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Review Article

The role of ChatGPT in scientific communication: writing better scientific review articles

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Abstract: Artificial intelligence tools represent an exciting opportunity for scientists to streamline their research and write impactful articles. Using artificial intelligence tools like ChatGPT can greatly improve writing review articles for scientists, by enhancing efficiency and quality. ChatGPT speeds up writing, develops outlines, adds details, and helps improve writing style. However, ChatGPT's limitations must be kept in mind, and generated text must be reviewed and edited to avoid plagiarism and fabrication. Despite these limitations, ChatGPT is a powerful tool that allows scientists to focus on analyzing and interpreting literature reviews. Embracing these tools can help scientists produce meaningful research in a more efficient and effective manner, however caution must be taken and unchecked use of ChatGPT in writing should be avoided.

Keywords: Artificial intelligence, ChatGPT, scientific writing, review article

Introduction

The use of artificial intelligence (AI) tools such as ChatGPT (OpenAI, San Francisco, CA), is becoming increasingly important in scientific writing [1-5]. Whether you like or hate it, you need to face the fact that many other people are using ChatGPT to generate a lot of manuscripts right now [6-9]. Instead of resisting it or wasting your time to blame it, a better choice is for you to manage to use this powerful tool as your personal assistant, ethically, to increase your productivity and the quality of your works.

Using ChatGPT is a powerful tool to help scientists to write review articles more efficiently. Here are several reasons why you should use it to increase your proficiency in review writing, speed up your writing process, and save time [10-12].

It saves us time. Writing a review article can be a time-consuming process, involving extensive research, organization, and writing. AI tools like ChatGPT can speed up the writing process by automatically generating contents that can be further edited and refined by human authors, saving valuable time and resources.

It can help us to manage your data. Scientists often need to sift through large volumes of data and research papers to find relevant information for their review articles. AI tools like ChatGPT can assist with data management by analyzing and summarizing large amounts of information effectively and much more quickly than humans.

It can help us to improve the quality of our scientific writing. AI tools like ChatGPT can help to improve the quality of our writing by identifying potential errors, inconsistencies, or gaps in the argument. This can help human authors to refine their writing and ensure that their manuscript is accurate, well-structured, and well-supported by all available evidence as much as possible.

It can help us to keep a more balanced perspective. ChatGPT is not personally biased and can thus provide diverse perspectives on a given topic. This can be particularly useful in fields where there are many conflicting opinions and viewpoints, for example, promoting a ketogenetic diet for patients with the cardiovascular disease.

Moreover, if you are not a native English speaker, ChatGPT can be tremendously helpful. Are you tired of being criticized by the reviewers and editors on your English writings for not using the standard English, and suggest you to ask a native English speaker to help proofreading or even use the service from a professional English editor? ChatGPT can readily help you with grammar and sentence structure, suggest appropriate vocabulary choices, assist in translating text from one language to another, so on and so forth.

In addition to the above reasons, ChatGPT can help suggesting the article title, shortening, or expanding the abstract, discussing the results, and even recommending creative ideas.

ChatGPT can also help us to do the plagiarism detection. AI tools have been utilized to assist with detecting plagiarism by checking the similarity of the text with existing, published sources, helping to ensure that the manuscript is original and not copied from others' work.

Overall, the use of AI tools like ChatGPT can significantly help scientists to write review articles more efficiently and accurately, thus improving the quality and impact of their research outcomes.

How ChatGPT works

ChatGPT is an AI language model developed by OpenAI [1, 2]. It is based on a deep neural network architecture called the transformer model, which adopts the mechanism of self-attention, differentially weighting the significance of each part of the input data. The transformer model is pretrained on an extremely large corpus of text data to learn context and thus meaning by tracking relationships in sequential data such as the words in a sentence. After the pretrained phase, the transformer model is then able to generate natural language responses to user inputs.

When a user inputs a text prompt, ChatGPT generates a response based on its understanding of the input and the patterns it has previously learned from the text data it has been trained on. ChatGPT is capable of generating responses in a variety of formats, including short answers, long-form essays, and even conversation-style interactions [1, 2].

ChatGPT works by breaking down the input text into a sequence of tokens, which are then processed by the transformer model to generate a probability distribution over the next token in the sequence. The model then selects the token with the highest probability and generates the corresponding output text. This process is conducted iteratively, with the model generating a new token and output text at each step, until a stopping criterion is met [1, 2].

