



Use of Artificial Intelligence [AI] in Research

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Learning outcome

At the end of the presentation, the learner should know

- The risk and concern of using AI in research
- The responsible and ethical use of AI in Research process
- How AI can help in research process
- Do's and don'ts of Using AI in Research



Risks and concerns of using AI in research

The issues and concerns related to the application of AI in research and its effects on the scientific community and society were detailed by Helmy et al. (2025) and Resnik et al. (2025). According to the authors the main risks are:

1. ***Mass Generation of Low-Quality Content:*** Some AI tools have the problem of creation of fake or low-quality research, including fabricated data, images, and entire manuscripts.
2. ***AI as an Author:*** ChatGPT cannot be designated as an author due to lack of accountability or consent while some initial preprints listed ChatGPT as a co-author. This method is currently dismissed by journals and publishers as it is incompatible with recognized authorship criteria.
3. ***Risk of Plagiarism:*** AI-generated text has risk of unoriginal or copyrighted content, raising serious plagiarism concerns.



Risks and concerns of using AI in research

4. ***AI Hallucinations:*** AI tools can produce convincing but entirely fabricated information questioning the reliability of the content.
5. ***Bias Amplification:*** Some AI models inherit the biases in their training data that lead to reproduce or magnify inequities, reducing the validity and fairness of their outputs.
6. ***Accountability and Moral Agency:*** AI lacks moral agency and cannot be held responsible for its actions. This raises questions about who is accountable for errors, misconduct, or harm caused by AI-generated outputs.
7. ***Unethical Use of Generative AI (GenAI):*** Using GenAI in university admissions, assignments, or scholarship applications undermines merit-based evaluations and is widely considered unethical.



Risks and concerns of using AI in research

8. ***Security and Safety Concerns:*** Chance of third-party access of data and risk of information misuse.
9. ***Intellectual Property (IP) and Originality Concerns:*** Uploading original content such as unpublished data or research proposals to GenAI platforms risks that content being incorporated into future outputs, leading to potential IP disputes and loss of originality.
10. ***Long-Term Implications on Research Skills:*** Dependency on AI in research risks diminishing the essential skills like critical thinking, hypothesis generation, coding, and scientific writing.
11. ***Public Trust and Social Responsibility:*** Ethical issues with AI can undermine public trust in science. Researchers must engage with stakeholders and communicate transparently about AI use and limitations.

Responsible use of AI in Research process

AI enhances research productivity and innovation,

But

It simultaneously creates complex ethical risks questioning the integrity and values of the research process

