

Impact of ChatCPT on Scientific Writing

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Artificial intelligence (AI) technologies now encompass all aspects of our living spaces. Particularly, generative AI (GAI) technologies like ChatGPT, supported by large language models (LLMs), have started being used by millions of people shortly after becoming accessible, indicating that their application potentials cover a wide range of areas. GAI technologies, using LLM and deep learning, easily produce consistent responses (text, image, or video) with user prompts. These features of GAI and its ease of content creation have allowed these tools to rapidly find a place in fields such as education, media and journalism, healthcare, accounting, finance, and customer support services (İlikhan et al., 2024; Ozer, 2024; Ozer & Perc, 2024; Pavlik, 2023; Perc et al., 2019; Septiandri et al., 2023).

AI technologies like ChatGPT and Bard have introduced a new dimension to text content creation with options for generating text, correcting existing text, shortening, expanding, and rephrasing sentences. People of all ages and professions can now use these platforms to produce short and long texts with a single command. Interlingual translations can also be easily performed. Moreover, these tools analyze the text and offer suggestions on grammar, punctuation, and style, thus supporting writers in improving their writing (Carobene et al., 2024). Therefore, GAI attracts writers, journalists, researchers, and academics with its abilities to generate new text content, improve grammar and vocabulary, quickly scan literature, translate text into various languages, follow articles in different languages without language barriers, suggest new research ideas, synthesize large amounts of information, recommend statistical tests, and write code (Ganjavi et al., 2024). In this context, ChatGPT can



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generate article content, write editorials, and be used to summarize articles (Aghemo et al., 2023). It can develop suggestions to improve draft texts built on the initial ideas of writers. In the field of media and journalism, GAI is extensively used for news writing, article creation, summarization, and news production for specific groups. For instance, news organizations like the Associated Press use GAI broadly in various areas such as news gathering, news production, and news distribution (Pavlik, 2023). Furthermore, GAI tools now offer a collaboration opportunity that goes beyond supporting writers, advancing knowledge in their research, guiding ideas, and explaining them (Polonsky & Rotman, 2023).

A significant number of articles about the potential benefits of ChatGPT have been published in a short period. There are even articles co-authored by ChatGPT. The opportunities provided by ChatGPT have started to be widely used by scientists at different stages of the article production process. In the first systematic analysis conducted to measure the prevalence of LLM-modified content on various academic platforms, the abstract and introduction sections of a total of 950,965 articles published across various academic disciplines, including the arXiv, bioRxiv, and 15 journals from Nature portfolios, between January 2020 and February 2024, were examined (Liang et al., 2024). This analysis found a sharp increase in the proportion of LLM-modified content in these sections after the release of ChatGPT. The greatest increase was observed in articles in the fields of computer science, electrical engineering, and systems science, while the least increase was observed in mathematics articles and journals within the Nature portfolio.

On the other hand, it has been shown that while 63% of the summaries generated by ChatGPT are detected by journal reviewers, 37% are not (Thorp, 2023). This opens the door to misuse and unethical practices. Furthermore, while focusing on article production, the use of these tools in the peer review process for articles submitted to scientific journals has been relatively overlooked. It is observed that GAI is widely used in peer review processes, which are critical for evaluating the originality and contribution of an article and providing significant contributions to the development of the article. However, when human reviewers use these tools to replace their own contributions rather than assist them or enhance the quality of their input, reviews that are irrelevant to the article or an increase in plagiarism can occur. Thus, concerns about the proper conduct of the review process are increasingly growing. Particularly, the rise of open access and predatory journals makes this critical process even more challenging (Carobene et al., 2024). For example, a research group investigated plagiarism in the reviews of two different articles they submitted to reputable journals and found similarities ranging from 44% to 89% in three out of four reviews for the first article, and from 44% to 100% in two out

of three reviews for the second article (Piniewski et al., 2024). Therefore, both the creation and writing of a scientific article and its review process can lead to ethical violations and include plagiarism.

Therefore, this rapidly evolving process has brought about heated and ongoing ethical discussions regarding the use of GAI in academia. The issue centers on how to express ChatGPT's contribution and who will take responsibility for this contribution. In other words, can ChatGPT approve the publication of the research, and when published, can it assume responsibility for the article? In articles where ChatGPT is a co-author, has ChatGPT approved the publication of the article, and how will it be held accountable?

