

Transparency Guidance for ChatGPT Usage in Scientific Writing

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The use of text-generating Large Language Models (LLM), such as ChatGPT, in scholarly writing presents challenges to transparency and credibility. Journals and institutes are in need to revise their policies on whether the usage of such tools is acceptable throughout the research workflow and to provide guidance on how to safeguard transparency and credibility when LLMs are allowed to assist researchers. The present practical guideline should help those scholars who use LLMs and journals and institutes that allow using them. We also provide an example text to show a transparent usage of ChatGPT.

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Challenges to Transparency and Credibility

A major challenge that text-generating LLM tools bring to science is to know how much of the content is the authors' own contribution. When the content of an article or book chapter is largely machine-generated, it feels inappropriate for the authors to claim all of the credit. AI authorship is currently disliked¹ and disallowed². Some updated journal policies forbid LLM usage in general³ others require its transparent reporting without specific guidance².

Another danger of LLMs is that human authors may uncritically accept the truthfulness of LLM-generated content when it can very well be inaccurate, misleading or convincingly sounding nonsense. Presently, the role of LLM in science may be likened to that of Cyrano de Bergerac when he helped Christian de Neuvillette in Edmond Rostand's play. The talented poet Cyrano helped woo a woman, Roxane, for the soldier Christian who lacked the required intellect and wit. For researchers, LLMs can provide convincing-sounding text on any topic or improve a rough, unsophisticated draft using any required style. Researchers should be keenly aware of this *Cyrano-trap* and resist the temptation of mistaking eloquence for truth. Researchers will need to become even more critical with written texts than before, especially when this text is written with the help of LLMs. Finally, LLMs present the danger of unintentional plagiarism, as LLMs can provide unreferenced direct copies of existing texts.

Transparency and Credibility Guidance for LLM usage

One simple method to prevent these dangers is not using LLMs for generating scientific texts. For those scholars who use it and journals and institutes that allow using it, we recommend the following three transparency and credibility safeguard measures to apply and require in every scholarly work. These recommendations are in line with the present ground rules and policies of *Nature*² and *arXiv*¹ regarding the use of generative AI language tools.

➤ Information

Whenever LLM has contributed to the content of a scientific work, researchers should disclose this fact by providing information on the specific model of LLM tool and the training data it used. They should also make the LLM-generated text itself, or a summary of it, available to readers.

➤ Accreditation

The contribution of LLMs to text or other aspects of a scientific work (e.g., stimuli, program code), just as of any coauthors, should be disclosed and specified (e.g., by CRediT taxonomy).

➤ Verification

Researchers should follow the *verify everything* approach to LLM-generated content. Journals and institutes can promote this approach by requiring authors to acknowledge that all the LLM-generated content that they used was verified by human contributors. This verification should include a check on plagiarism.

¹ <https://blog.arxiv.org/2023/01/31/arxiv-announces-new-policy-on-chatgpt-and-similar-tools/>

Example text for the transparent reporting of ChatGPT usage.

Learning to Live with AI: Lessons from the Chess World

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Will large language models such as ChatGPT⁴ help or hinder scientific progress? Recent discussions suggest that some researchers fear that large language models will make it difficult to gauge the extent to which a published article has been influenced by an AI. At its current state of development, ChatGPT generates convincing-sounding text that is occasionally bogus; in addition, ChatGPT does not indicate its sources. One of our graduate students asked ChatGPT a series of questions about his field of study, only to be presented with a paragraph that was taken word-for-word from his master thesis, without attribution, and with all references omitted. It is easy to ridicule ChatGPT, highlight its lack of understanding, and argue that it will negatively affect science.

Despite the current weaknesses of AI-generated texts, it seems inevitable that their sophistication and accuracy will greatly increase in the near future. Abstracts written by ChatGPT already fool scientists⁵ and it can draft article sections or suggest research directions⁶. Perhaps one day programs such as ChatGPT can replace human resources in a big part of academic life⁷. Should researchers be worried? The mixed feelings that accompany the rise to prominence of a new technology such as ChatGPT are not new, and it can be informative to consider the response of a field that has already experienced an AI-transformation: chess.

