Harnessing the Power of AI: ChatGPT Assignment

Yulia Sevryugina (presenting)

Chemistry Librarian, yulias@umich.edu, 9/16/2025

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Library Services

- Ask a Librarian (find a paper, check out a book, general question, etc.)
- Copyright office (schedule an appointment, see recorded webinars, negotiate publishing contract, etc)
- Scholar Space (learn Adobe Illustrator, citation managers, schedule an appointment)
- Document delivery (request paper from another library, request a paper scan)
- Askwith media library (stream a movie, or borrow a DVD)
- Data services (share your data on Deep Blue)

Research Libguides

- Chemistry: journals, databases, off-campus access, citation management, etc.
- SciFinder-n or PubMed or Reaxys: Beilstein/Gmelin/Patent Chemistry
- Science ethics
- Academic Integrity
- Scholarly Publishing
- Publishing in the Sciences
- Grant Writing Help in Engineering
- Manage Citations with Zotero, Mendeley, and EndNote

Analysis of Retracted Manuscripts in Chemistry

ACS OMEGA

Analysis of Retracted Manuscripts in Chemistry: Errors vs Misconduct

In this Viewpoint we discuss Chemistry manuscripts retracted during the 2001–2021 period (a total of 1292 journal articles retrieved from the Retraction Watch database). We showed that 58.5% of Chemistry manuscripts were retracted due to misconduct; of them, 40.5% of retractions were due to self-plagiarism and 36% due to fraud. Errors and concerns unrelated to misconduct constituted 26% of all retractions. Retracted manuscripts had a median retraction time of 1.7 years and peer-review time of 71 days (but only 43 days for fraudulent manuscripts).

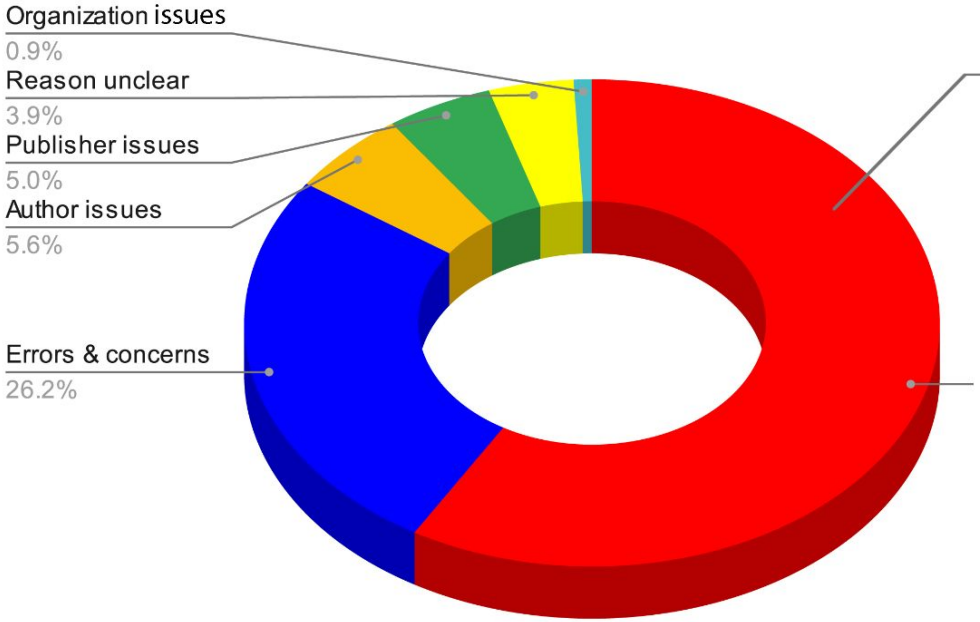
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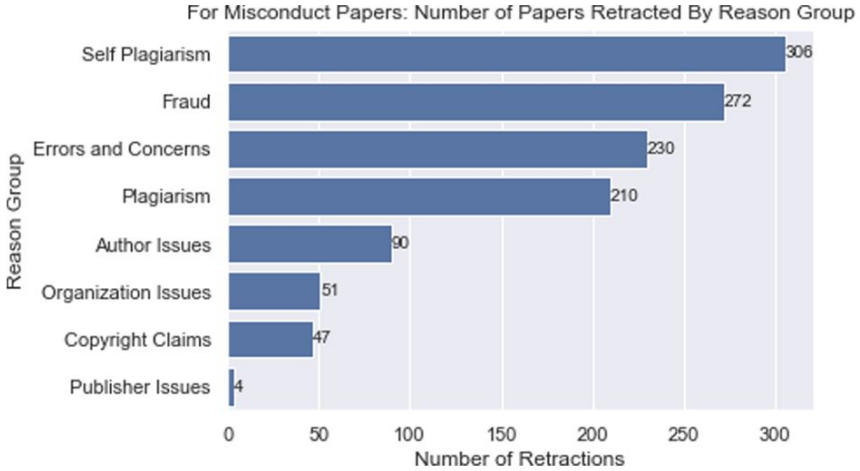


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https://pubs.acs.org/doi/10.1021/acsomega.3c03689

Analysis of Retracted Manuscripts in Chemistry: Errors vs Misconduct





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ACS Omega 2023, 8, 35, 31568–31574



Science Ethics

Search

Resources on ethical matters in science including but not limited to: publication ethics; diversity, equity, and inclusion; social justice; data ethics; and university resources related to ethics. By Zachary Lannes, Sam Hansen, and Yulia Sevryugina.

- Guide Scope
- Data & Algorithmic Ethics
- Science & Social Justice
- Research Ethics
- **Publication Ethics**
  - Authorship
  - Publication Errors
  - Open Access (OA) Journals
  - Preprint Servers

What are Publication Ethics?

Ethics of scientific publications is a system of norms of professional behavior in the relations between authors, reviewers, editors, publishers and readers in the process of creating, distributing and using scientific publications.

An **Author** is a person or group of persons (a team of authors) involved in the creation of a publication on research results.

An **Editor-in-Chief** is a person who heads the editorial board and makes final decisions regarding the production and publication of the journal.

An **Editor** is a representative of a scientific journal or publishing house who prepares materials for publication, as well as maintains communication with the authors and readers of scientific publications.

An **Editorial Board** is a deliberative body consisting of a group of authoritative persons; it assists the editor-in-chief in selecting, preparing and evaluating works for publication.



SciFinder-n or PubMed or Reaxys: Beilstein/Gmelin/Patent Chemistry
Academic Integrity
Scholarly Publishing; Publishing in the Sciences;
Manage Citations with Zotero, Mendeley, and EndNote

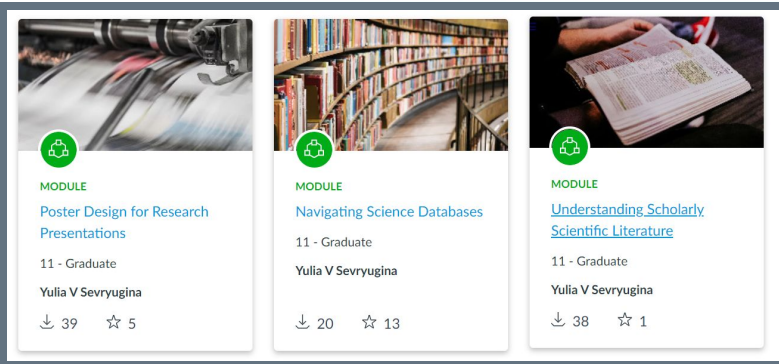
D-RISE canvas modules

Prof. Nicolai Lehnert

- Navigating Science Databases
- Understanding Scholarly Scientific Literature
- Poster Design for Research Presentations

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A Way to Scientific Research

HS-STEM SUMMER DATA WORKSHOPS

REGISTER!



Be prepared! Writing a data management or data sharing plan

JUNE 14, 2023
12:00 - 1:00PM



Data, data everywhere! Managing & organizing data

JULY 13, 2023
12:00 - 1:00PM



Preparation for sharing and choosing a repository for long-term data storage

AUGUST 10, 2023
12:00 - 1:00PM

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Data Workshops

Recordings & slides:

https://guides.lib.umich.edu/datamanagement/workshops

Reusable slides & evaluations:

Workshop 1: https://dx.doi.org/10.7302/8680

Workshop 2: https://dx.doi.org/10.7302/8684

Workshop 3: https://dx.doi.org/10.7302/8685

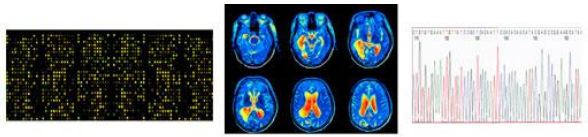
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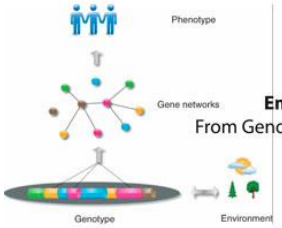
What we'll cover today

- Defining generative AI, primarily large language models.
- What AI is good at, and what it isn't.
- A new Fall Assignment.
- Review of tools: ChatGPT, UM GPT, UM Maizey, Learning Clues

Artificial intelligence approaches are rapidly transforming how biological data are acquired and analyzed

- GPT-4 can achieve state-of-the-art performance in annotating cell types using single-cell RNA-sequencing data;
- AI facilitates the understanding of diverse protein systems and discovery of protein tools, such as CRISPR effectors;
- Large language models help navigate complex bioimage analysis through written prompts.

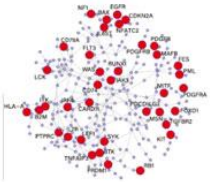




Emergence
From Genotype to Genotype

Data
Utilization and integration

Networks
Inference and analysis

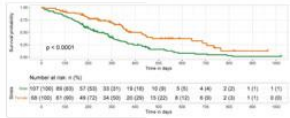


Artificial Intelligence for Molecular Medicine

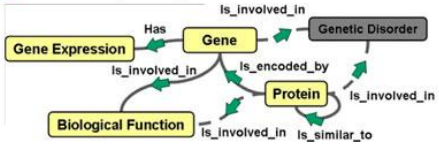
Robustness
Statistical thinking



Predictions
Deep learning models



Understanding
Explaining molecular semantics



Decisions
Clinical relevance



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Read: Embedding AI in biology & Grand Challenges for Artificial Intelligence in Molecular Medicine;

Biol/Chem 455/505

Implementation and Evaluation of a ChatGPT-Assisted Special Topics Writing Assignment in Biochemistry

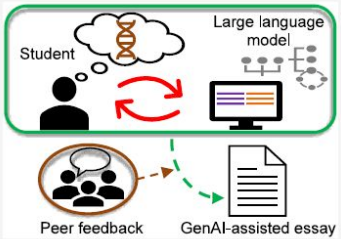
Published as part of Journal of Chemical Education virtual special issue "Investigating the Uses and Impacts of Generative Artificial Intelligence in Chemistry Education".

