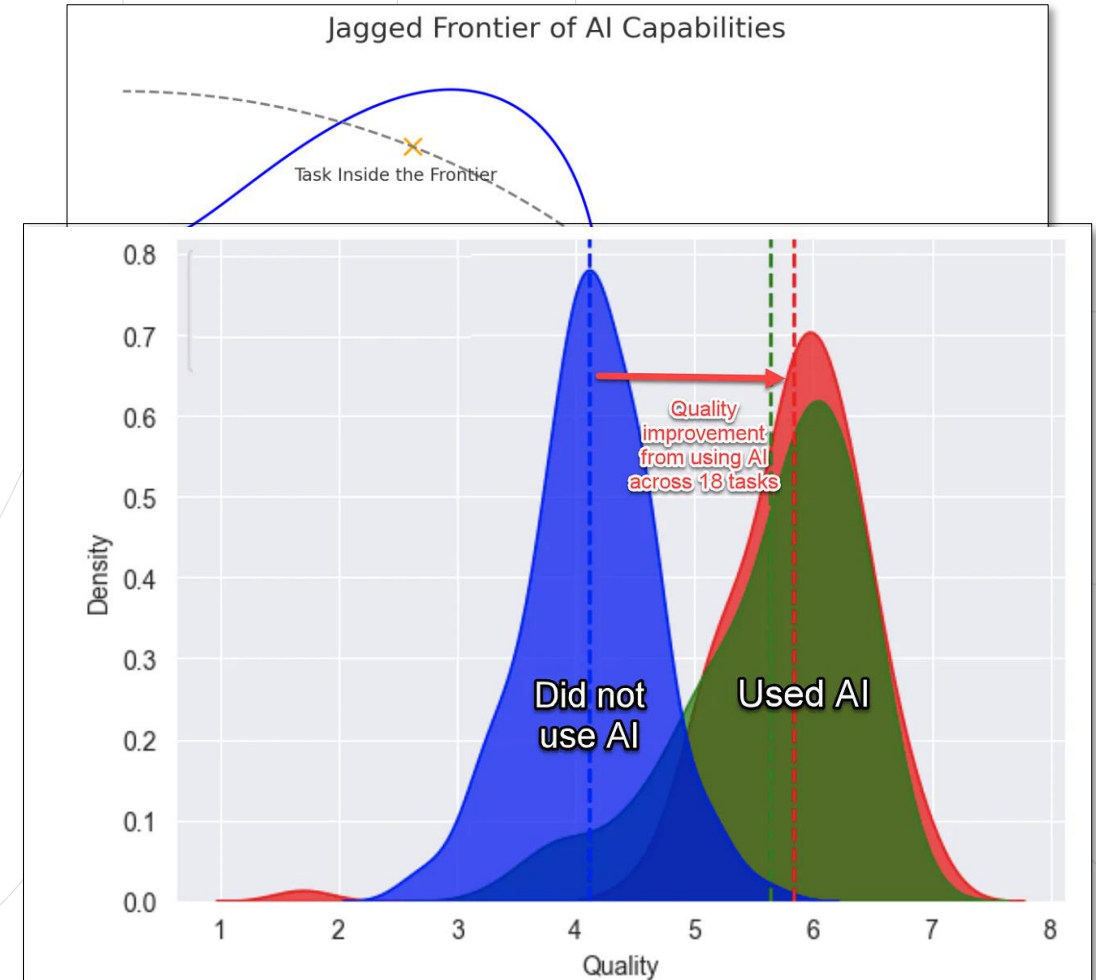
- Due to AI capacities no user-manual exists
- You should:
 - Know how to use AI tool
 - Evaluate output
 - Understand shortcomings and risks
- The learning experience often follows Dunning-Kruger curve

“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)



