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Generative AI in Scientific Publishing – Opportunities and Challenges

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Abstract: *This paper examines how generative artificial intelligence (AI) is reshaping scientific publishing through its growing role in authoring, reviewing, and editorial workflows. It maps the current landscape of generative AI adoption, highlighting how large-scale language models and image-based systems assist researchers and editors in writing, translation, visualisation, and content management. The analysis identifies both opportunities, such as efficiency, inclusivity, and innovation, and challenges, including accuracy, accountability, bias, and uneven policy implementation. Ethical implications are addressed through international and national frameworks that emphasise transparency, human oversight, and provenance verification. By synthesising recent literature and publisher policies, this paper argues for the institutionalisation of ethics-in-practice as a foundation for trustworthy AI integration in scholarly communication.*

1. INTRODUCTION

The accelerating development of generative artificial intelligence (AI) is reshaping the foundations of scientific publishing. Tools such as large language models (LLMs), capable of producing human-like text, are already being used to assist in drafting, editing, translating, and summarising scientific content. Their potential to streamline scholarly workflows is considerable and increasingly complex to ignore (Floridi & Chiriatti, 2020). While some praise these tools for enhancing efficiency and widening access to knowledge production, others warn of their disruptive power. The academic community remains divided, and journal policies vary markedly, from explicit prohibitions to restricted use with disclosure and heterogeneous instructions across publishers and titles (Ganjavi et al., 2024). Lack of coordination raises pressing questions about responsibility, authorship, and transparency. At the same time, the rapid pace of technological advancement frequently exceeds the ability of editorial boards, institutions, and individual researchers to respond ethically and systematically.

This review paper examines how generative AI is altering standards and expectations in academic publishing, explicitly integrating two perspectives - researchers/authors and publishers/editors. Further, it looks at AI's two sides, weighing the benefits of innovation, accessibility, and speed against the risks of integrity, accountability, and regulatory uncertainty. Drawing on current scholarly literature, ethical frameworks, and institutional guidelines, the paper provides a foundation for understanding how scholarly publishing is being reshaped under AI integration.

2. CURRENT LANDSCAPE OF GENERATIVE AI AND SCIENTIFIC PUBLISHING

Generative AI refers to models that learn from extensive collections of text or images and then produce new material based on those patterns. In current research workflows, large language models (LLMs) are central to text generation and processing, while image-based models are most

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often explained through two baseline architectures - generative adversarial networks (GANs) and variational autoencoders (VAEs). In simple terms, GANs rely on a dual structure of generator and discriminator models that iteratively refine outputs to achieve realism, whereas VAEs encode information into a compact latent representation that can be decoded into controlled variations preserving the main structure (Kim et al., 2025). A helpful distinction in the literature separates predictive AI, which forecasts outcomes from past data, from generative AI, which synthesises new content that resembles the data it has learnt from (Messeri & Crockett, 2024).

In the scientific publishing ecosystem, generative AI is already integrated into several stages of the publication workflow. Authors use LLM-based tools to support literature synthesis, translation, and language editing, as well as to generate concise summaries or outline structures that help organise complex material and/or data. These functions have become part of daily research practice, particularly in disciplines with high publication output or strong international collaboration (Ganjavi et al., 2024). Beyond text, image-based generative systems assist in preparing graphical elements, refining the clarity of figures, or simulating phenomena that are difficult to visualise experimentally. Although these techniques can enhance the precision and aesthetic quality of visuals, they also require responsible handling to ensure that synthetic content is distinguished from empirical data and accompanied by transparent provenance (Kim et al., 2025).

Publishers and editorial teams are simultaneously exploring AI applications on the management side of the publication process. Automated systems are increasingly used for technical checks, plagiarism detection, and preliminary topic classification, helping editors handle large submission volumes more efficiently (Ng et al., 2025). Alongside these developments, professional organisations and publishers have begun defining the boundaries of acceptable use. A basic consensus has emerged that generative AI cannot be listed as an author, that any use must be transparently disclosed, and that accountability remains with human contributors (COPE, 2023; WAME, 2023; ICMJE, 2025). Large publishers have translated these principles into their house policies. Springer Nature prohibits AI authorship and restricts AI-generated images, while Science regards unapproved AI-generated text as a breach of research integrity (Springer Nature, 2025a). Elsevier adopts a disclosure-based model, allowing language and readability assistance but requiring explicit author statements, with some journals demanding detailed explanations of AI use when methodologically relevant (Elsevier, 2024a; Elsevier, 2024b).

