Smart Learning Environments

REVIEW

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Artificial intelligence, generative artificial intelligence and research integrity: a hybrid systemic review

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Abstract

Current advances in academic research stem from two main sources: artificial intelligence technologies and the specific field of generative artificial intelligence. However, the ethical use of these technologies and their implications for academic integrity has not been sufficiently investigated. Therefore, this research examines the ethical use of artificial intelligence technologies and Generative Artificial Intelligence in academic research. It focuses on the current field conditions, detection of research trends, and critical gaps. The study uses a combination of bibliometric and thematic content analysis methods to examine the methodological framework of AI, GenAI, and academic integrity from an interdisciplinary perspective. The research reveals that GenAI integration speed has accelerated across all research stages, including academic writing, literature review, data analysis, and hypothesis development. The study also identifies risks such as biased algorithms, plagiarism risk, false information production, and potential damage to academic integrity. The research ethics approaches developed by academic institutions and journals have not reached maturity in the context of AI. Future research on GenAI within academic processes requires forming ethical principles integrated with oversight systems and policy frameworks.

Keywords: Artificial intelligence, Generative artificial intelligence, Research integrity, Ethics, Bibliometric analysis, Systematic review

Introduction

The interplay between research integrity and Artificial Intelligence (AI) and Generative AI (GenAI) has become increasingly salient in academic debate and discourse (Adarkwah et al., 2023). AI and GenAI tools keep developing their capabilities at a fast pace but their academic process implementation reveals various ethical concerns about authenticity alongside data creation and intellectual property provisions (Tlili et al., 2022). While research integrity requires studies to be conducted with accuracy, reliability and ethical responsibility, the increasing role of AI and GenAI in research processes is creating a remarkable transformation in terms of academic integrity (Zhai et al., 2024).

AI involves algorithms that replicate human thought capabilities to analyze data along with recognizing patterns and make decisions automatically for functions (Goodfellow

et al., 2016). Research in academia experiences transformations in data analysis modeling and automated content production through AI systems because of their learning abilities and problem-solving features along with prediction capabilities (Russell & Norvig, 2021). AI has developed sophisticated models known as GenAI specifically for producing text and image content and data generation. GenAI tools have become more desirable for academic work because of recent breakthroughs in natural language processing, visual generation and voice synthesis technology. The tools demonstrate the ability to quicken research work while automating extensive datasets and producing novel solutions for researchers (Floridi & Chiriatti, 2020).

Research integrity in academic life serves as an ethical framework that mandates scientific inquiry to uphold ideals of honesty, integrity, transparency, and responsibility, as articulated by Steneck (2006). The rapid proliferation of AI and GenAI tools has heightened the significance of research integrity concerns, encompassing originality, intellectual property, data manipulation, and plagiarism. Two primary concerns arise when GenAI facilitates knowledge development: issues with source documentation and the verification of information veracity (Zhu et al., 2024). The implementation of AI and GenAI systems necessitates equal regard for ethical issues alongside academic norms in the current context.

The study conducted by Bin-Nashwan et al. (2023) shows that shared ethical standards are one of the limiting factors of using GenAI among scholars, calling upon the institutions, publishers, and developers to cooperate to come up with joint ethical regulations. The lack of regulation in this area induces uncertainty in the academic use of AI (Tlili et al., 2025), so to combat it, institutional policies need to be developed that will integrate frameworks of use, education in ethics, and disclosure strategies. As far as investigations prove the educational worth of GenAI—individualization of learning to real-time feedback (Lim et al., 2023; Walter, 2024)—educational integration of the innovation entails some unavoidable contradictions: GenAI both exemplifies a tool and a threat, being both accessible and necessitating control (Lim et al., 2023). Finally, and most importantly, higher-order thinking will be needed in the academic sphere to guarantee that authentic knowledge building does not lose its ground even with the adoption of the technologies (Bozkurt, 2024).

Uncharted territories: defining the research gaps, objectives, and questions

Multiple studies explore GenAI's impact on higher education through diverse lenses that deliver detailed insights about academic integrity and ethical matters along with instructional techniques. Shailendra et al. (2024) comes up with a four-step plan for universities to follow when adding GenAI tools to their academic procedures: Adopt, Activate, Experiment, and Use. This plan helps universities keep their academic integrity. The aproach of Shailendra et al. (2024) makes it clear that they want to protect academic integrity in a systematic way, but it doesn't have the practical implementation skills, technological advancement skills, or global academic equality considerations. Francis et al. (2025) and others have looked into how GenAI can be used in academic learning and research to find a better balance between its ethical problems and its useful qualities. Yusuf et al. (2024) have presented a multicultural study about how university communities perceive AI-based generative technology capabilities and ethical matters. A

research effort analyzes diverse cultural views about GenAI ethical standards through investigations of how GenAI affects academic integrity. The analysis shows that GenAI enables students to learn faster along with working more productively in their studies, yet new ethical issues regarding academic integrity appear.

Academic publishing about AI together with GenAI and academic integrity remains at a developed stage both in the number of publications and their quality. Most research that has been done so far says that plagiarism, false data representation, and not giving enough credit are still a "focus of concern" in textual analysis of scientific metadata (Bender et al., 2021). In their 2020 study, Brown and Dueñas (2020) show that recent papers talk about two main methodological issues: peer review defense strategies and axiological research accountability requirements. The research field dedicated to protecting scientific knowledge at the boundary of"reality and illusion"has grown, but researchers remain doubtful about GenAI technology speed and diversity.

