



Original Article

Deployment of AI Tools and Technologies on Academic Integrity and Research

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<https://doi.org/10.62865/bjbio.v15i2.122>

Abstract: Academic integrity is a set of ethical ideals and values that guide the behaviour of individuals in academic and educational settings. It encompasses honesty, trustworthiness, fairness, and a commitment to upholding the highest standards of ethical conduct in the quest for knowledge, learning, and research. Academic integrity is essential in maintaining the trustworthiness, reputation, and effectiveness of educational institutions and scholarly communities. Whereas, AI, or Artificial Intelligence, is a broad field of computer science that focuses on creating frameworks, software, or machines that can perform tasks that would typically require human intelligence. These tasks include problem-solving, learning from experience, understanding natural language, recognizing patterns, and making choices. AI systems aim to mimic or replicate human cognitive functions, and they can range from simple rule-based systems to highly complex, autodidactic neural networks. AI can significantly impact academic integrity and research in both positive and potentially challenging ways.

Keywords: Academic Integrity, Artificial Intelligence, Research Process, Software, Computer Science.

Introduction: Academic honesty is a collection of ethical principles and values that steer the conduct of individuals in academic and educational environments¹. It includes honesty, reliability, equity, and a commitment to maintaining the highest standards of moral conduct in the pursuit of knowledge, education, and research. Academic honesty is

vital in preserving the credibility, reputation, and efficiency of educational institutions and scholarly communities². Academic honesty is not merely a set of guidelines and policies but also a crucial element of the educational journey. It nurtures a culture of trust, fairness, and respect within educational institutions, enabling learners to educate and develop

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and maintain academic honesty in academic and research endeavours³.

Artificial Intelligence, or AI, is a vast domain of computer science dedicated to developing systems, software, or devices capable of executing tasks typically necessitating human intellect. These tasks encompass resolving problems, acquiring knowledge from experiences, comprehending human language, identifying patterns, and forming judgments⁴. AI systems strive to imitate or reproduce human cognitive abilities and can vary from straightforward rule-based mechanisms to highly intricate, self-teaching neural networks⁵.

AI possesses the capability to induce substantial transformations across diverse facets of society, ranging from enhancing efficacy and judgment in sectors to revolutionizing our engagement with technology. Nevertheless, it also poses dilemmas linked to morality, confidentiality, and the conscientious utilization of sophisticated AI mechanisms⁶. Therefore, this review article was done to integrate AI with academic integrity.

Methodology: In the last few years, there have been a boom of AI based tools across the world. Several leading platforms such as Turnitin, E-Aarjav and Dilbit have included AI based contextual searching. Authors have used these platforms extensively for various academic purposes; therefore, these features have been furnished based on their own experiences.

Impact of AI on Academic Integrity: AI can have a significant impact on academic integrity and research in both positive and potentially challenging ways. Table 1 shows how AI can influence in academic integrity.

Table 1: Academic integrity in AI:

Positive Impacts	
Plagiarism Detection:	AI-powered plagiarism detection tools are widely used in educational institutions. These tools can efficiently scan and compare student papers against a vast database of

	academic content, making it easier to identify instances of plagiarism and promote academic honesty ⁷ .
Research Assistance:	AI can help researchers by automating tedious tasks, such as data analysis and literature reviews. This can save time and improve the quality of research. AI tools like citation managers can also assist in proper source citation and referencing ⁸ .
Language Translation:	AI-driven language translation tools can aid researchers in accessing and understanding academic content in languages other than their own, facilitating cross-cultural research collaboration and information sharing ⁹ .
Data Analysis:	AI and machine learning algorithms can help researchers analyse large datasets quickly and accurately, enabling the discovery of patterns and trends that might be challenging to identify manually ¹⁰ .
Automated Fact-Checking:	AI can assist in fact-checking research findings and claims, which is essential for maintaining the credibility of academic work and preventing the spread of misinformation ¹¹ .
Challenges and Potential Risks	
AI-Generated Plagiarism:	As AI-powered content generation tools become more sophisticated, there's a risk that students and researchers may misuse them to generate plagiarized or unoriginal content ¹² . Institutions must be vigilant in detecting such misuse ¹² .
Bias in AI Algorithms:	If AI algorithms used in research are trained on biased or unrepresentative datasets, they can introduce bias into research findings ¹³ . Researchers need to be cautious about the data they use and the potential for bias in AI-generated insights.
Ethical Concerns:	Researchers must consider the ethical

