



The use of artificial intelligence (AI) in thesis writing

Dr. Franziska Klatt | Guide | May 2023

Learning objectives

- Understand what ChatGPT is
- What it can and cannot do
- How to indicate the use of ChatGPT and other AI models in a scientific paper
- What other artificial intelligences can support scientific work

Please always consider the specifications of your supervisor. These are only general recommendations based on current knowledge.



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Agenda



- 1 What is it?
- 2 What can it do? What can it not do?
- 3 Use in thesis – Do you need to make that known?
- 4 What other AIs are available for scientific work?

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ChatGPT – What is it? (1/2)



- Text generator (chatbot) based on artificial intelligence and developed by the company OpenAI
- Aims to generate conversations that are as human-like as possible
- Transforms input into output by "language modeling" technique
- Output texts are generated as the result of a probability calculation
- This consists of calculating the most probable next word on the basis of huge amounts of training data, independent of actual facts
- Each input ("prompt") leads to a different answer (even with the same input) → Text production is not reproducible



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ChatGPT – What is it? (2/2)



- Quality of text production dependent on training data, which consists of:
 - Websites, public domain books, articles, social media, blogs, forums, Wikipedia.
- Predominantly English-language
- Not science-oriented
- Scientific sources are often behind a "paywall" and thus not accessible to ChatGPT
- Output depends on the quality of the input (the "prompt")

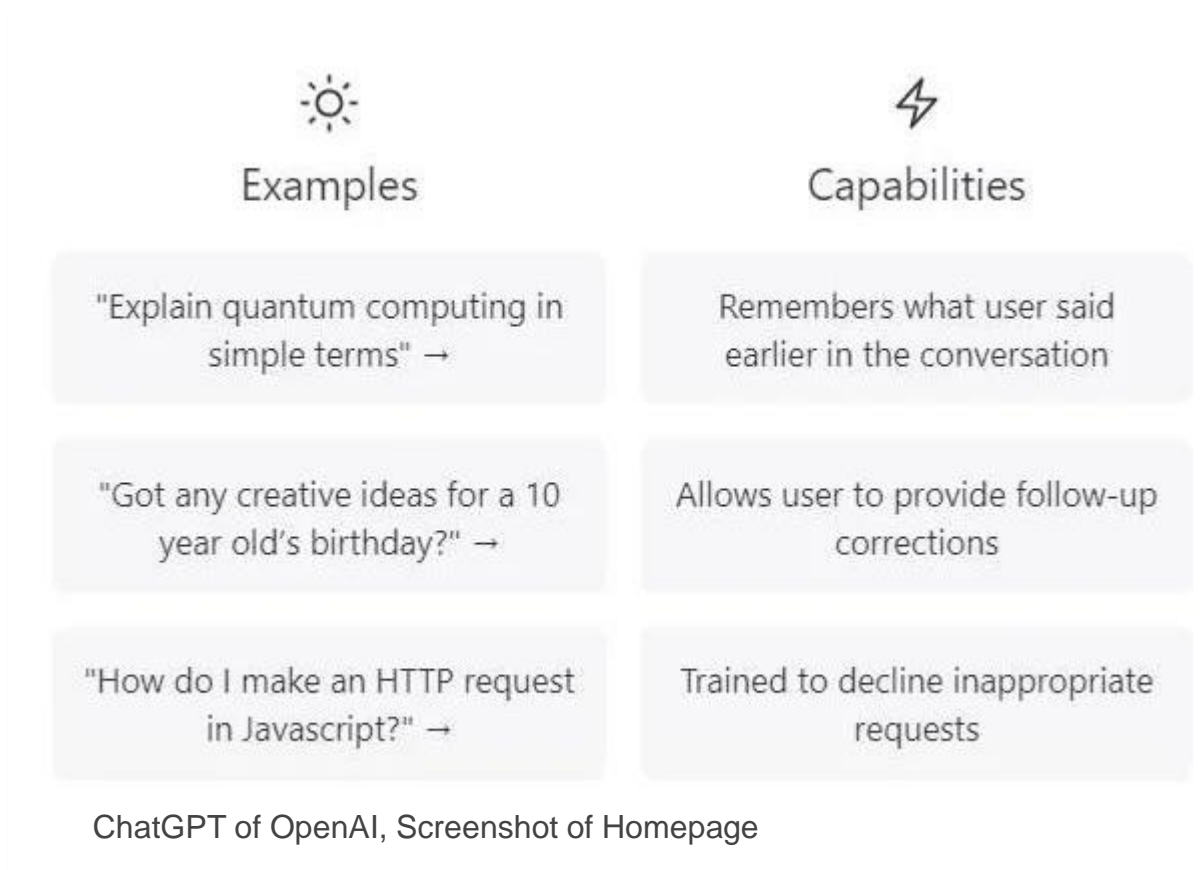
Source: Rudolph, Jürgen, Samson Tan, and Shannon Tan. 2023. "ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?" *Journal of Applied Learning & Teaching* 6(1): 3; <https://doi.org/10.37074/jalt.2023.6.1.9>