The modern integrative systematic analysis bridges the gap that the traditional methods did not overcome by integrating the multicultural ethics model proposed by Yusuf et al. (2024) with the interdisciplinary approach suggested by Bender et al. (2021) as well as the policy framework introduced by Shailendra et al. (2024), effectively contradicting the Eurocentric academic frameworks. Duality of analytical framework focuses on empirical patterns of publication (Francis et al., 2025) and normative aspects of research accountability and discloses important contradictions between technology advances and continuing inequalities in the world. Such a historical discussion of ethical paradigm changes (Zhu et al., 2024) of the 15-year duration is an important context to the research findings. With any such mixed-methods, the procedure draws upon both Format descriptive and Format thematic analysis and, therefore, can provide both theoretical observations and practical policy suggestions, upholding sophisticated awareness of cross-cultural ethical concerns in AI-fueled studies. This study acts as a foundation for future research by addressing absent information in existing literature. The research addresses three key questions that guide the investigation.

RQ1. What is the general outlook of academic publications on AI, GenAI, and research integrity?

RQ2. What are the main research foci of academic studies on AI, GenAI, and research integrity?

RQ3. In which areas and topics do AI and GenAI tools focus research?

RQ4. What are the opportunities and threats posed by GenAI technologies in terms of the knowledge production process?

RQ5. How are research ethics strategies and standards established and implemented by research institutions and researchers?

Method

Research design

The study examines Generative AI and research integrity academic publication status and main themes as well as publication trends for the period between 2010 and 2025. This research applies a mixed-methods integrative systematic review method through the integration of bibliometric analysis and thematic content analysis for its purpose. Several factors support the use of bibliometric analysis in this study. The initial frequency

and citation analysis through bibliometrics has evolved into modern methods including network analysis and machine learning and text mining. The combined use of these methods increases the reliability of the analysis by providing data triangulation (Blind et al., 2025). Research fields can be comprehensively analyzed through the recognized powerful analytical method Bibliometrics (Donthu et al., 2021; Tlili et al., 2023). The number of citations cannot determine study quality independently, yet it helps reveal the most influential research topics in the field according to researchers. Therefore, it is recommended to analyze publication and citation data jointly to achieve data triangulation and advance content analysis depth (Arar & Tlili, 2024; Wilczewski & Alon, 2023).

Research strategy

Two leading bibliometric software tools, VOSviewer (van Eck & Waltman, 2010) and the R-based *Bibliometrix* package, were utilized to evaluate the dataset. These research tools enable the generation of three primary network visualizations—co-citation networks, author collaboration maps, and keyword co-occurrence analyses—which are essential for identifying research trends and prominent scholarly contributors within a specific domain (Zupic & Čater, 2015). This paper opted to use Web of Science (WoS) as the main database because it follows a uniform data format and provides high-quality data on the number of citations, the study of keywords, the patterns of collaboration of different authors, and the tracking of sources analyzed (Mongeon & Paul-Hus, 2016). Although these alternative databases (such as Scopus) are more comprehensive, they are methodological, and there is heterogeneity, which makes it difficult to conduct sensitive research ethically. The choice in favor of WoS only will guarantee not only scientific validity but also analytical stability since this database unifies methodological consistency to exclude the limitations caused by duplicates and name changes of authors that arise when merging different databases (Harzing & Alakangas, 2016).

This study has taken a multi-bibliometric software software in order to provide sturdy bibliometric examination. Microsoft Excel and basic statistics calculations were performed on initial data and the intermediate data were prepared by R software—mainly by bibliometrix package—to perform advanced co-word analysis and thematic mapping. The combination with VOSviewer made visualization a lot easier and together, they made the process more analytically accurate through the methodical processing of data and detailed description of connections (Blind et al., 2025). The review strategy employed a set of carefully selected key terms to retrieve relevant literature on the topic:

> *"use of artificial intelligence"OR"artificial intelligence and research ethics"OR"research integrity and AI"OR"ethics in the use of AI"OR"ethical issues in research integrity"OR"ethics in the use of artificial intelligence"OR"academic integrity and AI"OR"AI challenges"OR"GenAI and research integrity."*

To ensure the dataset's relevance, various filters were applied. The systematic study description process follows the steps outlined in Fig. 1.

In the beginning of the study, a list of 8,743 publications was identified in Web of Science with unspecific search terms. This was narrowed down to 8323 records using application of temporal filters (2010–2025). Following disciplinary filtering between Education and Social Sciences fields, the dataset was reduced by 5 times (with only

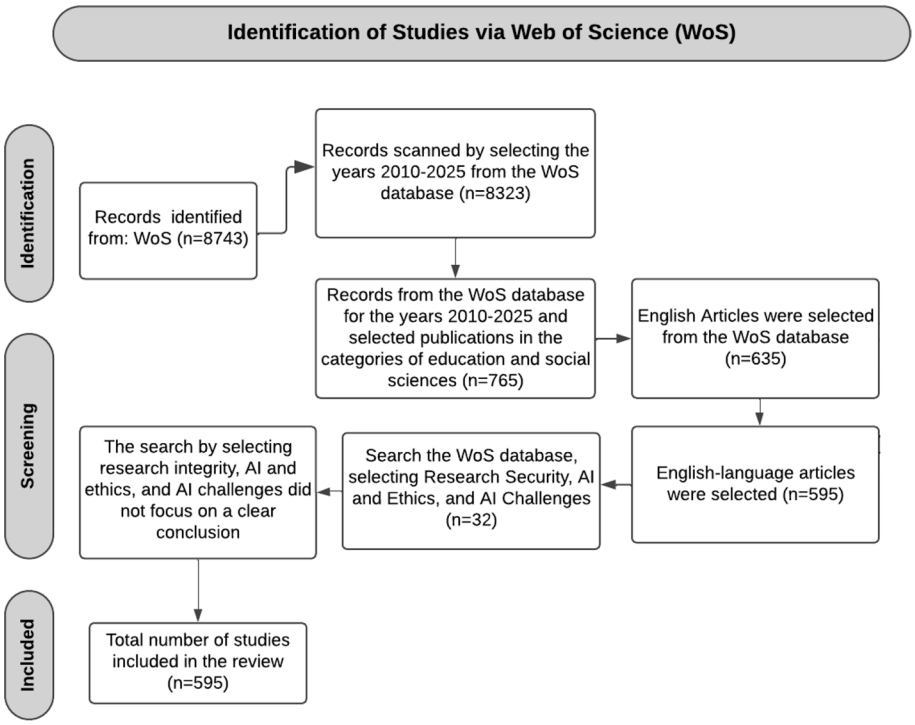

Fig. 1 Idendification of studies via WoS

8.70% of the original search results remaining) by means of the subset of peer-reviewed articles. This strict process of choosing the works was aimed at selecting research quality and credibility and studied only the relevant peer-reviewed work.

