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Responsible use of generative artificial intelligence tools in research practice

Significance:

Generative artificial intelligence (AI) tools are rapidly changing research practice. Their responsible use can boost efficiency and support researchers, but misuse threatens research quality and trust. This Perspective outlines a framework for use encompassing key research integrity values like honesty, fairness and respect. This discussion adds to the growing body of knowledge on the responsible use of generative AI tools by offering safeguard practices to protect the integrity and reliability of the research record.

The genAI landscape in research

Researchers have an extensive range of generative artificial intelligence (genAI) tools from which to choose. Many have experimented with these tools, and others have started to integrate them into their daily research practice. There is emerging research on how to use and leverage these tools in different spheres of the research ecosystem. Equally, there has been an increase in publications retracted or flagged due to inappropriate or undisclosed use of these tools (almost 100 specifically linked to ChatGPT according to the Retraction Watch list[1]). But we have not paused to ask whether we should be making use of genAI tools? And if so, what approaches might we apply to leverage the benefits and protect against the pitfalls? Researchers should be adequately supported to enable the production of reliable, robust, trustworthy and quality research, and to find the right balance of genAI use for research. Here I consider whether applying long-standing research integrity values can be leveraged to apply a values-based, critical reflection approach for the use of genAI.

Researchers want a clear, easy yes/no answer outlining what can or cannot be done in terms of ethical research. As is often the case for research integrity, there is no single yes/no answer. Instead, we need to reflect and deliberate on a case-by-case basis as to whether the use of a genAI tool is appropriate and what risks might be present, before making use of any tool.

Hosseini and Resnick argue that:

> *the scientific and scholarly community has reached a broad consensus that a) AI tools can be used in research and to assist scholars in specific tasks, such as copyediting and data analysis; b) … and c) the use of AI tools in research should be fully disclosed to promote transparency.*[2]

While it may be true that some consensus has been reached generally, I do not agree that there is consensus regarding the use of genAI for data analysis. Using genAI tools for data analysis comes with a range of benefits and potential risks that warrant further reflection. Hosseini and Resnick's position of consensus relating to data analysis is undermined when considering reproducibility in research, remarking that "the outcomes of some AI tools such as genAI, are not always reproducible"[2]. We must reflect on where genAI tools might be used in research practice, whether this use is supported by research integrity values and whether the potential value in using the tools outweighs possible harms to the scholarly record.

Ethical and integrity considerations

Anecdotally, amongst potential users, there is a wide range of attitudes towards genAI tools. On the one hand, there is complete refusal to use any genAI tool based on concerns centred around intellectual autonomy, honing one's academic voice and identity, coupled with concerns that genAI tools will become a crutch, and the loss of intellectual property to the algorithmic 'black box'. On the other hand, there is an enthusiastic embrace of a range of genAI tools to facilitate ideation, support language and grammar editing, enable faster and easier data analysis, and enhance identification of references.

In my view, the answer to the question of whether we should be using these tools rests on understanding the risks associated with using the tools and weighing that risk with the potential benefits. We need to be aware of various context-specific rules that may (or may not) permit use, such as the policies of publishers. It requires us to deliberate and come to a use-specific decision. This needs to be coupled with an understanding of how to interpret and use the outputs responsibly, and what the consequences of irresponsible use might be. The human using the tool needs to assess whether the output is appropriate and can be used in a responsible way, and needs to take accountability for any use of genAI tools.

GenAI tools, based on large language models, have algorithmic prediction built in, and while this has proved to be immensely powerful, it must be coupled with responsibility on the part of the user. International legislation like the European Union's *AI Act* (Article 14(2)[3]) requires that a human decides on the output of genAI and is accountable for it; South Africa does not yet have any equivalent legislation. Many research stakeholders are actively highlighting the role of human decision-making and accountability in the use of genAI tools. But considerations of risks related to transparency, reproducibility, explainability, data security, algorithmic bias, informed consent, copyright infringement, accessibility, production of synthetic knowledge and data, and the commercial interests of technology companies are less well considered and this means that we must err on the side of caution.

So, should we be using genAI tools in research practice? As is often the case with research integrity and ethics, it depends, and there is not always one easy answer that will fit all situations.

In general, research practice consists of a range of activities, starting with the conceptualisation phase and moving through data collection and analysis to writing up research results and sharing those results through dissertations, conferences and publications. Each of these phases presents opportunities for genAI to be leveraged – this can be done with an ethic of responsibility or with a disregard for ethical norms and standards. Use of genAI tools can occur on a spectrum (see, for example, Bekker[4]) rather than as a binary choice, and researchers should be equipped with responsible decision-making skills to enable them to make use of the tools in an appropriate manner. Data analysis warrants careful consideration.

