EDITORIAL

A Framework for Ethical Integration of Artificial Intelligence Tools in Medical Research and Writing

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The global landscape of medical research and writing over the last decade has been evolving rapidly. It got a major boost by the public launch of ChatGPT in November 2022. It has been further accelerated due to the widespread availability and easy access to a variety of artificial intelligence (AI) tools based on Large Language Models (LLMs).[1] The use of AI tools in medical research and writing is on the rise. However, many students, faculty members and researchers particularly in developing countries are still unclear on the transparent and ethical integration of the AI tools in research and writing. We propose a framework for the appropriate integration of AI in medical research and writing in context of a developing country like Pakistan. It highlights responsible and transparent use of AI tools, discuss authorship in the era of AI tools and how to ensure scientific integrity.

How AI Tools can Enhance Research and Writing

AI tools can help researchers with various steps of research and writing like brainstorming and refining research questions, creating questionnaires, detailed data analysis, creating outlines of the manuscripts and improving the readability by enhancing the language, grammar and syntax of the text.[2] This can potentially improve the efficiency and productivity of the researchers. However, there are some ethical challenges unique to the use of these AI tools that need consideration. It is important to establish and follow a framework for responsible and ethical use of AI in research and writing that promotes transparency, upholds the integrity of the research and maintains public trust in research findings.[3]

Brainstorming Ideas and Creating Research Questions

The first step in a research project is conceptualizing research goals and brainstorming ideas. Before using AI tools, researchers must understand questions they aim to answer, and the potential impact it can create. This clarity helps in ensuring that AI tools will complement, not dictate, the direction of the research. This step should not be totally delegated to an AI tool. Any LLM can be used to generate and brainstorm a research question using appropriate prompts. AI tools like "Research kick" (https://www.researchkick.com/) are specifically created to brainstorm ideas and refine research questions.

Literature Review and Data Analysis

AI tools can be used to quickly scan millions of articles, identify the relevant literature and then extract information from the PDF files of the articles. "Semantic scholar" (https://www.semanticscholar.org/), world's first AI based search engine, offers filters, summaries (TLDR), citations, and key insights. Tools like Connected Papers, Scite and "Litmaps" create literature maps and graphs centered around a seed paper and identify gaps in the research landscape. It is important to check the output for quality, relevance, and up-to-date content. Cross-checking and manual review will prevent the inadvertent inclusion of biased, incorrect or outdated research. [4] Data files can be uploaded in the excel format to the LLMs like ChatGPT or Claude for data analysis. There are specific tools like Julius.ai which can be used for detailed data analysis.

Structuring and Refining Manuscripts

When the literature search, data collection and analysis is complete other AI tools can be used for structuring the manuscript. AI tools like ChatGPT, Claude or Gemini can organize the content into a coherent flow, outlining introduction, methods, results, and discussion sections. A critical review is mandated for depth, and missing nuances, adding expert insights. While the AI tools provide a starting point, and save time, researchers must expand the

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final draft by adding their own analysis and thought process to draw meaningful conclusions. This is evident from recent analysis that compared reviews on various criteria, finding GPT-4 was superior in response time and knowledge breadth, while human reviews were stronger in accuracy, depth, and contextual understanding.[5] Once contents have been finalized, AI tools can improve the language, grammar and syntax of the manuscript. Grammarly, Hemmingway, Quill Bot, Paperpal and other LLMs can rephrase and simplify complex sentences, enhancing readability and flow of the manuscript particularly useful for non-native English researchers. However, it is important not to lose the personal voice and unique perspective of the researcher.

Ethical Challenges in AI Usage

Quality and Reliability of AI-Generated Outputs

A common issue encountered in using Artificial Intelligence tools is that recommended sources are either not accessible as links or articles are missing or taken from predatory journals. This raises questions about the reliability of the output. The problem of low-quality citations from predatory journals has been raised by experts in literature. [6] This challenge is compounded by the opaque nature of many AI systems, particularly deep learning models. Secondly, the AI generated outputs are not transparent as there is data and algorithmic bias and it is not clear if the AI output is generated on citation counts, impact factors, or some other criteria.[7]

AI "Hallucinations"

AI tools are prone to "hallucinations," generating fabricated or misleading content.[8] This can mislead researchers' understanding and potentially undermine the credibility of their work. Therefore, blind reliance of AI output must be avoided, and periodic manual cross-checking and validation of AI-generated outputs is recommended to mitigate these risks.

Ensuring Originality and Avoiding Plagiarism

Ensuring originality is a significant challenge when using AI in academic writing as it may generate content that closely resembles existing works. It may even produce text verbatim giving a high similarity index.[9] Therefore, plagiarism detection software must be used before submission. This additional layer of oversight will uphold academic integrity. The final manuscript should reflect researcher's own understanding, with AI serving only as a refining and supporting tool.

Transparency and Disclosure in AI Use

Transparency is another component of ethical AI use that needs attention. Researchers must disclose how AI tools contributed to their work, whether in the acknowledgments or methodology section of the manuscript. The International Committee of Medical Journal Editors (ICMJE)have recently updated their guidelines with a separate section on “How work conducted with the assistance of artificial intelligence technology should be acknowledged (Sections II.A.3 and 4 and IV.A.3.d)” and “Use of artificial intelligence in the review process (Sections II.C.2.and II.C.3)”.[10] This transparency is necessary to maintain trust within the academic community and shows responsible AI usage.

Evolving Ethical Guidelines

As AI technology continues to evolve, the ethical guidelines and frameworks also need to be reviewed and adapted to the rapidly changing scenario in academic writing. Staying up-to-updated on the latest developments in AI and adapting to new guidelines is necessary to ensure academic integrity. The role of AI in medical research is far from static, and researchers must be proactive in learning how to best leverage these tools ethically.

Conclusion

AI tools have a significant potential to enhance medical research and writing, particularly in resource-constrained settings. When used responsibly and transparently, these tools can streamline research processes and improve the quality of academic writing. However, they should remain assistants, not replacements, for human expertise. By adhering to a framework emphasizing ethical use, originality, and transparency, researchers can harness AI's power while preserving the integrity and quality expected in medical literature. While the future of AI in research is promising, vigilance and proactive adaptation are crucial to ensuring its ethical integration.

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CONFLICT OF INTEREST

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