The evaluation process encompassed 595 publications, excluding studies published in languages other than English from the analysis. This criterion was established to mitigate potential distortions from linguistic variations and to uphold data validity and coherence (Snyder, 2019). The use of English-language articles enhances accessibility to global literature, enabling a universally interpretable synthesis of research findings (Donthu et al., 2021).

Researchers utilized three thematic keywords in the search process:"research integrity,""ethics,"and"AI challenges."This thematic sensitivity resulted in only 32 records. The limited results indicate that the chosen keywords may not comprehensively encompass all pertinent concepts in the literature, or that the research theme was narrowly defined. The substantial numerical disparity between the initial 32 records and the final dataset of 595 studies necessitates careful examination. In academic discourse,"research integrity"and"ethics"are frequently used interchangeably or substituted with related terms such as"academic integrity"and"responsible AI."As a result, the predefined keywords may not have included all linguistic variations and conceptual interpretations of the topic. The limited quantity of thematic records (32) can be ascribed to discrepancies in terminology, diverse classification approaches in research indexing, or the restricted range of the chosen search terms.

Bibliometric performance indicators indicate that, following the application of disciplinary, language, and article-type filters, only 6.8% (595 publications) of the initial 8,743

records were retained for analysis. The evaluation criteria, which included disciplinary scope, language preference, and the necessity for peer-reviewed publications, significantly reduced the study population. The inclusion and exclusion parameters, detailed in Table 1, ensured the study's relevance and methodological rigor.

The powerful filtering method represented by the study was able to maximize analytical soundness since 8743 records were reduced to 595 publications of high quality using disciplinary and linguistic criteria in addition to peer review (Fu & Weng, 2024). Although practiced with the methodological rigor, such an approach had the potential trade-off: not every good study that conformed to these parameters might have been missed, and their generalizability could have been impaired (Torraco, 2016). The resulting corpus has presented an effective basis of exploring AI and research integrity, with a fine balance between exhaustiveness and strict criteria. Such selective approach produces scientifically plausible findings without dismissing the potential gaps in the more general scholarly environment.

Data processing and analysis

The research utilized a phased holistic approach to perform the data analysis. A bibliometric dataset analysis with co-citation and author collaboration and thematic development occurred using an R-based bibliometrics package (Aria & Cuccurullo, 2017). These approaches reveal system-wide publication tendencies as well as the main research areas explored in the academic literature domain (Donthu et al., 2021). The data cleaning and descriptive statistical work occurred through Excel and VOSviewer provided the visualization of co-citation and keyword networks (Fu & Weng, 2024). This multi-tool set supported the principles of triangulation by allowing different methods of analysis to overlap in order to increase the reliability of results and maintain data integrity (Blind et al., 2025). Through this analytical diversity researchers minimized their potential biases and obtained a comprehensive overview of the research field. The study includes the twenty most cited articles within its scope which are presented in Table 2.

The analysis of the third, fourth and fifth research questions required identification of the 20 most cited articles according to Table 1. Bibliometric analysis helped conduct integrative qualitative analysis of the identified 20 most cited articles. At this stage, the thematic analysis and narrative synthesis techniques outlined by Booth et al. (2021) were used (as cited in Blind et al., 2025). These articles demonstrate essential research trends

Table 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion critria
Publications indexed in Web of Science Core Collection	Studies that are not indexed in Web of Science
Peer-reviewed journal articles indexed in the Web of Science Core Collection	Studies not indexed in WoS. Any publication types other than peer-reviewed journal articles (e.g., conference proceedings, book chapters, editorials, letters, etc.)
Publications from 2010 to February 8, 2025	Publications released before 2010 or after February 8, 2025
Studies focusing on AI and Research Integrity in Education, Social Sciences, and Ethics	Studies on AI and Research Integrity outside the fields of Education, Social Sciences, and Ethics. Publications lacking a clear emphasis on Research Integrity
Articles published in English	Articles in languages other than English

Table 2 Top 20 cited articles

No	Title	Journal name	Total citations (TC)	TC per year	Normalized TC
1	Artificial Intelligence and the Public Sector-Applications and Challenges	International Journal of Public Administration	334	47,71	6,65
2	ElemNet: Deep Learning the Chemistry of Materials from Only Elemental Composition	Scientific Reports	303	37,88	5,01
3	Understanding managers'attitudes and behavioral intentions towards using artificial intelligence for organizational decision-making	Technovation	195	39,00	10,95
4	De novo generation of hit-like molecules from gene expression signatures using artificial intelligence	Nature Comminications	169	28,17	4,87
5	The Ethical Implications of Using Artificial Intelligence in Auditing	Journal of Business Ethics	151	25,17	4,35
6	Improving land-use change modeling by integrating ANN with Cellular Automata-Markov Chain model	Heliyon	139	23,17	4,01
7	Using artificial intelligence to read chest radiographs for tuberculosis detection: A multisite evaluation of the diagnostic accuracy of three deep learning systems	Scientific Reports	134	19,14	2,67
8	A new acceptance model for artificial intelligence with extensions to UTAUT2: An empirical study in three segments of application	Technology in Society	132	26,40	7,41
9	The Janus face of artificial intelligence feedback: Deployment versus disclosure effects on employee performance	Strategic Management Journal	129	25,80	7,24
10	Artificial Intelligence as a Growth Engine for Health Care Startups: Emerging Business Models	California Management Review	121	17,29	2,41
11	The Dark Sides of Artificial Intelligence: An Integrated AI Governance Framework for Public Administration	International Journal of Public Administration	120	20,00	3,46
12	Single test-based diagnosis of multiple cancer types using Exosome-SERS-AI for early-stage cancers	Nature Comminications	114	38,00	13,08
13	Agency plus automation: Designing artificial intelligence into interactive systems	Psychological and Cognitive Science	109	15,57	2,17
14	Improving public services using artificial intelligence: possibilities, pitfalls, governance	Asia Pasific Journal of Public Administration	89	14,83	2,57
15	Can Computers Create Art?	Arts	87	10,88	1,44
16	Artificial intelligence in medical education: a cross-sectional needs assessment	BMC Medical Education	83	20,75	7,43