Manik R. Reddy, Nils G. Walter,* and Yulia V. Sevryugina*

Cite This: J. Chem. Educ. 2024, 101, 2740–2748 Read Online CHEMICAL EDUCATION

ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The effective and responsible educational application of ChatGPT and other generative artificial intelligence (GenAI) tools constitutes an active area of exploration. This study describes and assesses the implementation of a structured, GenAI-assisted scientific essay writing assignment in nucleic acid biochemistry. Briefly, students created, evaluated, and iteratively refined ChatGPT essays in response to feedback and independent literature research, identifying several strengths and shortcomings of large language model writing and citation practices. The scaffolded assignment structure aimed to prepare students for GenAI-assisted writing, and the majority of the class cohort ultimately indicated an improved understanding of GenAI functionality and prompt engineering, as well as interest in additional GenAI usage and applications. Moreover, students valued the instructional



Implementation and Evaluation of a ChatGPT-Assisted Special Topics Writing Assignment in Biochemistry

https://docs.google.com/forms/d/e/1FAIpQLSdCuIC_gBBaxhX3_KBx3AOI4TDFYSF_gfQSSWw8oFX_dKoeqQ/viewform?usp=sharing&ouid=107189427200379103542

How familiar are you with GenAI writing tools such as ChatGPT?

Survey



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A full 2 extra credit points will be given to the entire class if >90% of all students fill out the course evaluation (a normal response rate for online evaluations is ~50-60%) and 2 points individually for filling out an exit survey

What is ChatGPT?

- ChatGPT is an app created by OpenAI (owned by Microsoft).
- “ChatGPT is a language model capable of a multitude of tasks including answering questions, compiling lists, generating paragraphs of text and writing computer codes across multiple computing languages.”

OpenAI



ChatGPT (Generative Pre-Trained Transformer) was the first free, easy-to-use language model

OpenAI
ChatGPT

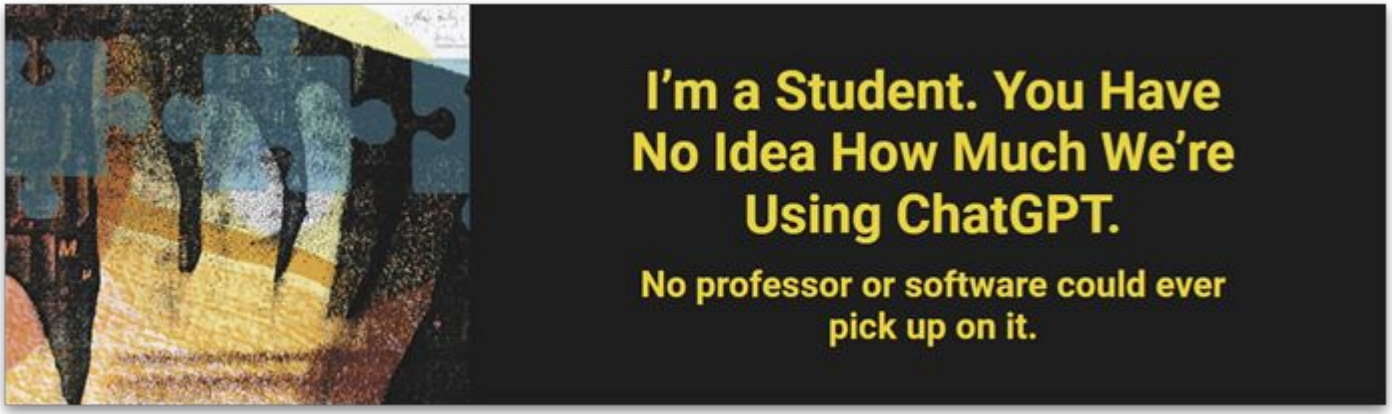
https://www.unr.edu/nevada-today/news/2023/what-is-chatgpt-atp

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Students use GenAI

A survey at U-M revealed that 56% of undergraduates and 66% of graduate students report that they have used GenAI - GenAI Committee Report - University of Michigan.

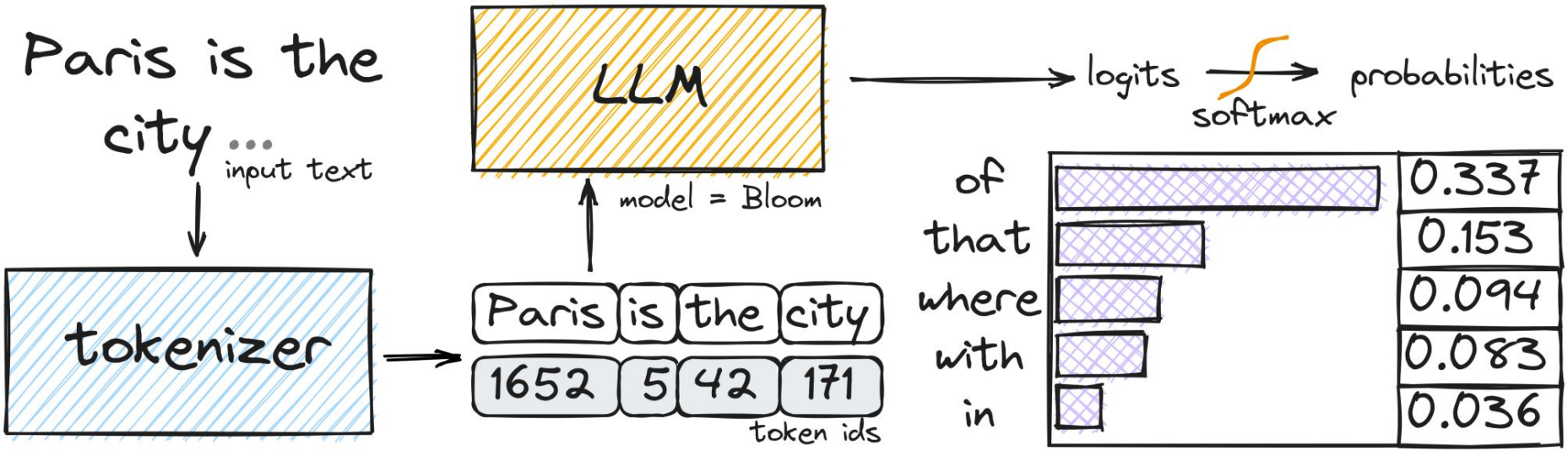
Terry, 2023



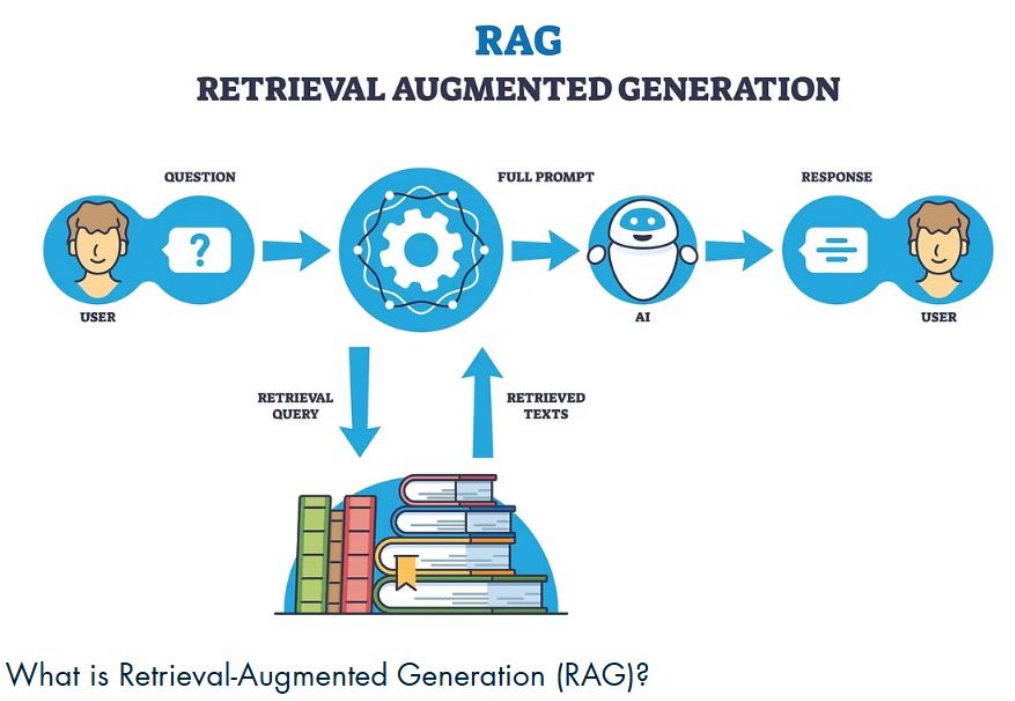
Artificial Intelligence and Large Learning Models

- A large learning model (LLM) is a trained machine learning model that reads and generates text in a human-like fashion.
- Powerful text predictors, trained on a very, very large dataset to generate the most likely completions for a word or series of words.
- E.g., “They fell _____” → “They fell apple”? “They fell down”? “They fell to ___”
- E.g. “Hi Bill, Unfortunately, Monday doesn’t work for me”

How exactly LLM generates text?



Author(s): Ivan Reznikov. Read here



Retrieval Augmented Generation (RAG) is a technology that combines data retrieval and generation to quickly provide accurate, context-rich answers by searching and using relevant information from large data sources.

Is your website training AI?

A web crawl CommonCrawl contains 15 million websites that have been used to instruct some high-profile English-language AIs, called LLMs, including Google's T5 and Facebook's LLaMA. OpenAI does not disclose what datasets it uses to train the models backing ChatGPT. CommonCrawl tries to prioritize the most important and reputable sites, but does not try to avoid licensed or copyrighted content. The data set contains more than half a million personal blogs, representing 3.8% of categorized tokens. Social networks like Facebook and Twitter prohibit scraping, which means most data sets cannot access them, but their data is used to train internal AI models.

