Artificial intelligence in academia: opportunities, challenges, and ethical considerations

Joshua Molligan[a,b,c,d] **and Edel Pérez-López**[a,b,c,d]

[a]Département de phytologie, Faculté des sciences de l'agriculture et de l'alimentation, Université Laval, Québec City, QC, Canada;
[b]Centre de recherche et d'innovation sur les végétaux, Université Laval, Québec City, QC, Canada; [c]Institute de Biologie Intégrative et des Systèmes, Université Laval, Québec City, QC, Canada; [d]L'Institute EDS, Université Laval, Québec City, QC, Canada

Corresponding author: **Edel Perez-Lopez** (email: edel.perez-lopez@fsaa.ulaval.ca)

The integration of artificial intelligence (AI) into academia has revolutionized the way research and education are conducted. Two AI tools that have received significant attention are ChatGPT (https://chatgpt.com), a large language model (LLM), and DALL-E (https://openai.com/index/dall-e-3), a text-to-image model, both developed by OpenAI. These tools offer immense opportunities for enhancing academic productivity, creativity, and accessibility. They can help researchers to overcome language barriers, streamline administrative tasks, and improve the clarity and readability of academic writing. For instance, researchers who are non-native English speakers can use AI tools to correct grammar and enhance the readability of their manuscripts, thereby increasing their chances of publication in the journals of their choice. However, these tools also pose several challenges, particularly concerning scientific integrity and ethical use. This editorial explores the uses of ChatGPT and DALL-E in academia by highlighting the opportunities they present, the challenges linked to them, and discusses strategies for maintaining scientific integrity while utilizing them.

Applications of AI in academia

- Grammar and readability: AI tools like ChatGPT can assist in correcting grammar and improving the readability of research papers. This is particularly useful for non-native English speakers who must publish in English to reach a broader audience.
- Scripting and coding: AI tools such as ChatGPT and Googles' DeepMind Gemini language model have become widely used for generating scripts for programs commonly implemented in data analysis. These tools can aid researchers with in-line corrections and debugging steps, improving time efficiency.
- Generating ideas: AI can help researchers generate ideas for titles, develop concise outlines, and draft cover letters, making the process of manuscript preparation more efficient.

- Summarizing and cutting down text: AI tools can provide summaries of long texts while extracting the most meaningful elements, thus helping researchers to condense their work to meet any required word limits without losing essential information.
- Creating figures: AI-powered tools such as DALL-E can generate ideas for high-quality figures that are necessary for research presentations and publications, helping to enhance the visual appeal and clarity of complex data. However, there have been recent cases in which publications that have used AI-generated figures are scientifically inaccurate, which has raised concerns about scientific integrity and the lack of scrutiny by some editorial houses (Frontiers Editorial Office 2024; Wu et al. 2024).
- Promoting research: AI can be used to promote research findings and increase accessibility through various platforms, reaching a wider audience and fostering greater engagement. An example of this is the use of ScienceCast (https://sciencecast.org), a tool that allows the creation of audio files of research posted as preprints on bioRxiv (https://www.biorxiv.org). DALL-E can also be used to generate promotional figures for social media to increase visibility (Fig. 1).

Ethical considerations and scientific integrity

While AI offers numerous benefits, it is crucial to use it ethically to maintain scientific integrity. AI tools should not replace the original contributions of researchers. As highlighted by Magdalena Skipper, Editor-in-Chief of *Nature* (Stokel-Walker 2023), AI does not meet the standard for authorship because it cannot be held accountable for the work. Therefore, researchers must ensure that AI is used to augment human capabilities, not replace them.

Verification and accuracy are equally important. Researchers must thoroughly review and verify the content generated by AI because AI-generated text can sometimes include

Fig. 1. Image generated by DALL-E after describing Canadian Science Publishing and the journals published by this editorial group. It is clear that this tool struggles with producing coherent text, but it serves as a useful visual aid for informal contexts. The full input used to request this image from DALL-E is provided as Supplementary material.

inaccuracies or irrelevant information. Cross-referencing AI-generated summaries and drafts with original sources ensures that the information is correct and appropriately contextualized. This step helps maintain the quality and reliability of academic work.

