

Can Artificial Intelligence Only be a Helper Writer for Science?

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The advent of artificial intelligence (AI) has brought about a profound transformation in numerous areas, including the field of science writing. With the rising complexity and data-driven nature of scientific research, effective communication of findings and ideas becomes ever more vital. AI has become a potent technology that may aid in producing scientific material, conducting data analysis, and optimizing literature reviews. Nevertheless, it is crucial to acknowledge the constraints of AI in generating scientific material and to comprehend its optimal integration with human expertise. We herein prospectively examined the role of AI in science writing, discussing its possible advantages and difficulties, and emphasizing the significance of upholding human subjectivity in this developing field.

Keywords: Artificial Intelligence; Scientific Writing; Critical Thinking; Data; Assistance

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Introduction

SCIENCE writing conventionally depends on human intelligence, since researchers and professionals communicate their expertise and findings through meticulously constructed articles and papers. Nevertheless, artificial intelligence (AI) has recently emerged as a prospective aid for scientific writing (1). AI algorithms can facilitate data processing, conduct literature reviews, and even generate content. Although AI undeniably provides certain advantages, it is crucial to comprehend its constraints and the difficulties it poses in terms of precision and contextual comprehension.

AI has made significant progress in comprehending and generating text that resembles human language (2). Nevertheless, there are distinct limitations to the extent of accomplishments that may be attained with AI-generated science writing. AI is unable to engage in critical thinking, analyzing intricate con-

cepts, or offering insights that surpass its training. Hence, depending exclusively on AI for the generation of scientific information would neglect the profound and subtle insights that human intelligence offers. Moreover, AI frequently encounters difficulties in achieving precision and comprehending context, underscoring the importance of being cautious and verifying information when depending on content provided by AI.

AI for Extracting Valuable Information from Extensive Data Sources

The efficacy of AI is in its capacity to process vast quantities of data rapidly and effectively. AI is an invaluable tool in scientific research, facilitating data processing by enabling researchers to detect patterns, make predictions, and reveal concealed insights. AI enables the automation of specific analytical processes, so liberating scientists' time and enabling them to concentrate on

more advanced analysis and interpretation (3).

An important benefit of utilizing AI for information extraction is its capacity to automate the operation. Conventional approaches of information extraction depended on human interaction, requiring significant time and being susceptible to mistakes. Nevertheless, due to the progress in AI algorithms, machines are now capable of autonomously analyzing and extracting pertinent data from many sources. This automation not only reduces the amount of time required but also enhances the precision of the acquired information.

Another essential component of AI-driven information extraction is its capacity to effectively manage large volumes of data (4). Given the rapid and significant increase in the amount of data being produced on a daily basis, it becomes difficult for people to manually sort through the enormous quantities of information. AI algorithms possess the ability to examine and derive meaningful insights from extensive datasets, surpassing human capabilities swiftly and effectively. This confers a notable advantage to businesses and researchers.

Moreover, AI systems have the capability to retrieve information from diverse forms of unorganized data, including text, photos, and videos. Natural language processing (NLP) algorithms have the capability to evaluate textual material and extract pertinent information, such as sentiments, entities, and relations (5). Computer vision algorithms, however, have the capability to analyze photos and videos in order to extract significant visual information. The capacity to derive information from many data kinds enables a more exhaustive examination and comprehension of the data.

The application of AI for extracting information has substantial ramifications across many industries. AI algorithms have the capability to extract significant information from medical records and research articles in the healthcare field (6). This can be beneficial in the process of diagnosing and treating diseases. Within the realm of finance, AI possesses the capability to scrutinize extensive quantities of financial data with the purpose of detecting patterns, assessing potential hazards, and pinpointing investment prospects. Similarly, in the field of marketing, the utilization of AI-powered information extraction allows for the analysis of consumer data in order to provide valuable insights into customer behavior and preferences. This, in turn, enables firms to focus their marketing efforts more precisely.

Nevertheless, the utilization of AI for extracting information also gives rise to apprehensions surrounding privacy and data security. Obtaining meaningful information frequently requires the retrieval and examination of personal and confidential data (7). In order to tackle these concerns, it is imperative to guarantee that AI technologies comply with rigorous ethical principles and privacy rules to safeguard the rights and privacy of persons.