In parallel, publishers are experimenting with AI-based text detection systems designed to identify content produced by large language models. Tools such as Turnitin's AI Writing Indicator, GPTZero, and Originality.ai are already being tested as part of editorial screening workflows. Yet comparative analyses demonstrate that their reliability remains limited, with accuracy rates ranging between 25% and 60% and frequent false positives and negatives (Erol et al., 2025). Misclassification is particularly concerning in the case of non-native English authors, who are disproportionately flagged by detection software due to linguistic bias in training data (Ayoobi et al., 2025; Giray, 2024). For this reason, leading editorial bodies and publishers advise using these systems only as auxiliary instruments, alongside human judgement and contextual evaluation, rather than as standalone proof of AI involvement (UNESCO, 2021).

Despite broad alignment in principles, practices remain uneven across journals and publishers. Variations appear in how disclosure should be formatted, where it should appear in manuscripts, and whether image generation is restricted or banned outright. Such inconsistencies complicate compliance for authors who publish across disciplines, yet they also signal that shared norms are gradually consolidating through practice. A clear picture of the current landscape, therefore, shows

a sector in transition-marked by active experimentation, partial standardisation, and growing awareness that transparency, human responsibility, and provenance verification are becoming foundational to trustworthy scientific communication.

3. OPPORTUNITIES OF GENERATIVE AI IN SCIENTIFIC PUBLISHING

The preceding section shows that the adoption of generative AI is advancing faster than the consolidation of shared rules and practices. Against that context, attention now shifts from description to utility, asking where generative AI already delivers tangible benefits for scholars and editorial teams. The focus is pragmatic - applications that demonstrably improve scholarly work while preserving accountability, transparency, and intellectual ownership.

Many of the immediate gains are practical. Large language models are proving to be invaluable "timesavers" for researchers, significantly improving and streamlining the writing process in academia (Fecher et al., 2023). They assist with idea generation, offering support for brainstorming and outlining to help authors establish a foundational structure for their work (Ramos-Remus et al., 2025). Beyond initial conceptualisation, LLMs aid in structuring sections, helping to organise complex ideas and data and ensure adherence to formatting guidelines, which can notably reduce the time spent on drafting manuscripts (Maddali, 2025).

A second opportunity concerns access. English is still the most common language in science, and the problems that non-native speakers face are well-known in many fields (Arenas-Castro et al., 2024; Lepp & Sarin, 2024; Zhao & Rubini, 2025). Researchers quantify the extra time and effort required to write, submit and revise in English, which can decrease participation from linguistically diverse communities (Amano et al., 2023; Ramírez-Castañeda, 2020). AI-assisted writing and translation tools can reduce that friction for early-career researchers and for international teams, with experimental and educational studies reporting measurable improvements in English academic writing among non-native speakers (Li et al., 2024). Emerging evidence and commentary also caution that language bias can persist despite tool use, which argues for complementary editorial awareness and training (Prakash et al., 2025).

In the realm of literature synthesis, LLMs can craft comprehensive literature reviews by quickly summarising extensive scientific texts, identifying key findings, trends, and research gaps (SeyedAlinaghi et al., 2024). This capability extends to assisting with systematic evidence syntheses, where AI can pinpoint relevant articles and extract crucial information, thus accelerating a typically time-consuming task (Bolaños et al., 2024). Furthermore, LLMs excel in editing, enabling the refinement and optimisation of textual content, making it virtually indistinguishable from the work of a professional writer or editor (Fecher et al., 2023; Lund et al., 2024). This aspect includes improving language clarity, refining complex sentences, and enhancing translations, particularly benefiting non-native English speakers (Ramos-Remus et al., 2025). While the concept of "compliance checks" is evolving, the ethical use of AI in academic writing is underscored by the need for transparency, disclosure, and adherence to established guidelines from professional bodies and publishers, highlighting the human oversight required to ensure integrity and compliance (Bell, 2023; Sharma et al., 2024; Yousaf, 2025). By automating these various tedious processes, LLMs can drastically reduce drafting time, in some cases, by as much as 97% for initial drafts (Eser et al., 2025), allowing researchers to redirect their energy towards deeper analysis and the development of more substantial ideas and arguments, rather than focusing solely on wording and repetitive tasks (Khalifa & Albadawy, 2024; Ahn, 2024; Atkinson et al., 2024; Buniel et al., 2025).