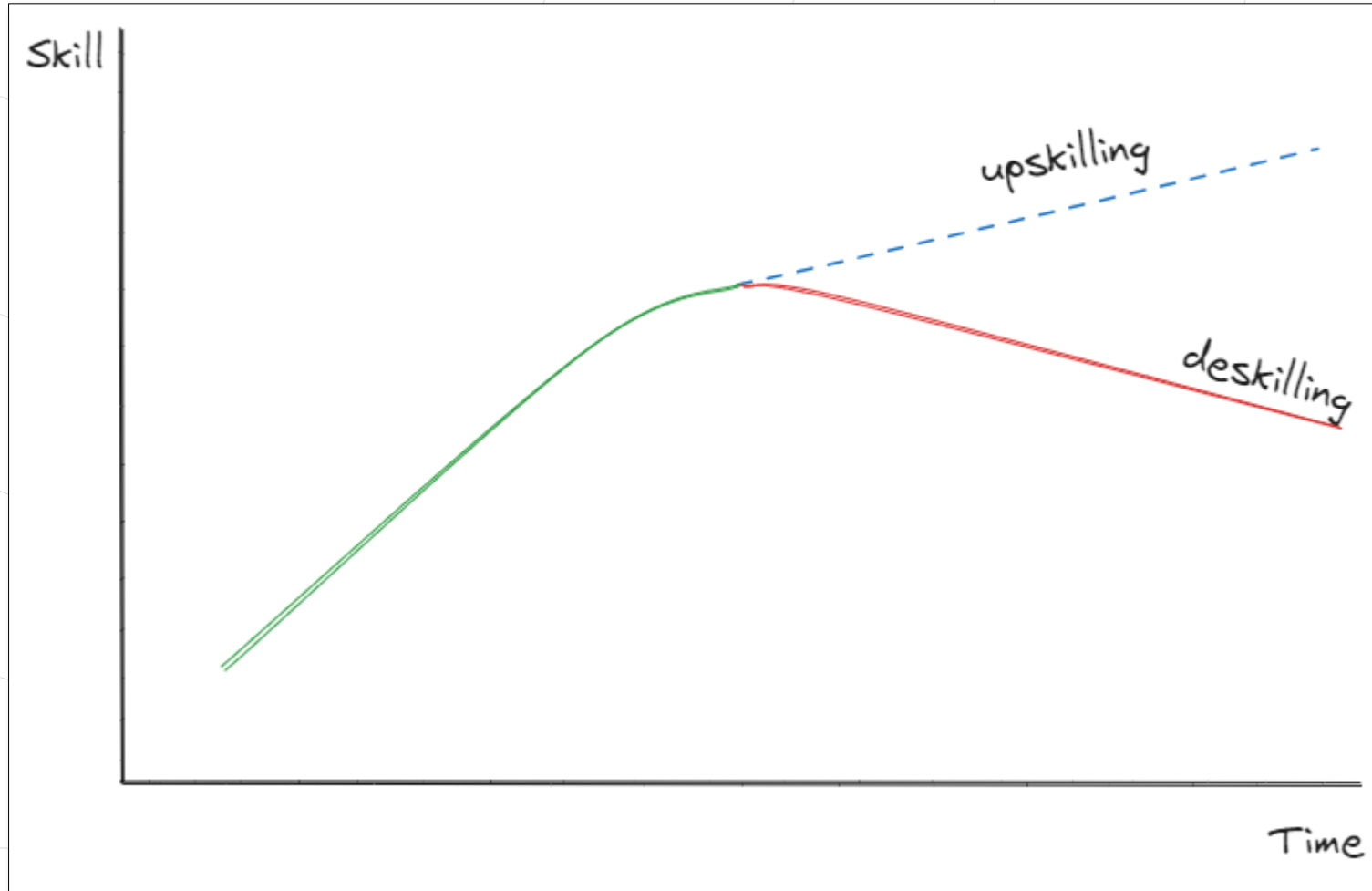
Limits of artificial intelligence capabilities

