

Dealing with LLM's at the LUMC

Bob Siegerink, PhD

b.siegerink@lumc.nl | [@bobsiegerink](https://twitter.com/@bobsiegerink) | bobsiegerink.com



LLM's ARRIVE IN ACADEMIA

generative AI as a blackbox multi-tool that is suddenly "dropped" in our organization



LLM & EDUCATION



LLM & SCIENCE



LLM in disserations



LLM's ARRIVE IN ACADEMIA

generative AI as a blackbox multi-tool that is suddenly “dropped” in our organization



General info - status January 2022

- GPT3 is a third generation AI model for text generation.
- “GPT3” pars pro toto for all variations for AI models that can generate output (text and image) based on (human) input.
- Inputs are given through prompts by the user in natural language, output can be for example pictures or texts.
- Applications are often open source, easy to use interfaces, commercial version exist, often pay for unlimited use.
- All based on stochastic processes - no causal relationships or hard coding present
- Limited hurdles to use in day to day live - output can be delivered in various languages
- Acceleration of development and applications since fall 2022
- I know of several cases where PhD candidates already use GPT3 as a writing aid for some parts of their thesis
- How is GPT3 related to research and teaching activities in academia?

ChatGPT

This is a free research preview.



Our goal is to get external feedback in order to improve our systems and make them safer.



While we have safeguards in place, the system may occasionally generate incorrect or misleading information and produce offensive or biased content. It is not intended to give advice.

Next

ChatGPT

How we collect data



Conversations may be reviewed by our AI trainers to improve our systems.



Please don't share any sensitive information in your conversations.

Back

Next

First warning on january 19th
Privacy, knowledge security, scooping

Q1



Posted by u/nitonitonii 9 months ago



279

OpenAI is not open.



[Other]

Normally, projects with "open" in their name tend to refer that their information will be transparent, usually non-profits, especially within computer science, very often used for open-source programs.

OpenAI has the right to pick the name that they want, but it's kinda misleading for the community.

They are very clear when they call themselves a company:

"OpenAI is an AI research and deployment company. Our mission is to ensure that artificial general intelligence benefits all of humanity. "

According to them, a kind of "ethical oriented company". Although it's hard to find a company that doesn't present itself as a "benefit for humanity".

Do not get confused by their name, OpenAI doesn't want to be like open-source projects, they haven't allowed free access to GPT, DALL-E, or any other software. They are a company with profit motives, even the domain of the website is ".com" for commercial.



86 Comments



Share



Save



Hide

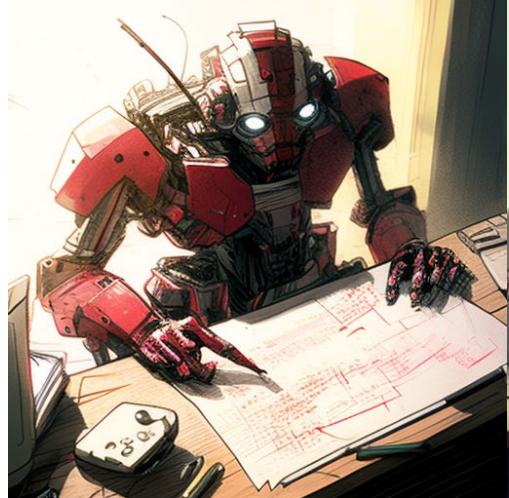
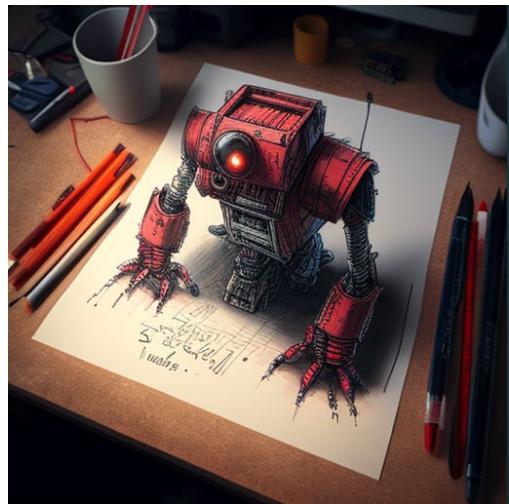


Report

95% Upvoted



a robot sitting at a desk, well lit, correcting a printed text with a red / green pen with many scribbles



Extract associations from training data - “bias”

Extrapolate based on observed probabilities -> “hallucinations”

 schrijf een korte biografische schets van bob siegerink. gebruik 200 woorden, wat zijn achtergrond is, en het onderwerp van zijn onderzoek. 

 Bob Siegerink is een vooraanstaand onderzoeker op het gebied van bloedstolling en trombose. Hij werd geboren in Nederland en ontwikkelde al op jonge leeftijd een passie voor wetenschap en medisch onderzoek. Na het behalen van zijn bachelor in de biomedische wetenschappen aan de Universiteit Utrecht, voltooide hij zijn promotieonderzoek aan dezelfde universiteit.

Siegerink's onderzoek richt zich op het begrijpen van de mechanismen achter bloedstolling en de ontwikkeling van trombose. Hij heeft zich gespecialiseerd in het identificeren van risicofactoren en genetische factoren die leiden tot trombotische evenementen, zoals diepe veneuze trombose en

Send a message. 

ACTION: discussion document “GPT3 and academic dishonesty” send to key stakeholders

GPT3 and research

GPT3 and academia:
introduction

GPT3 and science/authorship

GPT3 and academia:
future outlook and threats

GPT3 and teaching

GPT3 and academia:
further material

Most pictures/screenshot in this presentation contain text and images generated by AI models

QI

Screenshot of discussion document <https://osf.io/a85js>

ACTION: LLM is included in the workshop “scientific conduct” in all integrity classes and in two student/teacher symposia

Actions taken by QI team

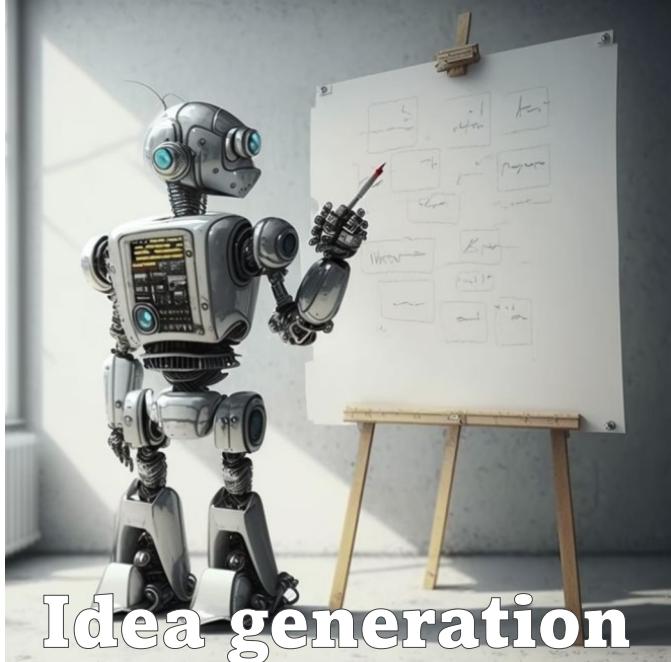
- “GPT3 and academic dishonesty” is discussed in the workshop “scientific conduct” for the LUMC and science faculties - other faculties might follow suit soon.
- A questionnaire on GPT3 and academic dishonesty is currently being developed, and will be send out to 400+ PhD candidates who followed the workshop “scientific conduct” in the last 18 months at the LUMC and science faculty
- GPT3 is being implemented in the assignments “critical and scientific reasoning” as well as “academic development” in year 1 and 2 of the bachelor Medicine. Other programs might follow.
- A blog reflecting on the issue is being written as a joint production of the QI team and the Center for Digital Scholarship.