The Role of AI in Optimizing Literature Review Processes

The literature review is a highly time-consuming component of scientific inquiry. AI algorithms have the capability to examine and condense extensive quantities of scientific literature, offering scholars a thorough synopsis of the current understanding on a specific subject. The process of streamlining saves researchers

a significant amount of time and effort, allowing them to remain current with the most recent advancements in research and make better-informed decisions.

AI can enhance literature review by utilizing automated techniques to search for and screen pertinent publications (8). AI algorithms possess the ability to rapidly analyze and sift through extensive collections of scholarly articles, books, and other materials in order to pinpoint the ones that are most pertinent to a certain research subject. This obviates the necessity for researchers to manually scour for pertinent material, so conserving their important time and exertion.

Moreover, AI has the capability to aid in the extraction of crucial data from literature for the purpose of study. NLP approaches enable the extraction of significant concepts, keywords, and themes from literature, facilitating researchers in obtaining a thorough comprehension of the current knowledge in their specific area of study. The automated extraction approach also minimizes the likelihood of human errors and biases in the interpretation of the literature.

AI can enhance literature review by suggesting relevant papers. AI algorithms can utilize data analysis techniques to examine the content and citation patterns of academic articles, thereby providing recommendations for further material that academics may have inadvertently disregarded. This process not only aids researchers in detecting deficiencies in the current body of literature but also facilitates the exploration of novel viewpoints and insights that can enhance their research.

AI could improve cooperation among researchers throughout the article review process (9). AI-driven online platforms facilitate the connection of academics who share similar research interests, allowing them to exchange and engage in discussions on pertinent literature. By adopting a collaborative strategy, researchers can enhance the likelihood of discovering the most current and thorough literature pertaining to a particular subject. This is achieved through the utilization of each other's specialized knowledge and perspectives.

AI algorithms can assist in condensing the obtained material. AI uses text summary algorithms to provide succinct summaries of large publications, allowing researchers to swiftly comprehend the primary concepts and discoveries without the need to peruse the complete article. This improves the effectiveness of the literature review process, enabling researchers to encompass a greater quantity of information in a reduced timeframe.

AI can aid in the systematic arrangement and classification of literary works (10). AI algorithms have the capability to categorize publications according to their topics, themes, methodology, or any other pertinent criteria. This classification enables researchers to browse the literature with greater ease and efficiency, enhancing their capacity to seek specific sources or discern trends and patterns within the literature.

Furthermore, AI can play a role in assessing the caliber and reliability of the material. AI algorithms can evaluate the credibility and dependability of sources by examining characteristics such as the author's reputation, the journal's impact factor, or the amount of citations received. This aids researchers in making well-informed selections regarding the inclusion or removal of specific publications in their literature evaluation,

guaranteeing their reliance on dependable and superior sources.

Ensuring Ethical Standards in AI-Generated Scientific Writing

Resolving Problems Related to Plagiarism and Attribution

Given the increasing integration of AI in the generation of scientific material, it is imperative to acknowledge and tackle ethical considerations (11). Ensuring the integrity of scientific research necessitates the recognition of plagiarism and the practice of appropriate attribution. Although AI has the capability to aid in text generation, it is imperative that it is taught to uphold intellectual property rights and acknowledge proper attribution. Maintaining a good equilibrium between AI assistance and human input is crucial to prevent plagiarism and provide adequate acknowledgment of original efforts.

A major challenge that AI encounters is the problem of plagiarism and credit. The proliferation of AI algorithms in content creation and data analysis has heightened the urgency of accurately identifying sources and detecting plagiarism. Plagiarism, the act of appropriating someone else's work without giving proper credit, is a grave transgression of ethical and academic standards. Conventional approaches to detecting plagiarism, such as manual identification or employing plagiarism detection tools, often prove inadequate in detecting AI-generated work (12). AI has the capacity to produce information that is nearly identical to work created by humans, hence complicating the identification of instances of plagiarism. Moreover, AI has the ability to imitate many writing styles and voices, which adds to the complexity of determining authorship.