Gen AI and data analysis

Data analysis uses many methodologies and is informed by the requirements of the discipline or research project. These uses can include statistical analyses, where algorithms and computer programs are regularly used to assist with analysing quantitative data sets. Bekker notes that:

> *for at least the past three decades, scientists have routinely used multiple regressions, typically executed by statistical software or a coding routine in a software library.* [And that] *Use of statistical software … requires a basic knowledge of statistics and data analysis.*[4]

Uses can also include thematic analyses and multi-round review of qualitative data. When dealing with large quantitative data sets, often not containing personally identifiable information, consensus may well have been reached that genAI assistance with data analysis is permissible or even encouraged for reasons of efficiency and expedience.

Qualitative data may be less well suited to genAI data analysis. Traditionally, researchers review data multiple times, to develop a deep understanding of the data, the themes that arise and the context of those themes. A myriad of qualitative data analysis methods exists. The key is to be immersed in the data, so that rich insights and deep understanding of participant perspectives are gained. It is often the case that qualitative data contain identifiers and personal information. Scrubbing these data from a data set before 'feeding' it to a genAI model for analysis may well mean that the analysis that is performed is substandard and critical links that existed in the original data set are missed. And it requires heavy editing of transcripts that may lead to unintentional falsification of data, as a result of over-cleansing or extremely cautious removal of potentially personally identifiable information. The utility of genAI tools is likely limited in this context and potentially undermines the analysis of data.

Critical to the use of genAI tools for data analysis is disabling the function that retains the data in the 'training black box'. The bare minimum for responsibly using genAI as a data analysis tool is ensuring that data are not retained by the tool to further train the models. Therefore, familiarity with how the tools function and how to disable certain settings is essential. This needs to be coupled with a well-justified reason that the benefits are far outweighed by the potential risks; expedience cannot be the only reason, especially with qualitative data. The risks of using genAI tools can range from bias in the analysis, loss of intellectual property (if a researcher does not fully understand how the tool works and where the data are stored), breaches of confidentiality (particularly if participants did not consent to their data being analysed by genAI tools), lack of reproducibility and breaches of data privacy laws (like the *Protection of Personal Information Act, Act 4 of 2013*.[5] Some of these risks can be addressed pre-emptively (e.g. obtaining informed consent from participants) but others simply cannot be addressed (e.g. potential breaches of data privacy laws) and may therefore rule out genAI use completely.

It may be permissible, on the condition that no data protection laws are being breached and that informed consent has been obtained, for researchers to perform preliminary analysis 'manually' and then to ask a genAI tool to replicate that analysis on a redacted data set. This way, the human output can be compared with the genAI output, similarities and differences can be examined and assessed, and the human researcher can decide whether to make changes to the final analysis. In this way, the tool is a supplement to the human researcher, not a replacement – the human is the ultimate decision-maker and is accountable for the analysis of the data. This is in line with Bekker's observations of the use of statistical analysis packages for quantitative data, and the need for the human to have basic knowledge of how these packages work and a working knowledge of basic statistics.

A values-based framework for responsible genAI use

Applying a values-based approach with critical reflection on key topics to the use of genAI tools, regardless of where and for what purpose they are used in the research process, could provide a productive framework for balancing risk and striving for high standards. The long-standing research integrity values I propose as framing values are: honesty, shared accountability, professional courtesy and fairness, good stewardship of research, mutual respect and epistemic justice. These values are drawn from the Singapore Statement on Research Integrity[6], and the Cape Town Statement on Fostering Research Integrity through Fairness and Equity[7]. The scholarly community appears to be in general agreement about using a values-based approach to enable the responsible use of genAI in research practice. Many values put forth in other publications are aligned with those I have proposed and include transparency and disclosure, accountability and responsibility, addressing bias, critical evaluation, awareness of limitations, proper citation and data sensitivity, amongst many other recommendations.[2,4,8] The framework which follows is an amalgam of these values, with descriptors for operationalisation and application.

Honesty

Researchers need to be transparent about the use of genAI tools, disclosing use, where appropriate, and ensuring accurate identification and representation of genAI content. Researchers should keep careful records of how, which prompts, and which genAI tools have been used; some publishers may require that this be submitted as supplementary material.

Shared accountability and human decision-making

Research organisations should set clear standards for the use of genAI in a collaborative way, which is flexible enough to be applied in different disciplines and at different stages of the research process. Critical to shared accountability is the responsibility of the human researcher in taking moral and legal responsibility for the research outputs and willingly accepting the consequences for the research (positive or negative).

Professional courtesy and fairness

Researchers should disclose the use of genAI, and recognise the contribution of the tools, whilst still upholding the important role of the human contribution to conceptualisation, organisation, application of critical thinking and communication.

Good stewardship of research

Research institutions should ensure a robust data protection environment. Researchers are responsible for ensuring data integrity in their research, and for overseeing the ethical management of any genAI content and insights. Researchers should also be aware of the efforts of publishers to protect against problematic genAI content and should ensure their publications meet ethical publication standards.

Mutual respect

Researchers and their collaborators must proactively agree to genAI use, under specific circumstances, for specific purposes in research practice. Use may be different across disciplines and by individuals, provided proactive agreements are in place, this need not compromise the integrity of the research.

