Applications and Challenges of Generative Artificial Intelligence in Scientific Journal Publishing: Postprint

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Abstract

[Objective] This study aims to conduct an in-depth investigation into the current application status of generative artificial intelligence in the scientific journal publishing process and the transformations it brings, providing theoretical foundations and practical guidance for the intelligent transformation of the scientific journal publishing industry. [Method] This research systematically analyzes the latest applications of generative artificial intelligence technology in various stages of scientific journal publishing, as well as the opportunities and challenges encountered, employing literature review, case analysis, and inductive synthesis methods. [Results] This paper takes the opportunities brought by generative artificial intelligence to scientific journal publishing as its starting point, analyzes the application of generative artificial intelligence in scientific journal publishing, and examines in detail the challenges faced by scientific journal publishing in the context of generative artificial intelligence from two perspectives: journal publishing operations and editorial staff career development. [Conclusion] The application of generative artificial intelligence in the scientific journal publishing process has brought unprecedented opportunities and challenges to the journal publishing industry, playing a significant role in intelligent topic planning, improving review efficiency, and enhancing both the effectiveness and quality of journal publishing. However, in facing these challenges, publishing institutions must actively strengthen technology research and development and talent cultivation to achieve deep integration of artificial intelligence technology with journal publishing operations, thereby more effectively promoting the dissemination and development of scientific research and meeting societal demands for high-quality academic achievements.

Full Text

Preamble

Applications and Challenges of Generative Artificial Intelligence in Scientific Journal Publishing

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Abstract

[**Purpose**] This study aims to thoroughly investigate the current application status of generative artificial intelligence in scientific journal publishing and the transformations it brings, providing theoretical foundations and practical guidance for the intelligent transformation of the scientific journal publishing industry.

[**Methods**] This research systematically analyzes the latest applications of generative artificial intelligence technology in various stages of scientific journal publishing, as well as the opportunities and challenges it faces, employing literature review, case study, and inductive summary methods.

[**Results**] This paper takes the opportunities brought by generative artificial intelligence to scientific journal publishing as its starting point, analyzes the application of generative artificial intelligence in scientific journal publishing, and examines in detail the challenges faced by scientific journal publishing in the context of generative artificial intelligence from two perspectives: publishing operations and editorial career development.

[**Conclusion**] The application of generative artificial intelligence in scientific journal publishing has brought unprecedented opportunities and challenges to the publishing industry, playing a significant role in intelligent topic planning, improving review efficiency, and enhancing the quality and effectiveness of journal publishing. However, in facing these challenges, publishing institutions must actively strengthen technology development and talent cultivation to achieve deep integration of AI technology with publishing operations, thereby more effectively promoting the dissemination and development of scientific research and meeting society' s demand for high-quality academic achievements.

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1. Opportunities Brought by Generative Artificial Intelligence to Scientific Journal Publishing

1.1 Optimizing Publishing Workflows and Enhancing Efficiency

The application of generative artificial intelligence in scientific journal publishing can not only significantly optimize workflows across all stages but also substantially improve overall efficiency. During the creation and editing phases, leveraging its powerful deep learning and natural language processing capabilities, generative AI can rapidly scan and analyze vast amounts of research materials, providing valuable writing inspiration and resources for researchers, drafting initial manuscripts, and even automatically generating critical components such as abstracts, introductions, and conclusions, thereby greatly alleviating authors' writing burdens. Simultaneously, generative AI can automatically detect and correct common writing errors in grammar, spelling, and formatting, offering targeted revision suggestions such as optimizing sentence structure and enhancing clarity, making the editorial process smoother and more efficient.

In the peer review stage, intelligent algorithms within generative AI can conduct preliminary screening of submissions, swiftly identifying manuscripts that do not align with the journal's scope or fail to meet academic standards, thereby effectively reducing reviewers' workload and ensuring that only high-quality papers advance to subsequent review processes [2-3]. For manuscripts that meet journal requirements, generative AI can further provide content-based preliminary evaluations, helping reviewers quickly grasp the core value and innovative aspects of the papers, thus accelerating the review process.