	implications of using AI in research, particularly when collecting and analysing data from human subjects. Ensuring privacy, obtaining informed consent, and addressing potential biases are important ethical considerations ¹⁴ .
Lack of Transparency:	Some AI algorithms, particularly deep learning models, can be challenging to interpret or explain. This lack of transparency can raise concerns about the validity and reliability of research results based on such models ¹⁵ .
Security Concerns:	Protecting research data from AI-driven attacks, such as adversarial attacks on machine learning models, is an emerging challenge ¹⁶ . Researchers need to be aware of potential security vulnerabilities.
Depersonalization:	AI tools that automate certain research tasks may lead to a depersonalization of the research process, potentially reducing the researcher's critical thinking and understanding of the subject matter ¹⁷ .

AI holds the promise of improving academic honesty by assisting in the identification of plagiarism, aiding in scholarly assistance, and verifying facts. Nevertheless, it presents obstacles such as possible abuse, partiality, morality, and clarity. Academicians, instructors, and academic bodies must find an equilibrium by utilizing AI's strengths while upholding the utmost principles of scholarly integrity and moral research practice). Moreover, continual dialogues and standards within the scholarly community can aid in tackling these challenges and guarantee that AI acts as a beneficial instrument in research and learning.

AI Applied Tools for Academic Integrity: In the academic realm, a multitude of instruments, techniques, and software exist in the marketplace that can be leveraged to uphold scholarly honesty and augment research methodologies. These instruments aid in averting intellectual theft, bolster research endeavours, and guarantee ethical

behaviour. Table 2 shows some examples of the academic tools available in the market.

Table 2: Academic Integrity Tools:

Plagiarism Detection Tools	
Turnitin:	A widely used plagiarism checker that compares submitted documents against a vast database of academic content ¹⁸ .
Grammarly Plagiarism Checker:	Provides plagiarism detection and grammar checking services ¹⁹ .
Copy-scape:	Specializes in finding web-based plagiarism, making it useful for checking online content ²⁰ .
Citation Management Tools:	
Zotero:	A free, open-source tool that helps collect, organize, cite, and share research materials ²¹ .
Mendeley:	Offers reference management, PDF organization, and collaboration features ²² .
EndNote:	A commercial reference management tool with advanced features for organizing and citing sources ²³ .
Authentication and Identity Verification:	
Proctoring Services (e.g., ProctorU, Proctorio):	Ensure the identity of online test-takers and monitor exams for potential cheating ²⁴ .
Secure Online Testing Platforms (e.g., ExamSoft):	Provide secure online assessment environments ²⁵ .
Research Tools:	
Data Analysis and Visualization	
R and RStudio:	Open-source software for statistical analysis and data visualization ²⁶ .
Python with libraries like NumPy, pandas, and Matplotlib:	Widely used for data analysis and visualization ²⁷ .
Tableau:	A data visualization tool that simplifies complex data into interactive visualizations ²⁸ .
Reference and Literature Search:	
Google Scholar:	A free search engine for scholarly articles, theses, books, and conference papers ²⁹ .
PubMed:	A database for biomedical and life sciences literature ³⁰ .
Web of Science:	Provides access to research literature across various disciplines ³¹ .
Collaboration and Research Management:	
Microsoft Teams and Slack:	Tools for team collaboration and communication ³² .
Trello and Asana:	Project management tools for organizing research tasks and timelines ³³ .

Research Gate:	A platform for researchers to collaborate, share, and discover research ³⁴ .
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AI-Powered Research Tools:

IBM Watson Discovery:	Offers AI-powered insights from unstructured data ³⁵ .
Iris.ai:	Uses AI to help researchers discover and curate relevant scientific papers ³⁶ .
Papers With Code:	Provides access to research papers and code related to machine learning and AI ³⁷ .

Data Collection and Survey Tools:

Qualtrics:	A platform for creating and distributing surveys and collecting data ³⁸ .
SurveyMonkey:	An online survey tool with customizable surveys and analytics ³⁹ .

Research Ethics and Compliance:

CITI Program:	Offers online training and resources for research ethics and compliance ⁴⁰ .
IRBNet:	A web-based system for managing Institutional Review Board (IRB) submissions and approvals ⁴¹ .