In this context, the first article discussing concerns about the use of ChatGPT in academic writing was published in *Nature* at the end of 2022 (Stokel-Walker, 2022). Scientific journals and publishing groups are now debating what ChatGPT's contribution could be in article production or whether ChatGPT should be considered an author. It is expressed that ChatGPT cannot take responsibility for the content and integrity of scientific articles and therefore cannot be considered an author (Stokel-Walker, 2023). Hibbert and Wright (2023) point out that one aspect of responsibility is related to the process of uncovering hidden assumptions embedded in texts/data through reflexive critical thinking. Conversely, GAI not only fails to uncover these hidden assumptions but reproduces biases present in texts/data, thus lacking this dimension of responsibility (Lindebaum & Fleming, 2024). Similarly, the highly respected journal *Science* has explicitly stated that text, figures, images, or graphics generated by ChatGPT or such tools can not be used in articles (Thorp, 2023).

A study examining the policies of academic journals and publishers toward GAI has shown that among publishers and journals providing guidance on the use of GAI, the inclusion of GAI as an author is prohibited at rates of 96% and 98%, respectively (Ganjavi et al., 2024). The main argument in this context is that AI tools are considered legally undefined entities (Ganjavi et al., 2024). Consequently, these tools cannot be held responsible for authorship or for carrying the responsibility of the written text or work.

Although it is expected that the efficiency, effectiveness, and quality of scientific publications will increase with the use of these highly capable assistants, leading to a more enriched environment for scientific research and discovery (Carobene et al., 2024), distinguishing between inspiration and imitation in content production based on extensive training sets remains a significant challenge (Carobene et al., 2024). The demonstration of a closer relationship among articles with LLM modification suggests that GAI reduces text diversity (Liang et al., 2024). While GAI promises

efficiency gains, it simultaneously suppresses core values of academic research such as reflexivity and responsible knowledge production. Moreover, warnings are issued that academics who advocate for and use ChatGPT may be complicit in the demise of the homo academicus (Lindebaum & Fleming, 2024).

On the other hand, how will the contribution of ChatGPT be attributed when it is not considered a co-author? In this context, Jenkins and Lin (2023) point to two indicators to measure the contribution to the product: continuity and creditworthiness. The continuity indicator refers to how much of GAI's contributions are carried over or reflected in the final product created by the human author(s), similar to how contributions of human authors are individually specified at the end of articles in some journals. The creditworthiness indicator, on the other hand, indicates whether the product is deemed worthy of credit for human authorship. If the product is deemed creditworthy and the continuity indicator (how well GAI's contribution is reflected in the final product) is high, then in the absence of considering GAI as a co-author or explicitly stating its contribution, all credit will go to the human author(s).

Acknowledging the contribution of GAI in the methods or acknowledgment section of the produced content can mitigate this inequality to some extent and encourage responsible usage. In this context, some journals include ChatGPT's contribution in the methods or acknowledgment sections, while others have created new, dedicated sections specifically addressing AI usage (Lund & Naheem, 2023). For example, 37.6% of scientific journals in the nursing field explicitly demand the disclosure of GAI tools or AI-supported technologies used in the writing process, while 36.8% clearly state that GAI tools or AI-supported technologies should not be listed as authors or co-authors (Tang et al., 2024). The study also suggests that reviewers should disclose whether AI tools were used in their evaluations. Another study proposes publishing peer reviews alongside articles (Piniewski et al., 2023).

In a study examining the usage policies of 300 high-impact factor journals regarding GAI, it was found that 58.7% of journals have a policy in place (Lund & Naheem, 2023). Among journals with a policy on GAI usage, 96.6% permit the use of ChatGPT to enhance the quality of articles. However, nearly all policy documents (98.9%) explicitly state that GAI like ChatGPT should not be included as authors in the author list. Therefore, the general approach is not to include GAI tools as co-authors in articles, but to clearly specify their contributions and ensure that all responsibility for the article rests with the human authors.

