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Artificial Intelligence Tools for Scientific Writing: The Good, The Bad and The Ugly

Giuseppe Biondi-Zoccai[a,b], Anna Cazzaro[a], Elisa Cobalchin[a], Diletta D'Auria[a], Giovanni Ardizzone[a], Salvatore Giordano[c], Ulvi Mirzoyev[d], Petar M Seferovic[e], Gani Bajraktari[f,g,h], Denisa Muraru[i,j]

[a] Department of Medical-Surgical Sciences and Biotechnologies, Sapienza University of Rome, Latina, Italy. giuseppe.biondizoccai@uniroma1.it
[b] Maria Cecilia Hospital, GVM Care & Research, Cotignola, Italy.
[c] Division of Cardiology, Department of Medical and Surgical Sciences, "Magna Graecia" University, Catanzaro, Italy. sasigiordano@gmail.com
[d] Medical Center of the Ministry of Emergency Situations, Baku, Azerbaijan. ulvi.mirzoyev@adam.az
[e] Faculty of Medicine, University of Belgrade, Serbian Academy of Sciences and Arts, Belgrade, Serbia. seferovic.petar@gmail.com
[f] Clinic of Rheumatology, University Clinical Centre of Kosova, Prishtina, Kosova. ganibajraktari@gmail.com
[g] Clinic of Cardiology, University Clinical Centre of Kosova, Prishtina, Kosovo.
[h] Department of Public Health and Clinical Medicine, Umeå University, Umeå, Sweden.
[i] Department of Medicine and Surgery, University of Milano-Bicocca, Milan, Italy. denisa.muraru@gmail.com
[j] Department of Cardiology, Istituto Auxologico Italiano, IRCCS, Milan, Italy.

Corresponding author
Prof. Giuseppe Biondi-Zoccai, Department of Medical-Surgical Sciences and Biotechnologies, Sapienza University of Rome, Corso della Repubblica 74, 04100 Latina, Italy. Email: giuseppe.biondizoccai@uniroma1.it

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Abstract

The integration of artificial intelligence (AI) tools in the workflow of scholarly writing, including scientific and medical writing, offers transformative advantages while raising critical ethical and practical concerns. Among the pros, AI substantially enhances efficiency by automating several time-consuming tasks such as literature review, data synthesis and text editing. In particular, tools such as ChatGPT, Grammarly, and SciSpace Copilot remarkably empower researchers when they draft, refine, and format manuscripts, increasing precision and speed. In addition, AI tools may foster inclusivity by assisting non-native English speakers with seamless translations and also enabling interdisciplinary collaboration, thereby hopefully democratizing access and boosting scientific communication and cooperation. However, the rapid adoption of novel AI tools brings significant challenges. First, there is a distinct risk of perpetuating biases in training datasets, and other key issues include ambiguity in authorship accountability and the potential erosion of critical thinking skills. In addition, AI tools could be purposefully misused to generate mock datasets and fraudulent papers (e.g. by paper mills), and this clearly poses a threat to academic integrity. This challenge is all too pressing given that traditional plagiarism detection tools often fall short against sophisticated AI-generated content. We hereby explore the pros and cons of AI on medical writing, poignantly leveraging Sergio Leone's The Good, The Bad, and The Ugly movie as a metaphor. By providing general concepts as well as focusing on several key AI tools, we are hopeful this overview may prove useful to anyone wishing to conscientiously adopt AI tools for scientific writing. In addition, we make a compelling case for transparent guidelines, robust and freely available detection mechanisms, and ongoing critical oversight to ensure AI will be able to serve as a catalyst for innovation and dissemination without compromising the credibility of scholarly endeavors.

Introduction

The transformative rise of artificial intelligence (AI) tools in scientific writing has redefined how researchers approach their work, bringing both profound opportunities and significant challenges to the forefront.[1] Notably, AI can be defined in general terms as the simulation of human intelligence in machines that are programmed to think and learn like humans.[2,3] These systems can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision-making, and language translation. In terms of AI applications for scholarly writing, these can entail grammar checks, generates abstracts, assists in data analysis, manages citations, and enhances collaboration, streamlining the production of high-quality scientific documents.[4] Indeed,

tools like ChatGPT, Grammarly, and Scite.ai are now indispensable for general writing tasks, enhancing efficiency by automating tasks such as grammar refinement, literature review, and even manuscript drafting.[5,6] For researchers in demanding fields like cardiovascular science, where time is critical, these innovations offer the ability to synthesize large bodies of literature, refine complex arguments, and communicate findings with unparalleled clarity.[7] Notably, AI is not just a productivity enhancer: it is rapidly becoming an intellectual collaborator![8]

Yet, as AI tools embed themselves into the workflows of academia, they present dilemmas that extend beyond technical capability. Ethical concerns surrounding AI-generated content—such as the risk of fabricated data, hidden biases, and the erosion of traditional authorship norms—cast shadows on the integrity of scholarly communication[9] Worse still, the specter of AI-driven fraud, exemplified by the rise of automated 'paper mills,' threatens to undermine the credibility of entire fields of research.[10] In any research field where precision and reliability are paramount, these risks take on heightened importance.