From an editorial point of view, AI also offers important chances to make better decisions and work more efficiently. Automated systems now support submission triage, topic classification, and plagiarism screening, allowing editors to allocate human expertise to more substantive tasks (Ng et al., 2025). In peer review, generative tools can assist in identifying suitable reviewers, detecting potential conflicts of interest, and even generating structured review summaries that help editors consolidate feedback and identify key points of consensus. Such applications demonstrate how AI can complement human expertise, reduce administrative delays, and promote greater consistency in evaluations when applied under clear ethical and procedural frameworks (UNESCO, 2021). AI can further enhance post-acceptance stages of publishing. Automated metadata extraction, reference verification, and language refinement streamline production workflows and improve the discoverability of published content. Advanced analytics help editors and publishers monitor submission trends, reviewer performance, and thematic shifts across journals, enabling data-informed decisions about editorial scope and resource allocation. Used judiciously, these tools free editorial teams from routine technical checks and redirect attention to maintaining quality, integrity, and ethical oversight - areas where human judgement remains indispensable.

In sum, generative AI has the potential to make scientific publishing faster, more inclusive, and more analytically grounded. Its strengths are most visible in routine yet labour-intensive stages of the publishing lifecycle - drafting, revising, synthesising, illustrating, reviewing, and managing submissions. The following section examines how these advantages coexist with serious challenges related to accuracy, accountability, bias, and confidentiality, which must be addressed to ensure that innovation does not erode the trust on which scholarly communication depends.

4. CHALLENGES AND RISKS

The rapid integration of generative AI into scientific publishing brings notable efficiency gains but also amplifies several long-standing vulnerabilities in scholarly communication. Key challenges arise around accuracy, authorship and accountability, confidentiality, bias, and uneven policy implementation. Each of these dimensions carries implications for the credibility and integrity of the scientific record.

Accuracy and reliability - Fluent writing style does not guarantee factual precision. Large language models may produce confident but incorrect statements, fabricated references, or distorted summaries of existing research. Such “hallucinations” can enter manuscripts when AI outputs are insufficiently verified, potentially misleading readers and reviewers. The risk is particularly acute in technical and biomedical disciplines where subtle inaccuracies may propagate downstream errors. A practical mitigation strategy is mandatory source verification at each revision stage, requiring authors to document the methods used to validate AI-generated content before submission (Bender et al., 2021; Ji et al., 2023).

Authorship, accountability and disclosure - Questions of authorship and responsibility remain central. Professional bodies converge on two core principles - generative AI cannot meet authorship criteria, and human contributors must take full responsibility for any AI-assisted output (COPE, 2023; WAME, 2023; ICMJE, 2025). Journals increasingly require statements that identify the specific tool used, describe its role, and explain who verified the resulting text or data. Compliance, however, remains uneven. Variations in journal templates and enforcement mechanisms produce uncertainty for authors, particularly in multi-author, cross-disciplinary collaborations. Clearer guidance at the journal level and consistent disclosure forms would improve transparency and ensure that accountability remains traceable throughout the publication process (Ganjavi et al., 2024).

Confidentiality and data protection - Another major concern involves confidentiality breaches. Uploading manuscripts, peer review reports, or sensitive datasets to external AI services may violate journal policies and, in some cases, data protection regulations. Editorial organisations explicitly warn reviewers and editors against using generative AI to process confidential materials without written permission from the publisher or data owner (ICMJE, 2025; WAME, 2023). Publishers are advised to incorporate clear confidentiality clauses into their AI-use policies and to provide secure, institutionally managed alternatives for permissible AI assistance.