Attribution, conversely, entails acknowledging and recognizing the rightful acknowledgment of credit. Erroneous or insufficient attribution can result in allegations of plagiarism and distortion of the original author's work. This poses a significant challenge in academic and scientific study, as precise acknowledgment is essential for the progress of knowledge. AI algorithms face challenges in effectively ascribing sources, particularly in situations involving the utilization of many sources or when the original source is unidentified or intricate. An effective approach to address these issues involves the advancement and enhancement of AI-driven plagiarism detection technologies. These technologies have the ability to utilize AI algorithms to examine information and make comparisons with an extensive library of sources. AI has the ability to identify not just exact word-for-word plagiarism, but also cases where someone has rephrased or copied with minor changes. Through iterative training on diverse textual data, AI can enhance its precision in detecting occurrences of plagiarism.

An alternative approach involves incorporating AI algorithms into the process of writing and publishing. AI might be utilized to offer authors recommendations for citations and references, guaranteeing precise attribution. Analyzing the content and identifying potential sources that match the author's writing style and voice can accomplish this task. AI can enhance the structure and management of references, hence improving efficiency and minimizing the likelihood of overlooking attributions.

Additionally, it is imperative for educational institutions and publishers to actively engage in educating users about plagiarism and the significance of proper credit. To mitigate cases of plagiarism, it is crucial to increase awareness and offer explicit instructions on how to accurately acknowledge sources. Incorporating ethics classes or workshops into educational curricula helps foster a sense of responsibility and integrity among students, who are frequently the main offenders in cases of plagiarism.

In order to effectively address issues pertaining to plagiarism and attribution in AI, a comprehensive strategy is necessary, which includes breakthroughs in technology, educating users, and implementing policy reforms. It is crucial to achieve a harmonious equilibrium between improving the capacity of AI algorithms to identify plagiarism and enabling users to exhibit greater responsibility in generating and crediting content. In order to guarantee the ethical utilization of AI and foster a culture characterized by integrity and intellectual honesty in the era of digitalization, it is imperative that we confront and tackle these difficulties.

Guaranteeing Transparency and Accountability in Content Generated by AI

Transparency is a crucial factor to consider in relation to information generated by AI. Users should possess awareness when content has been produced or aided by AI, as this transparency aids in upholding trust and responsibility. Explicitly designating AI-generated segments or offering details regarding the degree of AI participation enables readers to comprehend the possible constraints and prejudices associated with the content. Through upholding transparency, the scientific community may make well-informed assessments and participate in significant dialogues.

Transparency in AI-generated content is crucial for informing the audience about the nature of the content they interact with. Although algorithms and AI models are extremely advanced, they are not without imperfections. It is crucial to inform the audience that the content they are watching has been created by AI, enabling them to comprehend the possible constraints and prejudices associated with it. Transparency enables the audience to assess the content critically and make well-informed judgments regarding its authenticity and reliability.

Furthermore, accountability guarantees that the right stakeholders are held responsible for the development of AI-generated material. AI systems fundamentally lack ethical deliberation capabilities and can only function depending on the data they have been taught on. Hence, it is pivotal to develop ethical guidelines and ensure that AI systems and their users, such as content creators or platforms, are held responsible for the content they produce (13). This system of accountability guarantees that any prejudices, errors, or detrimental content generated by AI can be traced back to the individuals or organizations responsible and dealt with appropriately.

However, the absence of transparency and accountability in AI-generated material might lead to significant repercussions. Without explicit disclosure, viewers may inadvertently ascribe legitimacy and authority to content generated by AI. This can

result in the dissemination of false or misleading information and biased or misleading ideas, which can undermine public confidence and manipulate public sentiment. Additionally, without accountability, unscrupulous actors might exploit AI systems to propagate hate speech, propaganda, or fake news, further jeopardizing the integrity of online platforms and communities.

In order to promote openness and accountability, many methods and rules can be put into effect. An example of such a strategy is the implementation of explicit labeling systems that signify the origin of material as being generated by AI. This enables the viewer to make well-informed decisions and assess the information accordingly. Furthermore, it is essential to establish ethical norms to govern the utilization of AI in content generation and establish benchmarks for conscientious practices. By following these rules, content creators and platforms can show their dedication to transparency, responsibility, and the ethical implementation of AI technology.