AI tools like ChatGPT is capable of generating responses in a wide range of domains, including scientific writing, creative writing, and general conversation. Its ability to generate natural language responses that are coherent and contextually relevant has made it a popular tool for a wide range of applications, including automated content creation, language translation, and natural language processing, just to name a few [1-5, 13-16].

How ChatGPT can assist scientists in writing

ChatGPT can assist scientists in conducting literature reviews

Topic selection: ChatGPT can help scientists to select a suitable topic for their literature review by generating relevant keywords and suggesting related and meaningful research areas. For example, a biologist could input "What are the latest research areas in the field of molecular biology?" and ChatGPT could generate a list of relevant keywords and research areas, such as "CRISPR-Cas9 gene editing", "single-cell sequencing", and "epigenetics".

Literature search: ChatGPT can assist scientists in conducting literature searches by generating relevant search queries and suggesting relevant databases and resources. For example, a biologist could input "What are the best databases to search for articles on CRISPR-Cas9 gene editing?" and ChatGPT could generate a list of relevant databases and search queries, such as "PubMed", "CRISPR-Cas9 AND gene editing", and "CRISPR-Cas9 AND therapeutic applications".

Article selection: ChatGPT can help scientists to select relevant articles for their literature review by generating summaries and providing context for each article. For example, a biologist could input "Can you summarize the find-

ings of the latest review article on single-cell sequencing in cancer research?" and ChatGPT could generate a summary of the article, highlighting its key findings and relevance to the topic at hand.

Citation and referencing: ChatGPT can assist scientists in accurately citing and referencing their sources by generating the appropriate citation format and suggesting related articles to cite. For example, a biologist could input "How do I cite a journal article using the APA citation style?" and ChatGPT could generate the appropriate citation format and provide examples of related articles to cite.

Overall, ChatGPT can assist scientists in conducting literature reviews by helping them to select relevant topics, conduct literature searches, select articles, and accurately cite and reference their sources. By automating many of the time-consuming and tedious tasks associated with literature reviews, ChatGPT can help scientists to conduct more comprehensive and efficient reviews, leading to higher quality review manuscripts, and, in a much more efficient manner.

ChatGPT can assist scientists in developing outlines

Inputting the topic: Scientists can input the topic of their review article, for example, "The role of epigenetics in cancer development and treatment".

Generating subtopics: ChatGPT can generate a list of subtopics related to the main topic. For example, ChatGPT could suggest subtopics such as "Epigenetic modifications in cancer cells", "Epigenetic therapy for cancer", and "Epigenetic biomarkers for cancer diagnosis".

Organizing subtopics: ChatGPT can help scientists to better organize the subtopics into a logical outline for their review article. For example, ChatGPT could suggest organizing the subtopics under main headings such as "Introduction", "Epigenetic modifications in cancer", "Epigenetic therapy for cancer", and "Epigenetic biomarkers for cancer diagnosis".

ChatGPT can assist scientists in adding details

ChatGPT can assist scientists in adding greater details to the outline by suggesting key points and relevant literature for each subtopic. For example, ChatGPT could suggest adding details such as "Recent studies have identified several key epigenetic modifications that play a critical role in cancer progression, including DNA methylation and histone modifications", and "Several epigenetic therapies, such as DNA methyltransferase inhibitors and histone deacetylase inhibitors, have shown promise in preclinical and clinical studies for treating various types of cancer".

ChatGPT can assist in improving writing style

Inputting the text: Scientists can input the text they have written for their review article, for example, the abstract or introduction.

Analyzing the text: ChatGPT can analyze the text and provide suggestions for improvements. For example, ChatGPT can identify and highlight grammatical errors, ambiguous sentence structures, or repetitive phrases.

Suggesting improvements: ChatGPT can suggest improvements to the text based on its analysis results. For example, ChatGPT could suggest rephrasing sentences to further improve clarity, using more precise scientific terminology, or avoiding unnecessary jargons.

Providing examples: ChatGPT can provide examples of well-written scientific articles or sentences that illustrate the suggested improvements. For example, ChatGPT could suggest examples of articles with clear and concise writing style, or provide sentences that use technical terms accurately and in context.

Incorporating feedback: Scientists can incorporate the suggestions and examples provided by ChatGPT into their writing. They can also review the suggested changes and make any necessary adjustments to ensure that the changes fit with their intended writing style and tone.