LLM & EDUCATION

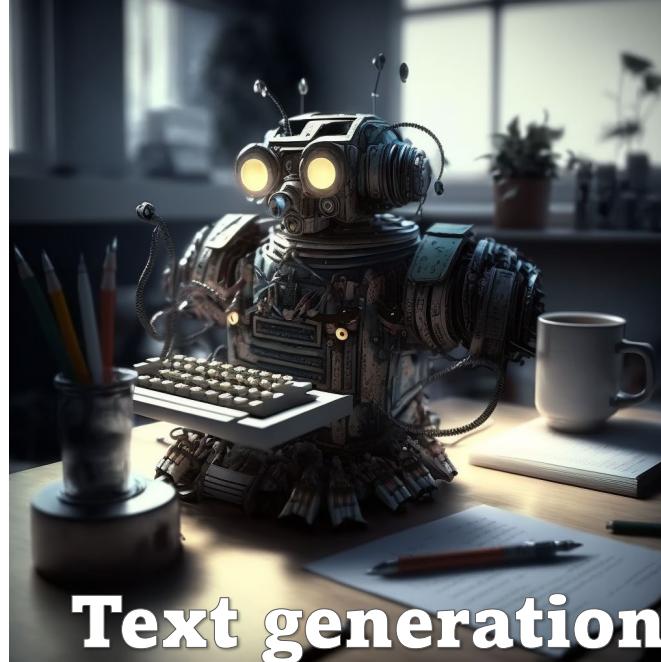


One tool for different writings tasks



Idea generation

Midjourney: a robot standing in front of a whiteboard that has a drawing with a mindmap, the robot holds a pen in his mouth and thinks, photorealistic



Text generation

Midjourney: A robot sitting at a desk writing on a typewriter, large pile of papers on the desk, dim lit office, cup of coffee on the desk, photorealistic



Text correction

Midjourney: A robot as an editor of a scientific journal, photorealistic

Written text as the product

- Text is proof of skill
- Validity of the exam is threatened
- Concepts no different from any other take home writing assignment - threshold and norms will change
- OER might already cover the concept of “own work”
 - does not mean the threat is lessened
 - Demands that you step up your game
- Committee of scientific integrity sees the issue primarily in the education section of our university



Written text as part of a process

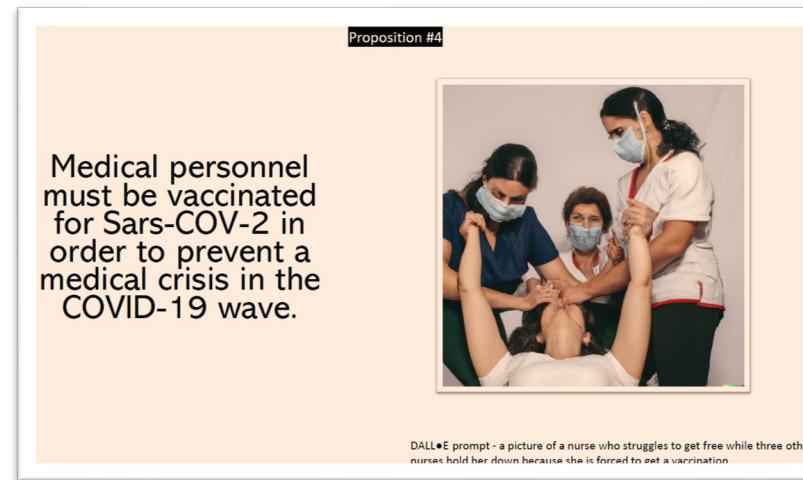
- If text must be proof of skill, then examination in person solves the issue
- Focus shifts to presentations, interactions to evaluate skill etc.
- Isolated approach not the answer
 - Snapshot of knowledge
 - Labour intensive
- Combine written text with small in-person examinations, the process is examined, not the product



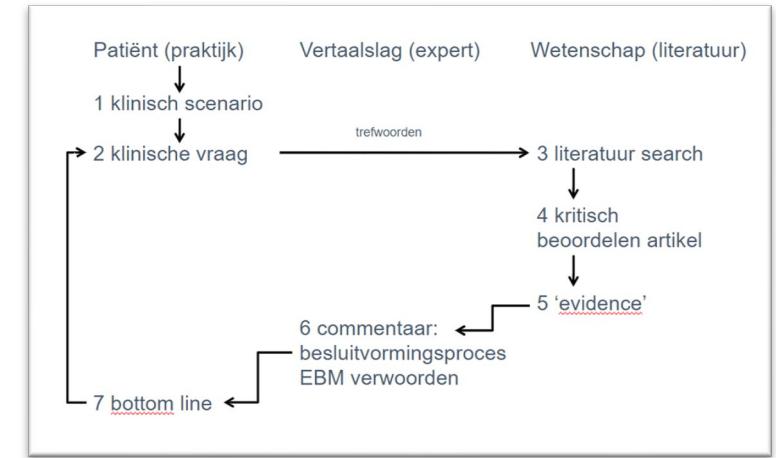
Example: Academic and scientific training BSc GNK LUMC



Year 1



Year 2



Year 3

All three years have a single central theme or activity,
but unit of examination is the process where subtasks are graded by specialists

We are currently considering the use of LLM as a teaching tool



CHAT GPT tijdens de CAT opdracht

Beste Studenten,
wellicht hebben jullie al wel gehoord over chatGPT, een zgn. large language model. Samen met de andere docenten heb ik me erin verdiept en onszelf de vraag gesteld hoe deze nieuwe technologie ons werk (onderzoek en onderwijs) gaat veranderen. We zijn hier nog lang niet mee klaar, maar we hebben al wel duidelijk wat de relatie is tot de CAT-opdracht.

Ons formele standpunt is eigenlijk samen te vatten tot twee punten.

- Vanwege de opzet van de CAT, waarbij een klinische casus de basis vormt voor een kritische beschouwing van enkele artikelen, zullen large language models (LLM) zoals chatGPT niet erg behulpzaam zijn in het schrijven van de CAT opdracht.
- De versie van je verslag dat beoordeeld wordt door je begeleider moet door jouw geschreven zijn; we informeren alle begeleiders dat LLM niet onderdeel vormen van de CAT opdracht.