So, AI must be used responsibly and ethically





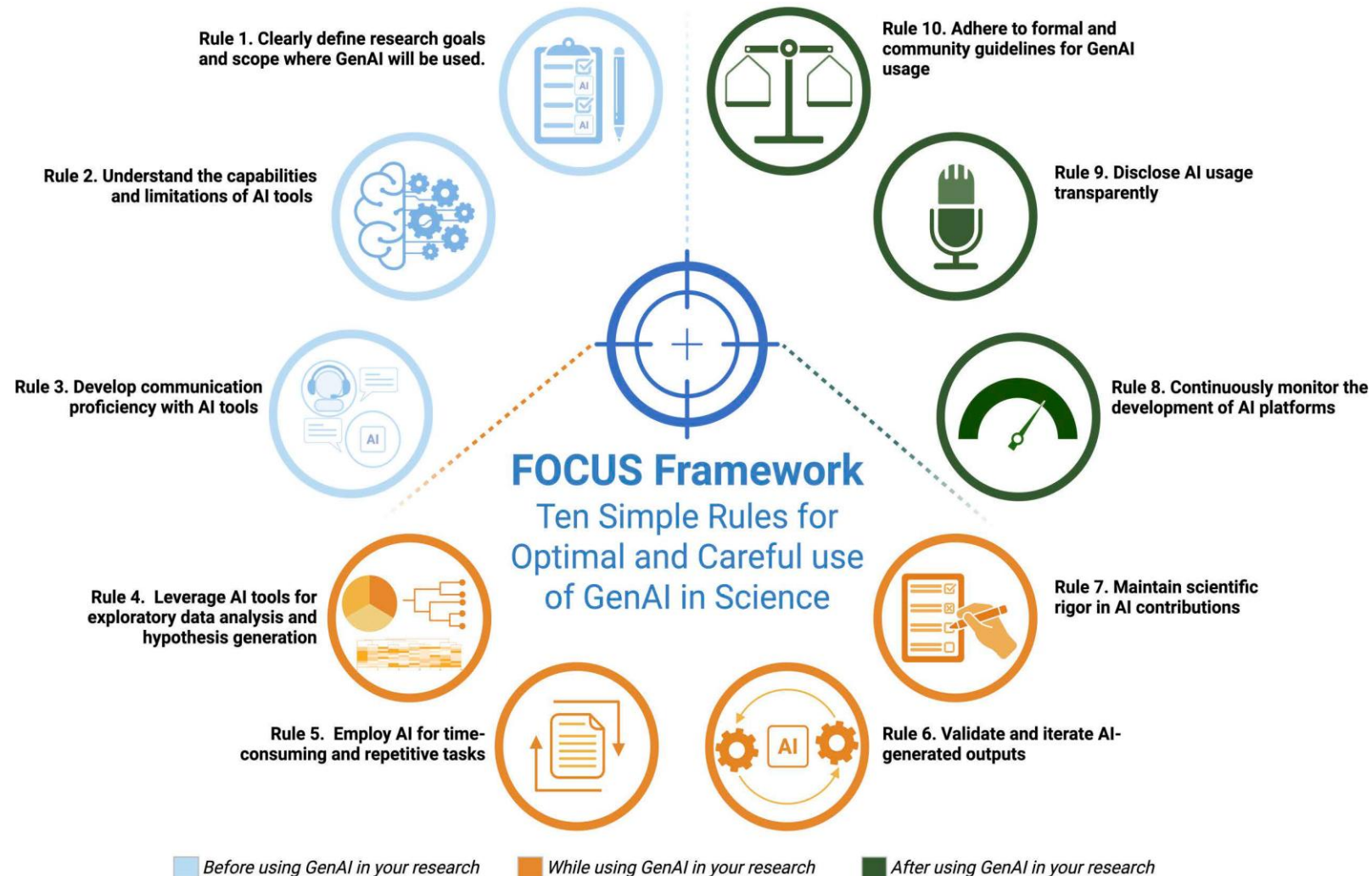
Responsible use of AI in Research process

- A broad range of institutions—including governments, universities, funding agencies, professional bodies, school boards, and publishers—have emphasized the need for ethical frameworks to guide the responsible use of GenAI. These initiatives prioritize transparency, accountability, and data security, which are essential for preserving the integrity of research.
- Helmy et al.(2025) suggested **FOCUS Framework (Framework for Optimal and Careful Use of AI in Science)** to use AI efficiently in scientific research and academic writing while maintaining ethical use and research integrity.
- Resnik DB et al (2025) also provided 9 recommendation for ethical use of AI in scientific research which coincides with Helmy et al.'s (2025)

The FOCUS Framework

- The FOCUS framework has 10 steps that represent a structured approach to integrating AI into scientific research responsibly and ethically.
- The steps are categorized into three colour-coded categories indicating when each step is applied:
 - **Before using AI in your research**
 - **While using AI in your research**
 - **After using AI in your research**

The FOCUS Framework



The FOCUS Framework for Optimal and Careful Use of GenAI in Science.

Helmy et al. (2025)

The FOCUS Framework

- **Before using AI in your research**
 - **Rule 1. The research goals and scope should be clearly defined** and the stages of the research process where AI will be applied, such as data analysis, hypothesis generation, or manuscript preparation should be identified.
 - **Rule 2. Understand the capabilities and limitations of AI tools** especially in processing large datasets, generating text, and identifying patterns. There is a risk of producing biased, incomplete, or inaccurate outputs due to the limitations of their training data or algorithms.
 - **Rule 3. Develop communication proficiency with AI.** Researchers must develop the skills to craft clear, specific, and unbiased prompts to guide the AI in producing relevant and high-quality outputs.