In 1997, IBM supercomputer Deep Blue defeated the reigning chess world champion, Garry Kasparov. It was a watershed moment that radically changed the perception of chess engines. Only a few years earlier, the engines still played chess relatively poorly. They often demonstrated a blatant lack of insight and were not strong enough to assist professional players in the analysis of their games. With increasing playing strength, the attitude of the chess community towards engines started to change. Mockery made way to fear: would the widespread availability of strong engines kill the game? Would the cold computer assessment of chess positions prevent players from wanting to think about the game on their own? Would it remove the game's mystique? After Deep Blue's victory, the renowned cognitive scientist Douglas Hofstadter exclaimed: "My God, I used to think chess required thought. Now, I realize it doesn't."⁸

Today, 25 years after Deep Blue, it is apparent that the engines did not kill chess. Instead, the engines have mostly had a positive influence. They can be used for training, for the analysis of one's own games, and for the online evaluation of games by top players. Imagine that a chess player could call world champion Magnus Carlsen and order him to analyze and assess any given position, immediately and at any point of the day. This is the service that chess engines provide – except that today's engines are much, much stronger than Carlsen. Mockery gave way to fear, but fear then gave way to acceptance and appreciation, to the point where the top engine move is now considered the ground truth.

The impact of chess engines has not been solely positive, however. Chess engines have made cheating easy and difficult to detect, and players who were caught have been sanctioned. Recently, a scandal unfolded at the highest level when Carlsen withdrew from a tournament after losing to Hans Niemann⁹ – a young player whose strength had increased dramatically over the past years. The high quality of Niemann's moves in the tournament contrasted with an inability or unwillingness to explain why he had made the moves he did: "the chess speaks for itself". No direct evidence has been produced for Niemann cheating in over the board games, although he has admitted to cheating in some online games. This cheating was first

detected by a sophisticated algorithm in which the moves played are compared to those suggested by the top engines.

AI has conquered the chess world and it is expected to profoundly change science as well. As in chess, AI is poised to overtake scientists in certain intellectual endeavors that have traditionally been assumed to be the sole domain of human intelligence – something that worries academics and educators alike^{10,11}. Researchers will find ChatGPT helpful for synthesizing text or producing computer code, but these benefits come with definite challenges. Researchers will need new skills to effectively utilize the technology but also to combat cheating and the disintegration of transparency and credibility. As in the chess world, the key to overcoming AI-fear in the research world is to find the appropriate place for AI in the research workflow and to develop strategies to protect core scientific principles. This includes a better understanding of the capabilities and limitations of AI, as well as guidelines for its use and ethical considerations. By approaching AI with a balanced perspective, researchers can harness its potential while minimizing negative impacts¹².

Conclusion

The general uneasiness with the dramatic advance of AI is understandable: while we do not have clear solutions to the present challenges, we sense that new challenges are to come. AI is certainly expected to become an increasingly important part of the research workflow. AI will be able to catch up or overtake humans on many of our intellectual activities. Perhaps, one day AI-authorship won't be avoidable, or we will find a special role (AIthor?) for them in the system. However the future unfolds, transparency and credibility are two principles that never ought to be exchanged for efficiency. Chess has often been referred to the drosophila of artificial intelligence¹³. It shows us that AI is capable of radically transforming old traditions and raising new challenges. But it also shows that AI doesn't kill the game.

References

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Declaration of AI-usage

For drafting parts of the presented text, we used the pre-trained ChatGPT (3.5, 2023-Jan-9) model developed by OpenAI as described in the paper by Brown et al. (2020). We would like to acknowledge OpenAI for providing the pre-trained model and the authors of the paper for their work on GPT models. All prompts and their generated texts are available in the Supplement. We checked the text for unintended plagiarism, and we verified all facts and references that we used from LLM outputs.

Supplement

Documentation of ChatGPT usage

Version: 3.5

Release date: 2023-Jan-9

Usage time: 2023-Jan-12 - 2023-Jan-23.

Prompts and generated texts

“What were the first reactions to chess engines in the chess community?” and “could you add more concrete details to the text you just generated?” and “Please write 3 paragraphs in the Comment style of the journal Nature on how Researcher’s current reactions to AI is many ways similar to what happened in the chess world when chess engines appeared”

In the early days of chess engines, they were considered to be nothing more than curiosities by the chess community. The earliest chess engines were basic programs that could only play at a very weak level, and they were often beaten easily by even amateur chess players. However, as technology advanced, chess engines began to improve, and they started to become more competitive. But even then, many chess players and enthusiasts believed that machines could not truly understand the game, and so they were not taken seriously as competitors. They were often seen as a gimmick or a toy, and some even mocked them as having no understanding of the game and being unable to play with the same level of creativity and expression as humans. Some grandmasters and trainers even refused to play against them or train with them because they believed that it would be an unfair advantage for the machine over the human.