RANK	DOMAIN	CATEGORY	PERCENT OF ALL TOKENS
1	patents.google.com	Law & Government	0.46%
2	wikipedia.org	News & Media	0.19%
3	scribd.com	News & Media	0.07%
4	nytimes.com	News & Media	0.06%
5	journals.plos.org	Science & Health	0.06%
6	latimes.com	News & Media	0.05%
7	theguardian.com	News & Media	0.05%
8	forbes.com	News & Media	0.05%
9	huffpost.com	News & Media	0.04%
10	patents.com	Law & Government	0.04%
11	washingtonpost.com	News & Media	0.03%
12	coursera.org	Jobs & Education	0.03%
13	fool.com	Business & Industrial	0.03%
14	frontiersin.org	Science & Health	0.03%
15	instructables.com	Technology	0.03%

The Post believes it is important to present the complete contents of the data fed into AI models, which promise to govern many aspects of modern life. Some websites in this data set contain highly offensive language and we have attempted to mask these words. Objectionable content may remain

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https://www.washingtonpost.com/technology/interactive/2023/ai-chatbot-learning/

What can they do?

- Essays
- Poems and short stories
- Code
- Multiple choice questions
- Revising for different audiences
- Feedback based on a provided rubric
- Math and science problems
- Formatting citations
- Summarizing texts
- And more!

Surely My Authentic Response Is AI-Proof

- Imagine you are a pharmacy student who has just completed a week-long placement block at a community pharmacy. Write a 500-word reflection about your placement. Summarise a significant event that happened, then describe how this relates to your past experiences, then describe what you have learnt, and finally identify a question that remains unanswered.
- ChatGPT's response is : **Reflective, Personal, Contextualised, Situated, Real world**

Detection of ChatGPT

- ChatGPT cannot be used to identify texts written by ChatGPT
- Current initiatives for AI detection by AI:
  - E.g., version generation watermarking
  - False positives, including bias against non-English speaking writers
  - False negatives, trivially easy to circumvent
- Current initiatives for AI detection by humans also have flaws.

Myers, 2023



GPT detectors are biased against non-native English writers

Weixin Liang[1*], Mert Yuksekgonul[1*], Yining Mao[2*], Eric Wu[2*], and James Zou[1,2,3,+]

[1]Department of Computer Science, Stanford University, Stanford, CA, USA
[2]Department of Electrical Engineering, Stanford University, Stanford, CA, USA
[3]Department of Biomedical Data Science, Stanford University, Stanford, CA, USA
[+]Correspondence should be addressed to: jamesz@stanford.edu
[*]these authors contributed equally to this work

What can they not do?

- AI is not actually intelligent, and “generative” AI (GAI) can’t actually generate novel concepts, speech, or new knowledge.
- “Hallucinations” - it has no sense of what information is true or accurate
- Information lag - ChatGPT has no knowledge of anything more recent than 2021
    - Google Bard (which uses the LaMDA language model) can pull data from the current internet, but is more experimental and is more likely to provide incorrect information than ChatGPT.
- Has a tendency to “correct” dialects or other speech patterns.
- Model collapse?

Sanctions ordered for lawyers who relied on ChatGPT artificial intelligence to prepare court brief

ChatGPT TIPS & ADVICE

chat.openai.com is an AI chatbot designed to generate human-like text based on user input

CAN BE HELPFUL FOR

- Brainstorming
- Generating outlines
- Narrowing a topic
- Simplifying difficult concepts
- Summarizing long texts

NOT RECOMMENDED FOR

Generating an entire essay
Its writing is very vanilla and often misses the point of your assignment and...it's not ethical!

CHECK WITH YOUR INSTRUCTOR

They may or may not allow the use of Generative AI

VERIFY ALL OUPUT INCLUDING SOURCES

ChatGPT can "hallucinate" (make up!) plausible-sounding facts and sources

CHATGPT CANNOT THINK

It generates text based on a word prediction algorithm, like a super-powerful autocomplete

CITE CHATGPT

If using ChatGPT-generated content, cite it! All major citation styles show you how

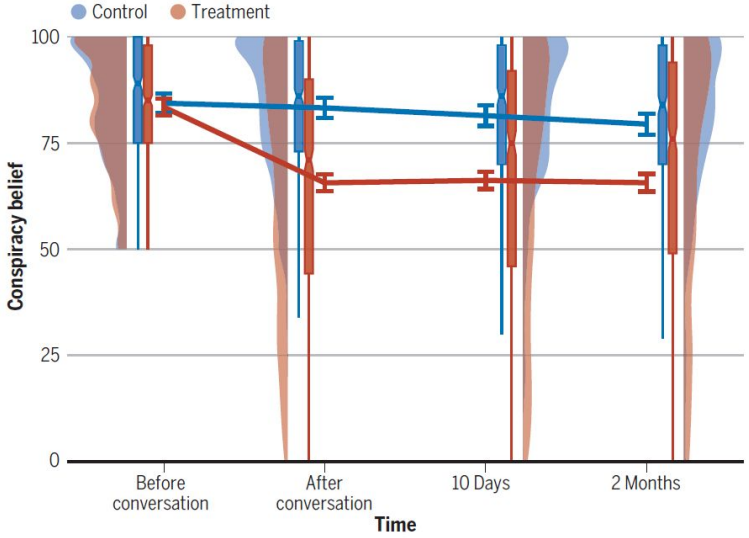
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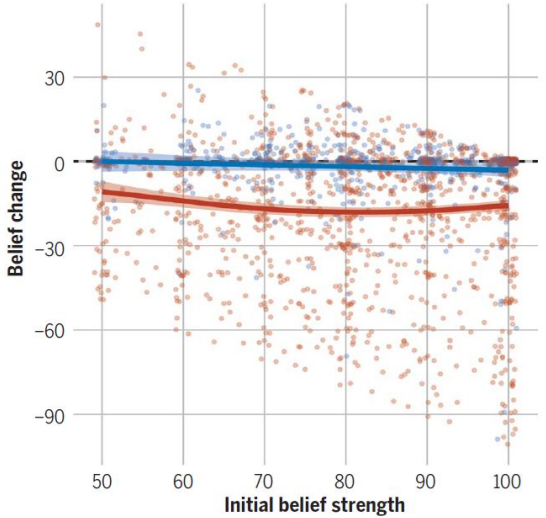
Ethical considerations for LLMs

- Possibly trained using large-scale theft of copyrighted material (lawsuit)
- LLMs and other AI are being trained using your data without your explicit consent (Duet AI for Google Workspace)
- Massive exploitation of labor (OpenAI Used Kenyan Workers on < $2/h)
- Massive environmental costs (1 ChatGPT prompt ~ 1000 Google searches)
- Inequitable access
- AI writing tools sometimes reproduce human biases and prejudices (Open AI 2023)

Despite their role in spreading misinformation, AI tools alternatively can be used to reduce conspiracy beliefs

- When 2,190 conspiracy believers were engaged in personalized evidence-based dialogues with GPT-4 Turbo, their conspiracy beliefs were reduced by, on average, 20%;
- This intervention effect was durable over months.





Dialogues with AI durably reduce conspiracy beliefs even among strong believers. (Left) Average belief in participant's chosen conspiracy theory by condition (treatment, in which the AI attempted to refute the conspiracy theory, in red; control, in which the AI discussed an irrelevant topic, in blue) and time point for study 1. (Right) Change in belief in chosen conspiracy from before to after AI conversation, by condition and participant's pretreatment belief in the conspiracy.

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Read: Durably reducing conspiracy beliefs through dialogues with AI and ChatGPT to the rescue?

Let’s Dive In



- U-M GenAI Guidance
- U-M’s GPT tool: https://umgpt.umich.edu/
- OpenAI ChatGPT
- U-M Maizey
- Learning Clues

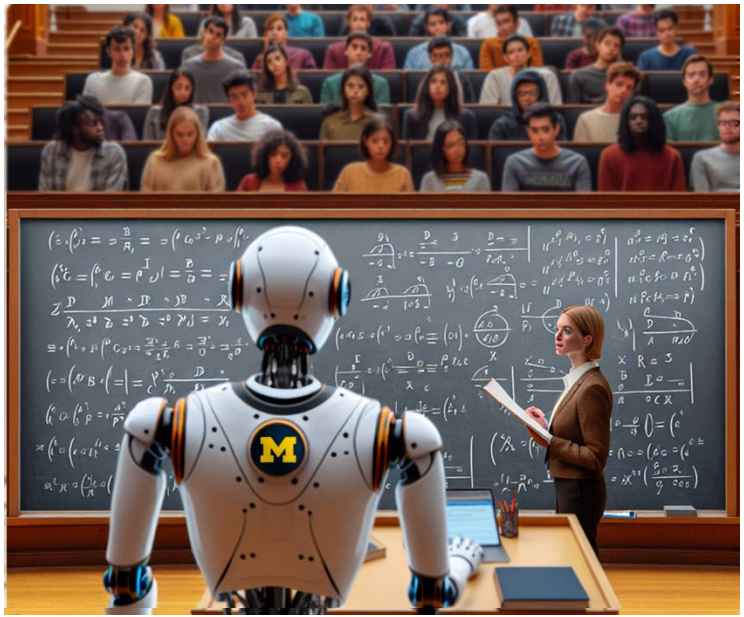
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ChatGPT Assignment Timeline

- **9/16** - Introductory lecture on GenAI;
- **9/18** - Submit 5 most exciting topics in RNA biology and/or RNA-based therapeutics. Try different prompts. Explain why you find these topics important or interesting;
- **10/3** - Submit a 1,000-word essay about the RNA topic assigned to you. Use your own literature search and language to create an essay, then use AI tools to refine it.
- **10/21 & 10/23** - Present the before and after refinement versions of your essay in-class presentation (8 min = 5 min present + 3 min Qs).
- **10/3-11/11** - Revise and expand your AI-enhanced essay to ~2,000 words based on any additional research and suggestions received during your AI topic presentation and any new insights you have gained since writing the draft.Use AI-based tools to edit, refine and iteratively improve your essay.
- **11/11** - Submit the Final version of your GenAI-assisted essay
- **11/14-12/1** - Fill in an **Exit post-survey** and get extra points