In addition, the establishment of resilient auditing and verification methods can aid in ensuring accountability for AI systems and their operators. These systems have the ability to assess the effectiveness of AI algorithms, detect possible biases or mistakes, and guarantee adherence to ethical standards. To achieve thorough examination and accountability, auditing should adopt a multidisciplinary strategy that incorporates the expertise of AI specialists, ethicists, and journalists.

The Significance of Human Expertise and Subjectivity in Science Writing

The Distinct Function of Human Scientists in the Interpretation and Analysis of Data

When it comes to science writing, the expertise and insights of human scientists cannot be substituted. Although AI is capable of producing precise and unbiased information, it is unable to comprehend and understand intricate scientific concepts. Human scientists introduce subjectivity into their work by considering multiple viewpoints and integrating personal experiences, which enhances their comprehension. Their inherent capacity to inquire, analyze, and establish associations is of immense value in the field of science communication.

Scientists initially tackle the essential duty of gathering and organizing data. Their role involves designing experiments or surveys, with the aim of ensuring that samples are representative and data gathering procedures are unbiased. In addition, scientists carefully manage datasets, systematically structuring and purging them of flaws and inconsistencies, thereby establishing a reliable basis for analysis. Scientists generate hypotheses by drawing on their expertise and comprehension of the topic area. These well-informed speculations direct their future examination and understanding of data, allowing them to concentrate on pertinent factors and reveal significant trends.

Scientists have a vital function in posing perceptive research inquiries. The analytic process is guided by these questions, which in turn determine the proper methods for data collecting and statistical tests (14). Probing questions result in clear, concentrated, and purposeful thinking, ultimately leading to more influential understandings. Scientists have a profound

comprehension of statistical methods and research protocols, use their expertise to choose the best appropriate methodology for studying a specific dataset. They ascertain the suitability of statistical tests for the given data, guaranteeing the durability and dependability in the analysis of outcomes.

Scientists utilize their specialized knowledge to discern patterns and trends within databases. By conducting a meticulous analysis, individuals are able to identify connections, anomalies, and the statistical importance of data. These abilities empower individuals to differentiate significant connections from irrelevant information and make accurate deductions, serving as the foundation of data analysis. Scientists possess a comprehensive comprehension of the current scientific literature and theories. By placing fresh data inside this framework, individuals can make well-informed judgments, utilizing known principles and previous research findings (15). This method facilitates the formulation of novel hypotheses or the modification of preexisting ones.

Numerous scientific research necessitates the amalgamation and consolidation of data from various sources. Scientists possess a high level of skill in combining information from different studies and drawing comprehensive conclusions from seemingly unrelated sources. Integration of several components consolidates knowledge and improves the accuracy of data interpretation. Scientists play a crucial role in ensuring the dependability and quality control of data. They carefully assess the quality of data, conduct data validation, and examine methods to guarantee the correctness of their conclusions. The adherence to rigorous scientific principles ensures the integrity of the entire data interpretation process.

Scientists exhibit exceptional communication abilities, enabling them to successfully express their discoveries. They utilize clarity, brevity, and suitable language to distribute explanations (16). Effective communication of research findings to both scientific colleagues and the general public is crucial for advancing scientific knowledge and promoting public comprehension. Scientists' interpretations and analyses have a significant impact on policies, decision-making, and the adoption of evidence-based approaches in several fields. Policymakers depend on empirical data to develop rules, educators modify instructional methods, and healthcare professionals apply evidence-based therapies (17). The interpretation of data by scientists plays a vital role and has extensive effects on society.

Integrating Human Insight into AI-generated Writing: A Means of Bridging the Gap

While AI can aid in producing scientific material, it is essential to recognize the significance of human understanding in the field of science writing. By incorporating the knowledge and analytical skills of human scientists into AI-generated writing, we may establish a connection between factual information and personal analysis. This collaboration enables us to communicate scientific knowledge with precision and clarity, so enhancing its accessibility to a broader range of individuals.