Epistemic justice

Researchers need to acknowledge that genAI "models may play a role in reifying conventional wisdoms, and in so doing, drown out marginal voices"[4]. Moreover, genAI models can be based on biased data sets, and are generally built by Western, Global North, anglophone epistemologies. This means that outputs based on a particular way of being and doing may overshadow other approaches, and risk intellectual or cultural homogenisation, particularly in scholarly communication. Given that many genAI tools mine data used in prompts, the dangers of inputting data which is of cultural significance for easy analysis are high and there is a risk of deepening epistemic injustice and undervaluing Indigenous knowledge.

To add to these six framing research integrity values, I encourage consideration of three key topics to round out the framework: context-specific evaluation, impact assessment and mitigation strategies. Reflection on these topics can enhance ethical decision-making when using genAI tools.

Context-specific evaluation

Researchers should assess the suitability of the genAI tools they wish to use, based on clearly understanding the data security measures in place, and what is permissible in terms of institutional, national or publication guidance, policy or legislation. Researchers are encouraged to constantly evaluate potential genAI tools against their current research and practice, and their intended use. This includes taking into account new developments related to genAI tools and policy or legislative environments.

Impact assessment

Researchers should engage with stakeholders (including participants, collaborators and the research community) regarding the potential impacts of genAI usage in the research process (e.g. potentially inputting personal information for data analysis). If the overall impact is potentially negative, then researchers will need a well-justified reason to use genAI in their research practice. Researchers should also consider the environmental impact of the use of genAI.

Mitigation strategies

All research stakeholders should implement strategies to minimise the risks of using genAI tools. These strategies can include a sound, responsive and context-specific policy environment, implementation of appropriate data management and security plans, adequate ethical review of research projects, requirements for transparent reporting practices, and environments which encourage researchers to regularly reflect on the use of genAI in research practice.

Applying these values encourages a culture of responsible research practice, where researchers leverage genAI tools while upholding ethical standards. This approach can foster trust, transparency, and accountability in research. By adopting a values-based, critical reflection approach, researchers can make informed decisions about the responsible use of genAI tools, balancing innovation with ethical accountability.

Role in publication

Many publishers are outlining what they deem as acceptable use of genAI tools. The *South African Journal of Science*, for example, permits different levels of use; some uses must be declared and documented, while other uses (such as copy editing) need not be declared. In line with the values-based framework proposed, their policy emphasises the responsibility of the human in ensuring scientific integrity and being accountable for the publication.[9]

Some publishers are developing specific publisher AI tools. Elsevier has a range of tools which use publisher data to develop research summaries, identify gaps in research fields, and compare research questions and methodologies. These tools are created in-house by the publishers who have policies in place to engineer prompts to reduce bias as far as possible, and they are making use of the scholarly publication record. Elsevier, in an attempt to address concerns related to algorithmic opacity, note that they "can explain how [their] solutions work"[10]. Availability of these tools comes at a cost. And this raises questions of equitable access and leveraging the power of genAI to 'level the playing field', which is often cited as one of its most obvious benefits.

Springer Nature has developed tools specifically designated as 'research integrity AI tools', to identify potentially fraudulent references in manuscripts (e.g. hallucinations)[11] and to detect problematic submissions (e.g. those written by AI, containing potentially fake information and data and to detect problematic images)[12]. Springer Nature's development of bespoke tools is to assist editors and, more generally, to filter out 'junk', rather than to help researchers in their research practice.

Human decision-making in the use of genAI tools is critical to responsible use in research. And while I have tried to outline a framework for the responsible use of genAI in research, it would be remiss of me not to acknowledge purposefully irresponsible uses. Paper mills are a prime example of where genAI has the potential to exponentially increase irresponsible outputs. Paper mills are

> *unethical organizations that produce manuscripts at scale using derivative, copied, and/or fabricated text or data sets. Manuscripts can be sold to preexisting author teams or individual authorship positions can be sold before and/or after manuscript acceptance. Some paper mills may offer other services, including editorial handling and peer review, post-publication communications, and citations to their products.*[13]

GenAI can be used to draft entire research articles, along with supporting data, that appear to be legitimate but are completely fabricated. Humans are driving these efforts, and the 'publish or perish' environment may tempt researchers to take the easy way out and purchase authorship or papers. These irresponsible practices are the result of human decision-making and putting genAI to use for nefarious purposes.

Conclusion

GenAI tools are shaping the future of research in profound ways. Asking the philosophical question of whether we should be making use of genAI tools was possibly naïve and maybe idealistic. The ship has sailed. But, striving towards working in an idealistic way may well serve as a map as we embark on the genAI journey. It is on us to reflect upon how we, as researchers, can use and guide the responsible use of genAI tools in research practice. Their integration into research practice necessitates a thoughtful and responsible approach. By leveraging research integrity values and the proposed framework, we can navigate the ethical complexities of genAI tools while fostering a culture of responsible innovation. There is no one-size-fits-all answer, but by maintaining the critical role of human decision-making, researcher accountability and transparency, we can responsibly engage with genAI tools.

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Declarations

I have no competing interests to declare. I have no AI or LLM use to declare.

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