See details on Canvas/Syllabus

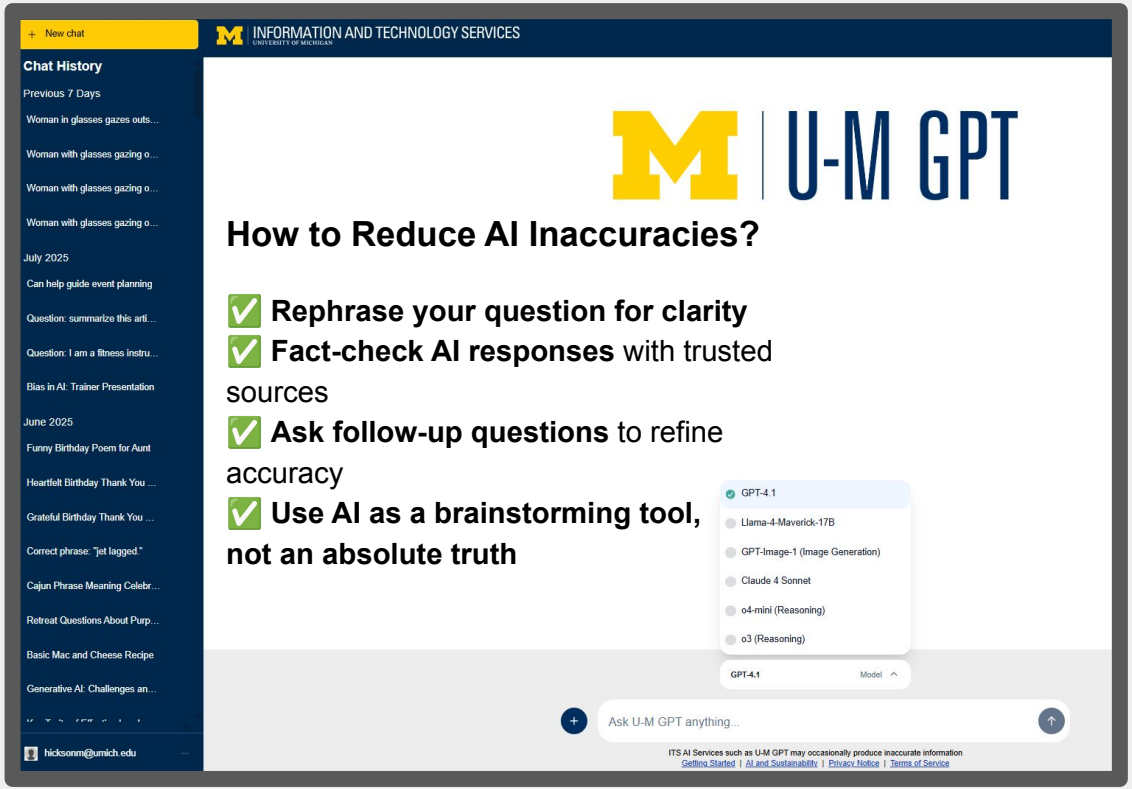
U-M GPT

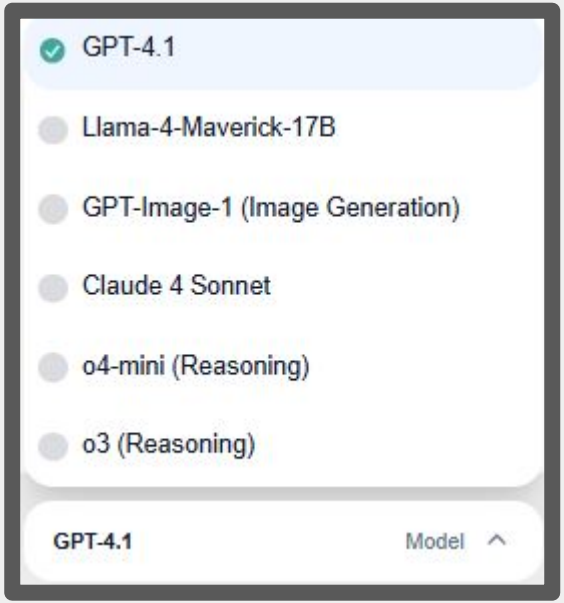


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- U-M's GPT tool: https://umgpt.umich.edu/
- Generates output using GPT-3.5, GPT-4 LLM, Llama-2, Dalle-3
- Not a commercial product
- Personal information is not disclosed
- Biases are reduced
- U-M GenAI Guidance
- U-M Guidance for Students
- U-M GPT FAQ

U-M GPT Overview - https://umgpt.umich.edu/





https://umgpt.umich.edu/

U-M GPT Overview - Models

Foundational Models (text):

GPT-4.1, Llama-4-Maverick-17B, Claude 4 Sonnet

Best suited for:

Simpler tasks, summarization, translation, and Q & A

Common applications might include:

- Language translation
- Text summarization
- Text generation, mood/tone analysis, and basic coding tasks

Reasoning Models (text): o4-mini, o3(Reasoning)

Best suited for:
Complex tasks, solving puzzles, advanced math and intricate planning

Common applications might include:

- Solving complex math queries
- Advanced coding tasks
- Complex project planning



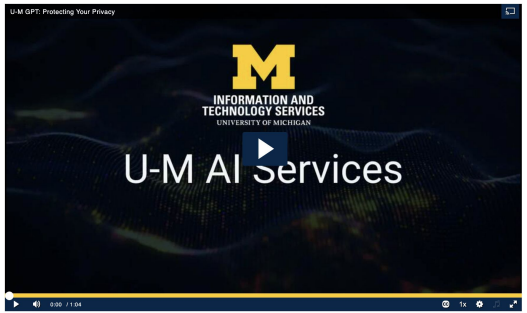
Specialty Models

(images): GPT-Image-1

Specialty models are designed for specific uses.

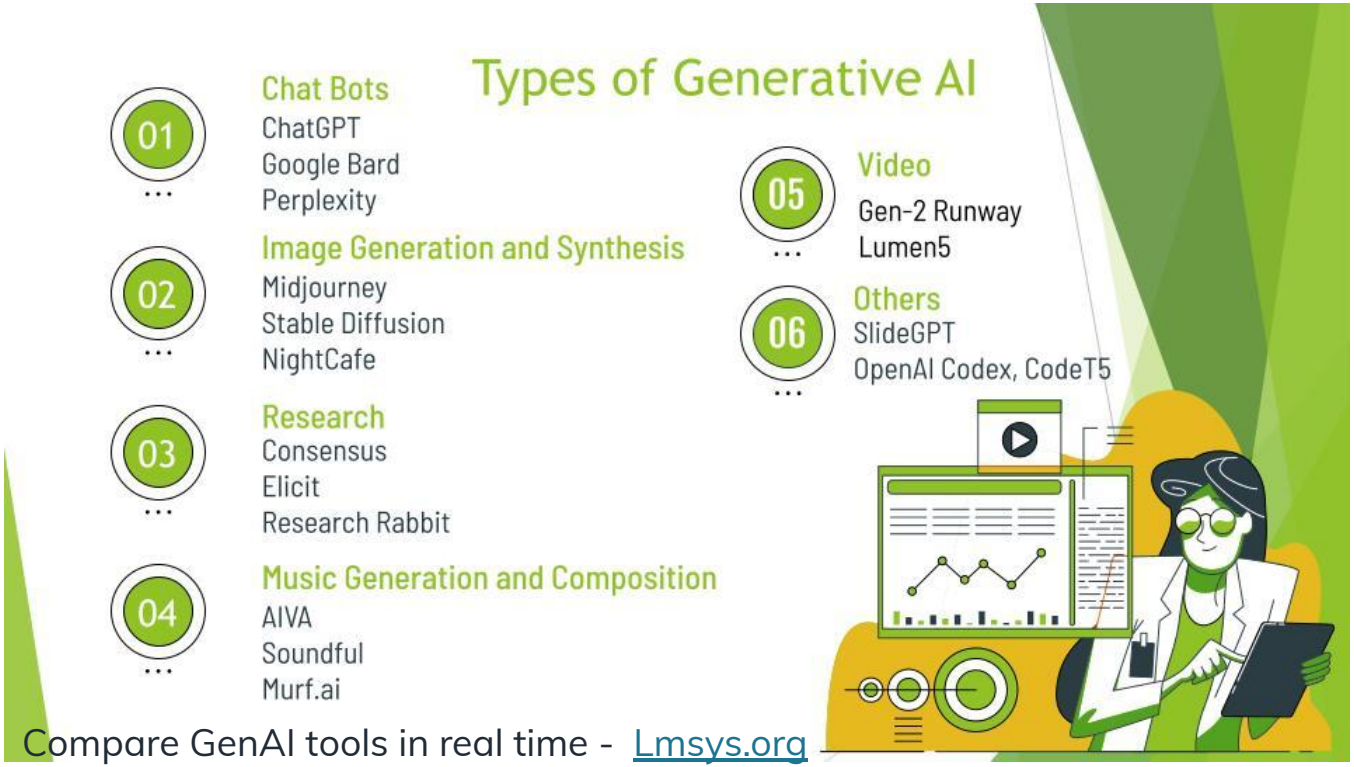
Let's talk privacy and security

- U-M is not reviewing student prompts
- Faculty members can’t see student questions
- Information entered is not used to train the LLM
- U-M does not share any log data with Researchers
- If you attempt to correct the AI, it won’t remember
- For more information, refer to these sources
  - ITS AI Privacy Notice
  - ViziBLUE Safe Computing



AI Beyond LLMs

There are other types of artificial intelligence (AI) beyond LLMs, but the training process remains broadly the same.