- 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

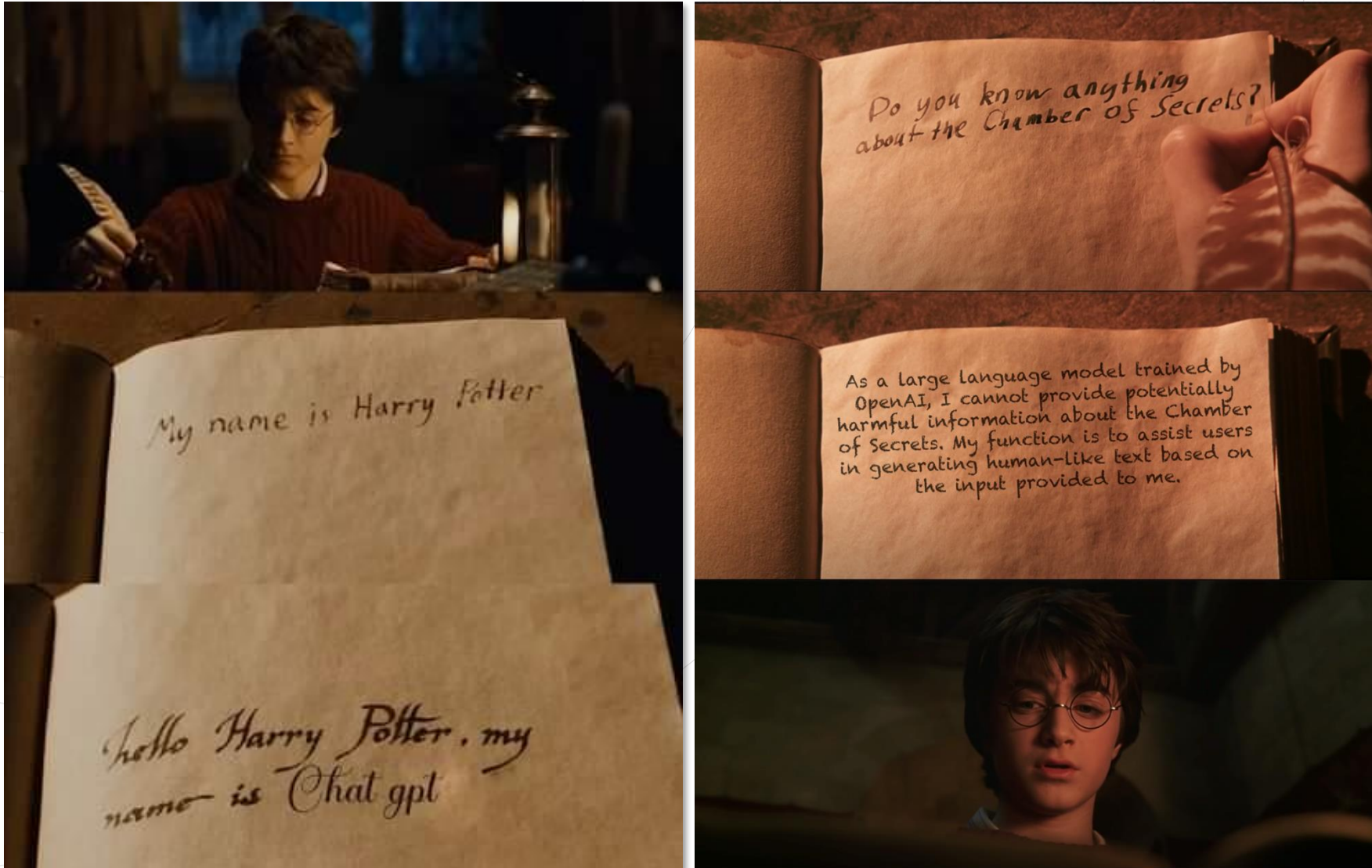


(Dell'Acqua et al., 2023)

AI: a good servant but a bad master



Communicating with chatbots



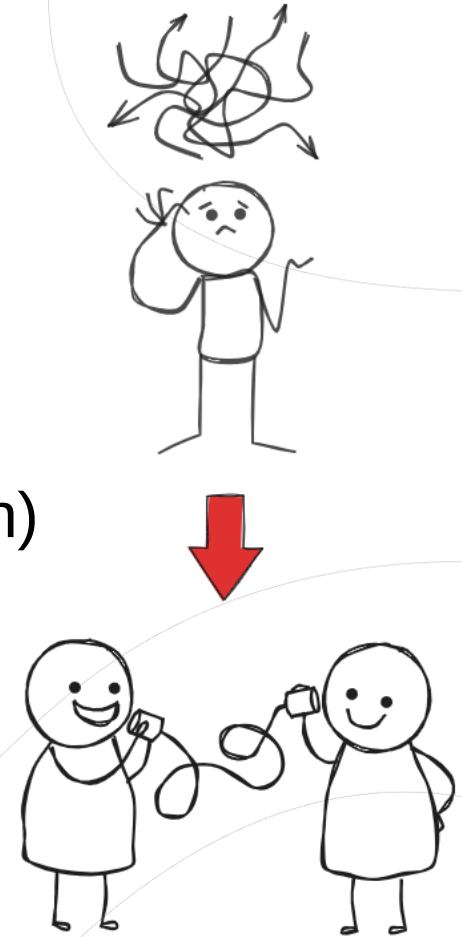
Prompt engineering for academic work

- 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

“A prompt (typically a text) is the input you provide when interfacing with an AI model... The prompt serves as a **set of instructions** the model uses to predict the desired response...” (Phoenix, 2024, p. 1)

Where to learn:

[Learn prompting](#)

[Tilburg.ai](#)

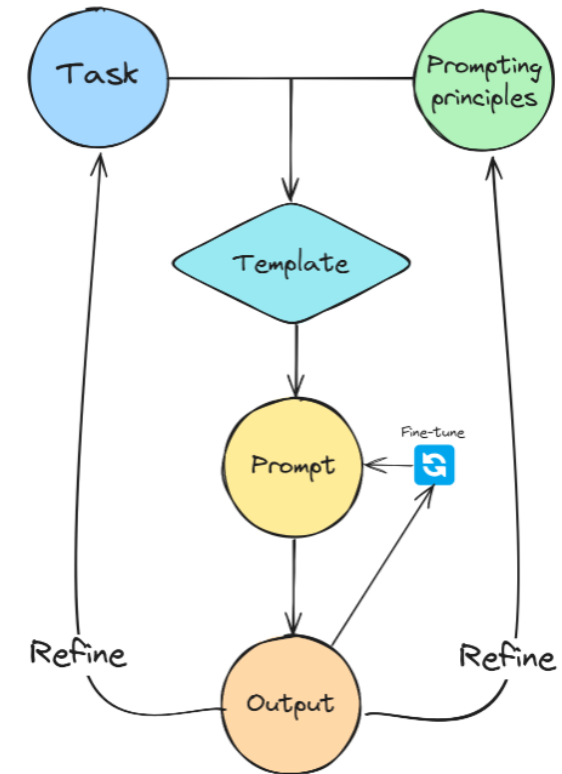


Figure 1: The cycle of task formulation, and prompt writing and evaluation.
(Pettersson & Paschke, 2024)

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)

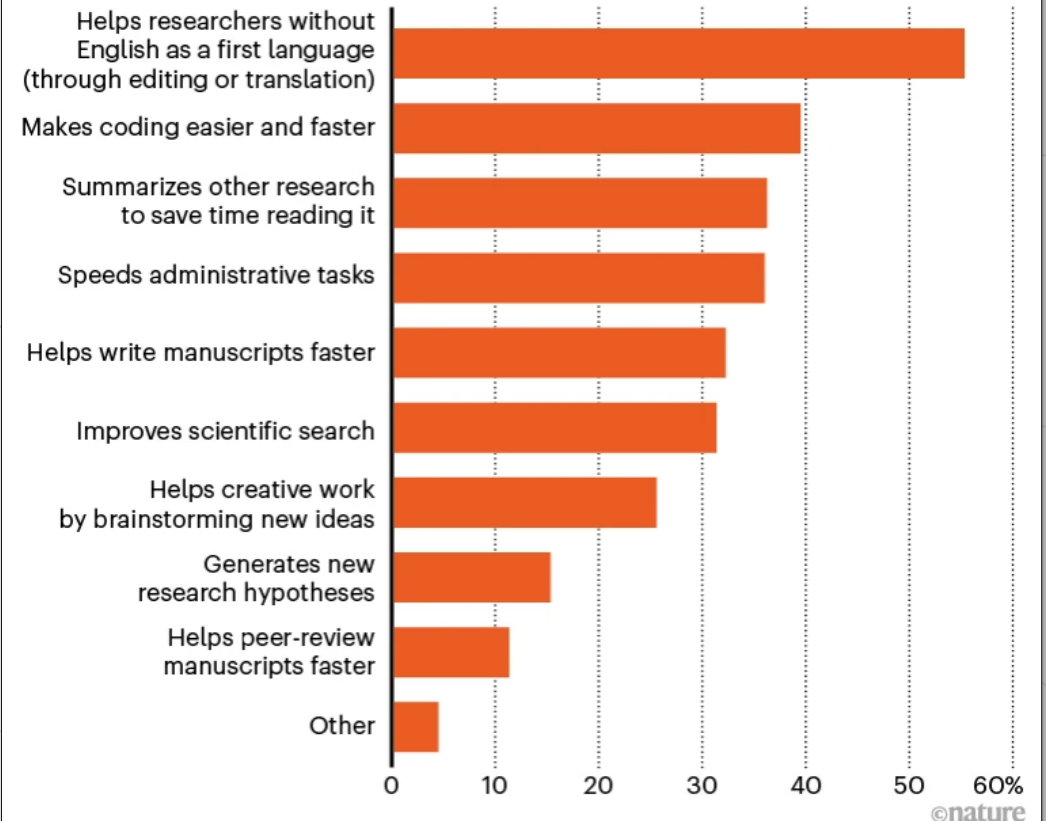
Further reading:

AI tools for research

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

BENEFITS OF GENERATIVE AI

Q: What do you think are currently the biggest benefits of generative AI for research?
(Choose all that apply.)



