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The use and ethical implications of artificial intelligence in scientific research and academic writing

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Abstract

The integration of artificial intelligence into scientific research has significantly changed research methodologies, including data analysis, literature review and academic writing. This paper aims to explore the diverse applications of artificial intelligence tools in scientific research and its relationship with scientific ethics. The review shows that artificial intelligence tools accelerate research processes, especially in data-intensive fields, by improving the efficiency and accuracy of data analysis and literature review. It also highlights the growing role of artificial intelligence in academic writing, where tools such as ChatGPT streamline text generation and editing. However, the rapid adoption of artificial intelligence tools has sparked ethical debates, particularly around academic integrity, originality and the reliability of artificial intelligence generated sources. This paper assesses these emerging challenges and highlights the need for clear ethical guidelines. Ultimately, it concludes that artificial intelligence tools are a powerful tool that can greatly benefit research if used responsibly, but unethical practices such as data manipulation and plagiarism must be avoided. Human oversight remains essential to ensure the ethical use of artificial intelligence tools in research processes.

Introduction

The advent of artificial intelligence has precipitated a profound transformation in the conduct of scientific research, fundamentally altering research processes. This transformation has manifested across a wide spectrum of activities, including data analysis, literature review and even academic writing processes. The potential offered by artificial intelligence in scientific research, particularly in fields that rely on big data, accelerates the pace of research, paves the way for new discoveries, and enhances the efficiency of research methodologies (Jordan & Mitchell, 2015). However, this widespread and rapidly increasing usage has made artificial intelligence a central topic of ethical debate. The aim of this study is to examine how artificial intelligence is used in scientific research, its relationship with scientific ethical principles, and the emerging challenges, by evaluating these issues from various perspectives.

Use of Artificial Intelligence in Scientific Research

A review of the literature reveals a number of noteworthy findings regarding the utilization of artificial intelligence tools in scientific research. These findings indicate that artificial intelligence has applications across a range of disciplines, offering potential benefits and opportunities. One of the most prevalent applications of artificial intelligence is in the domain of data analysis and modelling. Artificial intelligence provides scientists, particularly those engaged in research involving large datasets, with the capacity to process vast quantities of data in a rapid and efficient manner, thereby facilitating the derivation of meaningful insights from the data. This capability increases the speed and accuracy of scientific discoveries, thereby enabling research to be conducted in a more efficient and effective manner. In addition to traditional analysis methods, artificial intelligence algorithms provide the ability to process large datasets at a faster rate and extract more profound insights from the data (Al-Jarrah, Yoo, Muhaidat, Karagiannidis, & Taha, 2015; Goodfellow, Bengio & Courville, 2016).

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Furthermore, artificial intelligence is employed in the assessment and production of scientific literature. This facilitates the accelerated dissemination of scientific knowledge and enhances the accessibility of extensive information resources for researchers (Aljanabi, 2023; Maphoto, Sevnarayan, Mohale, Suliman, Ntsopi, & Mokoena, 2024). In this context, natural language processing (NLP) algorithms can analyses thousands of articles in a short time, identifying key trends, gaps, and relationships within the literature (Dergaa, Chamari, Zmijewski, & Ben Saad, 2023; Jarrah, Wardat, & Fidalgo, 2023). Such applications enable researchers to gain quicker access to the existing body of knowledge in a specific field. Furthermore, artificial intelligence tools are increasingly being used in the production and writing processes of scientific literature.

The advent of sophisticated artificial intelligence models such as ChatGPT has markedly streamlined the production and editing of academic texts, thereby accelerating these processes (Brown et al., 2020). These advanced artificial intelligence models provide substantial assistance to scholars engaged in tasks such as text generation, editing, and writing. The traditionally time-consuming and labor-intensive nature of writing processes has become more efficient with the help of these new technologies.

As evidenced by the summary above, artificial intelligence is a common tool in scientific research, particularly in data analysis, literature review, and academic writing. While there is a body of literature that supports the use of artificial intelligence in scientific research (Jarrah et al., 2023), there are also opposing views in the literature. For example, Grassini (2023) posits that artificial intelligence tools may impinge upon human creativity, give rise to ethical concerns, and automate academic procedures, thereby jeopardizing individual analysis and originality. Taiye et al. (2024) posit that while language models markedly expedite content creation and editing, they may also diminish academic originality. As stated by COPE (2021), the utilization of artificial intelligence in the assessment of academic publications gives rise to ethical concerns, given that it is not always feasible to ascertain the veracity of the decisions reached or the data on which they are based. The acceptance of such decisions without understanding their basis may be ethically problematic. Furthermore, the literature indicates that artificial intelligence supported systems in peer review processes may not fully replace the ethical oversight and analysis performed by humans regarding the quality of scientific work (Zohery, 2023).