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ChatGPT – What can it do?



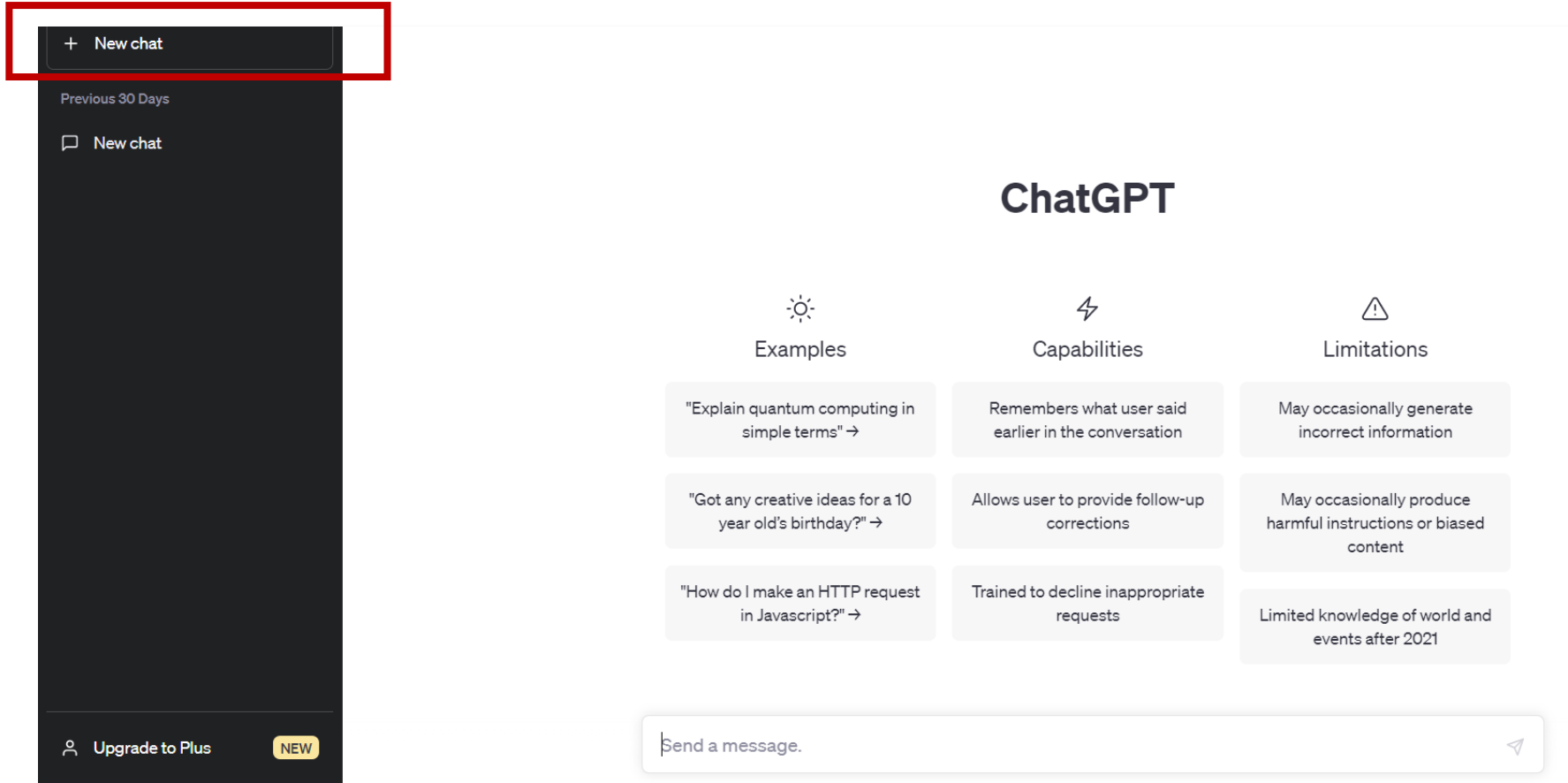
- Build on previous input
- Admits mistakes and apologizes
- Verbal fluency very good
- Is trained not to respond to questionable "prompts"

ChatGPT – What can it do?