The duality of AI's promise and peril demands a nuanced response from the scientific community.[11] On the one hand, AI democratizes access to scientific communication, helping researchers from diverse linguistic and resource backgrounds contribute to global scholarship (Table 1). On the other hand, it challenges foundational principles of originality, accountability, and human oversight in scientific inquiry (Table 2).[6] For instance, while tools like Elicit and ResearchRabbit accelerate literature reviews, they cannot substitute for researcher’s critical judgment in interpreting data and trends (Table 3, Table 4).[12,13]

We hereby explore in detail the impact of AI on scholarly writing, poignantly leveraging Sergio Leone’s The Good, the Bad, and the Ugly, movie.[14] We showcase how AI tools can be harnessed to expand the frontiers of knowledge while dissecting the ethical and practical concerns they raise. By framing AI as a double-edged sword, this overview calls for a collective commitment to transparency, critical evaluation, and ethical innovation. Only by embracing such a balanced approach can researchers ensure that AI remains a tool for enlightenment, rather than a catalyst for academic erosion.

The Good

Thanks to recent technological breakthroughs, AI has ushered in a transformative era for scientific writing, offering researchers unprecedented tools to enhance precision, efficiency, and collaboration.[15] By automating many routine tasks while potentially leveraging very extensive data sources, AI enables researchers to focus more on the intellectual and innovative aspects of their work, ultimately improving the quality and impact of scientific literature.

AI tools excel in streamlining writing processes.[6]. For instance, ChatGPT serves as a versatile assistant, aiding in the drafting and refining of manuscripts, summarizing complex findings, and generating plain-language summaries.[8] This capability is particularly valuable in cutting-edge research, where communicating intricate findings from studies on poignant topics to diverse audiences is critical. Similarly, tools like Grammarly and ProWritingAid improve the grammar, clarity, and tone of manuscripts, ensuring that submissions meet the high standards required by academic journals.[16]

The automation of literature reviews represents another significant advancement. Elicit and ResearchRabbit employ semantic search capabilities to identify relevant papers and uncover research trends.[12,13] For researchers, these tools can rapidly highlight pivotal studies on heart failure management or novel therapeutic strategies, saving weeks of manual effort.[17] SciSpace Copilot takes this further by offering interactive feedback on draft manuscripts, suggesting improvements in structure and coherence while ensuring adherence to journal guidelines.[18]

AI also fosters inclusivity in scientific communication. Non-native English-speaking researchers can rely on tools like DeepL Write for high-quality translations and language refinement, enabling them to share their work effectively across global platforms.[19] Similarly, Wordtune and Quillbot help simplify complex text, making research accessible to broader audiences, including patients and policymakers.[20] This democratization broadens the diversity of contributions in science and enriches global discourse.

Collaboration is another domain where AI excels. Platforms like Google NotebookLM and Otter Assistant enhance productivity by organizing research notes and transcribing discussions,[21,22] respectively. This is invaluable for interdisciplinary teams tackling complex research problems, such as designing interventions for coronary artery disease or studying the genetic underpinnings of arrhythmias. AI-powered visualization tools like BioRender also enable researchers to create compelling graphical abstracts, aiding in the effective communication of research findings.[23] Moreover, AI tools like Scite.ai and Consensus AI improve the reliability and context of research by evaluating citations and synthesizing evidence. Researchers can use these tools to critically assess supporting and opposing evidence in their studies, ensuring robust conclusions in any field of research.[24]

The benefits of AI extend to managing references and enhancing manuscript submission efficiency.[25] Tools such as EndNote Click and Zotero streamline citation tracking and bibliography creation, allowing researchers to focus on content quality. Additionally, Typeset.io ensures

manuscripts adhere to specific journal formats, reducing the administrative burden associated with submissions.

In summary, AI tools are redefining the scientific writing process. They empower researchers to communicate complex ideas with clarity, collaborate effectively across disciplines, and democratize access to scientific knowledge. For researchers, the strategic application of these tools accelerates discovery and enhances the translation of research into practice, advancing the frontiers of science.[26]

The Bad

While AI tools provide remarkable efficiencies in scientific writing, their integration introduces a set of ethical, practical, and technical challenges that demand careful consideration.[27] As these tools become increasingly entrenched in academia, their shortcomings can have profound implications for the quality, integrity, and reliability of scientific research.