In conclusion, it is evident that clear standards for the utilization of artificial intelligence in scientific research are yet to be established. From an ethical standpoint, it is not a robust approach to adopt a strictly negative stance towards the deployment of artificial intelligence tools. Fundamentally, artificial intelligence tools are merely a tool, and it is humans who utilize it. Consequently, unethical conduct will not originate from artificial intelligence tools themselves, but rather from the individuals who employ them.

Artificial Intelligence and Data Analysis

Correlational analysis employs mathematical formulas with the objective of identifying the direction and strength of the relationship between two variables. By means of these formulas, scientists undertake statistical analyses of data with a view to examining the correlations between variables. Such analyses are typically conducted using advanced data analysis programs, including SPSS, R, and Python (Field, 2018). It is therefore evident that researchers cannot be accused of behaving unethically when performing these analyses. Similarly, the use of artificial intelligence tools to make predictions based on existing data does not constitute an unethical act. Indeed, artificial intelligence tools are increasingly integrated into the data analysis process, and their use holds the potential to accelerate scientific research processes and improve accuracy rates (Russell & Norvig, 2020).

Nevertheless, the generation or manipulation of non-existent data for the purpose of achieving a desired result is unquestionably unethical. Such an approach not only undermines scientific integrity but also calls into question the reliability and validity of the results (Resnik, 2015). In conclusion, the proper and ethical use of artificial intelligence tools should be encouraged, while unethical practices such as data manipulation must be strictly avoided.

Artificial Intelligence and Literature Review

A literature review is a critical phase in the process of scientific research, forming the foundation upon which subsequent work is built. A literature review enables the researcher to gain an understanding of the existing body of knowledge on the topic, evaluate theories and concepts, and shape the theoretical framework of the study. This contributes to quick access to up-to-date information (Djalilovich, 2021). Furthermore, it provides a crucial framework for the selection of methods and data analysis techniques employed in the research process (Webster & Watson, 2002). A successful literature review serves to enhance the validity and reliability of the research, while also making

significant contributions to the scientific literature. In addition to forming the basis of the research, the literature review plays a crucial role in the interpretation of findings. By providing evidence to support the findings, it strengthens the researcher's arguments (Dinçer, 2018).

Nevertheless, conducting a literature review is frequently a protracted and arduous undertaking. The process of scanning a vast body of literature and conducting a systematic examination of the relevant studies can be quite time-consuming. At this juncture, the utilization of artificial intelligence tools can confer substantial convenience to researchers. Artificial intelligence is capable of expeditiously classifying, summarizing and analyzing pivotal studies during the literature review process. Consequently, researchers can access pertinent studies with greater expediency and examine works with disparate outcomes in the literature in a more systematic manner (Russell & Norvig, 2020).

The utilization of artificial intelligence tools in literature reviews should be approached in a manner analogous to the deployment of data analysis software, and should not be regarded as an unethical practice. To illustrate, searches conducted using keywords through databases such as Google Scholar, Web of Science (WOS), and Scopus are analogous to artificial intelligence assisted searches and do not give rise to ethical concerns in literature reviews. Artificial intelligence tools are primarily employed for the grouping and summarization of studies; however, the researcher's oversight and approval process are always a prerequisite. However, artificial intelligence tools may occasionally misclassify content or generate incorrect summaries due to faulty coding. Consequently, each grouped and summarized study must be subjected to careful review by the researcher (Kim, Yu, Detrick, & Li, 2024).

In conclusion, the use of artificial intelligence tools in literature reviews should be viewed as a method that saves time and increases efficiency for researchers. Nevertheless, it must continue to be utilized under human supervision and in line with ethical principles.

Artificial Intelligence and Academic Writing

The most controversial aspect of utilizing artificial intelligence tools in scientific research is their deployment in academic writing. From an ethical standpoint, academic writing must be contextualized within the themes of academic integrity and the potential limitations of artificial intelligence. The utilization of artificial intelligence tools can be readily elucidated within the context of academic integrity. The pivotal question is whether the researcher is acting with academic integrity. A researcher lacking academic integrity will produce ethically problematic research, regardless of whether they employ artificial intelligence tools or not, and this issue is not open to debate.