Bias, fairness and equity - Even when AI improves fluency, underlying biases in training data persist. Models trained on historically dominant sources can reinforce linguistic, geographic, or disciplinary imbalances, thereby marginalising minority perspectives and non-English literature. Overreliance on AI-mediated synthesis risks narrowing epistemic diversity by steering authors toward what is most prevalent in the training corpus. Awareness, intentional source diversification and transparent disclosure of AI involvement are, therefore, essential for preserving pluralism in scientific communication (Bender et al., 2021). The issue of bias also extends to detection systems. As highlighted in Section 2, AI-detection tools frequently misclassify texts by non-native English speakers as machine-generated, introducing a new layer of inequity into the review process (Ayoobi et al., 2025; Giray, 2024). If used uncritically, such tools may stigmatise certain author groups and discourage participation. Consequently, responsible editorial policy must ensure that we interpret detection results contextually and never use them as sole evidence of misconduct (UNESCO, 2021).

Policy fragmentation and governance - Policy heterogeneity remains a structural barrier to responsible AI integration. Leading publishers broadly agree on prohibiting AI authorship and mandating disclosure, but differ in how these rules are implemented. Discrepancies exist in terminology, statement placement, and procedural detail, even within the same publishing group (Springer Nature, 2025; Elsevier, 2024a; Elsevier, 2024b). Such inconsistencies complicate compliance for authors and editors and may inadvertently weaken trust in the publication system. Convergence is gradually emerging through shared guidance from COPE, WAME, and ICMJE, yet sustained coordination is needed to establish stable norms across disciplines and regions (COPE, 2023; WAME, 2023; ICMJE, 2025).

Reproducibility and transparency - Finally, reproducibility and interpretability are critical challenges for AI-mediated research communication. Generative systems can produce text and visualisations that appear coherent but obscure methodological details such as prompt design, model version, or parameter settings. Without such documentation, reviewers and readers face an illusion of completeness that hampers verification. To counter this, manuscripts should include explicit descriptions of how AI tools were used, what human validation steps were applied, and how outputs were cross-checked against independent sources (Ji et al., 2023; Bender et al., 2021).

Beyond author-side concerns, a second set of risks arises within editorial and peer review workflows.

Algorithmic bias in editorial triage and reviewer assignment - While automation offers efficiency, it also introduces new forms of vulnerability within editorial and review workflows. Algorithms used for submission triage, reviewer assignment and content classification are only as neutral as the data they were trained on. If past editorial records or citation databases serve as inputs, AI systems may reproduce historical patterns that privilege dominant languages, institutions, and research paradigms. These issues can lead to systemic bias in reviewer selection, inadvertently amplifying disciplinary hierarchies and reducing the visibility of novel or interdisciplinary work.

Over time, such biases could consolidate epistemic homogeneity, where the same networks of reviewers and topics receive disproportionate attention, limiting the diversity of perspectives that peer review is meant to safeguard (Bender et al., 2021).

Limits of AI-generated or AI-assisted reviews - The use of AI-generated or AI-assisted peer reviews raises an additional set of concerns. Automated summaries or full-text evaluations can misinterpret methodological nuances, overemphasise stylistic fluency, or apply inconsistent criteria for originality and scientific contribution. In experimental trials, LLM-based systems have demonstrated the capacity to generate assessments that appear persuasive yet lack analytical rigour or contain factual inaccuracies (Ji et al., 2023). When adopted without human moderation, such systems risk shifting peer review from a deliberative and context-sensitive process to one that privileges surface coherence over substantive judgment. The danger is not only in flawed recommendations but also in the erosion of reviewer accountability, since algorithmic contributions are difficult to trace, reproduce, or contest.

Confidentiality and data protection in AI-mediated review - Confidentiality represents another critical issue in AI-mediated review. Uploading manuscripts, datasets, or reviewer comments to third-party AI tools may violate editorial confidentiality and, in some cases, data protection regulations. Despite claims of anonymisation, AI systems may still retain prompts or metadata that reveal sensitive information. Professional bodies such as ICMJE and WAME explicitly prohibit the use of external AI tools for reviewing confidential content without written authorisation from the journal or publisher. Yet informal use continues, often driven by workload pressure and lack of training. Without clear institutional protocols and secure in-house systems, the risk of inadvertent disclosure or data leakage remains high (ICMJE, 2025; WAME, 2023).