Table 2 (continued)

No	Title	Journal name	Total citations (TC)	TC per year	Normalized TC
17	From Trash to Cash: How Blockchain and Multi-Sensor-Driven Artificial Intelligence Can Transform Circular Economy of Plastic Waste?	Administrative Science	83	13,83	2,39
18	Visual and kinesthetic modes affect motor imagery classification in untrained subjects	Scientific Reports	81	11,57	1,61
19	Use of ChatGPT in academia: Academic integrity hangs in the balance	Technology in Society	80	26,67	9,18
20	Artificial Intelligence in Education: AIEd for Personalised Learning Pathways	The Electronic Journal of e-Learning	72	18,00	6,45

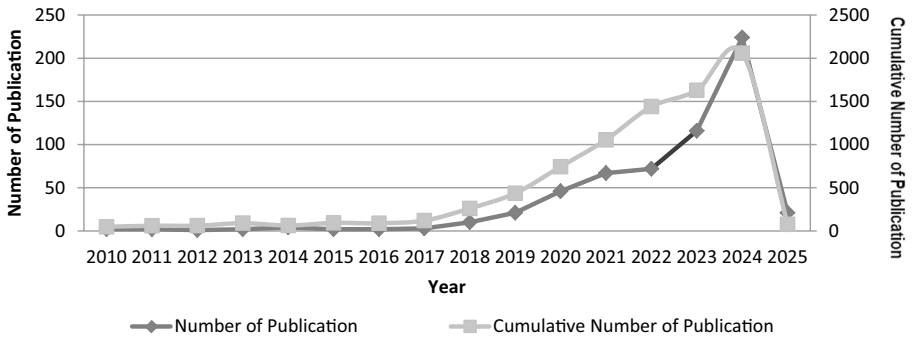

Fig. 2 Number of AI and GenAI and research integrity and cumulative number of AI and GenAI and research integrity by year

and main authors as well as theoretical approaches related to artificial intelligence and research integrity while acting as citation benchmarks.

Findings

RQ1: Overview of academic publications on AI, GenAI and research integrity

Figure 2 depicts the yearly and total count of academic research papers which focus on GenAI and Research Integrity from 2010 until 2025. Two distinct visual series exist in the graph which presents both annual publication frequency and the total published papers until that time period. This paragraph examines field development trends using graphs in Fig. 2 that illustrate yearly and accumulated publication data.

The production of academic research concerning Generative AI and research integrity showed a rapid increase during recent times. Between 2010–2017 the field's publications remained minimal yet their numbers started increasing significantly after 2018. Academic discussions now place special emphasis on AI-based academic tool usage since 2020 which resulted in the centralization of ethical GenAI usage together with its effects on academic ethics and scientific productivity (Donthu et al., 2021). The peak in publication numbers during 2023 and 2024 occurs due to three main factors: the implementation of large language models including ChatGPT, Bard, Claude within academic

research and the ethical researcher discussions and the emergence of GenAI usage policies by academic journals (Heaven, 2023). The number of publications experienced a sudden decrease during 2025. The research timeframe until February 8, 2025 was possible because the available data was incomplete for the entire year. Academic publishers alongside universities will likely implement tougher restrictions on GenAI because of ethical issues (Khalifa et al., 2024) even though literature suggests it enhances research productivity (van Dis et al., 2023). Future academic research demands studies on GenAI regulation approaches while establishing moral standards for its use within education.

The figure demonstrates both geographic representation and international research partnership levels in academic literature about GenAI and research integrity. A comparison exists between books written by one national research center (Single Country Publications—SCP) and books produced through global partnerships between multiple research centers (Multiple Country Publications—MCP). Academic publications about this field are most numerous for China, the United States and India according to research results.

Figure 3 shows that while China, the US and India stand out as the countries with the highest academic production, China is largely conducting research at the national level (SCP), while the US and European countries are more open to international cooperation (MCP). The high MCP rate of European countries is in line with the EU's global leadership efforts on AI ethics and research integrity (European Commission, 2023). Brazil along with Saudi Arabia and Iran have boosted their research on AI ethics while joining academic networks at a global level (Taddeo & Floridi, 2018). Research on AI ethics in general demonstrates divergent patterns because major technology producing countries like China and the United States perform their investigations independently, yet Europe and Canada prioritize international partnerships (van Dis et al., 2023). The presented figure demonstrates that academic productivity in GenAI combined with research ethics operates mostly within national boundaries while both Turkey and Ukraine display minimal international collaborative outputs (MCP). The results indicate weak academic networking between these countries and global research communities because national research remains their main focus.