A review of the use of artificial intelligence tools in academic writing reveals that the most prevalent applications include text generation, source identification, text editing, and translation services. The use of artificial intelligence tools to write an entire academic report from start to finish is not only a violation of the principle of academic integrity but also presents a risk of plagiarism if proper citation is not provided. A new form of academic misconduct, designated "AI-giarism," has been delineated, wherein texts generated by artificial intelligence tools are utilized in academic works without adequate attribution (Taiye et al., 2024). Furthermore, plagiarism remains a significant challenge to academic integrity. The question of how to address this issue in artificial intelligence generated content is a topic of considerable debate. Given that an academic report typically comprises approximately 8,000 words, relying solely on artificial intelligence to generate the text can result in the use of repetitive sentences, which may impair the coherence and integrity of the report.

The generation of entire texts by artificial intelligence tools present another significant risk: the accuracy of source attribution and the potential for plagiarism (Bender, Gebru, McMillan-Major, & Shmitchell, 2021; Floridi et al., 2018). It has been observed that artificial intelligence tools occasionally fabricate sources during the creation of scientific content (Safdar, Siddique, Gulzar, Yasin, & Khan, 2024), which represents a significant threat to the reliability of a study. It is imperative that every source suggested by artificial intelligence is subjected to rigorous verification. Failure to do so could result in studies that are supported by fabricated sources damaging the reputation of both the author and the publisher. While artificial intelligence tools offer significant advantages, including saving time and accelerating the research process, relying on them excessively could diminish the researcher's active role in knowledge production and limit their intellectual contributions (Nguyen, Hong, Dang, & Huang, 2024). Consequently, the practice of using artificial intelligence to generate entire texts should be avoided.

The utilization of artificial intelligence tools in academic writing, particularly in the context of source identification, has the potential to markedly expedite the writing process. However, this approach also entails the risk of inadvertently retrieving erroneous or deceptive sources. Researchers may occasionally experience difficulty in

identifying suitable sources to substantiate a specific argument. Artificial intelligence tools can assist in this regard by scanning uploaded documents or databases and providing a list of pertinent sources. However, as previously discussed, artificial intelligence tools may occasionally generate fabricated sources, which could either refer to non-existent studies or attribute content to sources that do not contain the claimed information. Consequently, researchers must meticulously verify the suggested sources by consulting primary materials directly to guarantee the veracity of the content.

It is important to recognize that an individual who is proficient in research may not necessarily possess the same level of writing proficiency. Consequently, another significant application of artificial intelligence tools is in the editing of texts and the provision of translation services. The utilization of artificial intelligence tools has the potential to markedly accelerate the translation process, thereby facilitating the expeditious dissemination of knowledge among researchers and academics through the expedient and efficacious translation of texts between diverse languages (O'Connor & ChatGPT, 2023; Tai et al., 2023; Lin, 2024; Semrl et al., 2023). While some software may flag such translations with warnings indicating that they were created with the assistance of artificial intelligence tools, this is no different from receiving support from a translation service. Furthermore, there are no ethical concerns associated with this practice. Indeed, the utilization of artificial intelligence for the purpose of translation frequently results in the generation of highly accurate outputs, obviating the necessity for human intervention. This approach offers significant time savings while simultaneously enhancing the accuracy of the translated text (Zhao, 2022). Nevertheless, it is recommended that these translations be subjected to a review by the researcher. Similarly, artificial intelligence tools can be employed for the purpose of editing texts, with the objective of creating more fluent, grammatically correct, and concise writings. However, it is essential that the final version be subjected to a rigorous review process in order to ensure quality and accuracy.

Acknowledging the Use of Artificial Intelligence in Academic Writing

It is becoming increasingly common for academic papers to be written with the assistance of artificial intelligence systems like ChatGPT. In such cases, it is important to ensure that the contribution of these tools is ethically disclosed. Nevertheless, the question of listing artificial intelligence as an "author" remains a topic of ongoing debate within the context of current academic and ethical guidelines. Some academic journals argue that artificial intelligence tools cannot be considered authors, while others require a detailed explanation of AI's contribution to the text generation process (Bom, 2023; Thorp, 2023). The prevailing practices and ethical standards do not recognize AI as an author, but they mandate clear disclosure of its role in the writing process.

Although a clear standard has yet to be established, it is generally considered appropriate to explain how artificial intelligence tools were utilized in the preparation of a manuscript. It is thought that clearly stating how ChatGPT assisted (e.g. by suggesting text, summarizing, or correcting language errors) will prevent unethical behavior.

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Declaration of Conflicting Interests

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