Editorial

Balancing innovation with responsibility: A policy proposal for ethical artificial intelligence use in medical scholarly publication

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The roots of artificial intelligence (AI) as a terminology go back to the mid-20th century, specifically to the year 1956 when this term was first introduced by John McCarthy, who is considered the father of AI [1]. However, it remained confined to laboratories and research centers, with its use limited to experts, and many aspects of AI remained theoretical during the AI winter period until the 21st century. The year 2022 can be considered a turning point in this field, as OpenAI introduced Chat Generative Pre-trained Transformer (GPT), the most famous AI chatbot that uses various advanced technologies to simulate human conversation for answering questions and generating texts. This breakthrough prompted other leading technology companies such as Google and Microsoft to develop their own chatbots [2]. This marked the beginning of the rapidly growing use of AI in academia and scientific research, with AI-generated articles being submitted to scientific journals, including medical ones, for publication, either acknowledging the use of AI or without disclosure. Some scientific papers have even been published with ChatGPT credited as one of the authors. Recently, voices have risen to reject this trend, considering it a threat to academic integrity, honesty, and responsibility, leading to calls for setting boundaries and regulations for the use of AI tools in academia and scientific publishing [3,4].

The major developments in the world of AI are enabling machines to imitate human writing style by leveraging the vast information available on the Internet and training modern tools to extract and generate information based on pre-defined models. In response to this, the development of intelligent tools for detecting non-human authorship is developing in parallel [5,6]. This should be a warning to those working in the field of biomedical research that there must be a commitment to transparency and balanced ethical use of this technology.

In this paper, we provide a simplified explanation of the architecture and functionality of AI chatbots and then explore the ethical issues associated with the use of AI tools in academic writing. We propose an AI usage policy as an attempt to share ideas with other workers in the field.

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AI-BASED CHATBOTS ARCHITECTURE

Chatbots or GPTs, which are also known as large language models (LLMs) built with a specific goal, are computer programs designed to simulate conversation with human users. They employ a variety of techniques to understand and respond to user inputs, including natural language processing (NLP) and machine learning algorithms. NLP helps chatbots understand the meaning and context of user messages, enabling them to extract relevant information and intent. LLMs are advanced models trained on vast amounts of text data to generate human-like responses. These models use machine learning techniques to process and generate text, allowing chatbots to provide more accurate and contextually relevant responses. Neural networks are a machine learning technique inspired by the structure of the human brain, consisting of interconnected nodes (neurons) organized in layers. They enable the model to learn complex patterns in the data and improve its performance over time. By combining all these techniques, chatbots can effectively engage in conversations with users, making them valuable tools for customer service, information retrieval, and other applications [7-9].

The diagram in Fig. 1 illustrates the architecture of a chatbot and its operation in a simplified manner. Users typically interact with chatbots over the Internet. Chatbots utilize NLP to understand and interpret user inputs, such as text or speech. This process involves tokenizing and parsing the input text to extract keywords, meaning, and intent, such as asking a question, making a request, or providing information. Once the chatbot comprehends the user's message and identifies the intent, it uses algorithms to retrieve relevant information from knowledge bases, databases, or other external sources. In addition, the chatbot considers user input as a source of information. Subsequently, the chatbot generates a response and delivers it to the user in a way that mimics natural conversation. Chatbots use machine learning techniques, such as

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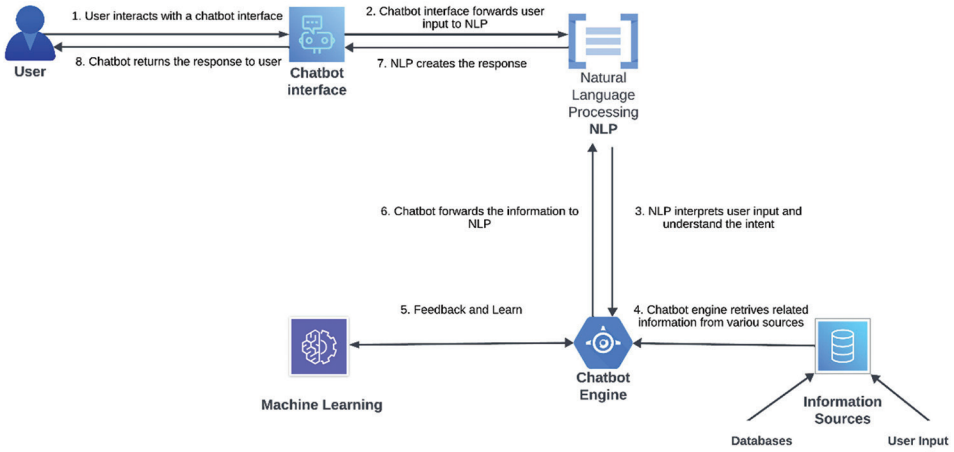

Figure 1: Chatbot architecture

neural networks, to learn and enhance their capabilities. The more information the chatbot receives, the more it learns and improves. That is why companies often introduce their chatbots with a free version initially, allowing them to train and improve without cost, leveraging the vast amount of information provided by users.