Maar daar hoort natuurlijk een uitleg bij. Ik heb een video opgenomen waarin ik in 20 minuten die uitleg geef. Als je gebruikt maakt van deze [link](#) (passcode C58vH*bU), krijg je zowel mij als mijn slides te zien. Deze versie is 60 dagen te streamen vanaf nu. Ook heb ik een versie met alleen de slides aangehangen aan dit bericht.

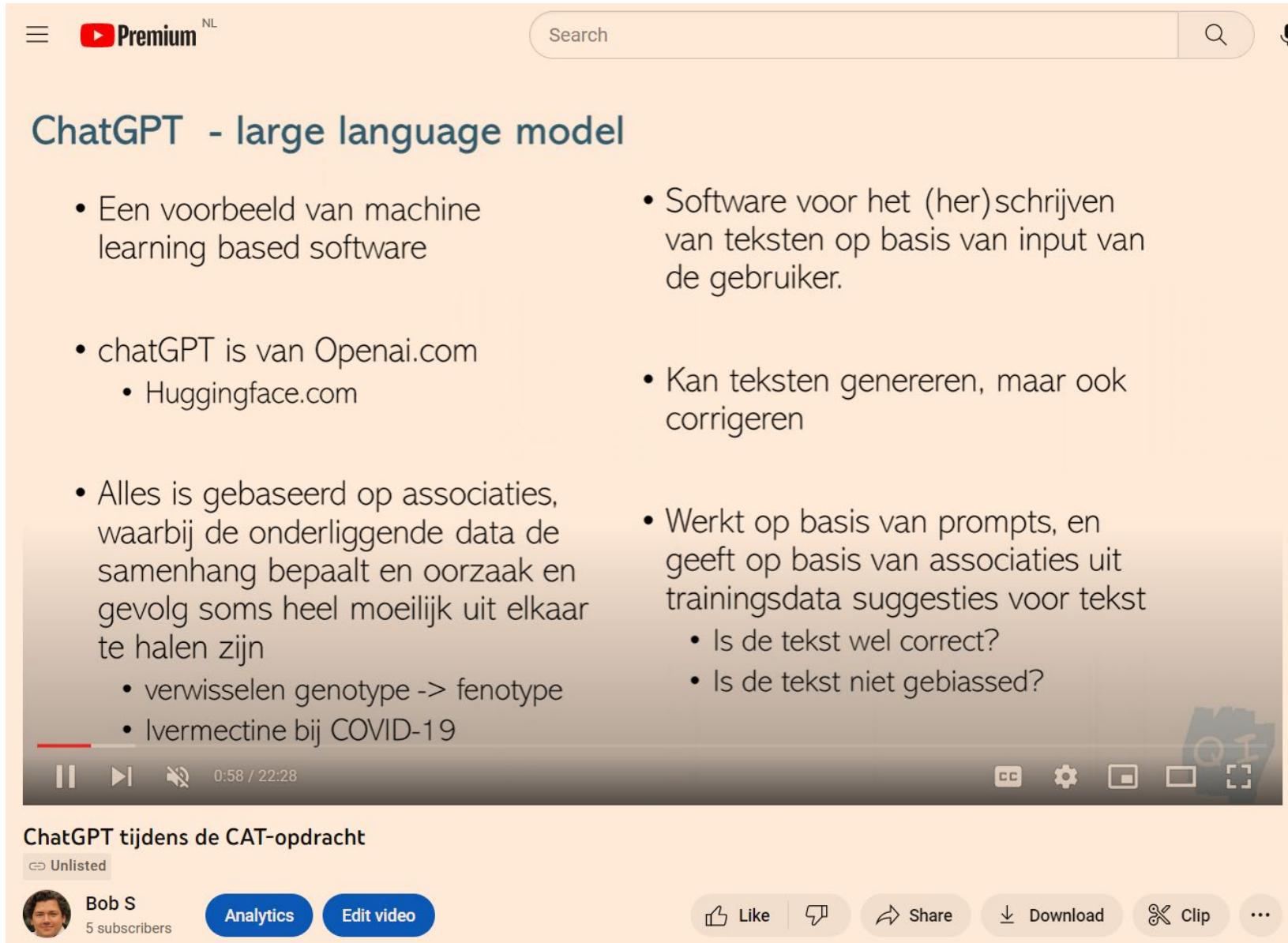
Mocht je vragen hebben, of verder willen meedenken over large language models in de geneeskunde, stuur me dan een mailtje op b.siegerink@lumc.nl. Ik zet je dan op een lijstje wat ik zo nu en dan raadpleeg als ik denk dat dat we wel wat inbreng van studenten kunnen gebruiken.

Succes met je CAT-opdracht.

Bob Siegerink



Ook een uitleg video voor docenten en studenten



The image is a screenshot of a YouTube video player. The video title is "ChatGPT - large language model". The content of the video is a list of bullet points in Dutch, which are as follows:

- Een voorbeeld van machine learning based software
- chatGPT is van Openai.com
 - Huggingface.com
- Alles is gebaseerd op associaties, waarbij de onderliggende data de samenhang bepaalt en oorzaak en gevolg soms heel moeilijk uit elkaar te halen zijn
 - verwisselen genotype -> fenotype
 - Ivermectine bij COVID-19
- Software voor het (her)schrijven van teksten op basis van input van de gebruiker.
- Kan teksten genereren, maar ook corrigeren
- Werkt op basis van prompts, en geeft op basis van associaties uit trainingsdata suggesties voor tekst
 - Is de tekst wel correct?
 - Is de tekst niet gebiassed?

The video player interface shows a progress bar at 0:58 / 22:28, a volume icon, and a list of sharing and download options. The video is unlisted and has 5 subscribers. The channel name is Bob S.