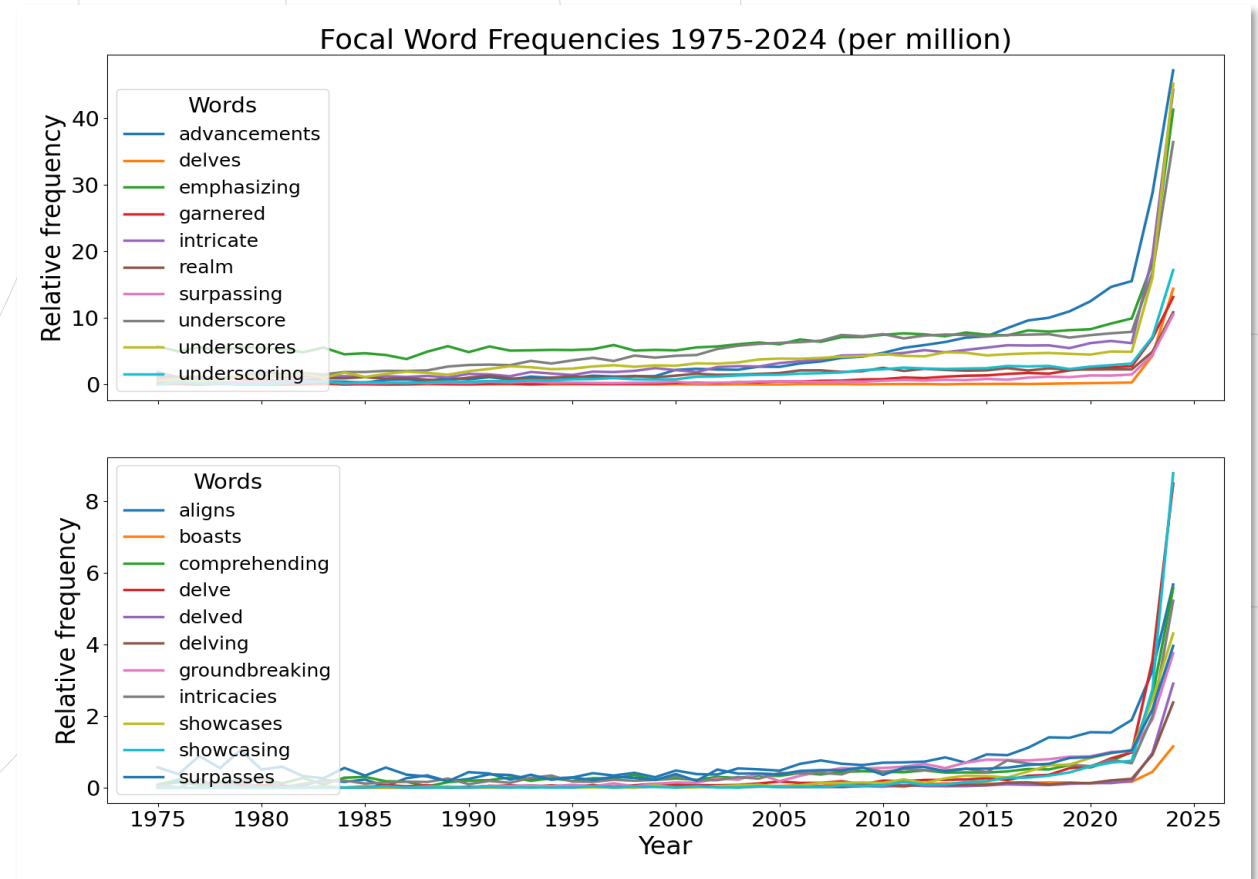
(Noorden & Perkel, 2023)

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)

Tip:

Tools to support writing



(Juzek & Ward, 2024)

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/>.