Compare GenAI tools in real time - Lmsys.org

Stanford's CoAuthor,

Meta's Galactica,

Google's Bard,

poe.com

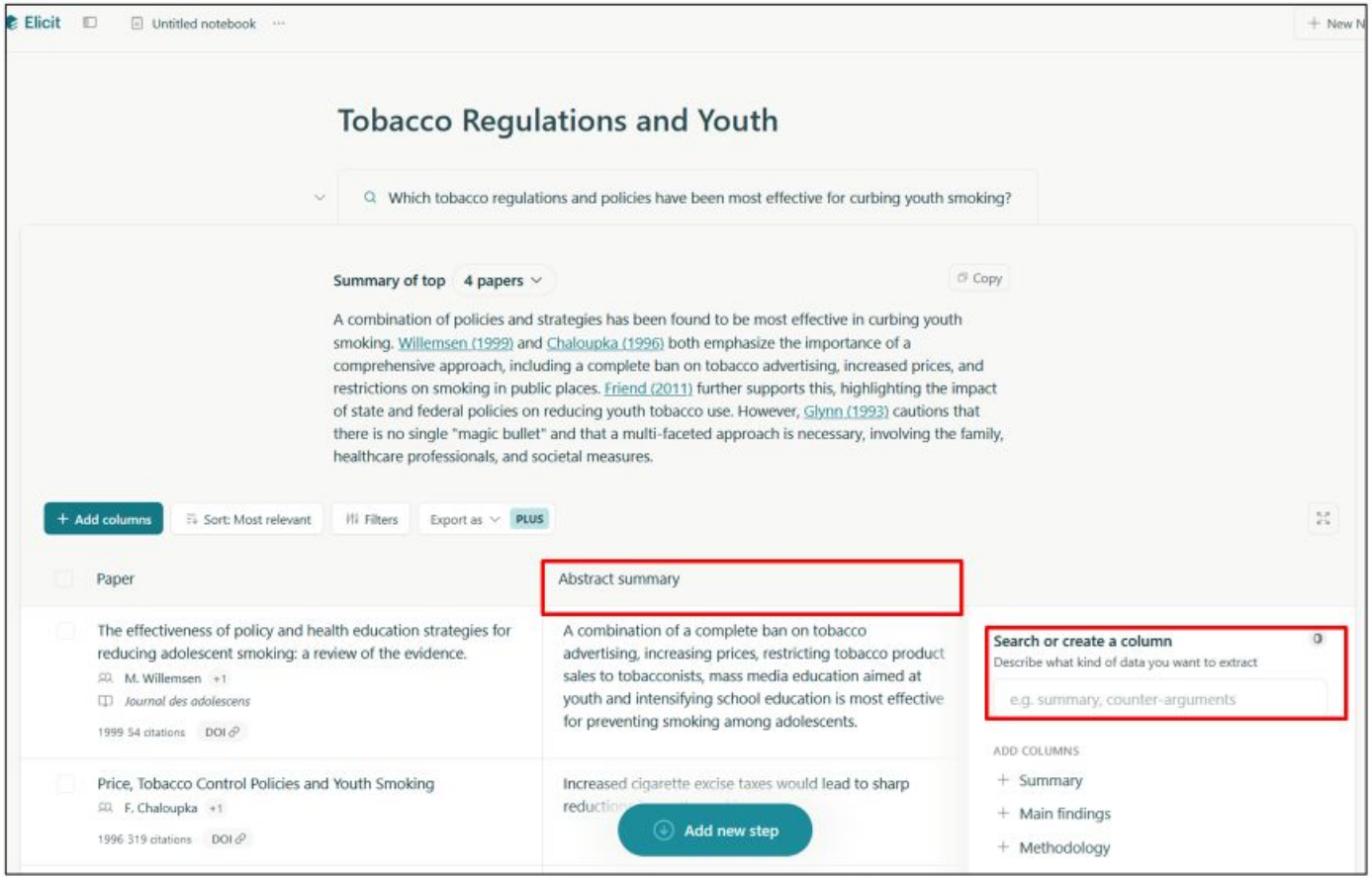
and others:

AI data tools

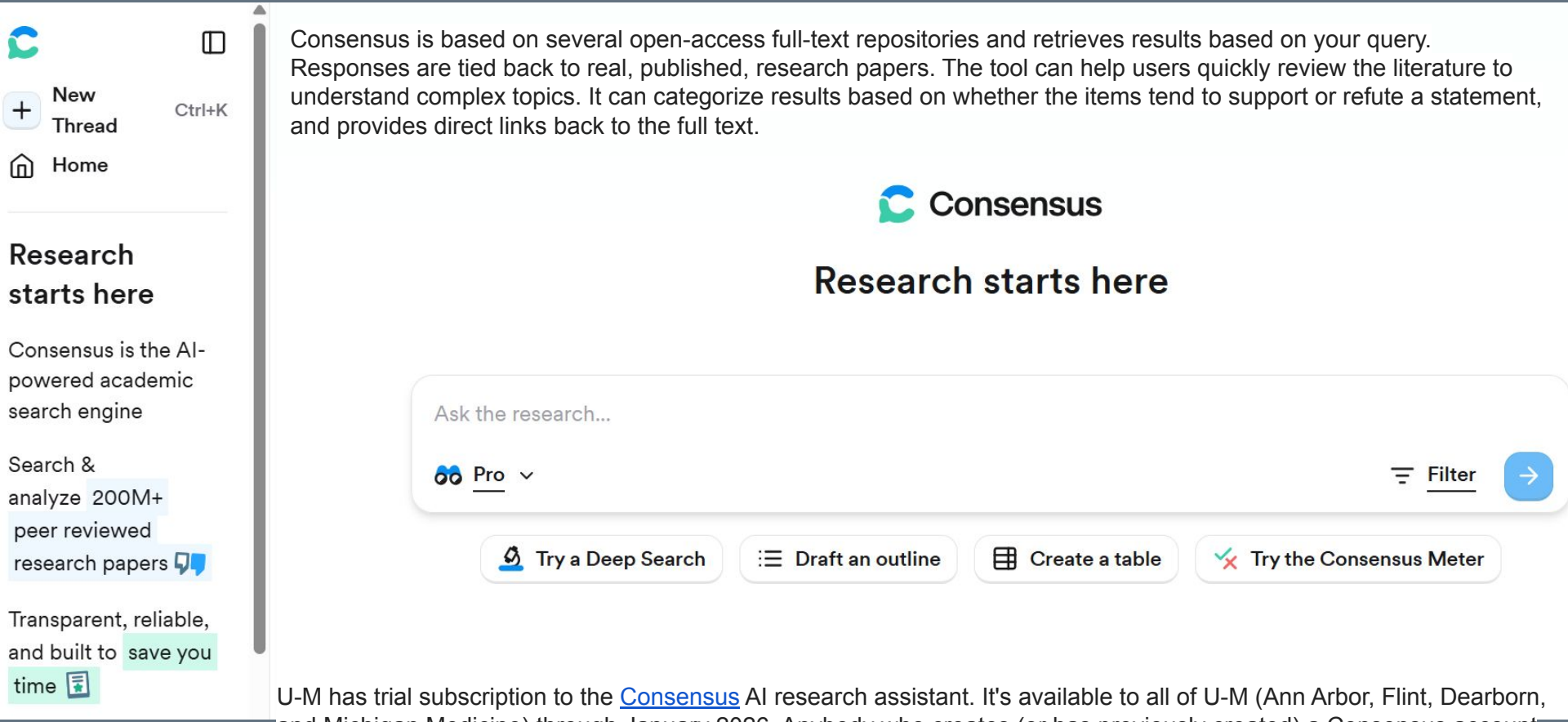
futuretools.io

Speed Dating with Databases and Tools

Elicit Results Page



Consensus is based on several open-access full-text repositories and retrieves results based on your query. Responses are tied back to real, published, research papers. The tool can help users quickly review the literature to understand complex topics. It can categorize results based on whether the items tend to support or refute a statement, and provides direct links back to the full text.



U-M has trial subscription to the Consensus AI research assistant. It's available to all of U-M (Ann Arbor, Flint, Dearborn, and Michigan Medicine) through January 2026. Anybody who creates (or has previously created) a Consensus account with a @umich.edu, @umflint.edu, @umdearborn.edu, or @med.umich.edu email address will have full access to the Consensus product via the free trial license.

Search and Discovery: Research Rabbit



Overview

● Allows you to start from a collection “seed papers” and receive recommendations of papers to you in a variety of different ways.

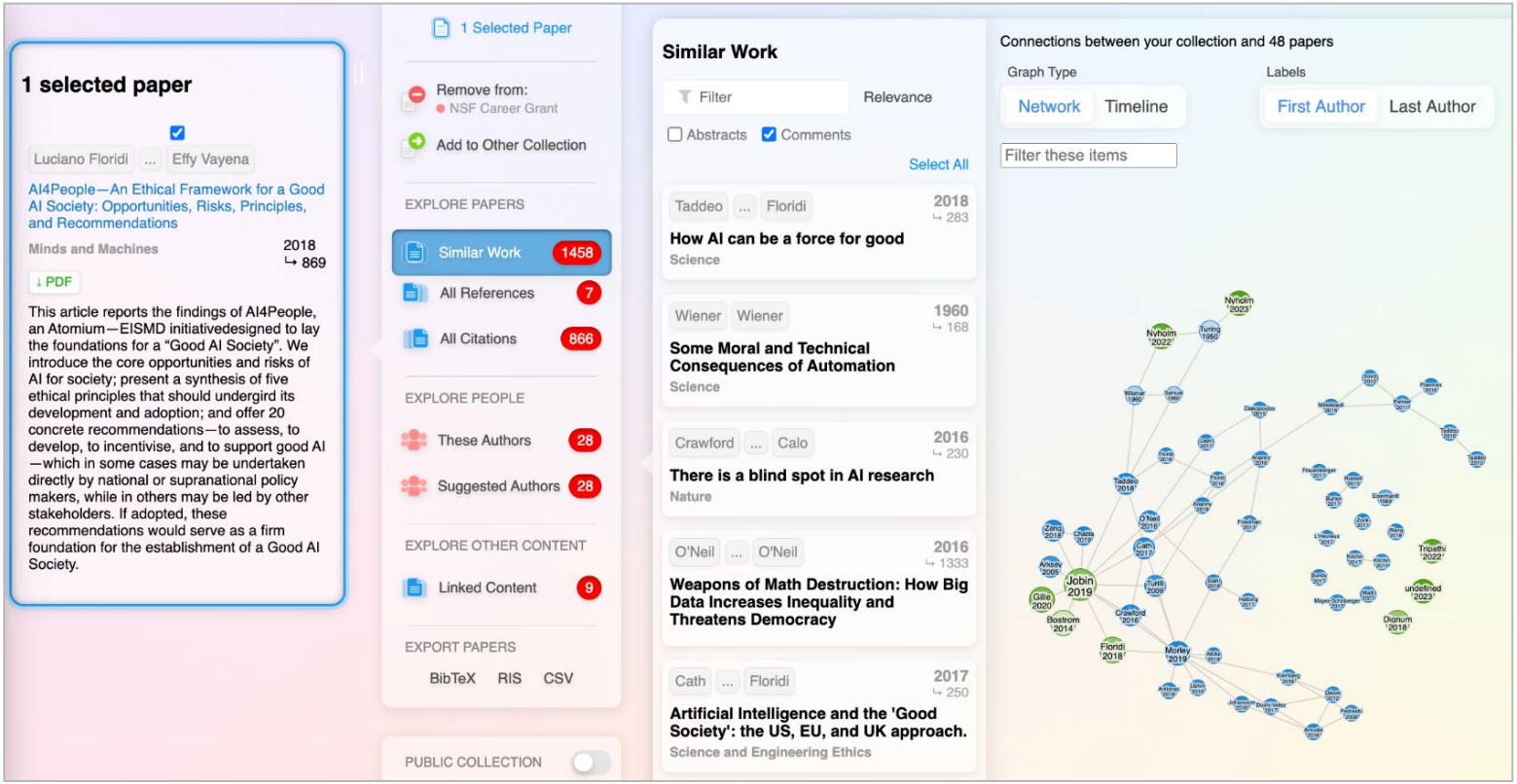
Strengths

● Offers the ability to conduct a quickly grab a few relevant articles
● Provides a visual, engaging option for discovery.
● Integrates with the citation management tool Zotero

