Impact of Chat GPT on Scientific Research: Opportunities, Risks, Limitations, and Ethical Issues

Omar Ibrahim Obaid[1,*] Ahmed Hussein Ali[1] Mohanad Ghazi Yaseen[1]

[1] Department of Computer, College of Education, Al-Iraqia University, Baghdad, Iraq

ABSTRACT: The creation of chatbots, such as Generative Pre-trained Transformer (GPT), is a result of recent developments in natural language processing (NLP). Even though Chat GPT has demonstrated enormous promise in a number of areas, including scientific research, this impact is still developing. This paper attempts to investigate the possibilities, threats, limits, and ethical issues surrounding Chat GPT in scientific research. The assessment of the literature on Chat GPT and scientific research is followed by the presentation of case examples that demonstrate the potential advantages and difficulties of Chat GPT use in scientific research. Finally, we conclude by pointing about the ethical issues that need to be tackled before Chat GPT can be completely utilized in scientific research.

Keywords: Chat GPT, Scientific Research, Opportunities, Risks, Limitations, Ethical Issues

1. INTRODUCTION

Chatbots are employed through natural language processing (NLP) technologies, they are computer programs that simulate conversation with human users. In the recent years, they have gained a progressive level of popularity in various fields, such as scientific research. By streamlining research procedures and intensifying the accuracy and productivity of data collection, analysis, and communication, they have become a useful tool [1, 2]. Applications like conducting surveys, collecting data, and helping with literature reviews are all various features which chatbots can provide. Chatbots powered by advanced AI models like Generative Pre-trained Transformer (GPT) are gaining traction in scientific research and outreach. These conversational agents allow scientists to engage audiences and enhance communication [3,4]. GPT, in particular, has revolutionized how researchers perform and collaborate on studies [4]. As a natural language processing system, GPT can interpret text, tackle tasks, and even generate original content. This makes it a game-changer for the scientific community [5].

Recently, there has been growing interest around GPT's potential impact on research. ChatGPT has immense capabilities for text mining, information retrieval, and natural language processing. It can logically respond to prompts, form hypotheses, conduct literature reviews, and analyze massive datasets [3,6]. While promising, evaluating GPT's opportunities, limitations, and ethical implications is crucial.

The goal here is to examine how GPT-powered chatbots could improve scientific research by boosting accuracy, efficiency, and quality in data collection and analysis. These tools have the potential to disrupt this field. However, we must fully consider their pros, cons, constraints, and ethical considerations first.

2. LITERATURE REVIEW

Natural language processing (NLP) models have become integral tools in recent scientific research across diverse fields like engineering, healthcare, and social sciences. Their wide range of applications provide new ways to analyze

large textual data sets, but also come with challenges. A major application is utilizing NLP models for data mining unstructured text, including health records, reviews, and scientific literature. By examining these massive text volumes, researchers can uncover previously hidden patterns, relationships, and insights to inform future studies [7]. NLP can also enable automated systems for text classification, sentiment analysis, and information retrieval. This allows efficient processing of huge text data to extract relevant details and generate knowledge [8].

For example, NLP models have powered automated tools to locate relevant academic papers, saving time and boosting research accuracy. In summary, NLP models hold immense potential to transform how scientists analyze and extract value from textual data in research. However, their application also poses hurdles to overcome. With thoughtful implementation, NLP promises to revolutionize scientific text analysis and interpretation. However, it is essential to contemplate the challenges and restrictions associated with their usage and to design proper security measures which guarantee that these models are applied ethically and responsibly [9, 10].

Finally, as it is a natural language processing model, GPT has the potential to significantly reduce the prior effort that is put into scientific research, as well as the likelihood of producing results of a higher quality. Nonetheless, some apprehensions still remain with regards to its ability to personalize and its general acceptance within related communities [6, 11]. In conclusion, having seen the promising and yet slightly concerning results that GPT can produce by using its "Common Sense" approach across a variety of applications, a more thorough review needs to take place before it can be used extensively in the scientific research field [12]. This is primarily due to the potential risks involved if not used correctly, such as incorrect information or the violation of intellectual property [13].

3.   OPPORTUNITIES OF CHAT GPT IN SCIENTIFIC RESEARCH

Chat GPT has opened up distinct possibilities for the progression of science, largely in the domains of natural language processing, text mining, and information retrieval. To begin with, Chat GPT can be employed to scan and condense large quantities of scientific literature, which can assist researchers in discovering new research ways, deciding upon novel hypotheses, and gaining understanding into existing research [14ChatGPT has many potential applications that could enhance scientific research:

- It can generate high-quality, coherent text in response to prompts. This helps researchers write manuscripts, proposals, and communicate findings more effectively.
- It can classify large datasets based on predetermined labels. This enables researchers to detect patterns, trends and connections.
- It can extract relevant data from massive datasets like medical records, papers, or social posts [14].
- It can provide personalized recommendations aligned with researchers' interests, skills, and goals. This helps them stay current and make informed decisions.