<https://www.youtube.com/watch?v=CTzvpugu4ME&feature=youtu.be>

Varying sensitivity, proper specificity

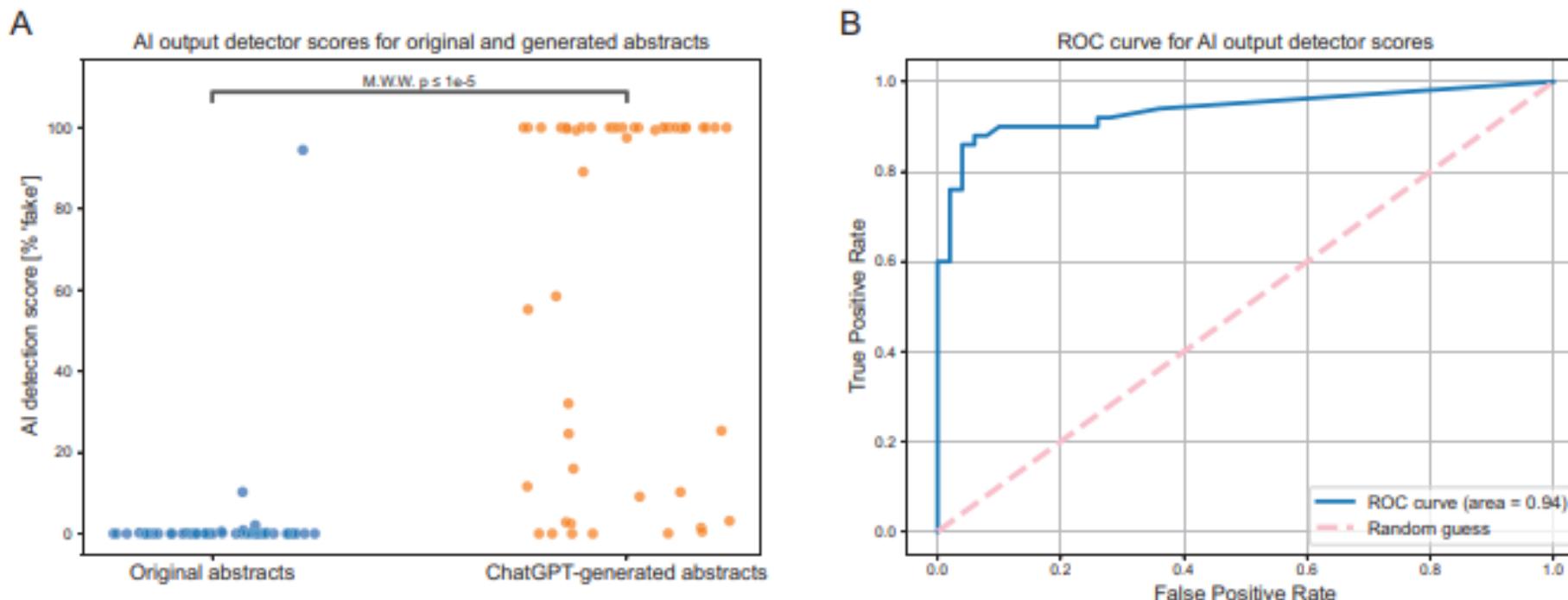
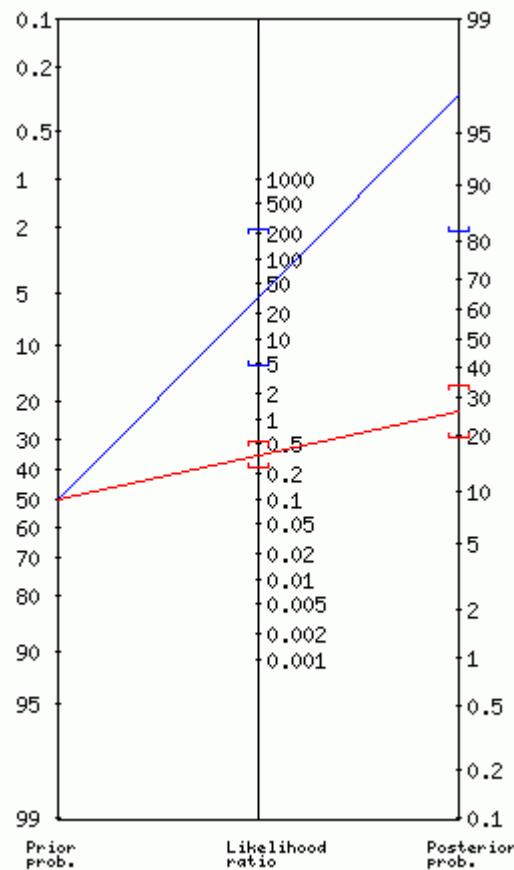
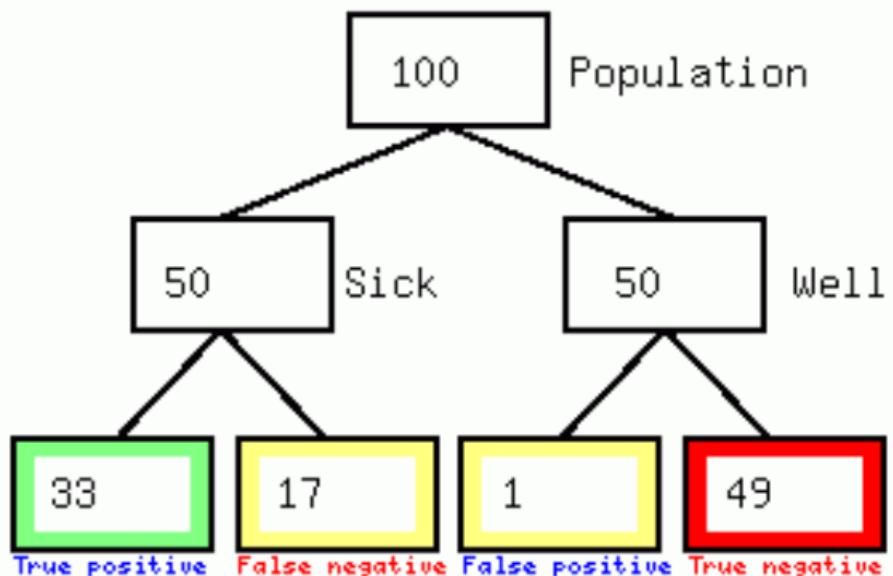


Figure 2. Many generated abstracts can be detected using an AI output detector. (A) AI detection scores as [% 'fake'] per GPT-2 Output Detector for original abstracts and generated abstracts. Except for one case, all original abstracts scored extremely low on the AI output detector. The majority of generated abstracts scored high on the AI output detector, but 17 (34%) scored lower than 50%. **(B)** The AI output detector ROC curve for discriminating between original and generated abstracts, with AUROC of 0.94.