As the chess engines progressed and became stronger, the attitude of the chess community towards them started to change. The chess engines started to beat human players in game and tournaments, and the chess community started to take them more seriously. For example, in 1997, IBM's chess program "Deep Blue" defeated Garry Kasparov, who was the world chess champion at that time, it was a significant milestone in the history of chess engines. This event marked a turning point in the chess community's perception of chess engines, and it marked the beginning of a new era in which chess engines were seen as serious opponents. This event has been a turning point in the chess community's perception of chess engines and it was the beginning of a new era in which chess engines were seen as serious opponents and valuable tools for training and analysis.

Similarly, the benefits of AI in research come with challenges, such as the potential for cheating and the need for new skills to effectively utilize the technology. The key to overcoming AI-panic in the research world, as it was in the chess world, is finding the appropriate place for AI in the research workflow and developing strategies to protect core principles. This includes a better understanding of the capabilities and limitations of AI, as well as guidelines for its use and ethical considerations. By approaching AI with a balanced perspective, researchers can harness its potential while minimizing negative impacts.

“How could researchers maintain transparency when they use AI-generated texts in their publication?”

Researchers can maintain transparency when using AI-generated texts in their publications by clearly disclosing the use of AI-generated text and providing information on the specific model and training data used. They should also make the AI-generated text itself, or a summary of it, available to readers. Additionally, they can provide evaluation metrics such as BLEU scores to show how well the AI-generated text compares to human-written text.

“Could ChatGPT be a coauthor on scientific papers?”

It is unlikely that ChatGPT or other AI models would be considered as coauthors on scientific papers, as authorship is generally reserved for individuals who have made significant intellectual contributions to the research and writing of the paper. While AI models such as ChatGPT can assist with data analysis and text generation, the primary authorship should be attributed to the individuals who designed the study, conducted the research, and wrote the

paper. However, the use of AI in the research can be acknowledged in the methodology section or in the author contributions section of the paper.

“what are the benefits of chess engines?”

There are several benefits of using chess engines, including:

1. Consistency and accuracy: Chess engines are able to calculate and evaluate positions much faster and more accurately than humans, which can lead to more consistent and accurate play.
2. Identifying weaknesses: They can help chess players identify weaknesses in their own play and suggest ways to improve.
3. Annotating and Analyzing: They can be used to analyze and annotate games, which can help players learn from their mistakes and improve their understanding of the game.
4. Playing against stronger opponents: Chess engines can provide a challenging opponent for players of all skill levels. They can also be used to play against other chess engines, which can help players improve their understanding of different chess playing styles.
5. Researching and developing new strategies: Chess engines can be used to research the game of chess and develop new strategies, which can help to advance the understanding of the game.
6. Online chess play: Chess engines can be used to play chess online with other people, which allows players to enjoy the game regardless of their location or time availability.

“How to refer to this ChatGPT version in a scientific paper?”

In a scientific paper, you can refer to the ChatGPT version you are using by including the version number and the date of the model's release. For example, you can refer to it as "ChatGPT (version number, release date)." If you are using a fine-tuned version of the model, you should also specify the task or dataset on which the model was fine-tuned.

It is also important to cite the original research paper that describes the model, which is "Language Models are Few-Shot Learners" by Tom B. Brown et al. (2020)

Additionally, it's worth noting that by using OpenAI's GPT models, you are bound by their terms of use. Typically, you are required to cite OpenAI, the authors of the paper and also add a disclaimer that says that it's been fine-tuned by you.

Example: "We fine-tuned the pre-trained ChatGPT (version number, release date) model developed by OpenAI on our dataset. The fine-tuning was performed according to the approach described in the paper "Language Models are Few-Shot Learners" by Tom B. Brown et al. (2020). We would like to acknowledge OpenAI for providing the pre-trained model and the authors of the paper for their pioneering work on GPT models."

Please make sure to use the correct version number and release date of the model you are using.