

## From advancements to ethics: Assessing ChatGPT's role in writing research paper

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### ABSTRACT

Artificial intelligence (AI), with its infinite capabilities, has ushered in an era of transformation in the twenty-first century. ChatGPT (Generative Pre-trained Transformer), an AI language model, has lately been in the spotlight, and there is an increasing partnership between the research authors and the chatGPT. Using ChatGPT, authors can set new benchmarks in paper writing in terms of speed, accuracy, consistency, and adaptability. ChatGPT has turned out to be an invaluable tool for manuscript writing, editing, and reference management. While it has numerous advantages, it has been criticised due to ethical quandaries, inaccuracies in scientific data and facts, and, most importantly, a lack of critical thinking skills. These disadvantages of using ChatGPT place limitations on its use in medical publications since these articles guide the future management of many diseases. While AI can fix issues, it lacks the ability to think like humans and thus cannot substitute human authors. To better comprehend the future of this technology in research, we discuss the advantages, drawbacks, and ethical dilemmas of using ChatGPT in paper writing by reviewing existing literature on Pubmed and Google Scholar and using ChatGPT itself to understand the prompt response.

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## INTRODUCTION

When asked to describe itself {"Hello, tell me about yourself?"}, the ChatGPT responded, "Hello! As an AI language model, I don't have a physical form, but I'm here to help you with any questions or tasks you might have that require language processing. I was created by OpenAI, a research organisation focused on advancing artificial intelligence safely and beneficially for humanity. I was trained on a large corpus of text data from the internet, and my architecture is based on the GPT (Generative Pre-trained Transformer) framework. I'm capable of performing various language tasks, such as answering questions, generating text, summarising documents, and much more. I'm here to help you in any way I can, so please don't hesitate to ask me anything!" (Source: *OpenAI/ChatGPT*).

The launch of ChatGPT by OpenAI in November 2022 gained recognition from a global audience. It was evident immediately that this was an entirely new level of service that artificial intelligence (AI) could provide to anyone looking for information, responses, or solutions online.<sup>1</sup> AI uses machines to perform functions that traditionally require human intelligence, such as sensing, reasoning, learning, and problem-solving.<sup>2</sup> Under the umbrella of AI comes machine learning (ML), which means the development of algorithms that can learn from data and make predictions or conclusions without being explicitly programmed to do so. Deep learning (DL) is a subset of ML that uses multiple-layer neural networks to learn progressively complicated properties from input.<sup>3</sup> Based on the GPT architecture, ChatGPT is a substantial language model created by OpenAI. GPT models are neural network-based language models that can produce coherent and natural language text in response to a prompt.<sup>4</sup> They have been pre-trained on vast volumes of text data. The ChatGPT model is specifically created for natural language processing tasks like conversation generation, chatbots, and question-answering systems. OpenAI initially presented the GPT architecture in 2018.<sup>5</sup> Since then, other large-scale language models, notably GPT-2 and GPT-3, have been created using the architecture and have demonstrated excellent performance on various language tasks. The ChatGPT model from OpenAI was first introduced in 2020 to produce human-like responses in conversational contexts.<sup>6</sup> It is founded on supervised and reinforcement learning methods, which employ human trainers. Although it has been acknowledged that its solutions can still be wrong or misleading, it gained popularity among millions of users for providing extensive,

organised answers to questions on practically any topic.<sup>1</sup> ChatGPT can be used in various ways, like chatbots, in language translation, content generation, and answering questions on a wide range of topics, including science, history, current affairs, and many more. A recent subject of debate is the application of ChatGPT for writing medical papers. According to ChatGPT, it can help the authors streamline the writing process by assisting in the following areas:

1. Literature review: ChatGPT can assist in the literature review process by providing summaries of relevant articles, identifying key concepts and trends, and generating hypotheses for further research.
2. Manuscript writing: ChatGPT can assist in writing the manuscript by generating sections such as the introduction, methods, results, and discussion. It can also help develop a coherent and logical flow for the paper.
3. Medical terminology: ChatGPT has an extensive knowledge base of medical terminology and can provide suggestions for using appropriate medical terminology in the paper.
4. Editing: ChatGPT can help in the editing process by identifying grammatical errors, suggesting improvements in sentence structure, and ensuring the overall coherence of the paper.
5. Citation management: ChatGPT can assist in the citation management process by suggesting appropriate sources and formats for citation.