Overall, ChatGPT can assist scientists in improving their writing style by analyzing their text, providing suggestions for improvements, and offering examples of well-written scientific articles or sentences. By incorporating ChatGPT's suggestions, scientists can further improve the clarity, precision, and effectiveness of their scientific writing, leading to higher quality review manuscripts, and, more efficiently.

ChatGPT can be helpful for non-native English speakers writing review articles

Grammar and sentence structure: ChatGPT can provide suggestions for correct grammar and sentence structure, which can be particularly helpful for non-native English speakers who may struggle with these aspects of writing in English. The model can suggest alternatives for sentence construction and can identify errors in syntax or grammar.

Vocabulary: ChatGPT can suggest appropriate vocabulary choices and can provide synonyms and alternatives for words, which can help non-native English speakers to find best words to express their ideas.

Translation: ChatGPT can also be trained on text in languages other than English, which can be helpful for non-native English speakers who are writing review articles in their native language. The model can assist in translating text from one language to another, providing suggestions for sentence structure and vocabulary in the target language.

However, while ChatGPT can be helpful for non-native English speakers in the abovementioned ways, it is important to notice that it is not meant to be a substitute for a thorough understanding of the literature and concepts in the field. Non-native English speakers should still review and critically evaluate the text generated by ChatGPT to ensure accuracy and coherence, and should seek feedback from peers or colleagues who are fluent in English to ensure that the manuscript is of high quality.

Potential drawbacks or limitations of using AI in scientific writing

While the use of AI tools like ChatGPT can offer many benefits to scientific writing, there are also some potential drawbacks or limitations to consider.

Lack of context: AI tools like ChatGPT may lack the ability to fully understand the context and nuances of scientific writing, which may result in suggestions that are not always most relevant or appropriate.

Inaccurate or biased information: AI tools may introduce Inaccurate or biased information based on the data they were trained on, leading to suggestions or recommendations that may be biased or even inaccurate in some way.

Over-reliance: Over-reliance on AI tools can lead to a reduction in creative and critical thinking and the ability to make independent judgments about the quality of writing.

Technical limitations: AI tools may not be able to understand complex scientific concepts, technical terminology, or nuances of scientific writing, which can limit the usefulness of these tools.

Cost: Some AI tools may require a non-trivial investment, including licensing fees and training costs, which may be a barrier for some researchers or institutions.

It is important to note that these potential drawbacks or limitations can be mitigated by using AI tools in conjunction with human expertise, creative and critical thinking, and judgement. In addition, researchers and institutions should consider the costs and benefits of using AI tools, and weigh the potential drawbacks against the potential benefits before deciding whether or not to adopt these tools in their scientific writing process.

The risk of plagiarism when use AI to write review articles

The risk of plagiarism

The risk of plagiarism when using AI to write review articles is a potential concern that should be taken seriously. AI tools like ChatGPT can generate text that may resemble text from other sources, including published articles or online resources, and may thus produce text that could be flagged as plagiarism.

However, it is important to note that the use of AI tools does not inherently increase the risk of plagiarism. Rather, the risk of plagiarism depends on how the AI-generated text is used and attributed. To minimize the risk of plagiarism, scientists should follow the below suggested protocol.

Use AI tools as a supplement rather than a replacement: Scientists should use AI tools to assist in writing their review article, but should not rely solely on AI-generated text. It is important to review and edit the AI-generated text to

ensure that it is accurate and appropriate for the context of the article.

Properly attribute sources: When using AI-generated text, scientists should properly attribute any sources used in the text. This includes properly citing any direct quotations or paraphrased information and avoiding copying and pasting large portions of text without attribution.

Check for plagiarism: Scientists should use plagiarism-detection software to check their writing for any potential instances of plagiarism, including any text generated by AI tools. This can help identify any potential issues before the manuscript is submitted for publication.

Overall, while the risk of plagiarism when using AI to write review articles is a potential concern, it can be minimized by using AI tools responsibly and in conjunction with best practices for proper citation and attribution of sources. The bottom line is, plagiarism does happen with or without using AI tools.

How to avoid the risk of plagiarism

Using AI tools like ChatGPT to write review articles can be very helpful in speeding up the writing process and generating ideas. However, as discussed in the previous section, it is important to avoid the risk of plagiarism when using AI-generated text. Below are some tips on how to avoid plagiarism when using ChatGPT.