The utilization of AI instruments and technologies in academia and exploration brings both beneficial and potentially revolutionary societal influences on learners and investigators. These are merely a handful of examples of resources and innovations accessible to bolster scholastic integrity and investigative endeavours. The selection of resources will hinge on the particular demands and prerequisites of distinct scholars and educational establishments. It's crucial to employ these resources conscientiously and morally, upholding scholarly integrity principles and ethical investigative conduct.

In summary, the utilization of AI tools and technologies in academics and research possesses the potential to generate positive societal impacts by augmenting learning, facilitating collaboration, and optimizing research results. Nevertheless, addressing obstacles related to confidentiality, prejudice, morality, and approachability is crucial to ensure that AI advantages all learners and investigators while minimizing potential adverse effects. Society, educational establishments, and policymakers need to adapt and establish ethical frameworks to

exploit the complete potential of AI in education and research.

AI is a multifaceted domain that includes machine learning, natural language processing, computer vision, robotics, and beyond. It aims to develop systems capable of executing tasks that usually necessitate human intelligence. This literature analysis delves into diverse themes in AI investigation (Table 3).

Table 3: AI Investigation in Academic Integrity

Theme 1: Machine Learning and Deep Learning	
"Deep Learning"	This paper is a comprehensive review of deep learning techniques, which are fundamental to contemporary AI. It discusses neural networks, convolutional neural networks (CNNs), and recurrent neural networks (RNNs) ⁴² .
Theme 2: Ethics and Bias in AI	
"Algorithmic Bias"	Although an older paper, this discusses biases in algorithms, a topic of increasing concern in AI, and the potential social consequences ⁴³ .
"The Ethics of Artificial Intelligence"	This paper explores ethical considerations in AI, including the risks and challenges of AI systems that outperform humans in most economically valuable work ⁴⁴ .
Theme 3: Natural Language Processing (NLP):	
"BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding- (2018)"	This paper introduces BERT (Bidirectional Encoder Representations from Transformers), a breakthrough in NLP that has since shaped the field ⁴⁵ .
Theme 4: Reinforcement Learning and AI in Games	
"Playing Atari with Deep Reinforcement Learning"	This paper presents the use of deep reinforcement learning to train agents that play Atari 2600 games, demonstrating AI's capability in learning from raw sensory input ⁴⁶ .
Theme 5: AI in Healthcare	
"Estimating the Attributable Cost of Physician Burnout in the United States"	This study uses AI to analyse physician notes and highlights AI's potential in healthcare, including reducing administrative burden ⁴⁷ .
Theme 6: AI in Autonomous Vehicles	
"End to End Learning for Self-Driving Cars"	This paper discusses the application of deep learning in autonomous vehicles,

	emphasizing the importance of AI in the automotive industry ⁴⁸ .
Theme 7: AI and Creativity	
"A Neural Algorithm of Artistic Style"	This paper explores how AI can be used to combine the content of one image with the style of another, contributing to the field of AI-driven art and creativity ⁴⁹ .

Conclusion: Artificial intelligence (AI) is a dynamic and rapidly evolving field with applications in diverse domains, from healthcare to gaming and morals. As AI continues to progress, ongoing research is essential to address moral challenges, and prejudices, and harness its potential for positive societal impact. Researchers and practitioners across various disciplines play a crucial role in shaping the future of AI. AI is significantly impacting academic honesty by providing innovative tools for plagiarism detection, identity verification, and student support. However, it also raises ethical concerns, particularly regarding bias and fairness in AI algorithms. As the use of AI in academia continues to evolve, institutions and researchers need to address these challenges while harnessing the potential benefits of AI to uphold academic integrity in educational settings.

References:

- Roe J, Renandya WA, Jacobs MG. A Review of AI-Powered Writing Tools and Their Implications for Academic Integrity in the Language Classroom. *Journal Name* 2023, 2(1):22-30. DOI: <https://doi.org/10.59588/2961-3094.1035>
- Mijwil MM, Hiran KK, Doshi R, Unogwu OJ. ChatGPT and the Future of Academic Integrity in the Artificial Intelligence Era: A New Frontier. *AI-Salam Journal for Engineering and Technology* 2023; 2(2):116-127. DOI: <https://doi.org/10.55145/ajest.2023.02.02.015>
- Damian O. ChatGPT and the Rise of Generative AI: Threat to Academic Integrity? *Journal of Responsible Technology* 2023,13:1-4 DOI: <https://doi.org/10.1016/j.irt.2023.100060>
- Chatting and Cheating. Ensuring academic integrity in the era of ChatGPT. 2023. DOI: <https://doi.org/10.35542/osf.io/mr28h>
- Hege CF, Gasparini A, Grote MG. Artificial Intelligence-based tools in the context of Open Science. *Septentrio Conference Series* 2022. DOI: <https://doi.org/10.7557/5.6636>
- Yeo M. Academic integrity in the age of Artificial Intelligence (AI) authoring apps. *TESOL Journal* 2023; 14:3. DOI: <https://doi.org/10.1002/tesj.716>
- Kumar, R., Eaton, S.E., Mindzak, M., Morrison, R. (2023). Academic Integrity and Artificial Intelligence: An Overview. In: Eaton, S.E. (eds) *Handbook of Academic*