One of the most pressing concerns is the risk of perpetuating biases embedded in the training data of AI tools. For example, models like ChatGPT and Claude are trained on vast datasets that may unintentionally reinforce stereotypes or exclude critical voices from underrepresented populations.[6,28] This can result in skewed interpretations of data or biased narratives in research outputs, particularly in fields such as translational medicine, where inclusivity in data representation is crucial for generalizability. In addition, LLMs are well known for their risk of generating inaccurate replies, veritably hallucinating. These hallucinations are not infrequent, with an average incidence of 3-5%, but such risk may reach 20%-30% for niche topics and prompts with limited informativeness.[29,30,31]

The over-reliance on AI for tasks like literature review and manuscript drafting risks eroding essential critical thinking and analytical skills among researchers. Tools like Elicit and ResearchRabbit, while proficient in automating literature searches and mapping trends, may promote superficial engagement with source material.[12,13] Researchers who rely too heavily on AI outputs risk overlooking nuanced arguments or misinterpreting evidence. For instance, oncologic researchers could inadvertently miss key limitations of studies on emerging treatments for breast cancer, leading to overoptimistic conclusions.[32]

Another significant challenge is the ethical dilemma surrounding authorship and accountability[33] AI tools such as Jenny AI and Writesonic can generate substantial portions of text, but they cannot take responsibility for the accuracy or originality of the content. This complicates traditional notions of authorship, raising questions about intellectual contribution and transparency. Furthermore, tools

like Quillbot and Wordtune, which excel in paraphrasing and rewriting, can blur the lines between legitimate textual refinement and unintentional plagiarism.[34]

AI's limitations in handling domain-specific nuances also pose risks. Tools like Grammarly and ProWritingAid, although exceptional for improving language and readability, may misidentify specialized terminology as errors or fail to adapt to the intricacies of science. For example, technical terms such as "fractional flow reserve" or "ejection fraction" might be flagged incorrectly, disrupting the coherence of highly specialized manuscripts.[35]

The use of AI in scientific writing also threatens academic integrity by increasing the risk of undetected plagiarism and data fabrication, lablelled AI-giarism (Table 5). While tools like Plagiarism AI Detectors aim to mitigate these risks, they are not foolproof, particularly against sophisticated AI-generated text that mimics originality. The emergence of AI-generated fraudulent papers, often produced en masse by 'paper mills,' highlights the urgent need for robust detection mechanisms. In any field of research fraudulent activities could undermine trust in the field.[36]

The technical limitations of AI tools exacerbate these issues. For instance, SciSpace Copilot and Scite.ai, while adept at providing manuscript feedback and citation analysis, depend on access to comprehensive databases.[37] Researchers without institutional access may encounter gaps in the resources available, leading to incomplete or biased outputs. Similarly, tools like ChatPDF, designed for summarizing PDFs, are limited by the quality and accessibility of the source material, potentially omitting critical insights.

Finally, the lack of transparency in AI algorithms raises concerns about accountability and interpretability. Researchers relying on tools like Consensus AI for evidence synthesis may not fully understand the rationale behind the AI's conclusions, complicating the validation of results.[38] This opacity can erode confidence in AI-assisted outputs, particularly in high-stakes research fields.

In summary, while AI tools significantly enhance the efficiency of scientific writing, their limitations underscore the need for cautious and informed use. Addressing these challenges requires comprehensive ethical guidelines, improved transparency in AI operations, and ongoing education for researchers. By balancing the benefits of AI with a critical awareness of its risks, the scientific community can harness its potential while safeguarding the rigor and credibility of academic research.

The Ugly

The integration of AI into scientific writing has unveiled profound vulnerabilities that threaten the integrity of academic research.[39] These challenges, exacerbated by the sophistication of modern AI tools, extend beyond mere ethical concerns into the realm of systemic exploitation, casting long shadows over the reliability of scientific communication.[9]

One of the most alarming issues is the rise of fraudulent scientific publications facilitated by AI technologies.[40] So-called 'paper mills' exploit tools like Writesonic and ChatGPT, using them to generate plausible yet entirely fabricated research articles.[6] These papers often evade traditional detection mechanisms, infiltrating legitimate journals and diluting the quality of scientific literature. Such issue clearly undermines trust and hampers the advancement of knowledge.[10]

AI-generated content is also challenging the efficacy of traditional plagiarism detection systems. Tools like Scite.ai and Plagiarism AI Detectors struggle to identify synthetically generated text, as these systems are typically designed to detect direct copying rather than the nuanced mimicry AI can produce.[41] This inadequacy allows deceptive practices to flourish, eroding confidence in peer-reviewed processes. For instance, an AI-generated review on heart failure treatments could pass undetected, leading to the dissemination of flawed or misleading conclusions.