Or in a context more familiar

Results

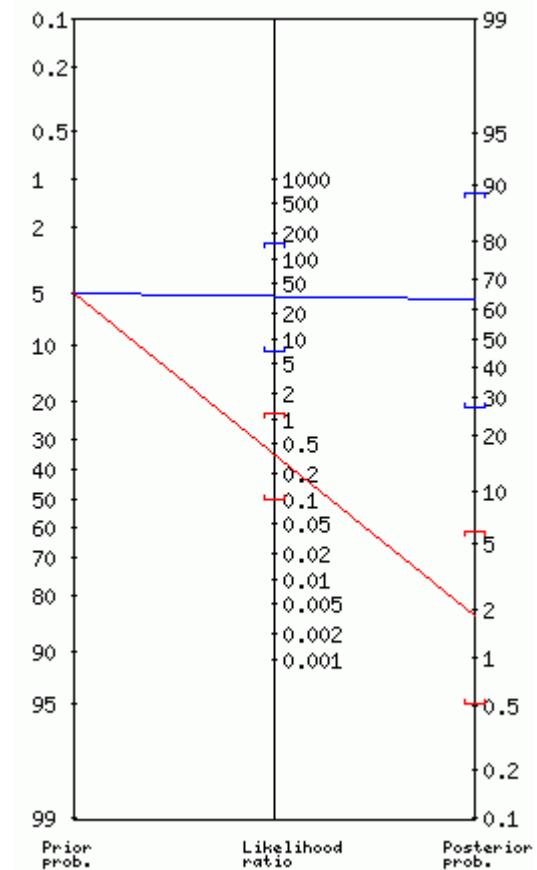
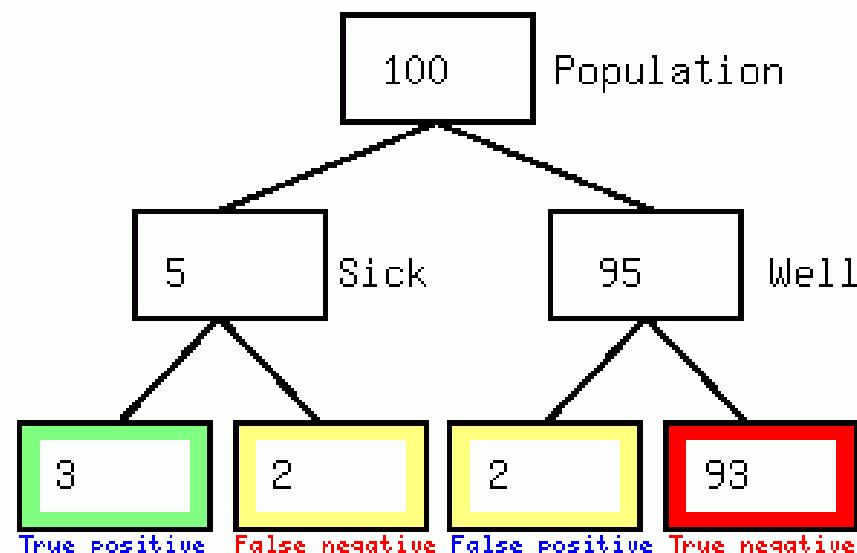
Statistic	Value	95% CI
Sensitivity	66.00%	51.23% to 78.79%
Specificity	98.00%	89.35% to 99.95%
Positive Likelihood Ratio	33.00	4.69 to 232.06
Negative Likelihood Ratio	0.35	0.24 to 0.51
Disease prevalence (*)	50.00%	
Positive Predictive Value (*)	97.06%	82.43% to 99.57%
Negative Predictive Value (*)	74.24%	66.16% to 80.95%
Accuracy (*)	82.00%	73.05% to 88.97%



Or in a context more familiar

Results		
Statistic	Value	95% CI
Sensitivity	66.00%	51.23% to 78.79%
Specificity	98.00%	89.35% to 99.95%
Positive Likelihood Ratio	33.00	4.69 to 232.06
Negative Likelihood Ratio	0.35	0.24 to 0.51
Disease prevalence (*)	5.00%	
Positive Predictive Value (*)	63.46%	19.81% to 92.43%
Negative Predictive Value (*)	98.21%	97.38% to 98.78%
Accuracy (*)	96.40%	90.63% to 99.10%

(*) These values are dependent on disease prevalence.



Chances of “**true positive**” is highly dependent on a priori chance of LLM use
For now; avoid a single detector for bulk analyses of all assignments - false positives will happen



Meeting of all exam boards of Leiden University

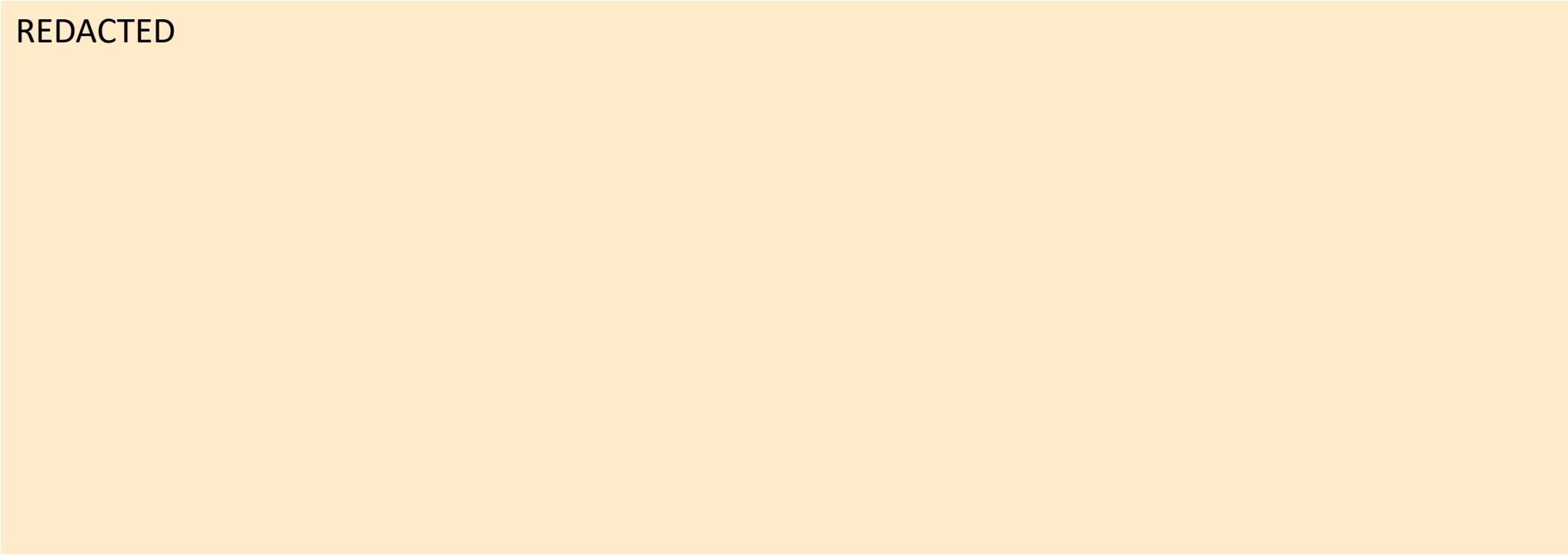
Call to action:

all exam boards need to actively ask their instructors

- identify where LLM might affect the validity of examination
- describe what context is already present to help ensure validity
- identify where LLM might be used as an educational tool
- describe a plan of action
- enforce change where needed

First case of ChatGPT fraud; high a priori chance and multiple detectors

REDACTED



Report of examiner for exam board filed roughly 1 week after first suspicion on May 24th 2023
BS is member of College bBeroep voor de Examens Universiteit Leiden