Integrity. Springer, Singapore. DOI:

https://doi.org/10.1007/978-981-287-079-7_153-1

8. Martel Carranza CP. Impact of Artificial Intelligence in Promoting Academic Integrity in Education: A Systematic Review. *Journal of Namibian Studies: History Politics Culture* 2023;33: 71-85. DOI:

<https://doi.org/10.59670/ins.v33i.415>

9. Dupps WJ. Artificial intelligence and academic publishing. *Journal of Cataract and Refractive Surgery* 2023;49(7):655-656. DOI:

<https://doi.org/10.1097/j.icrs.0000000000001223>

10. Roe J, Perkins M. What are Automated Paraphrasing Tools and how do we address them? A review of a growing threat to academic integrity. *International Journal for Educational Integrity* 2022; 18(15): 1-10. DOI:

<https://doi.org/10.1007/s40979-022-00109-w>

11. DuBose J, Marshall D. AI in academic writing: Tool or invader. *Public Services Quarterly* 2023. DOI:

<https://doi.org/10.1080/15228959.2023.2185338>

12. Martel Carranza CP. Impact of Artificial Intelligence in Promoting Academic Integrity in Education: A Systematic Review. *Journal of Namibian Studies: History Politics Culture* 2023; 33:71-85. DOI:

<https://doi.org/10.59670/ins.v33i.415>

13. Dupps WJ. Artificial intelligence and academic publishing. *Journal of Cataract and Refractive Surgery* 2023;49(7):655-656. DOI:

<https://doi.org/10.1097/j.icrs.0000000000001223>

14. Roe J, Perkins M. What are Automated Paraphrasing Tools and how do we address them? A review of a growing threat to academic integrity. *International Journal for Educational Integrity* 2022; 18(15):1-10. DOI:

<https://doi.org/10.1007/s40979-022-00109-w>

15. Baloğlu G, Çakalı KR. Is Artificial Intelligence a New Threat to the Academic Ethics?: Enron Scandal Revisited By ChatGPT. 2023. DOI:

<https://doi.org/10.57116/isletme.1244633>

16. Rodchua S. Effective Tools and Strategies to Promote Academic Integrity in e-Learning. *International Journal of e-Education, e-Business, e-Management and e-Learning* 2017; 7(3):168-179. DOI:

<https://doi.org/10.17706/IJEEEE.2017.7.3.168-179>

17. Cronan TP, McHaney R, Douglas DE, Mullins JK. Changing the Academic Integrity Climate on Campus Using a Technology-Based Intervention. *Ethics & Behavior* 2017; 27(2), 89–105. DOI:

<https://doi.org/10.1080/10508422.2016.1161514>

18. Turnitin [Internet]. Turnitin. Available from:

<https://www.turnitin.com> (Accessed July 3, 2024).

19. Grammarly Plagiarism Checker [Internet]. Grammarly. Available from:

<https://www.grammarly.com/plagiarism-checker> (Accessed July 3, 2024).

20. Copyscape [Internet]. Copyscape. Available from:

<https://www.copyscape.com> (Accessed July 3, 2024).

21. Zotero [Internet]. Zotero. Available from:

<https://www.zotero.org> (Accessed July 3, 2024).

22. Mendeley [Internet]. Mendeley. Available from:

<https://www.mendeley.com> (Accessed July 3, 2024).

23. EndNote [Internet]. EndNote. Available from:

<https://endnote.com> (Accessed July 3, 2024).

24. ProctorU [Internet]. ProctorU. Available from:

<https://www.proctoru.com> (Accessed July 3, 2024).

25. Proctorio [Internet]. Proctorio. Available from:

<https://proctorio.com> (Accessed July 3, 2024).