- Produce text for different target groups / linguistic levels (scientific, etc.)
- Structure topics
- Point out possible solutions
- Summarize texts
- Find synonyms
- Produce code and find errors in code
- Build tables

ChatGPT – How it works



ChatGPT of OpenAI

1. Open <https://chat.openai.com/>
2. Click on New Chat in the top left (or type in below)
3. Type question („prompt“)
4. Specify through further inquiries („prompts“)

Example: ChatGPT structures the topic well...



„prompt“



FK what are the main influencing factors of sustainability in supply chain management

The main influencing factors of sustainability in supply chain management can vary depending on the industry and specific context. However, some key factors that commonly impact sustainability in supply chains include:

1. Environmental Considerations: Sustainability in supply chains often involves minimizing the environmental impact of operations. Factors such as energy consumption, greenhouse gas emissions, waste management, and resource usage (water, raw materials) are critical. Implementing eco-friendly practices, adopting renewable energy sources, reducing emissions, and promoting recycling and responsible sourcing are important steps towards sustainability.
2. Social Responsibility: Supply chains must also address social issues such as labor rights, fair wages, safe working conditions, and human rights. Responsible sourcing practices, supplier diversity, fair trade cert or standards are crucial to ensuring social sustainability. Companies are expected to promote transparency, engage

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1/2

AI response



ChatGPT of OpenAI

... and explains each aspect



2/2

in community development, and avoid exploitative practices.

3. **Economic Viability:** Sustainable supply chain management should be economically viable for businesses. Balancing sustainability with cost-effectiveness is essential. Investments in green technologies, process optimization, and sustainable procurement practices should be financially feasible and offer long-term benefits. Businesses can explore strategies such as life cycle costing, value chain analysis, and assessing the return on sustainability investments.
4. **Supplier Collaboration and Engagement:** Collaboration with suppliers is crucial to driving sustainability throughout the supply chain. Establishing strong partnerships, engaging suppliers in sustainability initiatives, and promoting responsible practices are key factors. This involves monitoring supplier performance, conducting audits, and providing support for capacity building and improvement.
5. **Risk Management:** Sustainability in supply chains also involves identifying and managing risks associated with environmental, social, and governance (ESG) factors. Understanding and mitigating potential risks, such as regulatory compliance, reputational damage, supply disruptions, and climate change-related impacts, is essential. Implementing robust risk assessment frameworks, contingency plans, and sustainable sourcing strategies can help in managing these risks effectively.
6. **Regulatory and Legal Requirements:** Compliance with relevant laws, regulations, and industry standards is critical for sustainable supply chain management. Businesses need to stay updated on environmental regulations and ensure their

Regenerate response

operations meet the required standards. Adhering to legal requirements helps mitigate legal risks and demonstrates a commitment to sustainability.

7. **Technology and Innovation:** Leveraging technology and innovation can significantly enhance sustainability in supply chains. Adoption of digital tools, such as blockchain for traceability and transparency, data analytics for decision-making, and automation for process optimization, can contribute to resource efficiency, waste reduction, and streamlined operations. Embracing technological advancements can drive sustainability improvements and offer competitive advantages.

These factors interact with each other and may vary in importance depending on the industry, geographical location, stakeholder expectations, and organizational priorities. Effective sustainability strategies involve a holistic approach, considering environmental, social, and economic aspects throughout the supply chain.