Incorporating human understanding into AI-generated writing is essential for cultivating empathy and establishing emotional rapport with readers. Writing serves as a means of transmitting knowledge and possesses the ability to elicit emo-

tions, stimulate contemplation, and establish a personal connection. By integrating human knowledge, AI-generated writing can enhance its relatability, thereby establishing a profound connection with readers. It allows the AI to comprehend subtle details, underlying meaning, and cultural allusions that are deeply embedded in human encounters. As a result, readers can experience a heightened sense of engagement and connection to the information.

Human understanding contributes an additional level of discerning analysis and ethical deliberation to writing generated by AI. Although AI systems have exceptional proficiency in handling extensive quantities of data, they encounter difficulties when it comes to comprehending intricate moral quandaries or the broader societal ramifications (18). By incorporating human knowledge, AI may make decisions based on ethical standards, evaluate the possible outcomes of its actions, and prevent the presence of detrimental biases. It guarantees that AI-generated material conforms to ethical norms and acknowledges the varied viewpoints and sensitivities of the readers.

In addition, using human understanding aids in preserving creativity and authenticity in AI-generated work. Although AI excels in studying preexisting content and generating similar pieces, it frequently lacks the capacity to think creatively and produce genuinely groundbreaking work. By integrating human understanding, AI can access the distinct viewpoints, personal encounters, and inventive abilities of human writers, igniting innovative concepts that challenge the limitations of AI's capabilities. This partnership between humans and machines fosters a mutually beneficial connection, leading to the production of material that is more compelling and fascinating.

Nevertheless, incorporating human discernment into AI-generated text encounters certain difficulties. A significant challenge arises from the extensive and intricate nature of human knowledge and emotions, rendering it arduous to encompass every nuance and context. AI systems often have difficulties in comprehending sarcasm, irony, and cultural nuances. Moreover, the process of integration requires the refinement of AI algorithms, enhancement of language models, and establishment of feedback mechanisms that can assimilate knowledge from human input. To achieve this integration, it is crucial to foster interdisciplinary collaboration among AI researchers, linguists, and content experts who possess the essential human skills.

Another obstacle lies in achieving optimal equilibrium between human and AI contributions. Although the input of human writers provides essential insights, the objective is not to completely replace AI-generated work. Instead, the objective is to establish a harmonious fusion that integrates human ingenuity with the efficacy of AI. Achieving this equilibrium necessitates conducting experiments, making iterative enhancements, and possessing a profound comprehension of the capabilities and constraints of both human and AI contributors.

Synergistic Approaches: Human-AI Collaboration in the Field of Science Writing

The future of science writing hinges on the collaboration between human scientists and AI technology. Through the adoption of collaboration, we may effectively utilize the skills of

both sides to generate scientific material that is more influential and captivating. AI has the ability to analyze large quantities of data and produce preliminary versions, but human scientists contribute the human element by enhancing the information, infusing creativity, and customizing it for certain audiences. This collaboration enables a dynamic and efficient approach to the dissemination of scientific information.

A substantial benefit of incorporating AI in science communication is its capacity to analyze huge quantities of data rapidly and precisely (3). AI algorithms provide the capability to scrutinize intricate scientific data sets, effectively detecting patterns and trends that may elude human observation. This not only facilitates scientists in making well-informed conclusions but also empowers them to effectively convey their findings in a comprehensive and easily understandable manner.

AI technology can aid in creating intriguing storylines that effectively attract and fascinate people. Algorithms can be coded to comprehend the optimal methods of conveying scientific concepts and discoveries, customizing the content for the particular intended audience. This guarantees that communication is efficient and enhances the public's comprehension of intricate scientific concepts.

Another facet of human-AI collaboration in science communication involves the utilization of chatbots and virtual assistants. These tools offer immediate support to users by responding to inquiries and offering supplementary information. This not only reduces the workload for scientists but also improves engagement and interaction with the audience, promoting a more active and inclusive communication process.

AI not only aids in communicating but also streamlines the scientific research process. AI algorithms have the capability to develop and evaluate hypotheses, hence accelerating the process of discovery. Through the utilization of AI systems, scientists can effectively tap into a broader spectrum of resources and gain valuable insights, ultimately resulting in the discovery of groundbreaking innovations and progress that could have otherwise been disregarded.