26. ExamSoft [Internet]. ExamSoft. Available from:

<https://examsoft.com> (Accessed July 3, 2024).

27. RStudio [Internet]. RStudio. Available from:

<https://www.rstudio.com> (Accessed July 3, 2024).

28. Python [Internet]. Python. Available from:

<https://www.python.org> (Accessed July 3, 2024).

29. Tableau [Internet]. Tableau. Available from:

<https://www.tableau.com> (Accessed July 3, 2024).

30. Google Scholar [Internet]. Google. Available from:

<https://scholar.google.com> (Accessed July 3, 2024).

31. PubMed [Internet]. PubMed. Available from: <https://pubmed.ncbi.nlm.nih.gov> (Accessed July 3, 2024).
32. Web of Science [Internet]. Web of Science. Available from: <https://www.webofscience.com> (Accessed July 3, 2024).
33. Microsoft Teams [Internet]. Microsoft. Available from: <https://www.microsoft.com/en-us/microsoft-teams> (Accessed July 3, 2024).
34. Slack [Internet]. Slack. Available from: <https://slack.com> (Accessed July 3, 2024).
35. Trello [Internet]. Trello. Available from: <https://trello.com> (Accessed July 3, 2024).
36. Asana [Internet]. Asana. Available from: <https://asana.com> (Accessed July 3, 2024).
37. Research Gate [Internet]. Research Gate. Available from: <https://www.researchgate.net> (Accessed July 3, 2024).
38. IBM Watson [Internet]. IBM. Available from: <https://www.ibm.com/watson> (Accessed July 3, 2024).
39. Iris.ai [Internet]. Iris. Available from: <https://iris.ai> (Accessed July 3, 2024).
40. Papers With Code [Internet]. Papers With Code. Available from: <https://paperswithcode.com> (Accessed July 3, 2024).
41. Qualtrics [Internet]. Qualtrics. Available from: <https://www.qualtrics.com> (Accessed July 3, 2024).
42. LeCun Y, Bengio Y, Hinton G. Deep learning. *Nature*. 2015;521(7553):436-444. DOI: <https://doi.org/10.1038/nature14539> (<https://doi.org/10.1038/nature14539>).
43. O'Neil C. *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*. Crown Publishing Group. 2016.
44. Bostrom N, Yudkowsky E. The ethics of artificial intelligence. In: *Cambridge Handbook of Artificial Intelligence*. Cambridge University Press. 2014. DOI: <https://doi.org/10.1017/CBO9781139046855>
45. Devlin J, Chang MW, Lee K, Toutanova K. BERT: Pre-training of deep bidirectional transformers for language understanding. *arXiv preprint*. 2018. <https://arxiv.org/abs/1810.04805> (Accessed July 3, 2024).
46. Mnih V, Kavukcuoglu K, Silver D, Rusu AA, Veness J, Bellemare MG, et al. Human-level control through deep reinforcement learning. *Nature*. 2015;518(7540):529-533. DOI: <https://doi.org/10.1038/nature14236>
47. Han S, Shanafelt TD, Sinsky CA. Estimating the attributable cost of physician burnout in the United States. *Ann Intern Med*. 2019;170(11):784-790. DOI: <https://doi.org/10.7326/M18-1422>
48. Bojarski M, Testa D, Dworakowski D, Firner B, Flepp B, Goyal P, et al. End to end learning for self-driving cars. *arXiv preprint*. 2016. <https://arxiv.org/abs/1604.07316> (Accessed July 3, 2024).
49. Gatys LA, Ecker AS, Bethge M. A neural algorithm of artistic style. *J Vis*. 2016;16(12):326. DOI: <https://doi.org/10.1167/16.12.326>

Author Contribution: In the review paper "Deployment of AI Tools and Technologies on Academic Integrity and Research," **Shantanu Ganguly** played a crucial role in conceptualizing the research focus, developing the methodology for assessing the impact of AI tools on academic practices, and overseeing the project to maintain high academic standards. **Nivedita Pandey** conducted a thorough analysis of existing literature, synthesized the findings to evaluate the effectiveness of AI technologies in academic integrity, and took the lead in writing the original draft of the manuscript. Both authors collaborated closely to refine the arguments and approved the final manuscript, providing valuable perspectives on the integration of AI in academic settings.

Conflict of Interest: The authors declare no conflict of interest

Funding: This research did not receive funding from any sector.