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ChatGPT of OpenAI

Concretization of the "prompt" leads to helpful answers



„prompt for more detailed information“

FK Do you know a framework for that

Yes, there are several frameworks available that can help guide sustainable supply chain management practices. One commonly used framework is the Triple Bottom Line (TBL) or the three-pillar approach. The TBL framework focuses on three dimensions of sustainability:

1. Environmental: This dimension addresses the ecological impact of the supply chain, including energy consumption, carbon emissions, waste generation, water usage, and natural resource depletion. It aims to minimize negative environmental impacts and promote resource efficiency and conservation.
2. Social: The social dimension emphasizes the social and ethical aspects of the supply chain, encompassing labor rights, fair wages, safe working conditions, human rights, community development, and stakeholder engagement. It focuses on promoting social equity, diversity, and responsible business practices.
3. Economic: The economic dimension considers the financial viability and long-term economic sustainability of the supply chain. It involves assessing the costs and benefits of sustainability initiatives, evaluating the return on investment, and integrating sustainability considerations into business strategies to ensure economic success.

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ChatGPT of OpenAI

3. Economic: The economic dimension considers the financial viability and long-term economic sustainability of the supply chain. It involves assessing the costs and benefits of sustainability initiatives, evaluating the return on investment, and integrating sustainability considerations into business strategies to ensure economic success.

By adopting the TBL framework, organizations can assess their performance in each dimension and strive to achieve a balance between environmental, social, and economic objectives.

Another widely recognized framework is the Global Reporting Initiative (GRI) Standards. GRI provides comprehensive guidelines for reporting on sustainability performance, including supply chain management. The GRI Standards offer a structured approach to measure, manage, and report sustainability impacts across various aspects of the supply chain.

Additionally, there are industry-specific frameworks and certifications that address sustainability in supply chains. Examples include the Forest Stewardship Council (FSC) certification for sustainable forestry, Leadership in Energy and Environmental Design (LEED) certification for green buildings, Fairtrade certification for promoting fair trade practices, and Responsible Business Alliance (RBA) Code of Conduct for responsible supply chain management in the electronics industry.



- Get more detailed information through new requests "prompts" → like conversation (here: question about the framework)
- Test different variants and see what changes

....and it can also generate tables as output



FK can you give a tabular view of the tripple bottom line framework ← „prompt“

Certainly! Here's a tabular view of the Triple Bottom Line (TBL) framework, highlighting its three dimensions: environmental, social, and economic.

Dimension	Focus
Environmental	- Energy consumption
	- Greenhouse gas emissions
	- Waste management
	- Water usage
	- Natural resource depletion
	- Biodiversity and ecosystem preservation
	- Pollution prevention and control
	- Sustainable sourcing and supply chain practices
Social	- Labor rights and fair wages
	- Safe working conditions
	- Human rights and ethical business practices
	- Diversity and inclusion
	- Community engagement and development
	- Stakeholder engagement and partnerships
Economic	- Health and safety
	- Financial performance and profitability
	- Cost-effectiveness and efficiency
	- Return on investment (ROI)
	- Long-term economic sustainability
- Economic Ir	Regenerate response

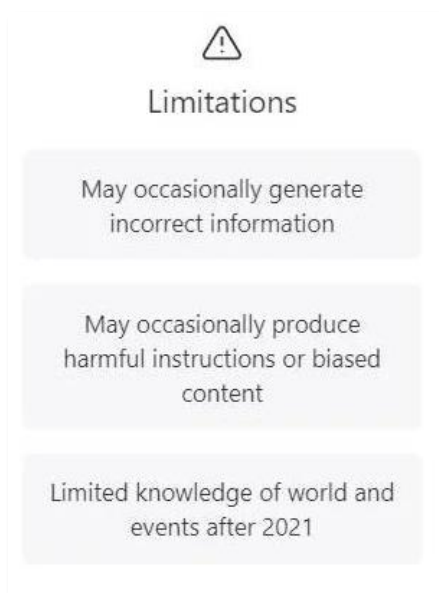
Send a message...

ChatGPT of OpenAI

ChatGPT – What can it not do?



- Is a language model and NOT a knowledge model
- No fact checking, because it has no own internet search function* → Invents things ("fantasizes") that are not true. Due to the coherent and linguistically sound presentation, however, this can go unnoticed. Background: only output of probable word sequences



ChatGPT of OpenAI, screenshot of homegae

- Sources and citations need to be checked by the users, as they might be wrong
- It can misbehave
- The training material used only includes sources up to 2021
- Free version not always available (system overload), alternative: ChatGPTPlus for a monthly fee of about 20 US\$

* However, ChatGPT is already integrated into Microsoft's Bing search engine.

Negativ example – What it cannot do!