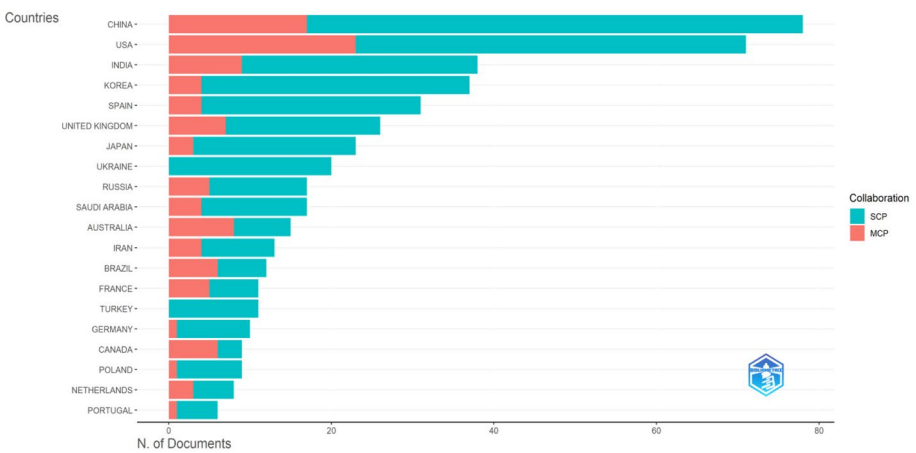

Fig. 3 Distribution of research on AI and GenAI and research integrity by country

Both countries should strengthen international collaborative efforts to boost their scientific impact. Different regulatory frameworks throughout the globe influence how academic scholars debate technology ethics of general artificial intelligence and create a necessity for standardized global AI governance rules (Jobin et al., 2019). Future research needs to study the formation of international AI ethics policies and also needs to understand how to develop interdisciplinary cooperation and international AI research collaborations (Whittlestone et al., 2019).

Figure 4 depicts academic collaborative networks between countries who publish research on GenAI and research integrity. The chart reveals the research collaboration activities among countries together with the intensity levels of international academic relationships. The importance of countries in this field increases proportionally with their size and research partnerships show greater intensity through robust link thickness (Zhang, 2023).

The network reflecting international GenAI and research integrity cooperation displays USA, UK and China, India and Saudi Arabia as central research participants because they maintain extensive networks for collaborative research with stronger intensity than other countries. The complete examination of this network structure shows research activities concerning GenAI and academic ethics maintain different regional approaches yet multinational efforts continue to rise. Different policy and cultural approaches must be harmonized to set global AI governance standards and ethical standards at the worldwide level.

The most publications about AI, GenAI (Generative AI) and research integrity appear in Fig. 5 within the 10 journals listed. The data analyzed showed which journals hosted research publications thus allowing researchers to determine relevant centers of knowledge in the field. Researchers and practitioners can use these data to effectively determine the multidisciplinary nature of the subject and its open

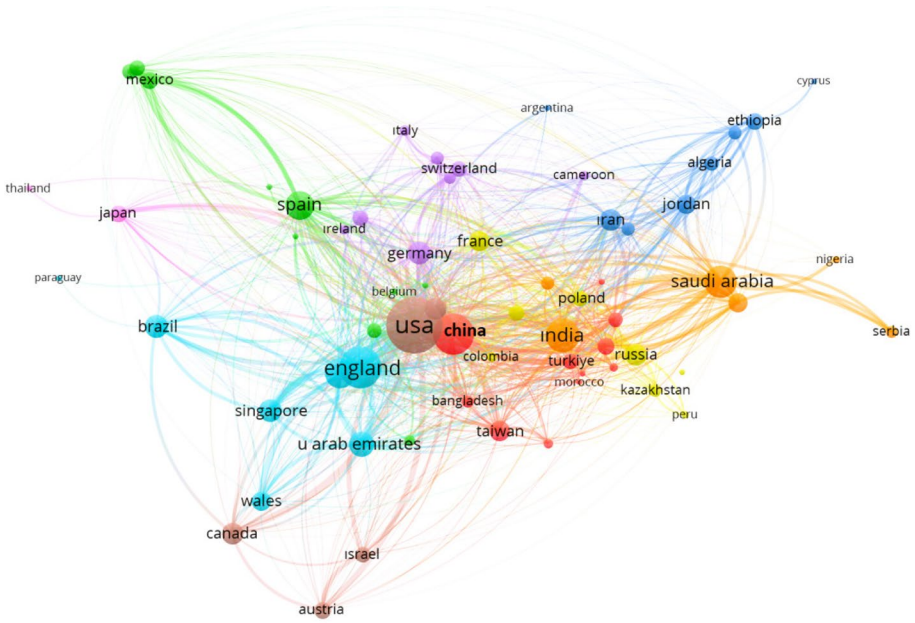

Fig. 4 Cooperation network between countries and territories in AI, GenAI and research integrity

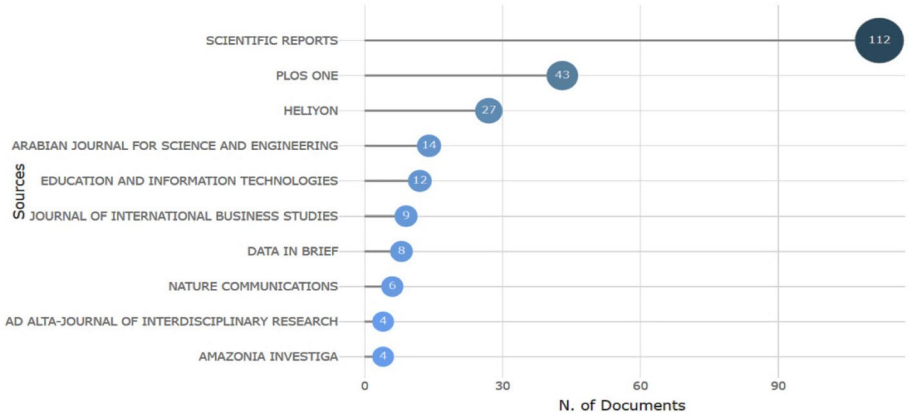

Fig. 5 Top 10 venues for GenAI and research integrity

access and publication channel effectiveness. Researchers can determine unidentified research areas as well as upcoming studies from the available data.