Nevertheless, it is absolutely critical to acknowledge that the incorporation of AI in science communication also presents certain difficulties. It is of utmost importance to guarantee precision and eliminate prejudice in AI systems, since incorrect or biased data might have harmful consequences on public comprehension and decision-making processes. Furthermore, upholding openness and ethical norms in the advancement and execution of AI technology is crucial for upholding confidence and credibility within the scientific community.

The Future Outlook for AI in Science Writing

Investigating the Capabilities of AI Progress in Scientific Writing

The future harbors vast possibilities for AI improvements in the field of scientific writing. With the ongoing advancement of AI technology, we may anticipate the development of more refined natural language processing algorithms and enhanced content generating capabilities. AI systems have the potential to examine intricate scientific topics and suggest original possibilities. These innovations possess the capacity to transform science writing

by facilitating expedited, more precise, and all-encompassing scientific communication.

A noteworthy functionality of AI in the realm of scientific writing is the mechanization of literature reviews. Large volumes of scientific literature can be rapidly analyzed and summarized by algorithms propelled by AI, enabling scientists to efficiently collect pertinent data. This technology significantly reduces the time and effort required for researchers, enabling them to concentrate on the core research. Furthermore, the utilization of AI algorithms to detect patterns and trends in scientific literature empowers researchers to draw more precise conclusions and make more informed decisions based on prior research.

Data analysis is another area in which AI has made remarkable strides in scientific writing. AI algorithms are capable of processing enormous volumes of data, identifying patterns and connections that may elude human researchers. AI is capable of identifying significant correlations, predicting future outcomes, and even generating new research hypotheses through the analysis of complex datasets. By harnessing invaluable insights from extensive datasets, this capability improves the efficacy and caliber of scientific inquiry.

AI can also aid in the revision of manuscripts by researchers. Although human editors are of utmost importance in the process of refining scientific manuscripts, AI tools can offer an additional level of support. Algorithms powered by AI can verify orthography, punctuation, and grammar, ensuring that the text is written professionally and accurately. Moreover, AI algorithms have the capability to propose alternative sentence structures, thereby enhancing the scientific text's overall legibility and coherence.

Detection of plagiarism is an additional AI capability that significantly improves scientific writing. Due to the proliferation of published research, adherence to academic integrity is of the utmost importance. Plagiarism detection software powered by AI can examine vast databases of published articles to identify similar or identical content. By aiding researchers in preventing inadvertent plagiarism, this technology guarantees the authenticity of their endeavors.

Moreover, AI is capable of producing comprehensive scientific articles. By analyzing patterns and prior research, AI algorithms are capable of composing sections of scientific pa-

pers including the introduction, methods, and discussion. Although human involvement remains essential for textual accuracy and coherence, AI-generated articles serve as a foundation for researchers, facilitating the writing process and allowing them to focus on their particular research discoveries.

Furthermore, AI has played a substantial role in advancing language translation specifically for scientific writing. Scholars across the globe frequently encounter linguistic obstacles when attempting to access scientific literature composed in languages other than their own. Translation tools based on AI can assist in bridging this divide by translating and summarizing research papers in multiple languages automatically. This technological development facilitates scientists' access to a wider array of scientific knowledge, thereby encouraging international cooperation and innovation (19, 20).

Finally, AI has the capability to offer customized writing support to researchers. By analyzing the writing preferences and styles of individual scientists, AI algorithms can recommend the most effective methods for communicating research findings. Algorithms of this nature offer guidance pertaining to the organization of scientific texts, the choice of suitable terminology, and the maintenance of overall precision and clarity. AI facilitates effective communication of research findings and improves the quality of scientific writing by customizing writing guidance to suit the specific requirements of each researcher.

Conclusion

AI possesses indisputable potential to assist in science writing by augmenting efficiency, precision, and data processing. Nevertheless, it is imperative to uphold a well-rounded strategy that acknowledges the constraints and moral implications of AI-generated material. The synergistic alliance between humans and AI in science writing has great potential, as it harnesses the distinct strengths of each to produce influential and perceptive scientific communication. In order to effectively utilize AI in science writing, it is crucial to adjust and maneuver through the progressing technological advancements. This will ensure that AI remains a beneficial instrument that enhances and complements human proficiency in the quest for scientific understanding. ■

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