It is important to note that while chatbots can provide helpful responses to your queries, the answers are based on the information they have been trained on, which may not always be correct or perfect [9]. Moreover, their training data may not be up to date, especially with free versions, such as ChatGPT 3.5, which is limited to 2022. Furthermore, chatbots do not have the ability to assess the quality of the information source, so they may provide information from non-authentic sources [10-12].

AI-RELATED ETHICAL CONCERNS IN BIOMEDICAL RESEARCH FIELD

The ethical concerns surrounding the use of AI-based chatbots in crafting scientific papers revolve around two key dimensions: The first is related to transparency and scientific integrity, and the second is the responsibility and accountability for the content [12,13]. Utilizing machine-generated texts in scientific papers raises concerns akin to scientific plagiarism, where credit is claimed by the human author for text generated by the machine. One proposed solution to this ethical quandary suggests including the used AI tool in the authors' list, as some have attempted [3,14]. However, this solution introduces another ethical dilemma, as machines inherently lack the capability to be responsible or accountable for content and potential biases. This limitation stems from the inherent inaccuracy of information on the World Wide Web and the likelihood of incorrect or biased outputs from these tools. The intuitive answer to the question of holding machines accountable for such nuances is a resounding no [15].

The year 2023 witnessed a heated debate on the optimal way to deal with this new development in the world of academic research and publishing. Journals and publishers have already started formulating their own policies to address this issue. While the editor of Science decided to completely ban the use of AI tools in writing manuscripts [16] before updating their policies to be more balanced [17], other journals such as the Journal of the American Medical Association [14,18], and the journal of the American Academy of Pediatrics (*Pediatrics*) [19] have adopted policies that allow the use of AI under conditions that enhance transparency, accountability, scientific productivity, and integrity. We argue that the complete ban on AI use in academic writing opens the door for undisclosed use, posing a threat to transparency and hindering the benefits that do not involve unethical aspects such as linguistic and grammatical corrections of texts. Therefore, we believe that the second direction which allows AI use in an ethical way is more applicable and logical, as it is not with the absolute rejection of AI use, but rather ensuring that its use is regulated to prevent data and image manipulation, with full detailed disclosure of its use under the methods section or acknowledgment section [14,17], and with the author or group of authors being responsible for the content of the text.

Adding the chatbot to the list of references was suggested [12]. We argue that this suggestion falls into the trap of honesty and responsibility as well, as the used AI tool itself is not the original source of the information and machines cannot be considered a party that bears responsibility and the developers of AI tools usually state that they do not guarantee the accuracy of their output. Moreover, AI sometimes hallucinates [20,21].

Journals and publishers play a crucial role in regulating AI utilization. Therefore, there is an urgent need for clear guidelines to prevent the misuse of AI tools in academic writing and maintain the integrity of academic research.

PROPOSED AI UTILIZATION POLICY

Based on the preceding discussion, we propose an AI usage policy comprising the following key points:

1. The conventional criteria of the International Committee of Medical Journal Editors for identifying authorship [22] do not extend to AI tools. As such, it is explicitly prohibited to attribute authorship to any AI tool or list them as authors
2. The author or group of authors is assumed to have complete responsibility for reviewing, approving, and disclosing all AI tools used during the preparation of their manuscript

3. AI tools are applicable for technical tasks such as literature reviews, data analysis, and linguistic and grammatical reviews of texts intended for publication. However, it is the author's responsibility to oversee the reviewing, approval, and referencing of information generated by these tools
4. A comprehensive disclosure is essential when utilizing AI techniques or tools. This disclosure should include details such as the name of the language model or AI tool, version and extension numbers, and manufacturer and the methodology employed during its application
5. In the scientific material construction part, such as literature reviews and data analysis, the disclosure regarding AI tools usage is typically integrated into the method section. Conversely, if the AI tool is employed to enhance text quality through linguistic and grammatical review, this disclosure should be placed in the acknowledgment section
6. AI is permissible for generating illustrative images in scientific material, provided these images undergo thorough review and approval, with the authors bearing full responsibility. However, any manipulation of real images to alter or conceal details, thereby distorting the reality of the image, is strictly prohibited
7. It is important to note that AI tools are not considered primary sources of information. They are not accountable for the conclusions they reach, and as such, they cannot be included in the reference list
8. The journal management has the full right to reject articles if the editor or the reviewers detect any AI usage that is not clearly mentioned by the authors in accordance with the policy. The journal may blacklist the authors and report the issue to their institute if this is repeated multiple times.

CONCLUSION

The advancement of AI and the proliferation of AI-based chatbots have revolutionized various aspects of academic research and publishing. However, this development has raised ethical concerns regarding transparency, accountability, and integrity in scientific writing. To address these issues, we have proposed an AI usage policy that emphasizes the responsible use of AI tools. Authors must take full responsibility for overseeing the review, approval, and referencing of information generated by AI tools. Journals and publishers play a critical role in regulating AI usage, and clear guidelines are necessary to ensure that AI tools are used ethically and transparently in academic writing. Implementing such policies will help maintain the credibility and integrity of academic research in the age of AI.

AUTHORS' CONTRIBUTIONS

All authors made substantial contributions to the reported work, participating in various aspects such as conception, study design, implementation, data collection, analysis, and interpretation, as well as contributing to drafting, revising, and critically reviewing the article, and ultimately approving the final version for publication.

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