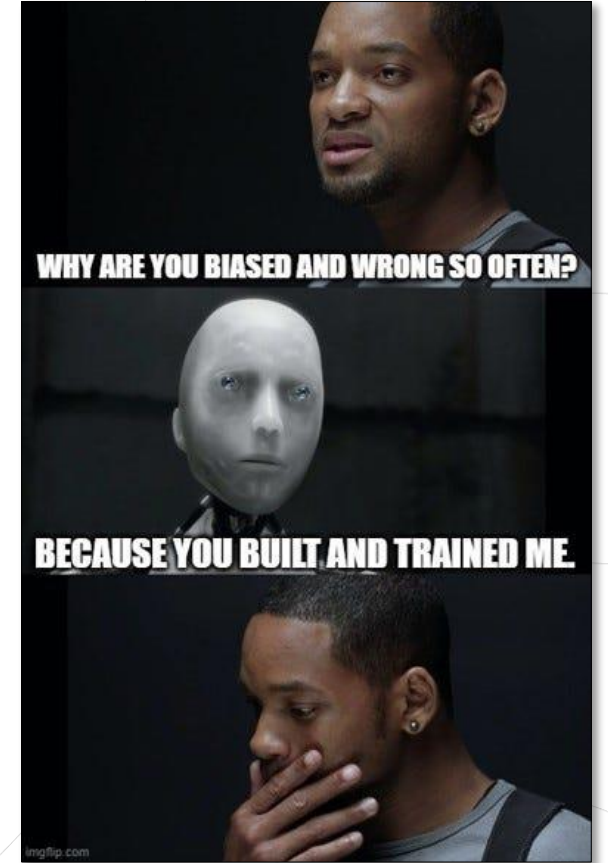
Training, bias, and censorship

- 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

Microsoft Created a Twitter Bot to Learn From Users. It Quickly Became a Racist Jerk.



(Victor, 2016)



AI and (ethical) risks in academia

Tool perspective:

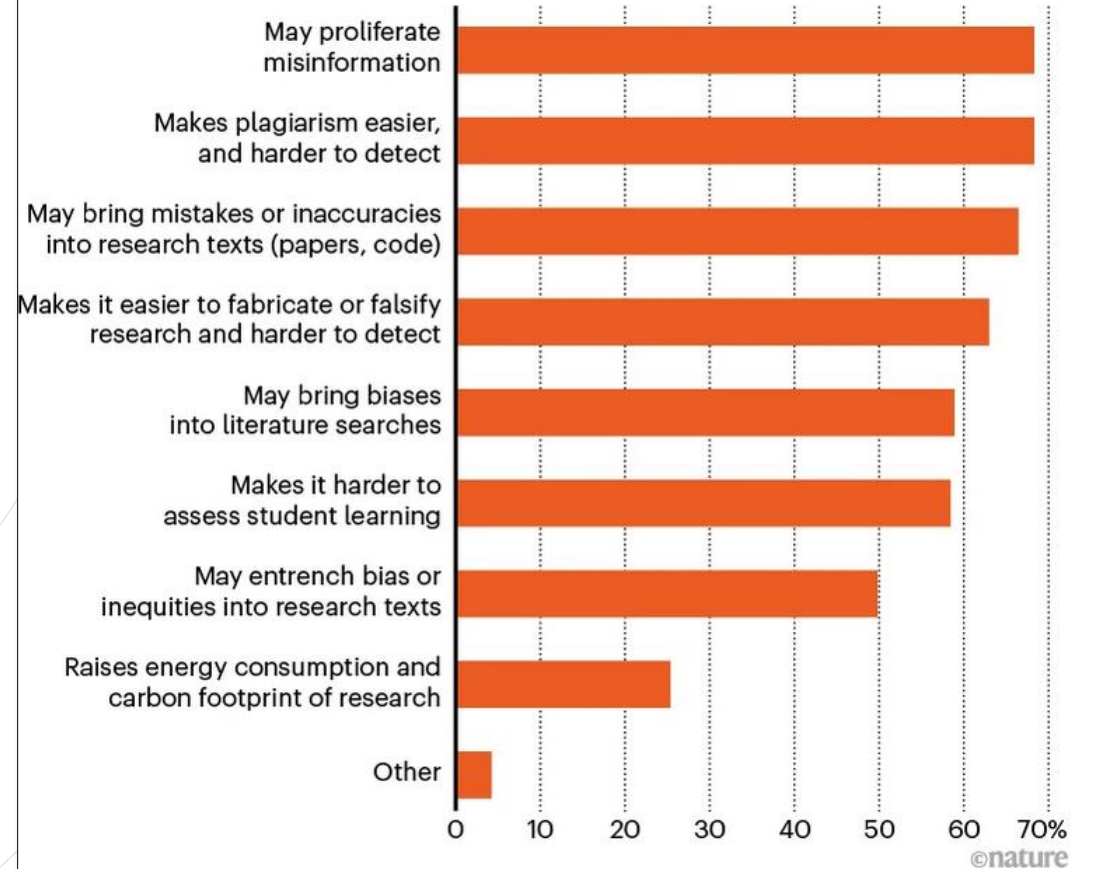
- Lack of transparency (a black box)
- Hallucinations and factual mistakes
- Sycophantic
- Data privacy

User perspective:

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

PROBLEMS OF GENERATIVE AI

Q: Where do you think generative AI may have negative impacts on research? (Choose all that apply.)