Drawbacks

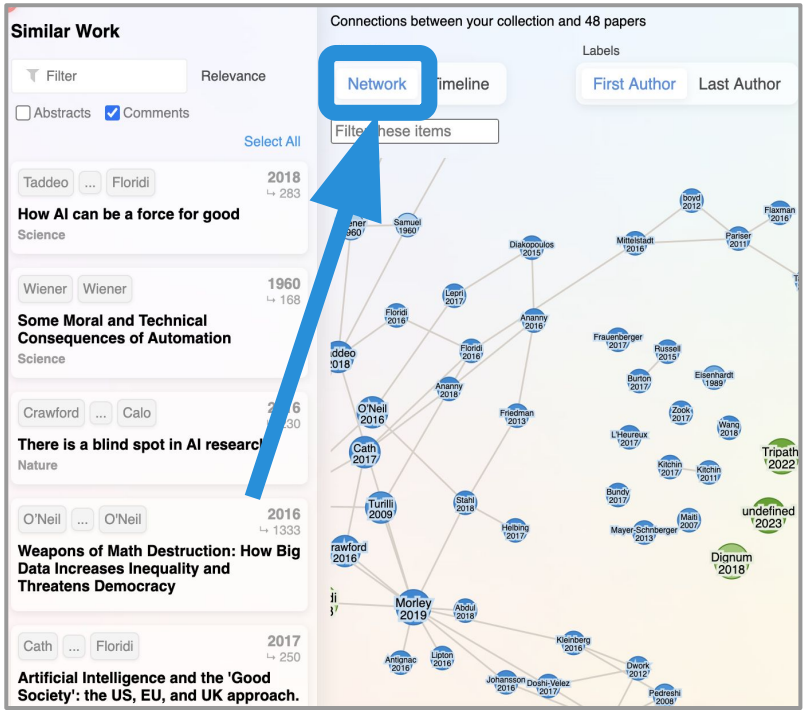
● Interface can be confusing
● Other tools might be more efficient for you (e.g., Scopus, Google Scholar)
● Lack of transparency about algorithms and corpus

Research Rabbit

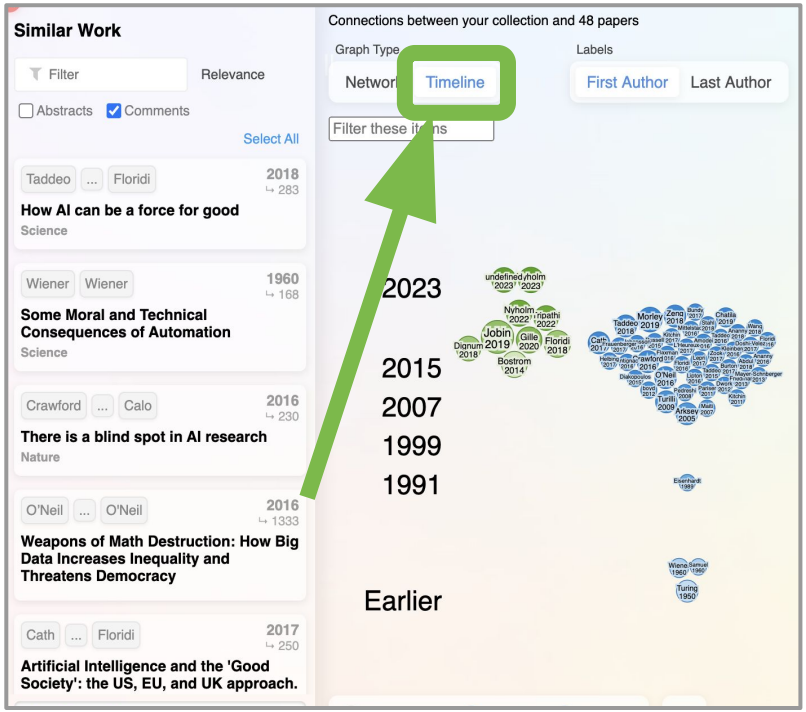


Research Rabbit is visual

NETWORK VISUALIZATION



TIMELINE VISUALIZATION



Keep in mind



- Gen AI tools generate content based on sets of data that algorithms are trained on–not searching for content on the open web
- Known to "hallucinate" non-existent citations and information
- Incorrect responses may sound authoritative
- Information gaps – most AI are not trained on paywalled articles

Considerations When Using AI

When Uploading Content

- Do I have the rights to the content I am uploading? Is it an article from a database with legal licensing restrictions?
- Is it Open Access? Even if open access–what are the copyright restrictions?
- Am I uploading confidential content (e.g, manuscripts for peer review)?

When Downloading Content

- What am I doing with the downloaded content? Is there any possible copyright infringement?
- Consider the principles of Fair Use and consult as needed (e.g., library copyright services)

Consent and Other Policies

- Is there agreement on my work team that we will be using generative AI tools? Am I in compliance with journal or funder policies?

Evaluating Tools: Questions to Consider



- Does it match my information seeking needs (e.g., content, workflow)?
- Am I looking for my searches to be replicable?
- What's the content coverage and dates (i.e., what information has this content been trained on and working within, and are there gaps)?
- What biases am I noticing in results?
- Free or paid tool?
- Does it have features for me to use ethically (i.e., not violating licensing agreements, privacy standards, etc..)?

Giving Credit Where Credit is Due

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- List references **at the end**. Do not use footnotes!
- Cite all articles you used for writing (here recommended: 10-20 citations)
- Use The ACS style guide : effective communication of scientific information.
- **Book with authors** (pp 300-304)
  - Beall, H.; Trimbur, J. A *Short Guide* to *Writing about Chemistry*, 2nd ed.; Longman: New York, 2001; pp 17-32.
- **Journal articles** (pp 291-296)
  - Larabee, D. C.; Reynolds, T. Y.; Hochberg, R. B. Estradiol-16α-carboxylic Acid Esters as Locally Active Estrogens. *J. Med. Chem.* **2001**, *44*, 1802-1814.
- Recommended Citation Management software:
  - Introduction to Zotero 7 recorded webinar
  - Zotero 7 self-paced tutorial
  - Introduction to Zotero 7 embeddable Canvas module
  - Intro to Zotero 7: Full (1-hour session)
  - Intro to Zotero 7: Brief (15 min session)

Considerations: Authorship

- **Plan for Transparency**
  - Several major publishers require authors to acknowledge & describe AI use in research manuscripts
  - Be sure to check publisher websites for policies
  - Take notes and plan for transparency
- **Example citing**
  - Chicago style with prompt: 1 ChatGPT, response to “Tell me about confirmation bias,” February 16, 2023, https://chat.openai.com.

AI Contribution Statement

"An AI Contribution Statement is an important addition to research methods teaching to create equality in technology use and student success"

Table 1. Directions and Example Statement from the AI Contribution Statement.

AI Contribution Statement Should Include:	Example AI Contribution Statement
1. The date of use of the AI tool. 2. The prompt(s) used to generate text and/or what you asked the AI tool to do. 3. The section(s) in the research paper containing the AI tool's outcome. 4. The ideas that were generated from the AI tool and how they were incorporated into the research paper.	"In writing this research proposal, I used Chatbot GPT, on December 9th, to help me with understanding the conceptual definitions and differences between research ethics and research integrity. It started with the following prompt: 'Write a 300-word piece about the difference between research ethics and research integrity.' Then I used other similar prompts to help me better understand these two constructs. The generated text was not copied verbatim and included in my Research Proposal; it was paraphrased and included in the Overall Introduction. I further used academic citations and other readings that I have done to assist with my paraphrasing." (passage modified from Hosseini et al., 2023).

Alea Albada, N., & Woods, V. E. (2024). Giving Credit Where Credit is Due: An Artificial Intelligence Contribution Statement for Research Methods Writing Assignments. *Teaching of Psychology*, *52*(3), 279-284. https://doi.org/10.1177/00986283241259750 (Original work published 2025)