Thus, given the notable surge in chatGPT usage, this article discusses the benefits, drawbacks, and ethical considerations of employing chatGPT in research composition.

### Advantages

"Hey, chatGPT, what are the advantages of using you to write scientific research papers?"

"As an AI language model trained on a vast amount of data, I can provide several advantages for writing medical research papers:

- Efficiency: I can help you save time by quickly generating high-quality content relevant to your research topic.
- Accuracy: I am designed to minimise grammar, syntax, and spelling errors. This helps ensure your medical research paper is clear and easy to read.
- Research: I can help you conduct research by suggesting relevant articles, studies, and other resources related to your research topic.
- Consistency: I can help you ensure consistency in terminology, phrasing, and formatting throughout your

medical research paper.

- Flexibility: I can adapt to your specific needs and preferences, whether you need help writing, editing, or formatting your medical research paper.” (Source: *OpenAI/ChatGPT*).

ChatGPT, within minutes, if not seconds, can generate a well-written and original article, produce a proposal requesting grants, and develop a quality improvement project just by using simple input the user gives. It is also well-versed in statistical analysis and can write codes.<sup>7</sup> Macdonald et al.<sup>1</sup> created a simulated data set of 100,000 healthcare workers to see the rate of hospitalisation due to COVID-19 infection in workers vaccinated with the COVID-19 vaccine versus those who are not. The authors then used this fictional data to ask chatGPT to draft a paper on vaccine effectiveness, write codes, calculate hazard ratio, and perform survivor analysis.<sup>1</sup> In a review of literature written using chatGPT, the authors found that it can create readable content if fed with a summary using bullet points. It can also help manage the references, arrange them in order, and edit them according to the journal’s requirements.<sup>8</sup> ChatGPT can quickly go through thousands of relevant published articles, summarise them, and write literature reviews, thus saving the researcher a lot of time and energy.<sup>9</sup> It is also an editing and revision tool that can provide alternative and better phrasing, correct grammar, spell-check the draft, and suggest additional data to consolidate the author’s argument.<sup>10</sup> Finally, the journals usually provide paid editing services for authors from non-English speaking countries or even in general when a paper requires editing. ChatGPT can replace those services well and perform the task with similar accuracy and at no cost.<sup>11</sup>

### Disadvantages and Limitations

As per ChatGPT, here are some potential disadvantages of using it in writing medical research papers:

- Lack of domain-specific knowledge: ChatGPT may not have a deep understanding of complex medical concepts or terminology specific to a particular field of medicine.

- Inaccuracy in scientific data and facts: ChatGPT generates responses based on the data it has been trained on, which may not always be accurate or up-to-date. Therefore, it may not provide accurate information for medical research purposes.

- Limited ability to interpret results: ChatGPT may not be able to analyse and interpret experimental data or results of medical research as a trained medical researcher can.

- Difficulty in identifying relevant sources: ChatGPT may be unable to identify relevant and credible sources for medical research papers. This can lead to inaccurate or unreliable information being included in the paper.

- Lack of critical thinking skills: ChatGPT does not have the ability to think critically and make informed judgments about medical research. Therefore, it may not be able to provide insights or draw conclusions based on research findings in the same way a human researcher can.