Research in this field predominantly relies upon Scientific Reports (n = 112) and PLOS ONE (n = 43) as their primary publication channels, given their multidisciplinary focus and open-access publishing policy. The results indicate that Heliyon (n = 27) and the Arabian Journal for Science and Engineering (n = 14) are top publication channels for studies in the field of engineering and applied sciences. Additionally, Education and Information Technologies (n = 12) has established significant rises in releasing research on artificial intelligence application in education and research ethics establishment. To add, Journal of International Business Studies (n = 9), Data in Brief (n = 8), and Nature Communications (n = 8) highlight the integration of AI as well as corporate operations research integrity, academic research with tremendous impacts, and in data-sharing protocols. Consequently, Ad Alta—Journal of Interdisciplinary Research and Amazonia Investiga (both n = 4 articles) illustrate how different geography fields incorporate interdisciplinary approaches into research in this field. Nevertheless, the presence of research on GenAI and research ethics in open-access and specialist journals, such as those focused on educational technologies, illustrates its growing visibility across a variety of academic disciplines. This trend underscores the increasing recognition of AI's ethical implications and its integration into various disciplines.

RQ 2: AI, GenAI and the main research foci of work in research integrity

Research in this field explores numerous theoretical as well as applied perspectives on the nexus between AI, GenAI and research integrity. The literature identifies the development of ethical guidelines (Bryson & Winfield, 2017), AI teaching and learning (Coeckelbergh, 2020), data protection practices (Mittelstadt, 2019), and human–machine interface redesign (Floridi & Taddeo, 2018) as key areas of inquiry. One of the primary issues in this field is the issue of reliability and transparency when AI-driven tools are utilized by scientists in academic studies (Hagendorff, 2020).

The findings underscore the necessity of interdisciplinarity among research ethics and GenAI, and its critical role in outlining future research. As more people become aware, researchers are increasingly realizing the importance of examining methodological

designs, ethical dimensions, and theoretical foundations from an integrated perspective. Using bibliometric and content analysis, the study identifies knowledge foundation domains that can be utilized as a basis for future academic research in this emerging field. The following figure (Fig. 6) illustrates the diverse thematic areas covered in General Artificial Intelligence published literature and research integrity.

The node measuring"artificial intelligence"demonstrates its intensive relation to both artificial learning mechanisms and data extraction elements as well as ethical and management systems involving regulation, usability and legal structures. AI technologies demonstrate quick advancement in educational applications and healthcare systems and user experience domains because education and health and chatbots and digital health concepts appear close together in this analysis. Ethical principles together with human-centered design concerns sustainability and value and students become important research elements within organizational and educational institutions. The engagement between innovation together with decision making and automation with law and regulation demonstrates that AI-based technologies develop at a high pace yet fail to maintain their progression unless they meet legal standards and ethical requirements. GenAI studies demand research ethics collaboration between different fields because the intricate relation system requires additional social educational research together with ethical evaluation.

The frequently used keywords for GenAI combined with research integrity have undergone shifts between 2021 and 2024 as shown in the temporal co-occurrence map in Fig. 7.

The original core concepts of machine learning, deep learning and training stay at the front of the color spectrum but newer topics such as reinforcement learning, mortality and art visualization gain prominence in the 2023–2024 timeframe. Research

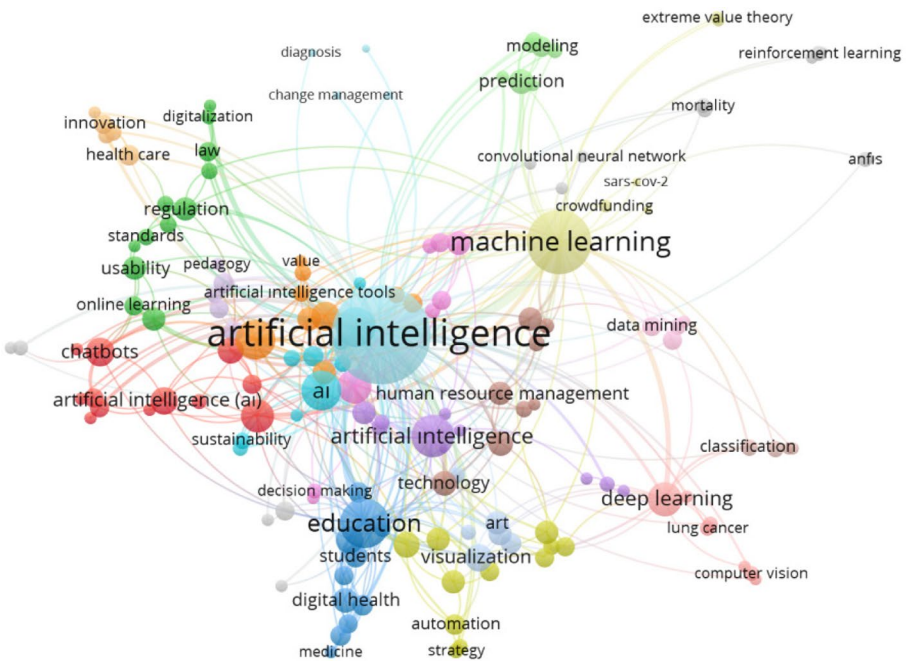

Fig. 6 Co-occurrence network analysis of research on AI, GenAI and research integrity