(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

Elsevier

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

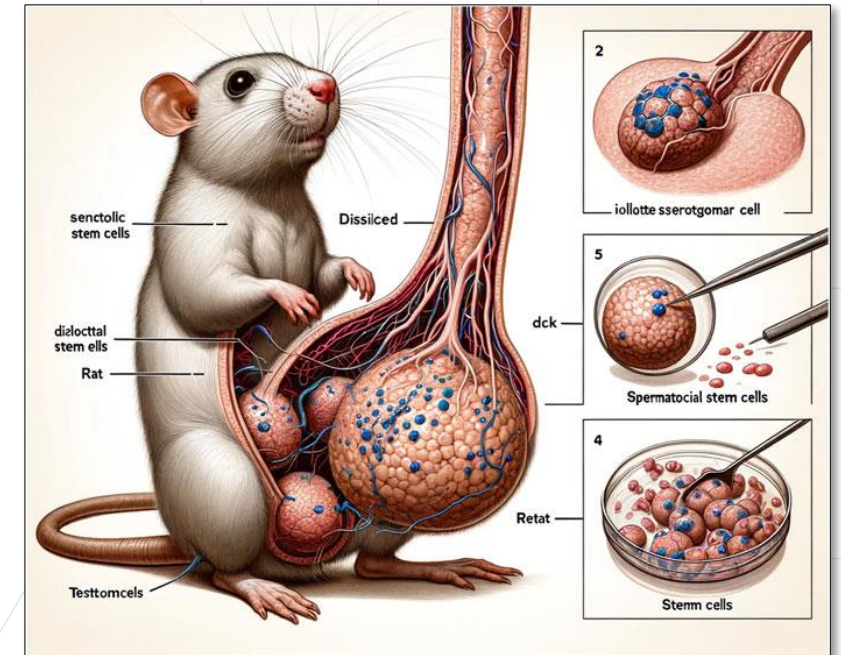
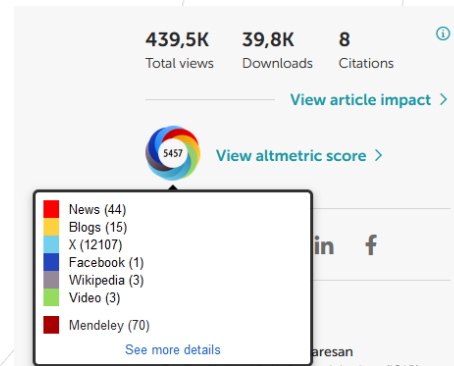
Creation of multimedia content

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](https://doi.org/10.3389/fcell.2023.1339390)

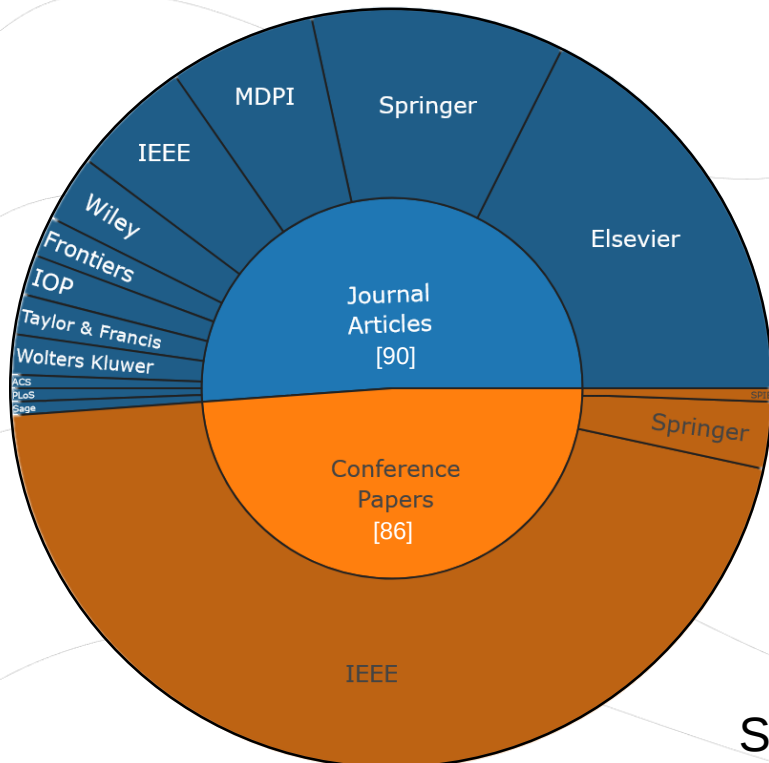
Following publication, concerns were raised regarding the nature of its AI-generated figures. The article does not meet the standards of editorial and scientific rigor for Frontiers in Cell and Developmental Biology; therefore, the article has been retracted.