The opacity of many AI tools further complicates accountability. Platforms like Consensus AI and DeepSeek, while valuable for evidence synthesis, often operate as 'black boxes,' leaving researchers unable to verify how conclusions are derived.[42] This lack of transparency not only diminishes confidence in AI-generated insights but also risks perpetuating hidden biases, particularly in high-stakes domains. Without clear accountability, the role of these tools in perpetuating errors remains obscured.

The ambiguity surrounding authorship in AI-assisted writing poses another significant dilemma. Tools such as Claude and Jenny AI, capable of producing significant portions of manuscript text, blur the lines between machine-generated content and human contribution. This ambiguity raises questions about intellectual property, credit allocation, and the integrity of authorship declarations. In any research endeavor where collaborative efforts involve large teams, the introduction of AI further complicates these dynamics, potentially leading to disputes or even ethical violations.[43]

Additionally, the rapid evolution of AI technologies has outpaced the development of effective regulatory frameworks. Institutions and publishers are often unprepared to address the nuanced challenges posed by tools like ChatPDF or Google NotebookLM, which streamline workflows but also introduce risks of misuse.[6,44] This regulatory gap creates an environment where the misuse of AI can proliferate unchecked, further jeopardizing the credibility of scientific endeavors.

Another disturbing consequence is the potential erosion of critical thinking skills. Over-reliance on AI tools, such as Elicit for literature reviews or SciSpace Copilot for manuscript optimization, risks creating a generation of researchers who may bypass essential evaluative processes.[45] For example, infectious disease researchers might inadvertently adopt AI-synthesized conclusions on treatments

for novel viruses without fully interrogating the underlying data, leading to superficial or flawed research outcomes.

Finally, the proliferation of AI-generated visual content presents unique challenges. While tools like BioRender and DALL-E are invaluable for creating graphical abstracts, they also introduce risks of misrepresentation.[46] Poorly designed or misleading visuals, whether intentional or accidental, can distort findings, compromising the integrity of scientific communication.

In summary, while AI tools bring undeniable advancements, their misuse or mismanagement risks undermining the foundations of academic research. To mitigate these dangers, the scientific community must prioritize the development of robust ethical guidelines, invest in advanced detection technologies, and foster a culture of critical engagement with AI-generated outputs. Only through collective vigilance and proactive governance can we ensure that AI remains a force for innovation rather than a vehicle for academic erosion.

Future Perspectives

As AI continues to evolve, its integration into scientific writing will likely deepen, offering novel opportunities and posing new challenges. The next generation of AI tools promises to go beyond mere automation of tasks, acting as intelligent collaborators capable of assisting researchers in hypothesis generation, study design, evidence synthesis, and even peer review processes.[29,30,31] For instance, emerging models like Med-PaLM 2 and BioGPT are designed to address domain-specific queries and generate insights tailored to fields like clinical medicine, making them invaluable for crafting precise and innovative research proposals.[47]

Future AI systems will likely incorporate enhanced transparency and interpretability features, addressing concerns about the "black-box" nature of many current models. Tools such as Explainable AI could enable researchers to trace the logic behind AI-generated outputs, fostering trust and accountability in their application. These advancements will be essential for ensuring the integrity of AI-assisted research in high-stakes domains where accuracy is paramount.

Moreover, AI-driven platforms are expected to facilitate real-time collaboration across disciplines and geographies. Integration with cloud-based ecosystems like Google NotebookLM and Otter Assistant will streamline project management, enabling teams to co-author manuscripts, share data, and refine visualizations collaboratively and seamlessly. This could significantly accelerate the translation of research findings into practice.[48]

However, these advancements will necessitate robust ethical frameworks and governance structures. As AI tools become more powerful, the risks of misuse, such as generating fraudulent research or exacerbating existing biases, may also grow. Future guidelines must mandate transparency in the

disclosure of AI use, standardize authorship practices, and promote the development of sophisticated detection mechanisms to counteract potential abuses.[49]

Ultimately, the successful integration of AI into scientific writing will depend on balancing innovation with responsibility.[50] By fostering a culture of critical engagement and ethical application, researchers can harness AI's transformative potential to advance knowledge, foster collaboration, and improve the accessibility and quality of scientific communication.

Conclusions

The integration of AI tools into scientific writing has already transformed the research landscape, enhancing efficiency, inclusivity, and collaboration while raising critical ethical and practical challenges, and further changes are expected in the future, even more momentous. To fully realize the potential of AI without being overwhelmed, the scientific community must prioritize transparency, ethical governance, and the development of robust detection mechanisms. By balancing innovation with responsibility, researchers can leverage AI to advance scientific discovery without compromising the integrity and credibility of academic communication.