In the publication and dissemination phase, through big data analysis and intelligent decision support systems, generative AI can assist journal editors and management in achieving data-driven decision-making, monitoring key quality metrics such as review cycles, acceptance rates, and impact factors in real time, and promptly adjusting and optimizing publishing strategies to ensure the long-term healthy development of journals. Additionally, generative AI can deeply analyze readers' habits and preferences, precisely pushing the latest research findings highly relevant to their fields of interest, thereby enhancing user experience. To better expand into international markets, the language translation capabilities of generative AI can provide convenient and accessible content for global readers, promoting worldwide academic exchange and collaboration and enhancing the journal' s competitiveness and influence in both academia and industry.

1.2 Enhancing Publishing Resource Allocation and Editorial Value Creation

In the era of intelligence, the scope of editorial work and the role of editors are undergoing subtle transformations. Faced with the rapid development of AI technology, editors need to adjust their work strategies in a timely manner, learning to delegate tedious and highly rule-based tasks to intelligent systems, thereby freeing up time and energy to focus on more challenging and creative intellectual labor. This transformation represents not only a reshaping of individual work capabilities but also a profound insight into and preparation for the future of the editorial profession.

In scientific journal publishing, generative AI can conduct in-depth analysis of accumulated big data, revealing hidden patterns and trends to provide editors with valuable insights. By leveraging diverse information channels, editors can employ participatory observation methods to capture potentially valuable new research topics from vast amounts of information. These topics often represent cutting-edge developments and hot trends in academic research, serving as important sources of inspiration for editorial topic planning [4]. While AI can process and analyze data, it cannot replace the unique perspective and keen intuition of humans in understanding the depth, breadth, and innovativeness of academic research. Therefore, based on this foundation, editors must rely on their own professional academic literacy and judgment to transform these insights into rigorous academic thinking for topic planning, ensuring accuracy and foresight in editorial decision-making.

In actual journal publishing practice, editors can also utilize big data analysis technology to deeply explore the meanings and connections behind data, creatively discovering new research perspectives and methodologies, further expanding their cognitive boundaries and injecting new vitality and momentum into academic journal development. This creative approach to work not only enhances editors' individual capabilities but also provides strong support for the differentiated development of academic journals. Furthermore, AI technology' s ability to learn, model, and compute based on massive datasets has significantly improved the precision of data analysis and prediction [5]. This technology can not only delve into all articles published since a journal' s inception to uncover their academic value and research trends but also continuously track papers currently under review and editing, updating data models in real time to improve predictive accuracy. More importantly, AI can effectively calculate the academic value and dissemination risks of planned papers, providing scientific foundations for editorial resource allocation. Simultaneously, the role of journal editors is no longer limited to traditional proofreading and layout design but increasingly involves deep exploration and value assessment of papers. Using intelligent algorithms, editors can explore the potential value of papers with unprecedented depth and breadth, even predicting publication outcomes to some extent. Such foresight helps editors plan promotional strategies in advance, creating momentum for paper publication and further enhancing the journal' s

academic influence and brand recognition.

2. Applications of Generative Artificial Intelligence in Scientific Journal Publishing

2.1 Intelligent Topic Planning

Generative artificial intelligence in scientific journal publishing workflows can help editors overcome personal biases and knowledge limitations, providing them with a comprehensive and detailed perspective for topic analysis [6]. Compared with traditional manual topic planning, intelligent topic selection systems can not only generate topics that align with publication characteristics but also demonstrate unique advantages throughout the topic generation process. The collaboration between Elsevier and University College London (UCL) in establishing the UCL Big Data Institute demonstrates that generative AI plays a significant role in predicting and serving academic research hotspots. This partnership not only validates the potential of generative AI technology in academic publishing but also provides editors with more precise topic recommendations, enhancing their topic planning capabilities. Similarly, at the end of 2023, the journal *Frontiers of Computer Science* actively explored the use of advanced generative AI technologies such as GPT-4 and Alibaba Cloud Brain to optimize article review and topic selection processes, further validating the significant effectiveness of generative AI in improving review quality and accelerating topic decision-making. These practical achievements not only confirm the enormous potential of generative AI technology in academic publishing but also point the way forward for the intelligent development of scientific journals, heralding the arrival of a new era of more efficient, precise, and innovative publishing and editing.