In summary, ChatGPT can accelerate discovery and improve the efficiency and efficacy of research [14]. It does this by aiding writing, finding insights in data, extracting key information, and recommending relevant content. Overall, ChatGPT has immense potential to enhance the scientific research process.

FIGURE 1. Opportunities of Chat GPT In Scientific Research

4. RISKS OF CHAT GPT IN SCIENTIFIC RESEARCH

Although ChatGPT shows promise for advancing scientific research, it's crucial to examine the potential dangers of utilizing this technology. Firstly, training on data that is not representative of the target population can create biases with the results being unreliable or inaccurate, potentially leading to negative consequences for research. Secondly, Chat GPT can generate unreliable or incorrect results when attempting to analyze complex or nuanced data, leading to erroneous conclusions and subsequently, a decrease in the credibility of research [15]. Thirdly, malicious intent may be an issue with Chat GPT as it can be used to generate false news, manipulate public opinion or disseminate misleading information. Fourthly, difficulties may arise in understanding the outputs generated by GPT, particularly when a complexity of data is present, making it hard to replicate or validate results and in turn, reducing the validity of the research [15]. Lastly, a number of ethical concerns can come up with the use of Chat GPT, notably in terms of privacy, consent, and fairness, especially if sensitive data is at play or decisions that affect individuals and groups are required to be taken. While Chat GPT could be a viable source for advancing research, it is important to take into account the potential risks associated with its usage in order to prevent any associated negative consequences. The following figure illustrates these risks [15].

Chat GPT Risks In Scientific Research

1. Biased Training Data
2. Accuracy and Reliability
3. Misuse or Abuse
4. Lack of Transparency
5. Ethical Concerns

FIGURE 2. Risks of Chat GPT In Scientific Research

5. LIMITATIONS OF CHAT GPT IN SCIENTIFIC RESEARCH

Chat GPT poses a range of limitations to the research process. Primarily, some specialized knowledge may be missing in Chat GPT, which could avoid delivering precise answers or pertinent information in certain areas. In addition, even if Chat GPT could produce well-structured and grammatically correct texts, it could lack creativeness or freshness, which could impair its capacity to bring fresh ideas or insights [16].

This inability to control output and certify exactness and dependability of the generated data may also manifest if complex or subtle data is analyzed. Relatedly, Chat GPT may faint to comprehend context or past knowledge, and this could finish up in being inefficient to explain or understand the produced information. Last but not least, Chat GPT demands substantial computational resources, which can be costly and time-consuming. On the whole, despite having the potential to reinforce research, one should responsibly examine its shortfalls and make use of it together with other methods and tools to certification research results is accurate and valid [16]. The following figure shows these limitations.

FIGURE 3. Limitations of Chat GPT In Scientific Research

6.   ETHICAL ISSUES OF CHAT GPT IN SCIENTIFIC RESEARCH

It is imperative to consider the ethical issues that come with the utilization of Chat GPT in scientific research. Firstly, it may be employed in order to inspect confidential data, such as medical records or accounts on social media, which could consequently affect the data privacy and confidentiality. Additionally, data regarding individuals may also be put through analysis, which requires the need for informed consent as well as allowing one the right to discontinue the research [15]. The utilization of Chat GPT in research may result in biased or discriminating results, largely due to it being educated on data that may reflect any existing biases or stereotypes. Furthermore, similar or copied content could possibly be created with such technology, thus giving rise to concerns regarding plagiarism and copyright infringement. It may even be used for malicious goals, resulting in fake news or wrong information, which shows the importance of using such technology responsibly. Unanticipated or unintended outcomes may also arise, demanding that accountability and responsibility be gotten for the data generated [15, 16]. So as to make sure the technology is utilized properly, ethical regulations for its appropriate use in research may be developed and verified. Furthermore, data privacy, informed consent, and accountability in the research procedures must be encouraged. The following figure demonstrates these issues.
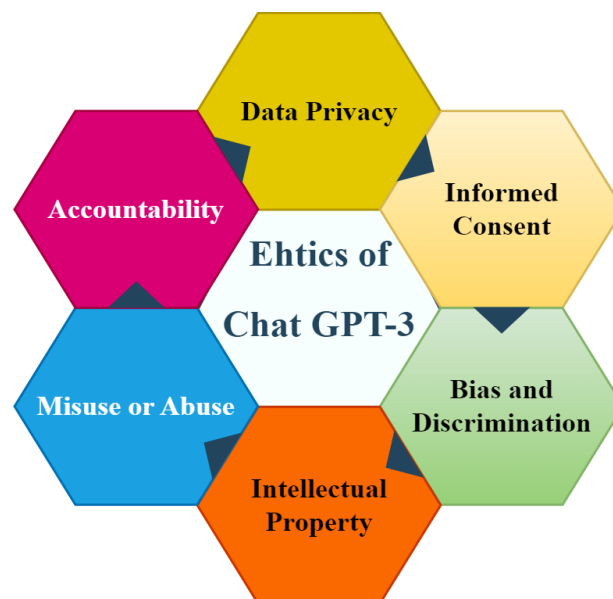
FIGURE 4. Ethical Issues of Chat GPT In Scientific Research