Declarations

Conflict of interest

Giuseppe Biondi-Zoccai has consulted for Abiomed, Advanced Nanotherapies, Aleph, Amarin, Balmed, Cardionovum, Crannmedical, Endocore Lab, Eukon, Guidotti, Innovheart, Meditrial, Menarini, Microport, Opsens Medical, Terumo, and Translumina, outside the present work. Denisa Muraru reports research support and speakers' fees from GE Healthcare and Philips Medical Systems, outside the present work. All other authors report no conflict of interest.

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Minerva Medica; 2024). The final content, including all conclusions and opinions, has been thoroughly revised, edited, and approved by the authors. The authors take full responsibility for the integrity and accuracy of the work and retain full credit for all intellectual contributions. Compliance with ethical standards and guidelines for the use of artificial intelligence in research has been ensured.

Table 1

Key benefits of using AI tools for scientific writing.

Domain	**Pros**	**Impact**	**Examples**
Citation management	Streamlines reference organization and formatting.	Reduces administrative workload and ensures compliance with journal guidelines.	Using Zotero for systematic review reference management.
Collaboration	Enables real-time transcription and shared editing.	Facilitates interdisciplinary research and streamlines teamwork.	Using Otter Assistant to transcribe team discussions on genetic underpinnings of arrhythmias.
Ethics and integrity	Helps detect plagiarism and ensure originality.	Preserves the credibility of research outputs.	Using Plagiarism AI Detectors to verify the originality of meta-analysis manuscripts.
Evidence synthesis	Contextualizes and evaluates citations for reliability.	Improves the robustness and accuracy of scientific conclusions.	Using Scite.ai to assess supporting and opposing evidence in TAVR studies.
Language editing	Improves grammar, style, and readability; supports non-native English speakers.	Elevates the quality of submissions to high-impact journals.	Using Grammarly to refine language in manuscripts on atrial fibrillation mechanisms.
Literature review	Automates search and synthesis of evidence; highlights trends and gaps.	Saves time and improves the comprehensiveness of reviews.	Using Elicit to identify key studies on heart failure management.
Manuscript drafting	Enhances speed and coherence; provides plain-language summaries.	Accelerates manuscript preparation and improves clarity of communication.	Using ChatGPT to draft introductions for papers on myocardial infarction treatments.
Visualization	Creates publication-ready visuals and graphical abstracts.	Improves the impact and accessibility of research findings.	Using BioRender to design graphical abstracts for research.

Table 2

Key issues and drawbacks of using AI tools for scientific writing.

Domain	**Cons**	**Impact**	**Examples**
Citation and reference management	Errors in formatting styles or incomplete data extraction from sources.	Delays in publication or rejection due to incorrect citations.	Formatting references for a TAVI manuscript using EndNote Click.
Collaboration and project management	Challenges in integrating diverse tools into seamless workflows.	Reduced efficiency and increased confusion in collaborative efforts.	Managing grant proposals using Google NotebookLM.
Data analysis	AI tools may oversimplify complex datasets or misinterpret statistical outputs.	Incorrect conclusions or flawed research outputs.	Analyzing large clinical datasets with Meta AI.
Ethical compliance	Potential misuse of AI to generate misleading or fraudulent content.	Compromised scientific integrity and credibility.	Ensuring ethical AI use for manuscript compliance via Plagiarism AI Detectors.
Hypothesis generation	Generated hypotheses may lack feasibility or alignment with clinical realities.	Wasted resources pursuing non-viable research directions.	Using BioGPT to propose mechanisms for novel diseases.
Peer review and evaluation	Difficulty detecting AI-generated submissions; biases in feedback loops.	Erosion of trust in peer-reviewed outputs and compromised quality control.	Evaluating AI-assisted reviews of atrial fibrillation papers with Scite.ai.
Translation and multilingual support	Loss of nuance or inaccuracies in domain-specific terminology.	Reduced trust and global dissemination of findings.	Translating abstracts on atrial fibrillation with DeepL Write.

Table 3

Features of the 5 best AI tools for scientific writing.