As an AI language model, ChatGPT can assist in generating text, including medical research papers; however, there are certain limitations and disadvantages to using AI-generated text in the context of medical research papers. ChatGPT might struggle to locate relevant and reputable sources for medical research articles. This may lead to inaccurate or fabricated information in the document.<sup>12,13</sup> Also, ChatGPT cannot articulate its thinking or decision-making process, making it difficult to comprehend how it arrived at a specific result or detect possible flaws.<sup>14</sup> While ChatGPT has access to a wealth of material, it may lack a thorough understanding of medical terminology, research methodology, and other domain-specific knowledge needed to write medical research publications. As a result, it may produce incorrect or unsuitable language for the target demographic. As medical research articles frequently contain complex data, statistics, and graphs that must be correctly analysed and interpreted, ChatGPT may be unable to effectively understand this data, culminating in inaccuracies in the research article.<sup>15</sup> Unfortunately, it may also be unable to completely comprehend the context or intricacies of a particular research article, resulting in erroneous or irrelevant content being created.<sup>16</sup> Medical students rely on their mentors to learn the fundamentals of research, but ChatGPT can take over the job of medical students, jeopardising their academic potential. While ChatGPT can create material instantly, it may not be as proficient at reviewing and revising text as a human writer. This may result in mistakes or inconsistencies in the research article. ChatGPT is based on AI and cannot substitute human knowledge and oversight in the authoring and review processes. ChatGPT can significantly alter the role of peer reviewers and editors. The partial outsourcing of editorial work to ChatGPT may have unintended effects on social and epistemic relationships within academia because editorial work plays a significant role in defining and forming epistemic communities and negotiating normative frameworks within such communities.<sup>17</sup> A human expert in medical research may provide essential insight,

analysis, and critique of the work that an AI language model cannot replace.<sup>18</sup> Therefore, while ChatGPT can help generate text for medical research papers, it is recommended to use it in conjunction with domain-specific knowledge and human oversight to ensure the accuracy and quality of the final product.

### Ethical Implications

In our conversation with the chatGPT about the ethical implications of using it for writing medical research papers, the AI model raised the following concerns:

“If the generated text is used in a research paper, it is important to consider the intellectual property rights of the original sources. Using copyrighted material without permission or attribution can be considered unethical and may result in legal consequences.”

- “Using an AI language model like ChatGPT to write medical research papers can be seen as a form of plagiarism or academic dishonesty.”

- “Using ChatGPT to write medical research papers without the proper knowledge and expertise could potentially lead to inaccurate or misleading results, which could have serious ethical implications.”

- “Using ChatGPT to write medical research papers could also raise issues related to bias and fairness.

Language models like ChatGPT are trained on large datasets, which can potentially contain biases and prejudices that may be reflected in the generated text. It’s important to be aware of these biases and take steps to mitigate them to ensure that the research is fair and unbiased.” (Source: OpenAI/ChatGPT)

The ethical red flags this honest AI system raises are similar to what the scientific community has discussed. According to the International Committee of Medical Journal Editors (ICMJ), for someone to be classified as an author, they should have contributed substantially to the concept, design, acquisition, and analysis of data, drafted and approved the manuscript, and finally, signed an agreement that the authors are responsible and accountable for the published work.<sup>19</sup> While submitting any paper, the authors are also required to sign a copyright transfer form.<sup>20</sup> Still, there are yet to be any policies determining the owner and copyright holder of all the text it generates, the authors or the coders who wrote the data set for ChatGPT or the company which owns it.<sup>21,22</sup> When queried by ChatGPT if its name should be on the author list, it responds that since it is an AI, it is not considered to be an author. The journals require unanimous consent and final approval from all authors before publishing any manuscript; hence it is unfair and unethical on ChatGPT

to be unable to provide its consent when it is mentioned as one of the authors. The author guidelines for journals need to address these moral conundrums.