7. CONCLUSION

In conclusion, Chat GPT has a tremendous impact on scientific research, facilitating the generation of new ideas, insights, and increased productivity. However, the use of Chat GPT also presents a number of potential issues, including potential bias, domain-specific knowledge requirements, and ethical considerations regarding data privacy and intellectual property. Therefore, it is essential for researchers to carefully contemplate these topics and establish thoughtful preventive measures to ensure the prudent and ethical use of Chat GPT in scientific research. In order to fully realize the capacity of this technology in scientific investigation and to solve the critical problems now facing society, further exploration and assessment is necessary.

CONFLICTS OF INTEREST

None.

REFERENCES

[1] E. Adamopoulou and L. Moussiades, "An overview of chatbot technology," in Artificial Intelligence Applications and Innovations: 16th IFIP WG 12.5 International Conference, AIAI 2020, Neos Marmaras, Greece, June 5–7, 2020, Proceedings, Part II, I. Maglogiannis, L. Iliadis, and E. Pimenidis, Eds. Cham: Springer International Publishing, 2020, pp. 3–14. [Online]. Available: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7256567/. [Accessed: Jun. 09, 2023].

[2] A. Følstad et al., "Future directions for chatbot research: an interdisciplinary research agenda," Computing, vol. 103, no. 12, pp. 2915–2942, Dec. 2021, doi: 10.1007/s00607-021-01016-7.

[3] E. Adamopoulou and L. Moussiades, "Chatbots: History, technology, and applications," Machine Learning with Applications, vol. 2, Dec. 2020, Art. no. 100006, doi: 10.1016/j.mlwa.2020.100006.

[4] M. Salvagno et al., "Can artificial intelligence help for scientific writing?" Crit Care, vol. 27, no. 1, p. 75, Feb. 2023, doi: 10.1186/s13054-023-04380-2.

[5] OpenAI, "Optimizing Language Models for Dialogue," OpenAI Blog, Jan. 28, 2022. https://openai.com/blog/chatgpt/ (accessed Jul. 11, 2023).

[6] M. Aljanabi et al., "ChatGpt: Open Possibilities," Iraqi Journal for Computer Science and Mathematics, vol. 4, no. 1, pp: 62–64, Jan. 2023, doi: 10.52866/ijcsm.2023.01.01.0018.

[7] D. Khurana et al., "Natural language processing: state of the art, current trends and challenges," Multimed Tools Appl., vol. 82, no. 4-6, pp. 3713–3744, Feb. 2023, doi: 10.1007/s11042-022-13428-4.

[8] M. Cai, "Natural language processing for urban research: A systematic review," Heliyon, vol. 7, no. 3, Mar. 2021, Art. no. e06322, doi: 10.1016/j.heliyon.

[9] M. R. King, "The Future of AI in Medicine: A Perspective from a Chatbot," Ann Biomed Eng., vol. 51, no. 1-2, pp. 291–295, Jan.-Feb. 2023, doi: 10.1007/s10439-022-03121-w.

[10] M. Hutson, "Could AI help you to write your next paper?" Nature, vol. 611, no. 7890, pp. 192–193, Oct. 2022.

[11] M. Hammad, "The impact of artificial intelligence (AI) Programs on writing scientific research," Ann Biomed Eng., vol. 51, no. 1-2, pp. 459–460, Jan.-Feb. 2023.

[12] M. Mijwil, Mohammad Aljanabi, and ChatGPT, "Towards Artificial Intelligence-Based Cybersecurity: The Practices and ChatGPT Generated Ways to Combat Cybercrime", Iraqi Journal For Computer Science and Mathematics, vol. 4, no. 1, pp. 65–70, Jan. 2023.

[13] X. Liu et al., "GPT understands, too," arXiv preprint arXiv:2103.10385, Mar. 2021.

[14] J. Homolak, "Opportunities and risks of ChatGPT in medicine, science, and academic publishing: a modern Promethean dilemma," Croat Med J., vol. 64, no. 1, pp: 1–3, Feb. 2023, doi: 10.3325/cmj.2023.64.1.

[15] B. Vasylkiv, "Limitations and ethical considerations of using chatgpt," Incora, May 04, 2023. [Online]. Available: https://incora.software/insights/chatgpt-limitations.

[16] A. KORKMAZ, C. AKTÜRK, and T. TALAN, "Analyzing the User's Sentiments of ChatGPT Using Twitter Data", Iraqi Journal For Computer Science and Mathematics, vol. 4, no. 2, pp. 202–214, May 2023.