2.2 Improving Review Efficiency

The rapid development of science and technology has not only greatly facilitated increasingly frequent academic exchanges but also led to a sharp rise in the number of paper submissions received by academic journals annually. For academic journal publishers, how to efficiently and accurately screen high-quality research papers from massive submissions has become an urgent issue to address. Traditional initial review processes for academic journal papers primarily rely on manual processing by editors. This approach is not only inefficient but also lacks interactivity, making it difficult to meet the needs of today' s rapidly developing academic exchanges [7-8]. To effectively address this challenge, an increasing number of journal publishers have begun exploring the use of generative AI' s machine learning and natural language processing capabilities to help editors preliminarily screen high-quality manuscripts that meet journal requirements, thereby reducing editorial workload.

In peer review work, generative AI can rapidly process large volumes of manuscripts, precisely screening articles that meet journal requirements and

effectively alleviating the heavy pressure of review work. Simultaneously, based on deep analysis of published papers, this technology can assist editors in evaluating the innovative value of submissions, providing solid data support for identifying high-quality research. Its built-in similarity detection function can keenly identify plagiarism, data fabrication, and content duplication, strongly safeguarding academic integrity. Furthermore, generative AI can automatically generate intuitive charts and reports to help reviewers deeply understand the essence of papers, accelerating the review process [9]. More notably, it can conduct comprehensive assessments of the review workflow, identifying potential biases or errors and providing detailed review feedback, offering scientific foundations for editorial decision-making. This series of applications not only strengthens the fairness, objectivity, and efficiency of academic review but also ensures the accuracy of evaluation results, injecting strong momentum into the sustainable development of academic publishing and effectively reducing reviewers' burden [10]. With the widespread application of generative AI technology in peer review, publishers should currently focus on integrating this advanced technology with the professional wisdom of reviewers to fully leverage the unique advantages of both. This fusion strategy can not only significantly enhance review process efficiency but also further strengthen the capacity and accuracy of academic evaluation.

For example, the SmartReview system introduced by *Nature Communications* represents a successful model. This system uses advanced algorithms to conduct preliminary quality screening of submissions, quickly eliminating manuscripts that do not meet standards while precisely matching reviewers with relevant professional backgrounds and strictly examining any conflicts of interest in the review process to ensure impartiality. The SmartReview system continuously undergoes self-iteration and performance improvement, aiming to accelerate academic evaluation processes, enhance objectivity and efficiency, while maintaining the rigor and transparency of the review process, establishing a solid foundation for the high-level development of academic journals.

2.3 Enhancing Quality and Efficiency of Journal Publishing

In China' s journal publishing work, strict quality control in editing and proofreading is a critical link in ensuring publications' academic impact and broad dissemination effectiveness. Although the traditional "three reviews, three proofreads, and one thorough reading" system is cumbersome and time-consuming, it lays a solid foundation for publication quality, ensuring that every process is carefully considered and meticulously polished. This multi-layered gatekeeping system not only effectively reduces errors but also invisibly elevates the overall standard of publications, allowing readers to perceive their professionalism and credibility. To further refine proofreading quality standards and promote the standardized development of the publishing industry, in June 2023 the National Press and Publication Administration issued the *Standards for Determining and Calculating Errors in Book Editing and Proofreading Quality*, which provides

detailed elaboration on the determination of various types of errors in text, images, and other elements, offering clear and explicit operational guidelines for proofreading personnel. It not only clarifies the classification and grading of errors but also details corresponding scoring methods, making proofreading work evidence-based, more scientific, and rigorous. Against this backdrop, generative AI demonstrates clear advantages in collaborative proofreading within the publishing field. Its powerful data processing and analysis capabilities can significantly enhance the precision and efficiency of proofreading. Automated proofreading technology can quickly capture and correct common errors in text, grammar, and logic, substantially reducing the workload of proofreading staff [11]. Meanwhile, the introduction of intelligent error-correction systems makes proofreading work more efficient and accurate, effectively avoiding omissions and errors caused by human factors.

Additionally, generative AI possesses risk assessment and automated polishing functions, enabling it to predict and evaluate potential risks based on publication content and characteristics, thereby taking timely preventive measures. In terms of polishing, AI can precisely grasp and adjust language style to make publications more aligned with readers' habits and aesthetic preferences, which not only enhances readability but also invisibly strengthens market competitiveness. More notably, generative AI can conduct deep evaluation of literature quality and citation standards. It can quickly retrieve and compare relevant literature to ensure citation accuracy and completeness [12, 13]. Simultaneously, through in-depth analysis of literature content, AI can assess academic value and innovativeness, providing valuable references and suggestions for editorial staff. The realization of this function not only reduces the risk of false information but also invisibly improves overall publication quality, injecting new vitality into the healthy development of the publishing industry.