FK can you give me a source for the green library framework of the ifla ← „prompt“

I apologize for any confusion caused. Upon further review, I couldn't find a specific document solely titled "Green Library Framework" published by the International Federation of Library Associations and Institutions (IFLA). While the IFLA has produced guidelines and resources related to sustainability in libraries, they might not have a singular framework with that exact name.

However, I can suggest referring to the following IFLA resources that discuss sustainability in libraries and can serve as valuable sources:

- "IFLA Guidelines for Library Services to Persons with Dyslexia or Related Disabilities": These guidelines, published by IFLA, include recommendations for creating accessible and sustainable library services for individuals with dyslexia or related disabilities.
- "IFLA Guidelines for Library Services to Children": This document outlines best practices for library services to children, including aspects related to sustainability, such as promoting environmental awareness, providing access to sustainable literature, and

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Makes up things that sound like facts! Apologizes and "corrects" itself.



Note the fine print!

Conclusion: ChatGPT is a "stochastic" parrot, but it can still help with the final work.....



The image was generated by OpenAI's artificial image generation intelligence DALL-E after entering the prompt: "create a stochastic parrot".

ChatGPT – What is it useful for?

- Structuring topics
- Understanding concepts of a topic
- Finding ideas
- Letting the AI improve the quality of a self-entered text
- Finding synonyms for search terms (term matrix)
- Reproducing methods (e.g. Systematic Literature Review)
- Improving one's own expression
- But ChatGPT is not a citable and quotable source (see our guide "[Cite correctly, avoid plagiarism](#)")

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Do not forget to reflect critically! You take the responsibility for the correctness of the information - NOT the AI!

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If you use ChatGPT and other AIs for your thesis, do you need to specify that?



Image generated by DALL-E from OpenAI

- Two things are crucial here: Can an AI be the author of a work according to copyright law?
- How is it used - as an idea generator or to copy the generated text?
- The following slides take a closer look at these aspects

ChatGPT – Is authorship by an AI possible?



- AI itself cannot have authorship, since no human creative activity in the sense of § 2 Abs. 2 UrhG is possible
- Regardless of the quality of the output, which may be better than that generated by humans
- If the text is no longer changed by humans, only the "prompt" is to be seen as a connecting factor for human, creative output
- In the case of ChatGPT this will not be sufficient to affirm copyright protection
- Only conceivable with very elaborate linking of "prompts", which limit the output in such a way that the AI no longer has margin for randomization → rather unlikely

See Salden, Leschke, & Wiethoff (2023), https://hss-opus.ub.ruhr-uni-bochum.de/opus4/frontdoor/deliver/index/docId/9734/file/2023_03_06_Didaktik_Recht_KI_Hochschulbildung.pdf

Indication of use mandatory - type depends on extent of use



Image generated by DALL-E from OpenAI

- Declaration of Independence - omission of ChatGPT usage despite having used it equals an attempt at deception or scientific misconduct
- It must be recognizable for third parties which parts of the text were generated by an AI and to what extent
 - Word-for-word takeover must be treated like a classic quotation
 - Mention for idea generation e.g. in the method section
- Please ask your supervisor for corresponding guidelines

How to quote? If you take the text generated by ChatGPT directly - Direct Quote



- Currently there are barely any guidelines for citation styles for generative AI technologies
- Where there are no guidelines, ChatGPT usage should be handled as personal communication or correspondence
- ChatGPT and other generative AIs do not produce reproducible outputs → Tip: Use [ShareGPT](#) as a Chrome extension to generate an assignable and retrievable URL for a ChatGPT request and attach it or take screenshot
- Be aware of possible specifications from the AI vendor on how to specify the use of the AI
- For general information on proper citation as well as citation styles, see our guidelines "[Cite Properly, Avoid Plagiarism](#)"

How to quote? If you take the text generated by ChatGPT directly - Direct Quote - Chicago Footnote Style



Footnote Style

- Number. Originator of the communication, medium, Day Month, Year.
- Example: ¹ OpenAI's ChatGPT AI language model, response to question from author, 26 May, 2023.
- Is often not included as a source in the reference list
- Include the conversation protocol with the AI in the appendix

Source: <https://guides.library.uq.edu.au/referencing/chatgpt-and-generative-ai-tools>

How to quote? If you take the text generated by ChatGPT directly - Direct Quote - Chicago In-Text Citation