Maintaining academic integrity involves using AI as a tool to enhance efficiency, not as a means to bypass critical thinking and original analysis. The primary intellectual contributions should come from the researchers themselves. Avoiding over-reliance on AI for substantive parts of the research, such as developing hypotheses, analyzing results, and drawing conclusions, is crucial.

Challenges and future directions

One of the primary challenges of using AI in academia is ensuring that its use does not compromise the originality or credibility of research. There is a risk that over-reliance on AI could lead to ethical issues, such as plagiarism, blatant inaccuracies, or an overall dilution of intellectual contribution. Fortunately, LLM developers have begun to incorporate Retrieval Augmented Generation (RAG) models, which go beyond pre-trained knowledge and access information from across the internet, making responses more comprehensive and up to date (Kenthapadi et al. 2024). In effort to further mitigate risk, institutions should provide additional guidelines on the ethical use of AI and promote standardized best practices among researchers.

Moreover, there is a need for continuous education and training on the ethical use of AI in research. Researchers should be made aware of the potential pitfalls and encouraged to critically evaluate AI-generated content. Institutions could offer workshops and resources to help researchers effectively integrate AI into their work in appropriate ways without compromising integrity.

The future of AI in academia also depends on the development of more advanced and transparent AI models. AI developers should focus on creating models that are not only powerful but also understandable and explainable. This transparency will help researchers trust AI tools and use them more effectively.

Conclusion

AI has the potential to revolutionize academic research by enhancing productivity, improving communication, and making research more accessible. However, it is essential to use AI responsibly, ensuring that it complements human efforts rather than replacing them. By adhering to ethical guidelines and leveraging AI's capabilities, researchers can achieve academic excellence while maintaining the integrity of their work. While the incorporation of RAG models improves the reliability of these models, institutions themselves can play a crucial role in the ethical landscape of AI in academia, through providing the necessary support and resources, which would aid researchers in navigating these new frontiers.

In conclusion, while AI tools such as ChatGPT and DALL-E offer significant advantages for researchers, it is imperative to use them judiciously. Ethical considerations should always be at the forefront to ensure that the integration of AI into academia contributes to enhancing, rather than undermining, the integrity and quality of scientific research.

Article information

History dates

Copyright

Data availability

No data were generated for this publication.

Author information

Author contributions

Conceptualization: EPL
Data curation: JM
Formal analysis: JM
Investigation: JM
Resources: EPL
Supervision: EPL

Writing – original draft: JM, EPL
Writing – review & editing: JM, EPL

Competing interests

The authors declare there are no competing interests.

Funding information

Supplementary material

Supplementary data are available with the article at https://doi.org/10.1139/bcb-2024-0216.

References

Frontiers Editorial Office. 2024. Retraction: cellular functions of spermatogonial stem cells in relation to JAK/STAT signaling pathway. Front. Cell Dev. Biol. **12**: 1386861. doi:10.3389/fcell.2024.1386861.

Kenthapadi, K., Sameki, M., and Taly, A. 2024. Grounding and evaluation for large language models: practical challenges and lessons learned (Survey). *In* Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD '24). Association for Computing Machinery. pp. 6523–6533. doi:10.1145/3637528.3671467.

Stokel-Walker, C. 2023. ChatGPT listed as author on research papers: many scientists disapprove. Nature, **613**: 620–621. doi:10.1038/d41586-023-00107-z. PMID:36653617.

Wu, Y.B.M., Pang, S.M.D., Guo, J.B.M., Yang, J.B.M., and Ou, R.M.D. 2024. Assessment of the efficacy of alkaline water in conjunction with conventional medication for the treatment of chronic gouty arthritis: a randomized controlled study [RETRACTED]. Medicine (Baltimore), **103**(14): e37589. doi:10.1097/MD.0000000000037589. PMID:38579090.

Biochem. Cell Biol. **103**: 1–3 (2025) | dx.doi.org/10.1139/bcb-2024-0216

3