AI Tool	Details	Pros	Cons	Example of Use
ChatGPT	Aids in drafting, brainstorming, summarizing, and proofreading. It supports iterative collaboration, where users can refine and expand text with step-by-step prompting. It can also explain complex concepts or generate plain language summaries for non-experts.	- Highly adaptive to various writing tasks. - Generates human-like text. - Fast and iterative content creation. - Can simplify technical terms for broader audiences.	- Potential for generating inaccurate or fabricated references. - Struggles with domain-specific nuance if not explicitly guided. - Lacks citation capabilities.	Drafting the Introduction for a scholarly manuscript, creating plain language summaries for patients, or generating a list of potential research questions.
Elicit	Assists with systematic literature reviews. It extracts key insights, identifies relevant papers, and synthesizes trends from research databases. Its semantic search capabilities go beyond keyword matching.	- Automates literature search and extraction. - Highlights trends and gaps in the field. - Reduces time for systematic reviews. - Provides interactive result filtering.	- Limited access to full-text papers without institutional access. - Misses nuances in highly specific or new research topics. - Requires familiarity to maximize potential.	Generating a list of the most cited papers on heart failure treatments and identifying key therapeutic trends for a comprehensive review article.
Grammarly	Provides real-time grammar, punctuation, and style suggestions. It enhances sentence structure, coherence, and readability. Premium features include academic tone adjustments and advanced stylistic suggestions.	- Excellent for polishing grammar and readability. - Tailors style for formal academic writing. - Real-time feedback speeds up editing.	- Limited domain-specific vocabulary support. - May flag correctly used specialized terms as errors. - Requires premium subscription for advanced features.	Refining the language and grammar of a manuscript discussing atrial fibrillation mechanisms to meet the standards of a high-impact scholarly journal.
SciSpace Copilot	Integrates advanced AI to help researchers with manuscript drafting, literature reviews, and interactive feedback. It offers detailed suggestions for restructuring and improving clarity.	- Provides tailored feedback for manuscripts. - Interactive queries enable deeper exploration of content. - Analyzes references for accuracy and relevance.	- Learning curve for effective usage. - Some advanced features require premium subscriptions. - Limited integration with other research tools.	Reviewing and optimizing the structure of a draft on coronary artery disease interventions, ensuring clarity and compliance with journal guidelines.
Scite.ai	Contextualizes and analyzes citations in research articles. It helps users assess whether citations support or contradict claims, providing a deeper understanding of research impact.	- Contextualizes citations for reliability. - Highlights supporting or opposing evidence. - Encourages critical evaluation of sources.	- Requires a subscription for advanced features. - May have limited coverage of niche journals. - Relies on indexed databases for citation data.	Evaluating the reliability and relevance of cited studies in a paper discussing ventricular arrhythmias, ensuring proper interpretation of cited evidence.

Table 4

Features of other AI tools useful for scientific writing.

AI Tool	Details	Pros	Cons	Example of Use
AI21 Labs' Wordtune	Advanced text refinement	Customizes tone and style	Focuses on short texts	Rewriting research abstracts
BioGPT	Biomedical text generation and mining	Domain-specific insights	Requires expert oversight	Generating hypotheses for molecular studies
BioRender	Scientific visualization tool	Creates publication-ready visuals	Requires design skills	Designing graphical abstracts for research
ChatPDF	PDF summarization and query tool	Quick document insights	Limited to accessible PDFs	Extracting insights from conference proceedings
Chatsonic	AI-driven text generation	Customizable outputs	Focus on general content	Drafting patient-focused summaries for heart health
CiteAI	Citation and bibliography formatting	Supports multiple styles	Limited to formatting tasks	Formatting references for manuscripts
Claude (Anthropic)	Advanced context-aware AI for drafting	Handles nuanced text well	Limited integration features	Refining discussion sections of manuscripts
Consensus	AI-powered literature search	Summarizes evidence-based findings	May miss obscure papers	Reviewing evidence for novel interventions
Consensus AI	Evidence synthesis from literature	Contextual results	Limited dataset coverage	Analyzing evidence for novel therapies
Copilot	Integrated productivity assistant	Wide application range	Requires Microsoft ecosystem	Drafting grant proposals for clinical studies
Copysmith	AI for content ideation	Good for brainstorming	Not academic-specific	Generating content ideas for outreach
DALL-E	AI-powered image generation	Creative outputs	Not text-focused	Visualizing complex concepts
DeepL Write	Translation and writing refinement	High-quality translations	Limited contextual suggestions	Translating multilingual research
DeepSeek	Domain-specific search enhancement	Highly precise biomedical searches	Niche usage	Searching for specific biomarkers
Elicit.org	Literature review mapping	Semantic insights	Dataset limitations	Mapping trends in imaging research
EndNote Click	Reference and bibliography management	Seamless citation tracking	Requires integration setup	Managing references for reviews
Explainable AI	Transparency in AI outputs	Ensures model accountability	Complex for non-technical users	Understanding predictive models for orphan diseases
Google Bard	Conversational AI with internet access	Fast and versatile	May lack academic focus	Generating summaries of recent scientific news
Google NotebookLM	Note-taking and idea integration	Organized and accessible	Limited advanced functionalities	Documenting hypotheses during clinical studies
GPT Builder	Custom AI model creation	Highly customizable	Requires technical expertise	Building a model for specific queries
Grammarly Premium	Advanced grammar and clarity checker	Customizable suggestions	Subscription cost	Polishing a manuscript
Hypothesis	Collaborative annotation tool	Great for group projects	Limited integration	Annotating journal articles with collaborators
Jasper	AI-driven marketing content creator	Highly creative	Less academic focus	Creating public engagement materials on novel topics
Jenny AI	Manuscript drafting tool	Good for initial drafts	Limited scientific depth	Drafting reviews of biomarkers