In summary, the risks associated with generative AI in scientific publishing extend across the entire ecosystem, from authorship and content creation to peer review and editorial governance. The main pressure points where technological innovation challenges the boundaries of research integrity continue to be accuracy, accountability, confidentiality, and fairness. Addressing these challenges requires a shared commitment to transparency, verifiable provenance, and human-centred oversight. The following section explores how these obligations are codified through ethical frameworks and policy instruments that seek to transform principles into enforceable standards for responsible AI integration in scholarly communication.

5. ETHICAL IMPLICATIONS

The ethical foundation of any tool usage begins upstream. Across reputable frameworks, a stable core emerges - transparency, accountability, integrity, fairness, and societal benefit (Ibitoye et al., 2025; Laflamme & Bruneault, 2025). In academic publishing, transparency means letting people know if, where, and how generative systems were used in manuscripts or peer-review activities. Accountability ties each AI-assisted step to identified human contributors who verify outputs. Integrity is about how accurate text, data, and images are, including where they came from and how to cite them correctly. Fairness requires attention to linguistic and epistemic inclusion when models encode historical imbalances. The concept of societal benefit requires authors and editors to consider the potential misinterpretation of persuasive prose or visuals by audiences beyond their expertise (UNESCO, 2021).

Policy instruments progressively establish those values as enforceable obligations. The EU AI Act (EU, 2024) adopts a risk-based approach with transparency requirements for general-purpose and generative models and prohibitions on certain manipulative or biometric practices, with staged implementation from 2024 onwards. National frameworks complement that trajectory. Serbia's

Ethical Guidelines for Safe and Reliable Use of AI (Government of Serbia, 2023) emphasise robust and accountable AI, human-centred design, non-discrimination and a practical self-assessment questionnaire that research teams can adapt to publish use cases involving language models, data synthesis, and image generation. Editorial communities translate principles into sector-specific norms: WAME and COPE affirm that AI systems cannot be listed as authors, require explicit disclosure of assistance, and urge safeguards for confidentiality in peer review (WAME, 2023; COPE, 2023). Those positions align with the operational guardrails already mapped in the previous chapters and provide a common baseline for venue-level policies. Nevertheless, principles may remain stagnant as mere phrases unless integrated into daily practice. Comparative reviews (Adjovi, 2025; Salwén et al., 2025) indicate a convergence on values and a paucity of evidence regarding impact when ethics is regarded as a checklist rather than fostered as a practice. Ethics-in-practice, therefore, prioritises process over proclamations - documenting prompts and parameters, recording who verified AI outputs, and using venue-specific disclosure templates that are easy to apply and easy to review (Hagendorff, 2020; Bleher & Braun, 2023). Such measures let editors and reviewers trace responsibility without outsourcing judgment to tools or generic declarations.

Visuals merit special care because generative models can fabricate convincing images or alter real data in ways that evade casual inspection. Publishing guidance points to complementary strategies. First, set clear admissibility rules for AI-generated images and require provenance statements, with access to original data on request. Second, equip editors and reviewers with workflows and tools for detecting manipulation and apply corrective actions when integrity concerns arise. Several publishers now restrict or ban AI-generated figures in research articles, while integrity handbooks and decision flowcharts provide practical steps for investigating problematic images and preserving a transparent record (Nature Geoscience, 2025; COPE, 2023; Council of Science Editors, 2023; Springer Nature, 2025b). Those expectations complement earlier discussions of detection technologies by clarifying that tool outputs are, at best, inputs to human judgment rather than final arbiters.