First case of ChatGPT fraud; high a priori chance and multiple detectors

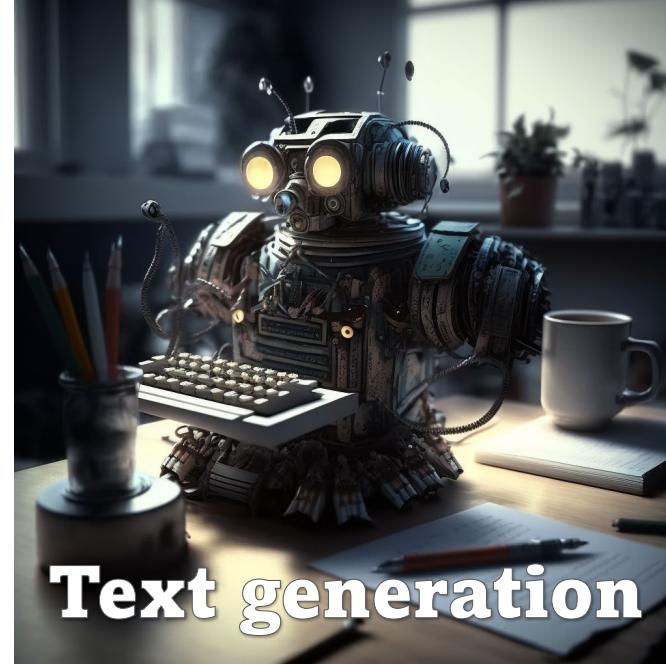
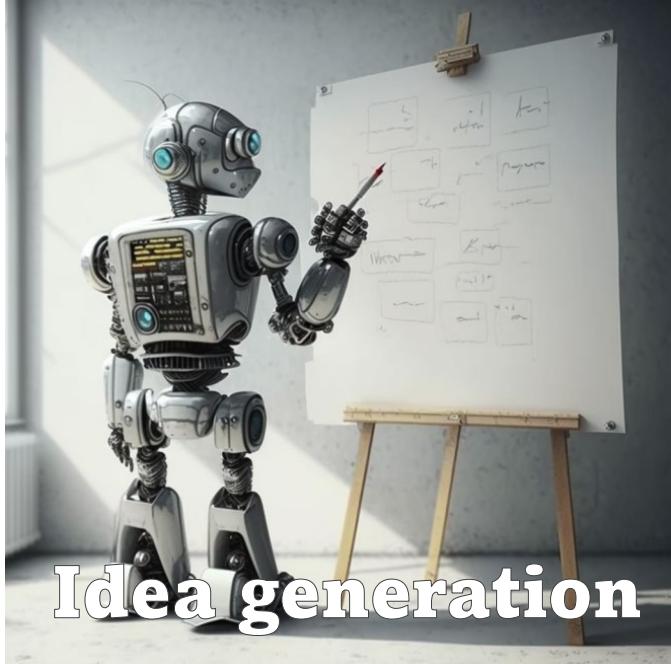
	GPT-2	Copyleaks		Writer	OpenAI
Paragraph	AI generated	AI generated	Human context	Human context	OpenAI
1	0.02		99.6	100	too few character
2	99.8	99.9		48	too few character
3	0.02		68.3	100	unlikely
4	57.47		43.2	100	unclear
5	0.02		92	100	unclear
6	99.96	97.6		24	possibly
7	99.54	89.9		51	unclear
8	97.34	91.4		100	unclear
9	77.81	94		42	likely
10	2.48		20.6	74	too few character
11	99.98	99.9		13	too few character
12	98.9	98.7		96	too few character
13	0.02	83		100	likely
14	0.06		68.8	87	unclear
15	0.09		29.9	100	possibly
16	99.98	84.9		1	likely
17	94.84			16	
18	7.65			99	
19	99.34			53	

Report of examiner for exam board

LLM & SCIENCE



One tool for different writing tasks



Type of text matters

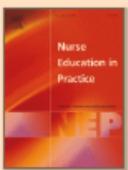
Empirical vs theoretical vs scholarly text

GPT3 as an author



Nurse Education in Practice

Volume 66, January 2023, 103537



Editorial

Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse?

Siobhan O'Connor ^a  ¹ , ChatGPT ^b 

Show more 

 Add to Mendeley  Share  Cite

<https://doi.org/10.1016/j.nepr.2022.103537>

[Get rights and content](#)

Q1

<https://bit.ly/3ZLF2aI> <https://bit.ly/3JgHVti> <https://bit.ly/3mRpdk9>

GPT3 as an author



Editorial

Open artificial education: Too

Siobhan O'Connor ^a ¹ , Chi

Show more

+ Add to Mendeley

<https://doi.org/10.1016/j.nep.2023.103537>

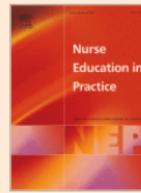
Nurse Education in Practice

Volume 66, January 2023, 103537



Nurse Education in Practice

Volume 68, March 2023, 103599



Editorial

ChatGPT as an author of academic papers is wrong and highlights the concepts of accountability and contributorship

Bob Siegerink ^{a b 1} ¹, Lodewijk A. Pet ^{a 2}, Frits R. Rosendaal ^{a 3}, Jan W. Schoones ^{b 4}

Show more

+ Add to Mendeley Share Cite

<https://bit.ly/3ZLF2al> <https://bit.ly/3JgHVti> <https://bit.ly/3mRpdk9>



GPT3 as an author

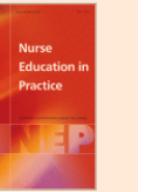
Not alone, e.g. Nature, Science but also WAME
NB “open artificial intelligence” is up for debate

NB “open artificial intelligence” is u

 **Nurse Education in Practice**
Volume 66, January 2023, 103537 

Editorial
Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse? [Nurse Educ. Pract. 66 (2023) 103537]

Siobhan O'Connor^a    
[Show more](#) 
+ Add to Mendeley  
<https://doi.org/10.1016/j.nepr.2022.103537>

 **Nurse Education in Practice**
Volume 68, March 2023, 103599 

Editorial
ChatGPT as an aid to nursing practice: A wrong and highly problematic approach to accountability and responsibility

Bob Siegerink^a     
[Show more](#) 
+ Add to Mendeley  
<https://doi.org/10.1016/j.nepr.2023.103599>

 **Nurse Education in Practice**
Volume 67, February 2023, 103572 

Corrigendum
Corrigendum to “Open artificial intelligence platforms in nursing education: Tools for academic progress or abuse?” [Nurse Educ. Pract. 66 (2023) 103537]

Siobhan O'Connor 

<https://bit.ly/3ZLF2aI> <https://bit.ly/3JqHVti> <https://bit.ly/3mRpdk9>

Accountability and contributorship

2. Who Is an Author?

The ICMJE recommends that authorship be based on the following 4 criteria:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
- Drafting the work or revising it critically for important intellectual content; AND
- Final approval of the version to be published; AND
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he or she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their co-authors.

Good research practices in the Dutch code for scientific integrity

30. Ensure a fair allocation and ordering of authorship, in line with the standards applicable within the discipline(s) concerned.
31. All authors must have made a genuine intellectual contribution to at least one of the following elements: the design of the research, the acquisition of data, its analysis or the interpretation of findings.
32. All authors must have approved the final version of the research product.
33. All authors are fully responsible for the content of the research product, unless otherwise stated.