Lightkey	Predictive text and grammar tool	Speeds up writing	Limited to basic editing	Drafting reports on clinical trials
Med-PaLM 2	Medical-specific question answering AI	High accuracy in medical Q&A	Still maturing for niche topics	Answering clinical queries about TAVI outcomes
Meta AI	Biomedical data analysis	Strong for computational tasks	Not user-friendly for non-programmers	Analyzing large-scale datasets
Otter Assistant	Live transcription with collaborative features	Enhances meeting productivity	Audio quality dependent	Transcribing research discussions
Otter.ai	Transcription and note-taking tool	Fast and accurate	Limited to transcription tasks	Recording research interviews
Paperpal	Language and formatting optimization	Journal-specific suggestions	Focuses on style, not scientific accuracy	Preparing a manuscript for a journal
Paperpile	Reference manager integrated with Google Docs	Efficient citation management	Limited advanced features	Collaborative writing for scholarly projects
Perplexity AI	Evidence-based answers to queries	Contextual and precise	Dataset limitations	Answering clinical questions on novel treatments
Plagiarism AI Detectors	Originality check for content	Ensures uniqueness	Does not improve content	Verifying manuscript originality
ProWritingAid	Advanced style and grammar tool	Comprehensive language feedback	Not tailored for scientific writing	Improving readability of grant proposals
Quillbot	Paraphrasing and summarization	Improves text clarity	Limited to short text inputs	Paraphrasing study results for abstracts
ResearchRabbit	Literature connection mapping tool	Visualizes research trends	Requires extensive input for customization	Identifying trends in biomarkers
Scholarcy	Paper summarization tool	Highlights key paper findings	Simplistic for in-depth reviews	Quickly summarizing new research articles
SciNote	Electronic lab notebook	Organizes experimental data	High learning curve	Tracking experimental data in medical studies
Scite Assistant	Citation extraction and context	Evaluates citation impact	Dependent on indexed papers	Finding key references for meta-analyses
Semantic Scholar	AI-enhanced literature search	Broad search coverage	Generalist focus	Finding seminal papers on aortic stenosis
SmartRevise	Peer review optimization	Enhances feedback quality	Limited adoption	Improving research drafts
Typeset.io	Template-based academic writing	Ensures adherence to journal styles	Rigid templates	Formatting a manuscript for submission
Wordtune	Text rewriting tool for clarity	Improves readability and tone	Limited to rewriting, not comprehensive editing	Rewriting complex research findings
Writesonic	AI-powered text creation tool	Fast content generation	May lack academic depth	Generating patient education material
Zotero	Reference management tool	Free and widely used	Not AI-driven insights	Organizing references for systematic reviews