Understand the source of the text: When using ChatGPT to generate text, it is important to understand the source of the text. ChatGPT uses a large dataset of text to generate new text, so there is a risk that the generated text may include content that has been previously published. It is important to carefully review the generated text to ensure that it is not simply a reworded version of previously published content.

Use multiple sources: To avoid plagiarism, it is important to use multiple sources when writing a review article. ChatGPT can be used to generate text based on one or more sources, but it is important to supplement the generated text with information from other sources. This will help to ensure that the review article is not simply a regurgitation of previously published content.

Cite sources properly: ChatGPT can generate citations and references based on the input text, however, based on our experience, ChatGPT may suggest wrong references or even cite article references that do not exist; therefore it is extremely important to review and edit the generated citations and references to ensure their accuracy and completeness.

Use plagiarism-detection software: Plagiarism-detection software can be used to identify instances of plagiarism in the review article. This can help to ensure that the review article is original and not simply a reworded version of previously published content.

Review and edit carefully: Finally, it is important to review and edit the review article carefully to ensure that it is original and does not include any instances of plagiarism. This includes reviewing the text generated by ChatGPT and editing it as necessary to ensure its originality and accuracy.

In summary, while AI tools like ChatGPT can be very helpful in writing review articles, it is important to be vigilant about the risk of plagiarism and take steps to avoid it. By understanding the source of the text, using multiple sources, citing sources properly, using plagiarism-detection software, and reviewing and editing carefully, scientists can ensure as much as possible that their review articles are original and accurate.

Use ChatGPT to write review article need human oversight

While AI tools like ChatGPT can be incredibly helpful in the scientific writing process, it is important to note that they are not perfect and may produce errors or inaccuracies. As such, human oversight is essential to ensure that the content generated by ChatGPT is accurate, appropriate, and meets the needs of the intended audience.

Here are a few reasons why human oversight is necessary when using ChatGPT to write review articles.

Contextual understanding: AI tools like ChatGPT lack the ability to understand the full con-

text of the scientific writing process. While they can generate text that may be grammatically correct and relevant to the topic, they may not be able to understand the broader implications of the content or the needs of the intended audience. As such, human oversight is necessary to ensure that the generated text is appropriate for the intended purpose.

Checking for accuracy: AI tools can generate text that is not always accurate or appropriate. For example, they may include factual errors or make assumptions that are not supported by the available evidence. Human oversight is necessary to ensure that the content generated by ChatGPT is accurate and supported by the available evidence.

Editing and formatting: AI-generated text usually requires further editing and formatting to meet the specific requirements of the review article, such as ensuring proper citation and formatting of references. Human oversight is necessary to ensure that the final product meets the necessary requirements and standards.

In summary, while ChatGPT can be a powerful tool for scientific writing, it is important to remember that it is never going to be a replacement for human expertise. Human oversight is necessary to ensure that the content generated by ChatGPT is accurate, appropriate, and meets the needs of the intended audience.

Conclusion remarks

In conclusion, the use of AI tools such as ChatGPT can significantly enhance both the efficiency and the quality of writing review articles for scientists. ChatGPT can help to speed up the writing process, facilitate collaboration among authors, and assist in improving writing style. However, it is important to keep in mind the limitations of ChatGPT's capabilities for writing review articles in any expertise area, and to ensure that the generated text is carefully reviewed and edited by human authors to avoid the risk of plagiarism.

Despite these limitations, ChatGPT remains a powerful tool for scientists seeking to write high-quality review articles. By carefully inputting the relevant keywords and data, scientists can generate comprehensive and insightful reviews that summarize the latest advances in their field. With the assistance of ChatGPT, scientists can focus on analyzing and interpreting the results of their literature reviews, rather than spending hours poring over the literature and drafting summaries by hand.

Overall, the use of AI tools such as ChatGPT represents an exciting opportunity for scientists to streamline their research process and produce high-quality, impactful review articles in a timely and highly effective manner. As the field of AI continues to evolve, it is likely that we will see even more advanced tools that are tailored specifically to the needs of scientists. Potential examples include Google Bard, Microsoft Bing, and Jasper Chat, just to name a few. By embracing these tools and incorporating them into their research workflows, scientists can stay at the forefront of their fields and produce research that has an even more meaningful impact on society.

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Disclosure of conflict of interest

None.

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