Although an advanced system, ChatGPT cannot take responsibility and be held accountable for the information it provides as many publishing services like Elsevier have come to a consensus that ChatGPT and other AI cannot be listed as the authors as it does not fulfil the ICMJ criterion.<sup>23</sup> The authors certify that the submitted work is original, but the big question is, “Is it?” It is not as it has been copied from ChatGPT, which is nowadays known as “AIgariism”.<sup>24</sup> By dishonouring the ethics of paper writing, students are also committing academic dishonesty by simply copy-pasting from ChatGPT, which can have severe implications for their careers in the future.<sup>13</sup> Additionally, under the limitations section on the home page of Open AI’s ChatGPT, the company acknowledges that the information might be incorrect, misleading, and limited to the events before 2021 (Source: OpenAI/ChatGPT). The responses generated by ChatGPT are easy to read, look pleasing to the eye, flow smoothly, and without grammatical errors. However, it is seen that sometimes a link does not work or a citation does not exist, and there is no way for the journals to validate each reference if it slips from the reviewer or is not flagged by them during the rigorous peer review process.<sup>25</sup> All this can pave the way for misinformation and incorrect health policies formulated using this data.<sup>26</sup> Biases will always be present in any algorithm or machine humans create, and ChatGPT is no different, and neither is it claimed to be. Not only does the bias exist, but it can also amplify it. For instance, studies have shown that ChatGPT can generate biased outcomes based on sexist stereotypes, and it can favour the scientific hypothesis on which the original layers of code were trained.<sup>21,27</sup> Lastly, as of March 12, 2023, ChatGPT is available at no cost for people to exploit its full potential, but it has been confirmed that this is temporary.<sup>23</sup> In the future, this might lead to inequalities as countries and institutes that do not have the funds and resources to sponsor will not be able to reap the benefits of the monetised model, thus widening the already existing disparities in the publishing world.<sup>17</sup> In addition to biases and dishonesty, ChatGPT-generated text may have highly plagiarised content, sometimes exceeding the acceptable tolerance level. This is because ChatGPT generates text from its training data, and the proportionality of this plagiarism is directly related to the more commonly researched data in the field. In addition, due to large data sets and machine learning protocols, ChatGPT often threatens sensitive medical and

personal data, especially when data is shared during a conversation with ChatGPT or other AI-powered tools, or ChatGPT is being used on public servers. It becomes the moral duty of the writer to ensure the safekeeping of any sensitive data and be aware of the legal implications of using ChatGPT for academic writing.<sup>28</sup>

### Future

The role of ChatGPT in writing scientific papers cannot be entirely discarded, and just as the computer and internet revolutionized the world in the 20<sup>th</sup> century, this large language model (LLM) might take over research paper writing one day.<sup>29</sup> However, this will only be possible once journals and other publishing companies find out a way to detect the text generated by ChatGPT. Currently, 2 to 3 % of research papers are plagued with plagiarism, and using AI models can inflate this number.<sup>30</sup>

Already existing tools like iThenticate, which are already being employed by journals, lack the capability to detect text copied from an AI interface. Still, new software is being developed to bridge this gap. The creators of ChatGPT, OpenAI, are themselves in the process of creating a detector and even launched one earlier this year, called the “classifier,” which has its own limitations and can be fooled by fraudulent authors at this stage.<sup>27</sup> Additional checkpoints like asking authors to disclose the use of AI can be used during the time of submission, and more tools and training can be provided to the editors to assist them during the editorial review process.<sup>31</sup>

## CONCLUSIONS

AI and its resources have undoubtedly become valuable in scientific research, but they cannot fully replace researchers' critical and reflective thinking abilities. ChatGPT relies on pre-existing content and lacks the analytical capabilities of humans, such as the ability to weigh values and draw on sensory experiences to make technical and scientific decisions in the current context. While AI can aid in the processing and analysing large datasets, it cannot replace human judgment or intuition. Researchers play a crucial role in identifying meaningful patterns and interpreting the results generated by AI models. The ability of researchers to evaluate the reliability and validity of data is paramount in producing high-quality research. Furthermore, researchers possess the skill set to draw on various sources of evidence, such as experimental findings, theoretical frameworks, and

previous research, to contextualize their findings and discuss their implications. This is an essential aspect of scientific research that AI cannot fully automate. In addition, researchers are responsible for communicating their findings in a way that is both informative and engaging for the reader. The ability to articulate complex scientific ideas clearly and concisely is a skill that requires human expertise and experience. In conclusion, while AI and its resources are valuable in scientific research, they cannot replace the human expertise and experience required for interpreting results, contextualizing findings, and communicating them effectively to readers.

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