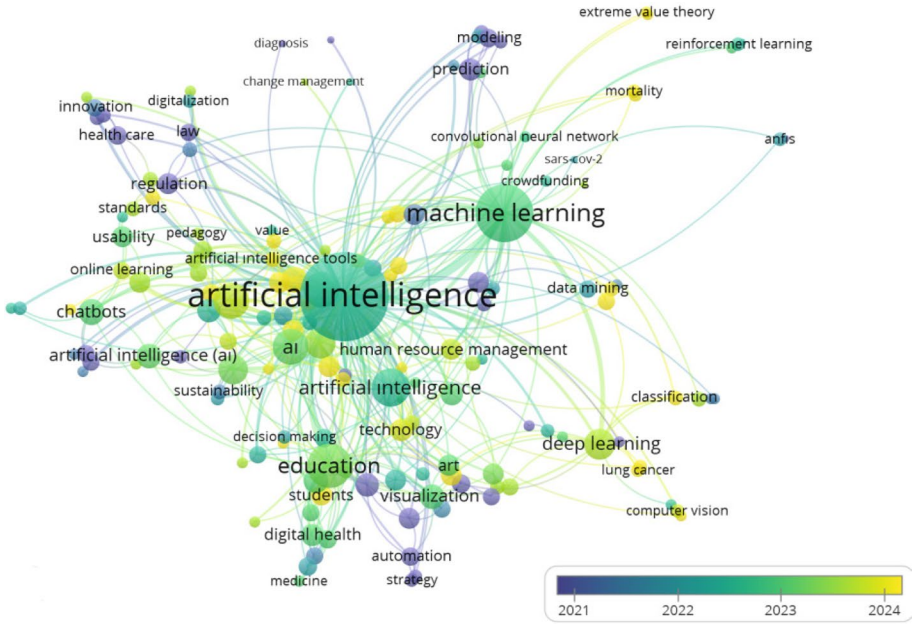

Fig. 7 A temporal co-occurrence map of most frequently used keywords in AI, GenAI and research integrity

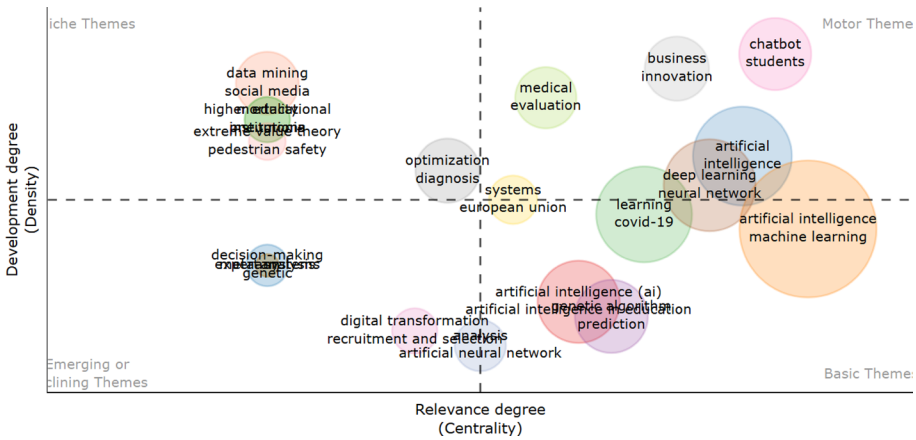

Fig. 8 Thematic map analysis of research on AI, GenAI and research integrity

in the field demonstrates continuous growth through expanded technical and ethical and social developments alongside fast adoption of new concepts in literature.

Figure 8 displays a thematic map that presents an overall research agenda depiction by placing essential GenAI and research integrity concepts throughout four areas based on centrality and density metrics. The placement scheme depicts both the importance and developmental stage of literature topics.

The motor themes ("artificial intelligence", "machine learning", "learning", "neural network") located in the upper right part of the map in Fig. 8 are the main drivers of research in this field due to their high centrality and high intensity values. The themes ("artificial intelligence (ai)", "genetic algorithm", "prediction") that appear in the simple theme quadrant on the bottom right represent topics that are already established but

still remain in the limelight. The aforementioned concepts lead the available literature yet current research has not advanced them beyond initial stages of development. The more specific but intense topics in the niche theme section in the upper left ("data mining", "social media", "higher education") are addressed by a relatively narrower audience, but require in-depth exploration in terms of the sub-problems and possibilities they contain. Their minimal recognition currently indicates that these themes have the potential for fast advancement. Finally, the topics included in the emerging or declining theme at the bottom left ("decision-making", "explanations", "digital transformation"), with lower centrality and intensity of development, indicate a research focus that is either new to the literature or declining as interest wanes. Future paths of concept development will become more noticeable through both field trends and academic field modification interests. The graphical representation demonstrates that GenAI and research integrity require multi-dimensional technical ethical pedagogical research collaboration across multiple academic fields. New research connecting these academic topics through unexplored areas would result in more complete progress in the corresponding literature fields.

RQ3: use of AI and GenAI in scientific and industrial/commercial applications

The study scrutinizes the technological applications of AI and GenAI across various domains, organizing its findings into two primary categories. The initial theme focuses on the analysis of how AI transforms science along with education and industrial manufacturing operations. The second theme covers AI integration into decision frameworks and its applications within artistic creation, together with its management of digital information.

Health and medical practices

Studied areas examined within this paper include Artificial Intelligence technology (AI) together with Generative Artificial Intelligence technology (GenAI). The research by the study confirms that scientists direct their efforts toward developing medical and health applications. The research demonstrates how AI has transformed clinical decision support systems with medical diagnostics alongside drug discovery along with molecular design and business flow methods within the healthcare industry.

The research by Qin et al. (2019) demonstrates that CAD4TB together with qXR and Lunit perform effectively in diagnosing tuberculosis from chest X-ray results. Shin et al. (2023) investigates the training procedures of AI-based diagnostic models for early-stage cancer detection together with their database origins and accuracy outputs. The paper demonstrates that AI applications serving data analysis functions together with diagnostic processes fasten decision-making accuracy in healthcare settings.

The healthcare business sector shows how AI technologies adapt existing value propositions and launch entrepreneurial strategies through enhanced operational effectiveness according to Garbuio and Lin (2019). Independent AI systems raise ethical quandaries about legal responsibilities according to Wirtz et al. (2020) so a full governance system becomes essential. The use of AI in healthcare operations continues to face evaluations from both the perspective of transforming health practices as well as institutional policy development and ethical considerations.

The application of GenAI demonstrates significant effectiveness according to Méndez-Lucio et al. (2020) within the drug discovery process for developing new molecules and designing future pharmaceutical compounds. Jha et al. (2018) prove that AI now has the power to forecast chemical compound formation enthalpies while making advanced predictive analyses through compound variety evaluations. The analysis of structural data and chemical information extracted from extensive datasets through these technologies facilitates both shorter research periods and discovery of new innovative medications known as smart drugs.