The FOCUS Framework

While using AI in your research

- **Rule 4. Leverage AI tools for exploratory data analysis and hypothesis generation.** Researchers must critically assess AI-generated hypotheses and ensure that they are grounded in empirical evidence or theoretical frameworks before pursuing them.
- **Rule 5. Employ AI for time-consuming and repetitive tasks.** AI tools can assist in automating repetitive and time-consuming tasks like data cleaning, error correction, and formatting standardization, ensuring datasets are ready for robust analysis. They can also help in annotating large datasets, such as labelling biological sequences, categorizing images, or tagging textual data, which accelerates workflows significantly.

The FOCUS Framework

- **Rule 6. Validate and iterate AI-generated outputs.** ALL AI outputs should be cross-verified against empirical evidence, domain expertise, or established scientific knowledge.
- **Rule 7. Maintain scientific rigor in AI contributions.** To maintain research integrity, scientific rigor must remain a cornerstone when incorporating AI-generated content into research. The research questions, main findings and study conclusions should all be done by the researchers, not the AI tools.

The FOCUS Framework

After using GenAI in your research

- **Rule 8. Continuously monitor the development of AI platforms.** researchers should routinely update their knowledge on the platforms/tools they are using and the new ones as well. Regular updates to AI models or algorithms should be scrutinized to understand their impact on outputs.
- **Rule 9. Disclose AI usage transparently.** Researchers should explicitly disclose where and how AI tools have contributed to their work, such as in data preprocessing, hypothesis generation, analysis, or manuscript preparation
- **Rule 10. Adhere to formal and community guidelines for GenAI .** Researchers should align with institutional policies, funding agency requirements, and journal standards regarding AI applications in research



How AI can help in Research process

AI is beneficial with:

- Summarization of literature and creating different theoretical frameworks
- Developing measurement items
- Data Analysis and Image Processing
- Data Interpretation
- Hypothesis Generation
- Modelling Complex Phenomena
- Planning sampling techniques
- Creating protocols for experiments
- Drafting scientific writing
- Peer Review and Evaluation



Idea generation and theory development

AI can help generate competing causal mechanisms, identify boundary conditions, and produce alternative theoretical explanations.

But

Researchers must determine whether those mechanisms are theoretically meaningful and original.

Measurement development

AI can assist with:

- drafting survey items
- generating behavioural indicators
- organizing content validity matrices
- proposing response-verification procedures

But

AI cannot detect subtle cultural bias or determine whether survey items truly capture a construct. Only researchers can validate measures through pilot testing and data analysis

Sampling and study design

AI can help researchers to:

- Design sampling frames,
- Define inclusion criteria,
- Produce sample-size planning documents.
- Draft recruitment scripts and participant-flow plans.

But

AI cannot determine whether a population is accessible or whether organizations will grant research access. Those logistical realities require human judgment and negotiation.

Experimental and causal designs

AI can generate detailed protocols for experiments like:

- manipulation scripts
- randomization procedures
- pre-registration templates
- manipulation checks

But

AI cannot test manipulations, deal with unexpected issues in the field, or obtain ethical approvals. Those responsibilities remain with researchers.



Drafting reporting/ writing

AI can:

- Suggest structure and flow
- Simplify language and improve clarity
- Summarize long texts and abstract
- Check grammar and readability
- Generate outline and key points
- Manage referencing
- Create table/ diagram

But

AI can't:

- Interpret data or understand context
- Ensure factual or ethical accuracy
- Assume intellectual responsibility



Organizing replication plans

AI can assist researchers in designing replication programs by generating multi-study portfolios and outlining replication roadmaps.

But

AI cannot execute replications or interpret conflicting results across contexts. Those tasks require scientific judgement.

Conclusion

- AI is beneficial but also possesses complex ethical issues.
- Researchers should follow the guidance and the policy of use of AI in research.
- Since AI continues to advance rapidly, scientists, academic institutions, funding agencies and publishers should continue to discuss AI's impact on research and update their knowledge, ethical guidelines and policies accordingly.

References

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