3. Challenges Faced by Scientific Journal Publishing in the Context of Generative Artificial Intelligence

3.1 Challenges in Review and Assessment

In academic journal review and assessment processes, although generative artificial intelligence demonstrates enormous potential in content generation due to its efficiency and speed, the problems it brings cannot be ignored. Since generative AI lacks the deep analytical and judgment capabilities of human experts when generating research outcomes, effectively evaluating the authenticity and academic value of these results has become a significant challenge. The root of the problem lies in the fact that generative AI' s output depends on training data and algorithmic models, which may introduce bias or misinformation into content, thereby affecting research fairness and accuracy. First, the imbalance in training data is a major issue facing generative AI. Due to difficulties and limitations in data collection, training data often cannot comprehensively and objectively reflect the diversity and complexity of academic research. This

imbalance leads to bias in AI-generated content, distorting the true nature of research. Such bias not only damages research fairness but also misleads readers and researchers, negatively impacting academic progress.

Second, the application of generative AI in academic journal review also involves data privacy issues. During content generation, AI may need to access and process large amounts of personal information and sensitive data. If this data is not properly protected, it may violate ethical standards and privacy regulations, leading to serious legal consequences [14]. Additionally, even when data is protected, the unpredictability of AI in generating content may create risks of privacy breaches.

Furthermore, generative AI also has limitations in understanding instructions and generating content that meets requirements. Since AI' s language understanding and generation capabilities are not yet fully mature, it may misinterpret instructions or produce content that does not meet academic standards. This not only affects review quality but may also damage the reputation of academic journals. Moreover, reliance on generative AI for academic review may also undermine academic integrity. Since AI output may lack sufficient accuracy and credibility, leading to inaccurate evaluation results, it directly damages the authenticity and reliability of academic research. This dependence may also trigger new forms of academic misconduct, such as using AI to generate false research results, severely impacting the reputation of academic journals and the credibility of academic research.

Meanwhile, as generative AI technology continues to develop and improve, academic journals need to constantly adjust their review standards to adapt to these changes. However, in practice, this process may lack sufficient resources and support, causing difficulties for journals in responding to new technological challenges. Editors and reviewers need to receive new technical training and education to better understand and apply generative AI technology, thereby ensuring the accuracy and fairness of academic review.

3.2 Challenges in Editorial Career Development

In the face of the rapid development of AI technology, some editors cling to old ways, adopting a negative attitude toward learning emerging technologies or encountering numerous obstacles in the learning process. Consequently, in the context of continuous AI advancement, continuing education for traditional editors has become an unavoidable issue. In 2017, the State Council' s *New Generation Artificial Intelligence Development Plan* explicitly stated the need to accelerate research on changes in employment structure and patterns brought about by AI and to support higher education institutions, vocational colleges, and social training organizations in conducting AI skills training. Currently, the talent demand structure in the journal publishing industry is undergoing profound changes, with interdisciplinary talent becoming increasingly favored, particularly those who are proficient in both traditional publishing expertise and

intelligent software applications. To respond to talent needs in the intelligent era, educational institutions such as Beijing Institute of Graphic Communication have established new majors in intelligent science and technology, aiming to cultivate interdisciplinary talents capable of meeting future industry development demands.

In reality, whether they are newly trained professionals from universities or senior editors with years of experience in editorial positions, all must regard proficiency in and effective use of intelligent editing software as an indispensable professional skill. They should rely on their respective work experiences to continuously stimulate innovative thinking and enrich practical accumulation, ensuring their sustained competitiveness in the professional domain [15]. Additionally, from a macro industry perspective, policy-making institutions should keep pace with intelligent technology development, carefully plan top-level strategies, establish sound regulatory frameworks, and accelerate the construction of standardized systems.

Generative artificial intelligence is gradually penetrating and revolutionizing the traditional model of scientific journal publishing. While this process is accompanied by a series of challenges, the enormous opportunities it contains cannot be ignored. Facing these profound changes, we should adopt a proactive attitude and fully leverage the unique advantages of generative AI in scientific journal publishing. Through the rational application of this advanced technology, optimizing publishing workflows, improving publishing efficiency, and enhancing the academic influence of journals, we can more effectively promote the dissemination and development of scientific research and meet society' s demand for high-quality academic achievements.

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Note: Figure translations are in progress. See original paper for figures.