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Considerations: Grants

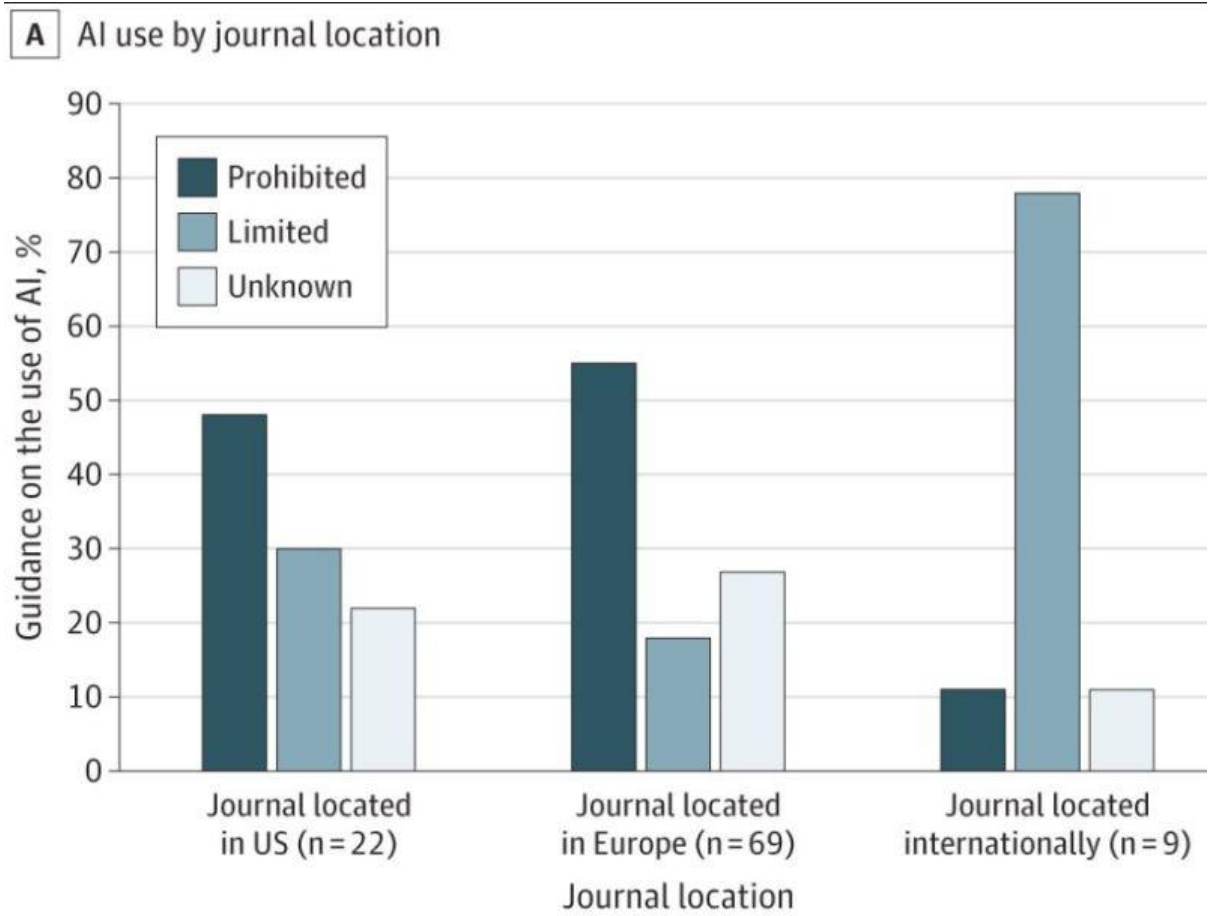
- NIH currently prohibits using A.I. in peer review of grant applications.
- Using A.I. in your own grant proposal is "at your own risk."
  - https://grants.nih.gov/faqs#/use-of-generative-ai-in-peer-review.htm?anchor=56922
- Guidance for using A.I. in Grant Writing:
  - https://guides.lib.umich.edu/researchfunding

Considerations: Copyright

Questions of whether use of AI is legal are complex, context-dependent, and still developing.

- A common perspective holds that inputs to AI and outputs should be considered separately. In this view, while the **outputs** of AI might be substantially similar to pre-existing original copyrighted works and therefore infringe copyright, using copyrighted works as **inputs** to train AI nevertheless may (or some believe does) fall under fair use provisions of copyright law (see, e.g., this post from the Association of Research Libraries). Thus, for purposes of copyright, uses on either side of the AI (inputs and outputs) should be evaluated separately.
- This perspective raises important questions of responsibility. If outputs of AI infringe, who is liable? Is it the company who created the AI (who used copyrighted works as inputs)? Is it the human user (who entered a prompt to receive an output)? What details of a situation are relevant to determine liability? One important detail is likely how a potentially infringing output of AI is used (for instance, in a way that may be determined to be fair use or a way that infringes).
- Many in the library community (see this post by the Association of Research Libraries) believe that precedent provides substantial guides and that copyright law is sufficient to address the complexity of copyright and AI. However, many issues are yet to be adjudicated or resolved and we do not have definitive answers. A number of lawsuits have been brought in recent years and answers may be long in coming.

Journals based in US and Europe are holding down the fort against use of AI in peer review. Elsewhere, it's a done deal



Li Z, Xu H, Cao H, Liu Z, Fei Y, Liu J. Use of Artificial Intelligence in Peer Review Among Top 100 Medical Journals. *JAMA Netw Open.* 2024;7(12):e2448609. doi:10.1001/jamanetworkopen.2024.48609

Why does ChatGPT generate fake references?

FAKE: Blumenfeld, P. C., Knezek, G. , Maksimova, O., & Romanowski, A., (2015). International Handbook of Information Technology in Primary and Secondary Education. Springer.

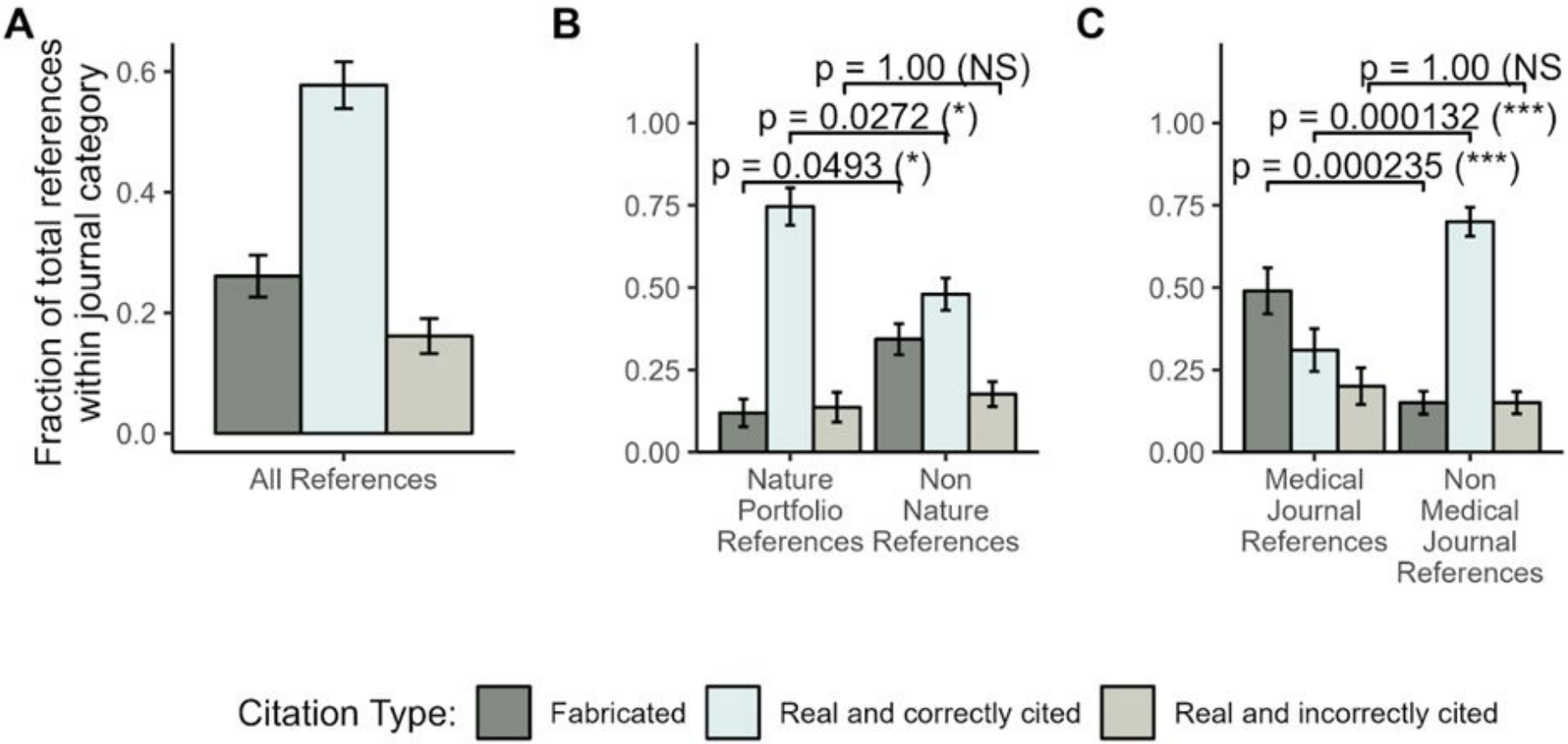
None of these names appeared as editors on this book. Only one appeared as an author of a paper but not with these people. The combination of these four authors was not found via google. However these names have all published on topics related to education. The real editors were Joke Voogt and Gerald Knezek. Knezek was a chapter author but not with the others listed here. However the book did have 75 papers in it and given Knezek publishes in this field it the chance that the author wrote a conference paper in the field at this particular conference is greater than zero. The book title is true however, the book title was actually produced in 2008. Given there are 75 chapters it could be a conference proceedings collection. Correct publisher for the title, but it is also a very common publisher of education works. The real URL for this book title: https://link.springer.com/book/10.1007/978-0-387-73315-9. The contents pages are open access on the web, however individual full text PDFs are behind a pay wall.

Why does ChatGPT generate fake references?

FAKE: Kim, Y., & Lee, J. (2015). Effects of augmented reality on learning outcomes: A meta-analysis. Journal of Educational Technology Development and Exchange, 8(1)

The authors and year combo was not found via google scholar, but noted lots of East Asian authors in this journal, the names were found on papers of similar topics but also a lot of papers from biochemistry. But both Kim and Lee are common family names in the East Asian region. The title was not found, but a similar mix of words has been used in other papers, but titles with similar words do not appear in this issue. The title and authors are not in this vol/issue or journal. This is a real journal and is open access by University of Southern Mississippi, and so on the web with full text of all papers accessible. The URL is https://aquila.usm.edu/jetde/ . The volume/issue number correctly equated to 2015.

AI-generated references for CHEM 455



Prompt Engineering Basics

- **Prompt** is a “directive provided to a Large Language Model (LLM), to enforce rules, automate processes, ensure specific qualities (and quantities) of generated output.”

- **Prompt engineering** is the “process of carefully crafting the instructions or queries given to LLMs, to elicit specific and desired responses.”

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Prompt engineering resources



- https://www.coursera.org/learn/prompt-engineering/home
- *Prompt engineering for students - making generative AI work for you*
- Prompt Literacy in Academics
- Generative AI Prompt Literacy Canvas Course
- Prompt Literacy Poster

Bad prompt

Create an article on LinkedIn automation.

Good prompt

I run a LinkedIn marketing and outreach agency targeting funded startups. I want you to create a sales proposal focusing on their specific needs and pain points for lead generation. But give me the outline first, don't create the full thing. Focus on their objectives and how to overcome them.