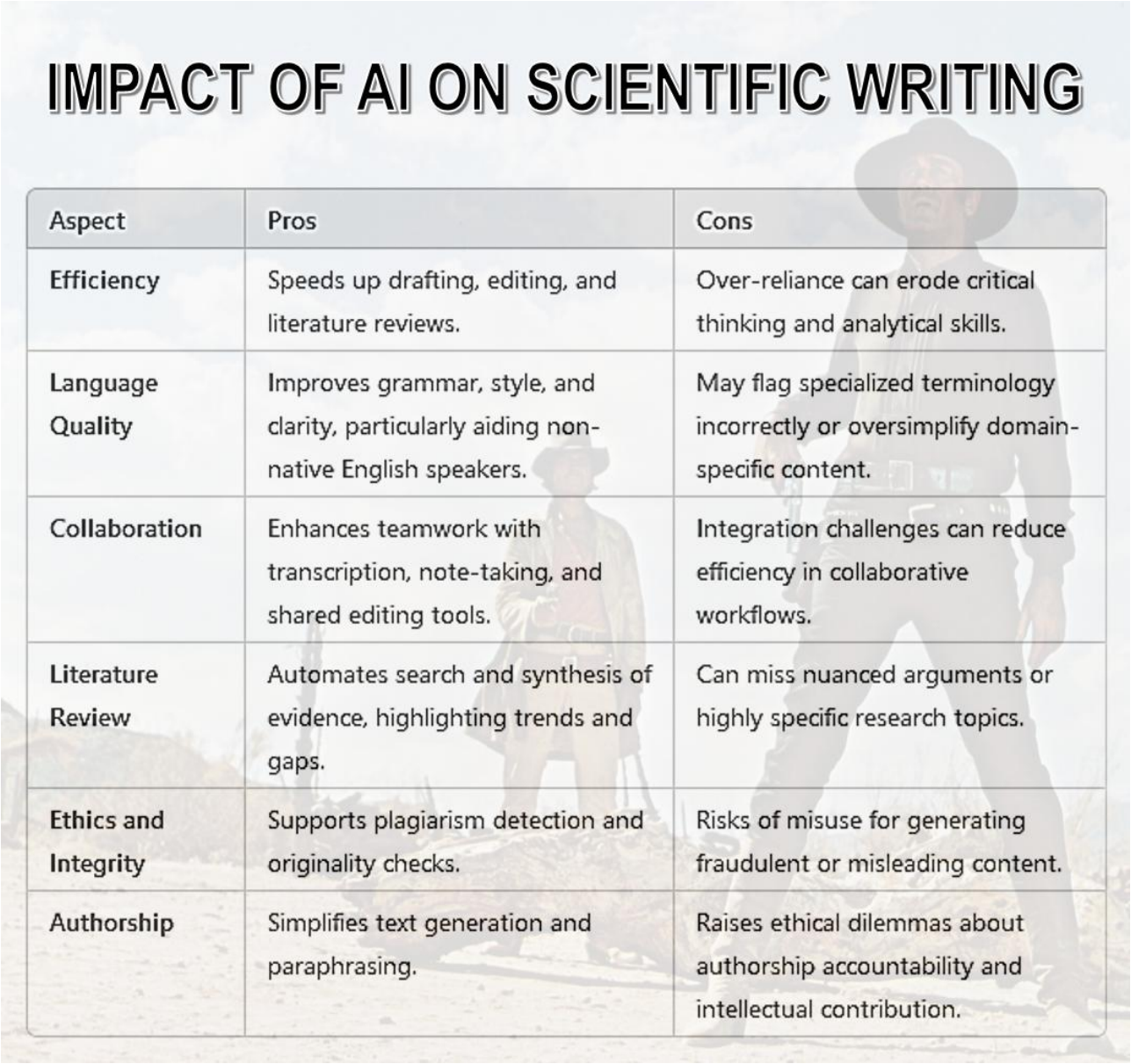
Table 5

Features of AI-giarism vs plagiarism.

Aspect	**AI-giarism**	**Plagiarism**
Definition	The use of AI-generated content without proper acknowledgment or attribution.	The use of someone else's work, ideas, or words without proper acknowledgment or citation.
Source	Content produced or enhanced by AI tools, such as ChatGPT, without transparency.	Content taken from existing works (e.g., books, articles, websites) authored by others.
Intent	Often unintentional due to lack of clarity in AI use ethics or policies, but can also be deliberate.	Frequently deliberate with the intent to deceive or gain undue credit, though it can be unintentional.
Ethical issues	Challenges traditional notions of authorship and originality; raises concerns about intellectual ownership.	Violates established ethical and academic standards by misrepresenting authorship.
Detection difficulty	Harder to detect as AI can produce novel, paraphrased, or synthesized content.	Easier to detect with plagiarism-checking tools that compare text against existing databases.
Consequences	Raises questions about academic integrity, but consequences depend on clarity of policies for AI use.	May result in reputational damage, academic penalties, or legal consequences.
Example	Using AI to draft a manuscript and failing to disclose its role or contribution.	Copying and pasting text from a published article into a manuscript without citation.
Prevention	Transparency in AI usage, mandatory disclosures, and educational programs for researchers.	Education on proper citation, use of plagiarism detection tools, and fostering academic ethics.
Resolution	Requires clear policies on AI disclosure, ethical AI use training, and proper acknowledgment protocols.	Enforces strict adherence to citation norms and anti-plagiarism practices.

Figure 1

Key pros and cons of leveraging artificial intelligence for scientific writing.



IMPACT OF AI ON SCIENTIFIC WRITING

Aspect	Pros	Cons
Efficiency	Speeds up drafting, editing, and literature reviews.	Over-reliance can erode critical thinking and analytical skills.
Language Quality	Improves grammar, style, and clarity, particularly aiding non-native English speakers.	May flag specialized terminology incorrectly or oversimplify domain-specific content.
Collaboration	Enhances teamwork with transcription, note-taking, and shared editing tools.	Integration challenges can reduce efficiency in collaborative workflows.
Literature Review	Automates search and synthesis of evidence, highlighting trends and gaps.	Can miss nuanced arguments or highly specific research topics.
Ethics and Integrity	Supports plagiarism detection and originality checks.	Risks of misuse for generating fraudulent or misleading content.
Authorship	Simplifies text generation and paraphrasing.	Raises ethical dilemmas about authorship accountability and intellectual contribution.

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