- ICMJE recommendations resonate in the Dutch code.
- What is the relevance for LLM?
- NB #30 - not all disciplines work with “first/senior author” principle. Non adherence may be scientific misconduct

Good research practices in the Dutch code for scientific integrity

- #34 and #40 are about explicitly labelled as plagiarism/misconduct.
- #35: “verifiability” and “replicate”

34. Present sources, data and arguments in a scrupulous way.
35. Be transparent about the method and working procedure followed and record them where relevant in research protocols, logs, lab journals or reports. The line of reasoning must be clear and the steps in the research process must be verifiable. This usually means that the research must be described in sufficient detail for it to be possible to replicate the data collection and its analysis.
40. When making use of other people’s ideas, procedures, results and text, do justice to the research involved and cite the source accurately.

Accountability and contributorship

CRediT – Contributor Roles Taxonomy



CRediT (Contributor Roles Taxonomy) is a high-level taxonomy, including 14 roles, that can be used to represent the roles typically played by contributors to scientific scholarly output. The roles describe each contributor's specific contribution to the scholarly output.

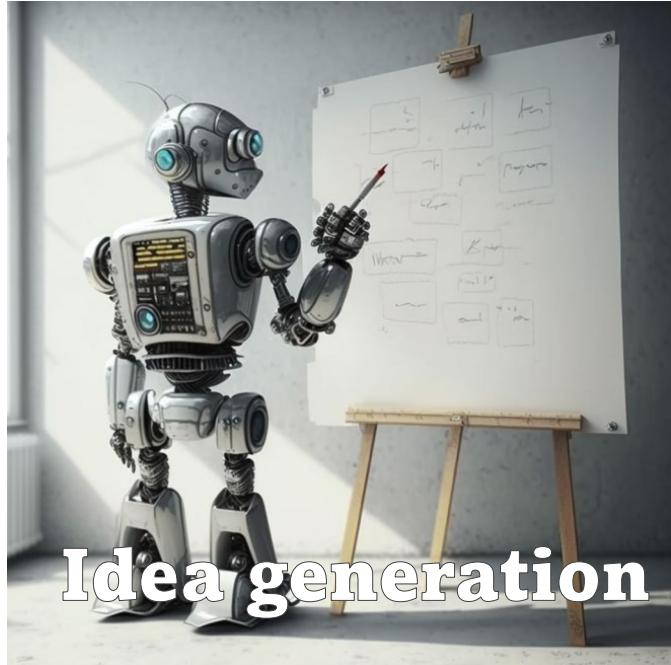
14 Contributor Roles

Conceptualization	Resources
Data curation	Software
Formal Analysis	Supervision
Funding acquisition	Validation
Investigation	Visualization
Methodology	Writing – original draft
Project administration	Writing – review & editing

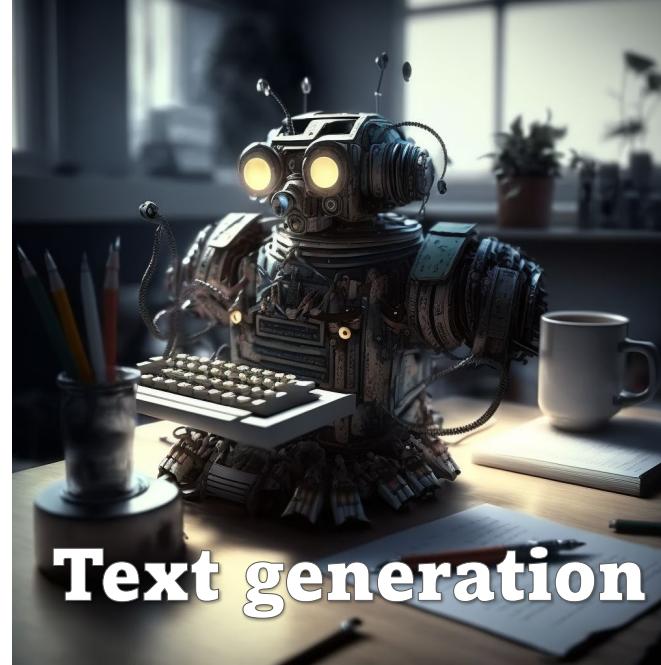
WAME position

- **1. Chatbots cannot be authors.** Chatbots cannot meet the requirements for authorship as they cannot understand the role of authors or take responsibility for the paper. Chatbots cannot meet ICMJE authorship criteria, particularly “Final approval of the version to be published” and “Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.” (21) A chatbot cannot understand a conflict of interest statement, or have the legal standing to sign a statement. Chatbots have no affiliation independent of their creators. They cannot hold copyright. Authors submitting a manuscript must ensure that all those named as authors meet the authorship criteria, which clearly means that chatbots should not be included as authors.
- **2. Authors should be transparent when chatbots are used** and provide information about how they were used. Since the field is evolving quickly at present, authors using a chatbot to help them write a paper should declare this fact and provide full technical specifications of the chatbot used (name, version, model, source) and method of application in the paper they are submitting (query structure, syntax). This is consistent with the ICMJE recommendation of acknowledging writing assistance. (22)
- **3. Authors are responsible for the work** performed by a chatbot in their paper (including the accuracy of what is presented, and the absence of plagiarism) and for appropriate attribution of all sources (including for material produced by the chatbot). Human authors of articles written with the help of a chatbot are responsible for the contributions made by chatbots, including their accuracy. They must be able to assert that there is no plagiarism in their paper, including in text produced by the chatbot. Human authors must ensure there is appropriate attribution of all quoted material, including full citations. They should declare the specific query function used with the chatbot. Authors will need to seek and cite the sources that support the chatbot’s statements. Since a chatbot may be designed to omit sources that oppose viewpoints expressed in its output, it is the authors’ duty to find, review and include such counterviews in their articles.
- **4. Editors need appropriate tools to help them detect content generated or altered by AI** and these tools must be available regardless of their ability to pay. Many medical journal editors use manuscript evaluation approaches from the 20th century but now find themselves face-to-face with AI innovations and industries from the 21st century, including manipulated plagiarized text and images and paper mill-generated documents. They have already been at a disadvantage when trying to sort the legitimate from the fabricated, and chatbots such as ChatGPT take this challenge to a new level. Editors need access to tools that will help them evaluate content efficiently and accurately. Publishers working through STM are already developing such tools. (23) Such tools should be made available to editors regardless of ability to pay for them, for the good of science and the public. Facilitating their use through incorporation into open-source publishing software such as Public Knowledge Project’s Open Journal Systems (24), and education about the use and interpretation of screening outputs, would make automated screening of manuscript submissions a much-needed reality for many editors.

LLM in dissertations



Idea generation



Text generation



Text correction

Dissertations are both science and exams

Conflicting stance towards allowance of generative AI?

What are the norms?

Norm exploration at the LUMC graduate school

1) Did you use Large Language Models, such as ChatGPT, in the creation of your thesis?

No

Yes, for (multiple options possible)

i. Idea development: I used LLM to further investigate aspects of my field of research. This led me to new ideas that were eventually included in this thesis. I did not include any text output from LLM in my thesis.

ii. Text correction: I used LLM to correct/improve/translate a draft I had written. I incorporated this newer version of the text into my thesis, with or without manual adjustments.

iii. Text generation: I used LLM for text generation based on my input. I incorporated this generated text into my thesis, with or without adjustments.