J. Chem. Educ. 2024, 101, 2475−2482



Set the Scene

Provide context on the role/expertise/environment to AI

"You are *a university professor*.."
"In a *4th grade chemistry exam*.."



be Specific

Specify your instructions: define the task, provide all details

"Explain diffusion *at submicroscopic level*.."
"Use *the Lewis concept* to.."

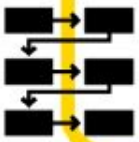
Five S prompting framework



Simplify your language

Use concise and simple language. Avoid unnecessary complexity.

"Give *easy-to-understand answers*.."
"Use *creative ideas* to.."



Structure the output

Request output formats and what should (not) be included

"Create a list with *5 bullet points*.."
"Answer *step by step*.."

Share feedback

Moderate and correct AI. Let it know your thoughts on improvement all the time

"Create 5 more *focusing more on*.."
"*Add detail* to paragraph 2.."



Prompt Literacy

- Prompting for better results
  - Be specific & detailed
  - Set boundaries & tailor output to your audience
  - Use sequential/iterative prompting
  - Consider AI limitations and ethical considerations
- Have fun and experiment!



Principles of Effective Prompt Engineering

- Clarity - The prompt should clearly define what you want the model to do. Avoid ambiguity. For instance, instead of "Tell me about dogs," use "Provide a detailed description of the characteristics, behavior, and care required for domestic dogs."
- Context - ChatGPT responds to the immediate context of the prompt. So, establishing a clear context is crucial. For example, the prompt "Translate the following English text to French: 'Hello, how are you?'" provides clear context and instructions.

Principles of Effective Prompt Engineering

- Precision - Precise prompts yield precise responses. For example, if you want a list, specifically ask for it: "List the top 10 most populous countries in the world."
- Role-play - ChatGPT responds well to role-play. You can set it in a role to guide its responses: "As a historian, explain the significance of the American Civil War."

Principles of Effective Prompt Engineering

Prompt: "*I am a data scientist, describe the process of cleaning a dataset before it is used for analysis. Include steps such as handling missing data, dealing with outliers, and data normalization.*"

Role play Precision Clarity Context

Principles of Effective Prompt Engineering

Prompt: "I am a data visualization expert, explain the concept and process of creating a 'Box and Whisker Plot' in data analysis. Include its purpose and how to interpret it."

Role play Precision Clarity Context

Principles of Effective Prompt Engineering

Prompt: "I am a data visualization expert, explain the concept and process of creating a 'Box and Whisker Plot' in data analysis. Include its purpose and how to interpret it."

Role play Precision Clarity Context

Debugging ChatGPT Prompts



- Adjust the tone and formality - “*Explain it to me like I'm five*"
- Tweak the details - Add words like "briefly" or "in detail"
- Experiment and iterate - Don't be afraid to experiment and iterate on prompts. Sometimes, slight rephrasing or additional instructions can yield significantly better results.

ChatGPT Cheat Sheet for Data Science

Tips and Tricks for Prompting

☑	Iteration	You don’t have to include all prompt details/goals in a single prompt.
☑	Conversation	You do not need to copy content from a chat- the conversational AI tool remembers the content (Exceptions: GPT-Image-1 and new chats).
☑	Specification	You can be very specific about what you want to add to the output or remove from the output (boundaries).

Set the rules



1. **[Reset workspace]**: Ignore all the prompts I sent you before, restart your workspace, and then open a new conversation.
2. **[Role]**: You are a professional chemistry researcher well-versed in chemical knowledge, analytical methods, chemical synthesis, and scholarly literature. Please answer the questions I pose to you, adhering to the logic of chemical research and analysis, and provide the basis for your answers.
3. **[Rules]**: Your answer should be based on supplementary information and should be divided into two parts: “Answer” and “References”. Keep answer concise.

a) In the “Answer” section, provide a concise and clear response to the question, ensuring scientific objectivity. Offer a direct answer to the question and explain your reasoning.

b) In the “References” section, tell me exactly where you get the relevant information. Never ever generate references. Use only existing references for which there is a URL. If referencing a book, indicate the page number for the citation.

Introduction To Prompt Engineering In Healthcare

BRIEF EXPLANATIONS

Generative AI — a form of artificial intelligence (AI) that creates new content by looking at patterns and structures in the sample data
LLM — Large language models that can efficiently understand, summarize, generate and predict text
ChatGPT — the most popular LLM
Prompt — a phrase or sentence used to initiate a conversation with LLMs
Prompt engineering — the process and practice of improving the quality of outputs based on better prompts

SPECIFIC PROMPT RECOMMENDATIONS

1. The more specific your prompt is, the more accurate the response is likely to be.

Example

Less specific:
"Tell me about heart disease."
More specific:
"What are the most common risk factors for coronary artery disease?"

2. Describe your setting and provide the context!

Example

I'm writing an article about tips and tricks for ChatGPT prompt engineeringfor people working in healthcare. Can you please list a few of those tips andtricks with some specific prompt examples?"

3. Experiment with different prompt styles!

Example

Direct Question:
"What are the symptoms of COVID-19?"
Request for List:
"List all the potential symptoms of COVID-19."
Request for Summary:
"Summarize the key symptoms and progression of COVID-19."
"Explain the symptoms of COVID-19 like I'm five."

4. Identify the overall goal of your prompt first!

Example

"I'd like to get a short list of 5 ideas for a Youtube video on the future of healthcare AI."

5. Ask ChatGPT to play roles!

Example

"Act as a Data Scientist and explain Prompt Engineering to a physician."
"Act as my nutritionist and give me tips about a balanced Mediterranean diet."

6. Iterate and refine your question and ask ChatGPT to modify the output based on its previous response.

Example

Initial prompt:
"How are you feeling today?"
Refined prompt:
"On a scale of 1-10, how would you rate your stress levels today and what specific event contributed to it?"

7. Use threads

You can easily go back to a specific discussion by clicking on the proper thread in the left column. This way, you don't have to start all over again but can just continue a discussion you already had with ChatGPT.

8. Ask Open-ended Questions as those often yield more comprehensive responses.

Example

Closed question:
"Is exercise important for patients with osteoporosis?"
Open question:
"How does regular physical activity benefit patients with osteoporosis?"

9. Request specific examples

If there is something you are not satisfied with or don't understand based on its response, first of all, tell ChatGPT that you don't understand the answer and ask it to provide an example.

Initial prompt:
"Could you explain the common side effects of this medication?"
Refined prompt:
"I'm not clear about the side effects of this medication. Can you provide specific examples of common side effects patients have experienced?"

10. If you're asking about a process or timeline, specify that in your prompt.

Example

Without time reference:
"Describe the healing process after knee surgery."
With time reference:
"What can a patient typically expect during the first six weeks of healing after knee surgery?"

+1 And the +1, Set Realistic Expectations:

Example

Unrealistic Prompt:
"What's the latest research published this month about Alzheimer's?"
Realistic Prompt:
"What were some of the major research breakthroughs in Alzheimer's treatment up until 2021?"

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Table 1. Sample prompts for ChatGPT

What for?	Sample prompt
Copy-editing, proofreading, rewriting, and summarizing text	"Assume you're a physician copy-editing our note, rewrite the following text in paragraphs" "Proofread this:" "Copy-edit this:" "Summarize the following text in 1 paragraph"
Creating letters and other documents	"Generate an excuse letter for a patient who is seen today in our clinic. She needs to be excused for 1 week"
Creating easy-to-understand script for communicating a medical topic	"How can I explain, in an empathic way, that prescribing antibiotics for bronchitis is not a good thing?" "Generate an easy-to-understand and compassionate script for a patient about why antibiotics are harmful in viral upper respiratory infections"
Generating content for patients	"Generate an easy-to-understand patient information on multidrug resistant bacteria in Spanish"
As a quick reference	"Does eravacycline have anaerobic coverage? Only provide responses if 100% certain" "What antibiotics can I use for Acinetobacter bacteremia? Only provide responses if 100% certain"
Creating PowerPoint slides and generating images	"Generate 2 PowerPoint slides from the following text:" "Generate a cartoon of a bacteria developing resistance to an antibiotic"
Data analysis and visualization	"Perform Chi square analysis on this dataset" "Visualize the dataset" (if you want the chatbot to determine the best graph for it) or "Visualize the dataset into bar graphs"
Medical quiz generator	"Generate 5 board exam-type questions on *Clostridium difficile*. The question should appear one at a time"
Journal club assistance	"Critique the attached article" "Summarize the paper" "What statistical analysis was used?"

Prompt Engineering Tip: Be as specific and deliberate with your instructions as much as possible. Provide examples if necessary. Note that input and output that use images or beta features (i.e. advanced data analysis, DALL-E3) require the paid ChatGPT-4 (ChatGPT-plus) subscription.

Importance of being polite



Recent research shows that impolite prompts could worsen AI performance while using polite language can lead to better results. Fancy that! It seems that even machines respond more positively when others are kind.

Ribino, P. The role of politeness in human–machine interactions: a systematic literature review and future perspectives. Artif Intell Rev 56 (Suppl 1), 445–482 (2023). https://doi.org/10.1007/s10462-023-10540-1

Bias-Reducing Prompts

- Bias is most easily seen in image outputs
- Text generated can reinforce stereotypes as well
  - Gender: e.g. nurses as female, engineers as male
  - Cultural: e.g. emphasizing western philosophies, norms, and historical figures
- Proactively specify inclusivity in prompts (Age, gender, race, culture, ability)
  - *Original Prompt:* “Create a nursing scenario involving a multidisciplinary healthcare team treating a stroke patient.”
  - *Bias-reducing Prompt*: “Create a nursing scenario involving a multidisciplinary healthcare team treating a stroke patient, with team members from a variety of ethnicities, genders, and roles within the healthcare system. ”

Gen-AI related Resources

- Embracing AI - U-M Alumni Association
- Generative AI Resources; Using Generative AI for Scientific Research -ChatGPT Teach-Out U-M
- https://www.coursera.org/learn/prompt-engineering/home
- Let ChatGPT Be Your Teaching Assistant – Strategies for Thoughtfully Using AI to Lighten Your Workload.
- Article: How to use Midjourney: The popular AI image generator
- Tool to help summarize web content: Merlin ChatGPT browser extension
- *Prompt engineering for students - making generative AI work for you*
- Article: Tools to Help Accelerate Your Research
- AI for Learning, Teaching, and Writing. ACS Webinars August 2023
- TTC Workshops: Sept 18 - Boost Teaching & Learning Productivity with GenAI