In-Text-Citation

- (Originator of communication, medium, Date Month, Year)
- (OpenAI's ChatGPT AI language model, response to question from author, 26 May, 2023)
- In text only
- Is often not included as a source in the reference list
- Include evidence as an appendix together with the "prompt"

Source: https://www.chicagomanualofstyle.org/tools_citationguide/citation-guide-1.html

How to quote? If you take the text generated by ChatGPT directly - Direct quote APA 7th



In-Text-Citations

Author/organisation of generative AI model, Year of version used

Example:

(OpenAI, 2023)

Reference list

Author of AI model used. (Year of AI model used). *Name of AI model used* (Version of AI model used) [Type or description of AI model used]. Web address of AI model used

Example:

OpenAI. (2023). *ChatGPT* (May 12 Version) [Large language model]. <https://chat.openai.com/>

Include proof as an attachment including the "prompt".

Source: <https://guides.library.uq.edu.au/referencing/chatgpt-and-generative-ai-tools>, see also <https://apastyle.apa.org/blog/how-to-cite-chatgpt>

In summary, is ChatGPT compatible with the rules of good scientific practice?



- „ The marked use of AI writing tools in scientific papers, however, will not formally violate the rules of good scientific practice, since it is explicitly stated that the text in question does not originate from one's own knowledge, but was generated by an AI.“ (translated from Hoeren 2023, p. 23)*
- “... However, the (unknowing) adoption of third-party works, which may be part of the adopted AI product (see above), may constitute a copyright infringement and thus a violation of the rules of good scientific practice ...” (translated from Hoeren 2023, p. 23)*
- unlikely with ChatGPT due to the way it works, but needs to be tested

* Hoeren (2023), https://hss-opus.ub.ruhr-uni-bochum.de/opus4/frontdoor/deliver/index/docId/9734/file/2023_03_06_Didaktik_Recht_KI_Hochschulbildung.pdf

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Other AI tools for scientific work and what they can do - An overview



Type of AI	Explanation	Beispiele
Text generation	The software generates self-formulated texts of limited length in response to a "prompt". To change or continue a text, a new prompt is necessary	ChatGPT von OpenAI, Neuroflash, AlephAlpha, Mindverse, Copycockpit, Writesonic, Perplexity
Text correction	Corrections at a higher level of text production, e.g. in style	Grammarly, DeepL Write, Plag, Trinkta
Translations	Tools for text translation from one language to another have been known and established for quite some time	DeepL, Google Translate
Paraphrasing	Tools that can summarize texts and customize the style	QuillBot, PolitePost, ChatPDF
Literature search	Can find sources for research topic questions and identify connections between authors, publications, and subject areas. Perspectively, find appropriate sources for written text.	Elicit, ResearchRabbit, Semantic Scholar, IRIS, SciSpace, Consensus

Source: https://hss-opus.ub.ruhr-uni-bochum.de/opus4/frontdoor/deliver/index/docId/9734/file/2023_03_06_Didaktik_Recht_KI_Hochschulbildung.pdf

ChatGPT - Only the beginning - What can we expect?



- **Commercialization:** Language models will be integrated into commercial applications (example: Microsoft's involvement in OpenAI).
- **Integration:** various functions will be integrated into an AI tool
- **Specialization:** through adapted use cases and training data, a chatbot can be trained for specific domains (e.g., scientific publications)
- Rapid developments in the last 5 years → not foreseeable what will be possible in the next 5 years, as research is already being done on new AIs
- New AI tools are presented and verified, for example, at <https://www.futurepedia.io/>

Last, but not least: ChatGPT - privacy not forgotten



- To use ChatGPT you have to provide your mobile phone number and personal data
- Requests ("prompts") are stored
- OpenAI has privacy policies, but does not guarantee security of data
- **Do not enter personal, confidential or proprietary information and data into ChatGPT**
- Presumably there are also copyright violations related to the training data
- Data protection authorities of the German states are investigating possible violations of the German General Data Protection Regulation (DSGVO)* by ChatGPT

* source: <https://www.tagesspiegel.de/politik/handeln-der-gesetzgebung-gefordert-chatgpt-offenbar-nicht-nur-risiko-fur-datenschutz-9615842.html>

Thank you for your attention! If you have any questions,
please feel free to contact us!



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The guideline was translated from German into English with help of DeepL