2) If yes, please describe below how, and where in your thesis. Clearly differentiate between the scientific and the non-scientific part of the thesis.

3) Did you describe the use of LLMs as answered above in your thesis:

Not applicable

No: explanation

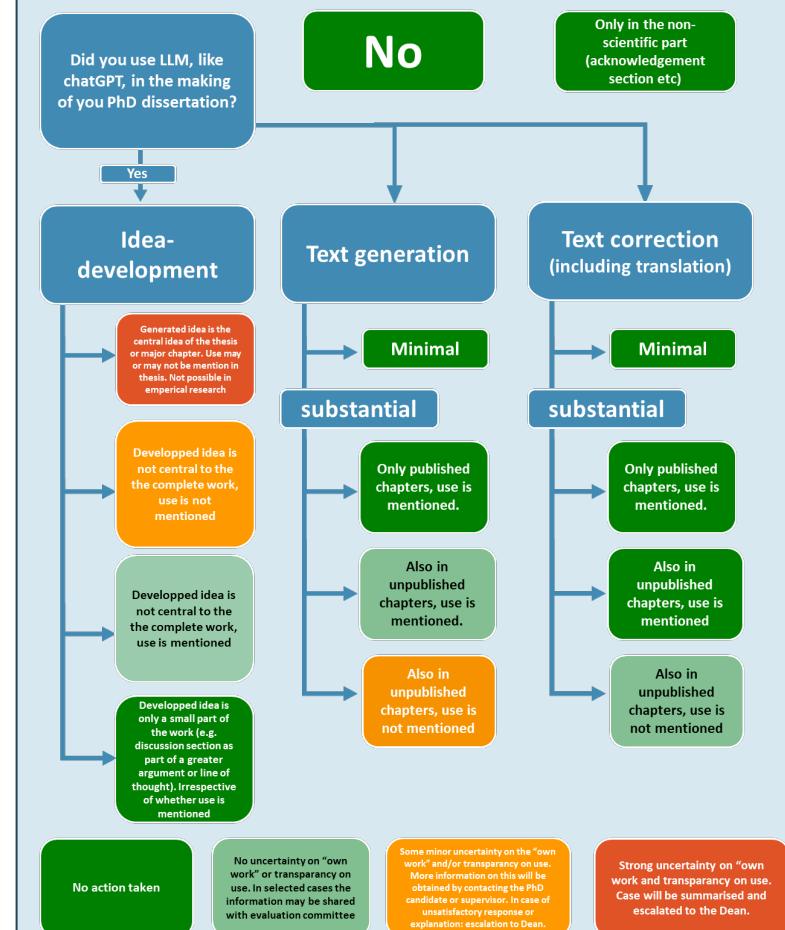
Yes, partially: explanation + reference to page numbers

Yes, completely: explanation + reference to page numbers

This leaflet is shared on OSF under CC-BY-4.0 license via osf.io/2syfm.

LLM in PhD dissertations - decision tree

This is the decision tree used by the LUMC graduate school office to collect data on the use of LLMs in dissertations. When there is uncertainty regarding two widely accepted principles of scientific integrity (i.e. transparency, and accountability/own work) in a dissertation, actions may be taken by the graduate school office in order improve transparency and accountability before finalization of the dissertation.



Build into Converis -

Large Language Models (e.g. ChatGPT) and thesis chapters *

The LUMC graduate school keeps track of the use of Large Language Models (e.g. ChatGPT) in PhD dissertations. Please answer the following questions.

Did you use Large Language Models, such as ChatGPT, in the creation of your thesis? *

No Yes, for idea development Yes, for text correction Yes, for text generation

Idea development: I used LLM to further investigate aspects of my field of research. This led me to new ideas that were eventually included in this thesis. I did not include any text output from LLM in my thesis.

Text correction: I used LLM to correct/improve/translate a draft I had written. I incorporated this newer version of the text into my thesis, with or without manual adjustments.

Text generation: I used LLM for text generation based on my input. I incorporated this generated text into my thesis, with or without adjustments.

If yes, please describe below how, and where in your thesis. Clearly differentiate between the scientific and the non-scientific part of the thesis.



0/3950

Did you describe the use of LLMs as answered above in your thesis? *

Select LLM usage description 

Select LLM usage description

- Not applicable
- No: explanation
- Yes, partially: explanation + reference to page numbers
- Yes, completely: explanation + reference to page numbers

- agile as we run our own instance of Converis
- Announced before implementation (March 1st vs 15th)

First entry on 24-4-2023

REDACTED



conclusions

Take your academic writing to the next level | with Paperpal



Tailored for researchers
and academic writing



Extensive English language
recommendations



Accurate detection of
complex grammar errors



Suggestions to rephrase
confusing sentences



Checks for structural and
technical inconsistencies



Paperpal is available
real-time, where you write



Students



Researchers



Publishers



Paperpal for Manuscript



Paperpal for Web



Paperpal for Word

Identify the norms of LLM in academia

- Questionnaire to 300+ PhD candidates, all with same level of training on scientific integrity. (LUMC and Science faculty)
- Previous participants of workshop “Scientific Conduct” (before february 2022)
- Question type is based on a scenario, with varying levels of chatGPT use, and varying types of use (idea generation, text generation, text correction)

conclusions

- LLM are now available to most of us as closed blackbox multi-tools
 - Bias, hallucinations, commercial aspects
- What does Authorship mean and convey?
 - accountability vs credit vs proof of skill
- Will improve written text and readability
 - especially for protocolized text like code (not even discussed here!)
 - Not sure whether it will improve writing
- Having a dedicated team to QI was particularly useful in the first couple of months.
 - Quick to react
 - Research, policy and teaching activities were mutually informative
 - BS unique combination of roles (AWV teaching, graduate school, epidemiologist)



- Two formal announcements/guidance
 - GDPR warning,
 - converis launch,
- Third is being drafted as a wrap-up of first 6 months.
- All products of the activities I just described are gathered and shared
- A redacted version of this slidekit will also be included.



Improve the way we do and organize our research

[About QI](#)

[QI projects @ OSF](#)

[QI Journal Club](#)

[Dossier: LLM in science](#)

[Publications](#)

[Get in touch](#)



most activities in one slide in semi chronological order

- First intranet message GDPR warning
- Discussion document circulated
- Change in policy AWV courses
- Meeting with CWI
- Publication editorial
- Change in workshop scientific conduct covering 75% of new PhD's uni Leiden (LUMC & Science)
- LUMC Graduate school board decision on actions
- Second intranet message: authorship
- Converis implementation LUMC
- Teacher/student debate
- Lecture Open Science Community Leiden - future of academic writing
- Meeting with all exam boards uni leiden
- Lectures for several depts at LUMC upon request
- Lecture for Student Council LUMC
- Monitoring via Converis
- QI journal club
- Start survey new PhD's for research
- First case of chatGPT fraud in BSC thesis





Quality and Integrity of Science

seminars | lectures | journal club | policy | research | information
qi-leiden.com