On the other hand, the use of ChatGPT as a tool for writing scripts for films or television shows has sparked a new debate, expanding the scope of ethical

considerations to include discussions on whether the data used for training these tools falls under copyright protection. In this context, the Writers Guild of America emphasizes that the use of previous writings in training AI algorithms should be considered within the framework of copyright law. Otherwise, authors are left vulnerable and their labour is not protected when their previous works are used as raw material to train algorithms developed by others (Calacci, 2023). Unions advocating for the recognition of the labor in producing previous texts as copyright material highlight this issue as a critical matter in discussions and negotiations related to GAI. A similar situation has recently been underscored in copyright infringement lawsuits brought by major music companies like Sony Music and Universal Music Group against companies using AI technologies for music production. If these lawsuits result in rulings against AI companies, the aftermath could extend beyond compensation payments. It may spark complex discussions on copyright and ethical violations concerning products created with the assistance of these tools. Therefore, ethical issues related to GAI are two-dimensional. The first is the ethical concern of using content not generated by the author themselves, while the second pertains to whether the training dataset used in the learning phase of GAI falls under copyright protection.

Beyond ethical considerations in the use of GAI tools, there are other issues as well. One of the foremost concerns is that these tools can generate fictional content as a result of a behavior termed as hallucination (Ji et al., 2023). This phenomenon manifests in article production as well, where references cited in the generated text often do not actually exist (Tam et al., 2023). On the other hand, especially in journalism and media, GAI tools' ability to generate new content like text, audio, or visuals makes it difficult to distinguish from reality, thereby facilitating the creation and rapid dissemination of misleading news (Pavlik, 2023). Furthermore, these types of tools can reproduce biases based on religion, culture, gender, race, and socioeconomic status present in the training data through which they learn (Özer et al., 2024a; 2024b). Therefore, the risks associated with the generated texts can be quite complex.

Another issue is the performance gap that may arise between those using GPT tools for article generation and those who do not, as seen across various fields. It is observed that researchers who publish more tend to use LLMs more intensively (Liang et al., 2024). In other words, considering the benefits provided by GAI, authors actively using these tools continuously increase their advantages, while non-users may find themselves at a disadvantage. This situation could exacerbate inequalities among authors (Lund & Naheem, 2023).

Another area of concern relates to young scientists. The ecosystem that traditionally required years of apprenticeship and mentorship to cultivate scientists is undergoing transformation. Young researchers now have access to numerous tools that accelerate their training and paper writing processes. For example, a study on the impact of ChatGPT on writing efficiency showed significant improvements in the speed and quality of writing outputs, with the least skilled writers benefiting the most (Noy & Zhang, 2023). In other words, these tools offer greater developmental opportunities to young scientists compared to senior researchers. In another workplace study, it was demonstrated that novice employees starting a job reached expected competency levels much faster with the aid of these tools (Brynjolfsson et al., 2023). Therefore, these tools also hold significant potential to provide similar benefits and increase productivity for young scientists.

However, there are serious risks associated with these tools, such as ethical violations they may cause or the danger of relying too heavily on them, which could lead to a lack of skills in verifying and critically evaluating the results produced by these tools (Carobene et al., 2024). The pressure on young scientists to “publish or perish” can potentially lead them towards ethical violations. The ability of GAI tools to make changes and reproduce texts exposed to plagiarism by altering expressions poses the greatest challenge for similarity detection platforms, potentially encouraging this unethical trend. Particularly with AI chatbots like ChatGPT capable of generating multiple versions of any sentence, the situation becomes quite challenging (Piniewski et al., 2024). In this context, ethical lapses young scientists might commit early in their careers could follow them throughout their lives, damaging their reputations.

In sum, it is clear that GAI tools have the potential to assist authors and academics in enhancing their productivity to higher levels. However, it is also evident that along with the benefits provided by GAI tools, they bring along a wide range of risks. Once the AI genie that supports scientific research and text production is “out of the bottle” (Polonsky & Rotman, 2023), putting it back seems quite difficult. Therefore, it is crucial to take measures that respect ethical principles and use AI tools not as substitutes but as supporters and enhancers of scientists and authors. In this context, the indispensable and irreplaceable role of human oversight should be emphasized, particularly in verifying and interpreting the contributions made by these tools. Furthermore, in this evolving transformation, the role of reviewers has become even more critical. New mechanisms should be developed to reward reviewers for their crucial contributions, akin to how article production and citations are rewarded, in determining the originality of articles and maintaining academic integrity (Carobene et al., 2024). On the other hand, it should be noted that many reputable scientific journals and publishing groups emphatically prohibit GAI from

being listed as an author, emphasizing that scientific article production is inherently a responsibility of humans. They require that GAI's contributions be explicitly stated. In short, while discussions and attempts to converge on different approaches to the issue continue, there appears to be nearly a consensus that GAI should not be considered a co-author but its contributions should be clearly acknowledged in the article or final product.

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