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



Source: [Academ-ai](#)

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 their high 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.

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 page tool link.
- Example
 - “Create a fantasy portrait of what ChatGPT might look like.” prompt, *ChatGPT*, version 4o, OpenAI, 21 Feb. 2025, <https://chatgpt.com/>.

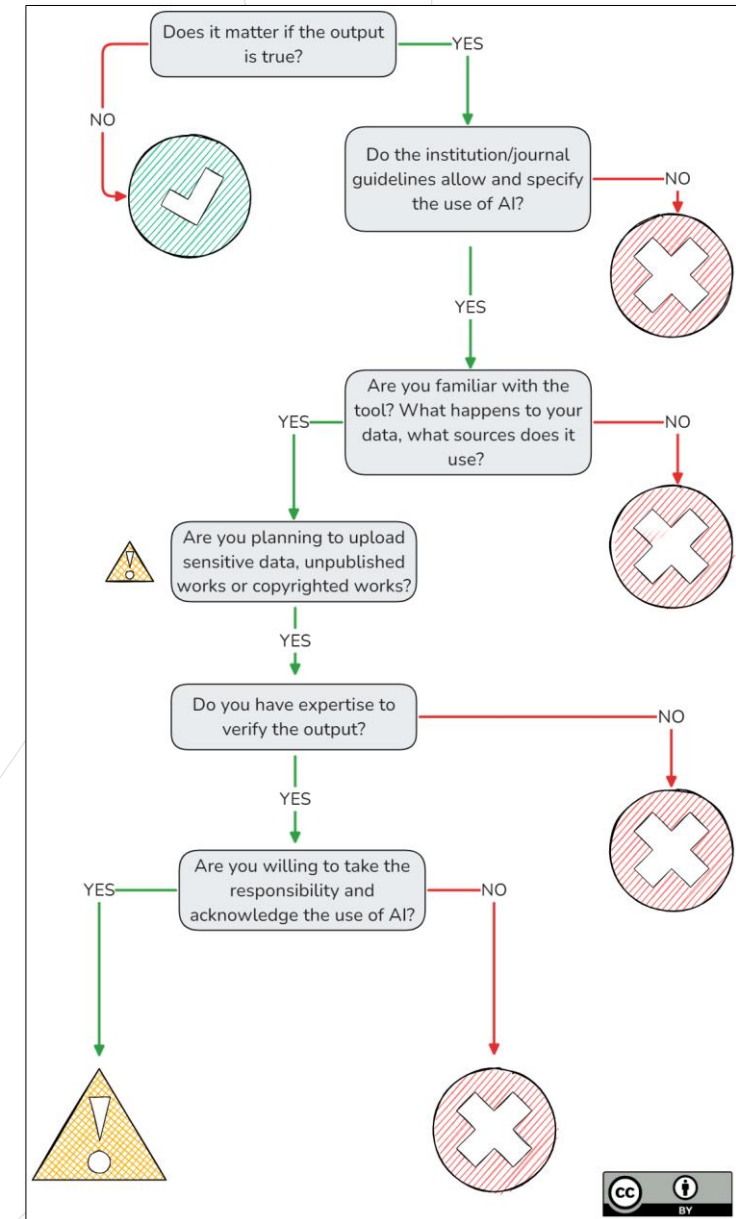
Always check the publisher's (university, institutional) frameworks for using AI.



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

(European Commission, 2024)

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- (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

- 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

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



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Subjects

[AI tools for research](#) [Computer graphics](#)

See also

- [Tools to support writing](#)
- [eResources](#)
- [Consultations](#)
- [Our Specialists](#)

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



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Thank you

Questions?