Responsibilities are distributed but not diffuse. Authors should disclose AI use with sufficient detail for replication, verify every AI-mediated statement or visual against trusted sources, and avoid uploading confidential or third-party material to external systems without permission. Editors should adopt venue-specific disclosure templates, request original data or figures when AI involvement is declared, and ensure reviewers know when AI assistance is impermissible. Publishers should harmonise house policies, provide training for text and image provenance checks, and support tools that flag likely AI-generated content so that human judgment can focus on hard cases. Converting principles into operational habits at each role boundary strengthens trust among readers, institutions, and funders (WAME, 2023; COPE, 2023; EU, 2024). Ethical implications, therefore, span the entire publication lifecycle. Clarity about human responsibility, disciplined disclosure, and robust provenance for text, data, and images are the load-bearing elements. Where policies remain uneven, journals can still achieve high standards by adopting the shared core of international frameworks and institutionalising ethics-in-practice rather than relying on principle lists alone (UNESCO, 2021; EU, 2024; Government of Serbia, 2023; Hagendorff, 2020).

6. DISCUSSION

The review has shown that generative AI is transforming scientific publishing on multiple levels, from authoring and reviewing to editorial decision-making. Adoption is progressing faster than the establishment of consistent rules and shared ethical standards. While most publishers now agree that AI cannot be an author and that its use must be transparently disclosed, differences in implementation and interpretation persist across journals and disciplines.

The discussion centres on the balance between innovation and integrity, efficiency and accountability. Generative AI offers measurable benefits by saving time, improving accessibility and supporting multilingual participation in global science. Yet those advantages are meaningful only if matched with transparent disclosure, human validation, and robust provenance for text and images. The core challenge is not whether AI should be used, but how it can be integrated responsibly without undermining the credibility of the scientific record. Another dimension concerns culture and community. Responsible use of AI cannot depend solely on formal rules. It requires shared professional norms and a collective understanding of ethical responsibility. Authors, editors, and publishers play complementary roles. Authors disclose and verify, editors interpret and enforce, and publishers harmonise policies and training. Embedding ethics-in-practice, where integrity is operationalised rather than declared, emerges as a precondition for trust. Global asymmetries further complicate this landscape. Large publishers move faster in policy adoption than smaller journals or emerging research systems. National frameworks, such as Serbia's Ethical Guidelines and the EU AI Act, provide valuable alignment but require consistent institutional uptake. Without coordination, uneven enforcement could reproduce existing inequalities, especially for non-native English authors who already face linguistic and technological bias.

Ultimately, generative AI highlights a dual imperative for scholarly publishing - to innovate without compromising reliability and to democratise access while safeguarding intellectual authenticity. Achieving that balance depends less on the technology itself and more on human judgment, collaboration, and ethical reflexivity across the publishing community.

7. CONCLUSION

Generative AI is no longer peripheral to scholarly communication. It has become embedded across the publication lifecycle. From idea generation and manuscript drafting to image creation and editorial screening, AI-driven systems now influence how research is written, reviewed, and presented. The review identified both the opportunities and the risks associated with this transformation. Benefits include improved efficiency, linguistic inclusivity, and analytical depth, while the main risks concern accuracy, accountability, bias, and uneven governance. The key finding is that sustainable integration of AI in scientific publishing depends on transparency, human oversight, and ethical alignment. Principles alone are insufficient unless they are translated into verifiable practice through disclosure statements, provenance documentation, and reviewer training. A human-centred model, where technology supports but does not replace expert judgment, remains essential for maintaining credibility and trust.

This paper contributes to the growing literature by mapping current policies and ethical frameworks, identifying inconsistencies across publishers, and linking global standards with national contexts. It argues for the institutionalisation of ethics-in-practice, turning abstract principles into operational norms within editorial and research workflows. Future work should address several directions: examining how AI influences writing style and scientific rhetoric; assessing the long-term effects of detection tools and linguistic bias on non-native authors; and tracking the convergence of journal policies as AI governance matures. For researchers, editors, and publishers alike, the challenge ahead lies not in resisting technological change but in ensuring that its adoption strengthens, rather than dilutes, the integrity of scholarly communication. The author recognises future research potential in empirically examining researchers' practices, habits and attitudes toward the use of AI in scholarly publishing.

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Declaration of Generative AI and Ai-Assisted Technologies in the Writing Process

During the preparation of this paper, the author used ChatGPT and QuillBot solely to improve the clarity, grammar, and readability of the English text. In addition, author used Jenni.ai to refine literature. All tool-generated suggestions were reviewed, revised, and approved by the author, who takes full responsibility for the final content of the publication.

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