AI and its GenAI variants are expanding their applications for environmental sustainability beyond healthcare. The study conducted by Gharaibeh et al. (2020) demonstrates how artificial neural networks succeed in time-based land use forecasting for environmental sustainability purposes. In this context, integrating geographical, climatic and socioeconomic parameters from large data sets contributes to the development of predictive models for land management and the protection of ecosystem services.

The study presented by Wirtz et al. (2019) establishes how AI-based data analysis together with process automation boosts operational efficiency levels in both industrial frameworks and scientific operations. Data processing speed becomes faster when AI-based classification techniques and automation methods enhance both decision-making and feedback operations for complex data sets according to Tong et al. (2021). Heer (2019) acknowledges that Voyager alongside Data Wrangler and PTM solutions provide users with powerful predictive interaction methods that automate quick data implementation processes. Current studies prove that artificial intelligence implements essential workflow modifications that enhance competitiveness in digital transformation activities.

Education, governance and creative spaces

The paper investigates how AI and GenAI technology enhances education and governance and creative fields through a dedicated section. The research demonstrates that AI technology transforms schooling practices yet provides major chances across artistic domains and content development and blockchain implementations.

Tapalova and Zhiyenbayeva (2022) reveal artificial intelligence generates substantial influence on current educational spaces to allow students various customization options for their academic work and curriculum development together with writing enhancement solutions. The study from Bin-Nashwan et al. (2023) finds that educational technologies assisted by AI enhance student achievement by customizing lesson content according to personal learning preferences and achieve considerable results for both teaching duration and assignment management. The perception and concerns regarding artificial intelligence by medical students lead Civaner et al. (2022) to advocate for interdisciplinary educational approaches and a standardized AI curriculum in educational institutions. AI-supported education systems promote digital transformation because they establish vital educational elements which transform student-teaching relationships.

Hertzmann (2018) demonstrates that the hybrid relationship between artificial intelligence and creative processes allows artists to discover technological and artistic innovations for producing art. AI-based algorithms provide artists and designers with

new innovations for creative expression because they naturally create original content. According to Chidepatil et al. (2020) blockchain technology which utilizes artificial intelligence enables better reliability and tracking abilities across data analysis and process management and supply chain transparency areas. New frameworks need development to solve ethical and academic integrity problems while managing AI-based content regulation because of the need for better control (Wirtz et al., 2020).

As a result, the integration of AI and blockchain is becoming a key component of the digital ecosystem, not only in the creative industries, but also in many different fields from education to governance. The research implies that AI deserves analysis through multiple aspects including educational program individualization and artistic content creation and data management system strengthening. The combination of AI and GenAI demonstrates substantial potential for changing numerous fields starting from education through the arts during the forthcoming years.

RQ4: Opportunities and threats posed by artificial intelligence and GenAI technologies for the knowledge production process

This paper explores two fundamental themes where it examines the benefits of and GenAI technologies and analyzes their connected threats. The first section of the paper discusses the benefits of AI and GenAI through a study of their ability to enhance business efficiency and decision-making systems while creating new scientific breakthroughs. The second main theme examines the risks which emerge from AI systems through their inherent structures along with data quality and model functioning which expose threats because of bias and reliability problems and create ethical and accountability challenges.

Opportunities offered by AI and GenAI in research processes

Efficiency, objectivity and innovation: The role of GenAI and AI applications in business processes: The functioning of artificial intelligence-based analytical systems effectively processes large data sets to identify risky areas which lead to process enhancement and improved decision quality with reduced errors. AI auditors help identify risks and reduce errors and enhance audit quality by analyzing extensive datasets according to Munoko et al. (2020). Public administration gains advantages from AI technology that includes better processing systems and enhanced analytical predictions and stronger data-assembled decision-making methods (Wirtz et al., 2019). GenAI technologies quicken data analysis operations which grant researchers full access to expansive and detailed information (Wirtz et al., 2020).

Méndez-Lucio et al. (2020) demonstrates through chemical and pharmaceutical research that artificial neural networks and generative artificial intelligence models deliver time-efficient and efficient results above traditional methodologies when detecting molecular structures and generating synthetic datasets. Both high performance results with small data sets and the removal of feature engineering combine expedite scientific discovery procedures and decrease human-generated biases in research outcomes (Jha et al., 2018). The studies support the observation that GenAI technology demonstrates significant potential to enhance efficiency and support decision-making in extensive business procedures (Cao et al., 2021).

Artificial neural networks eliminate human subjectivity through expert opinions according to research while GenAI establishes new scientific methods with increased research process objectivity (Gharaibeh et al., 2020). Various studies prove that deep learning (DL) systems help minimize human biases during data-driven decision-making systems (Qin et al., 2019). According to Tong et al. (2021) artificial intelligence feedback allows analysis of massive unstructured data sets with objective structured information that aids both error detection and successful practice identification among employees.

The healthcare sector utilizes AI and GenAI-powered systems to increase patient interaction resulting in better healthcare services quality according to Garbuio and Lin (2019). Through the art field AI enables productivity growth while producing artistic advancements by offering fresh approaches to artistic production and creative techniques which work as aids for artistic development (Hertzmann, 2018). AI applications serve as the main driver for academic and industrial advancement through their work toward enhancing operations by boosting accuracy and precision and improving data reliability (Chidepatil et al., 2020). The techniques enable objective data examination at an advanced level (Chholak et al., 2019).

Human centered development, creativity and psychological support: GenAI's contributions: An investigation explores the ways GenAI together with AI affects human-centered development, creativity and psychological support systems. The findings reveal that AI and GenAI offer significant opportunities in a wide range of fields, from academic knowledge production to healthcare, from education to individual psychological well-being.

The results from Gansser and Reich (2021) indicate GenAI supports educational and academic knowledge production which boosts researchers'academic self-efficacy together with self-esteem. AI-supported knowledge production tools boost academic productivity and motivational levels which allows researchers to perform their work in an organized and efficient manner.

AI-supported healthcare systems supply medical staff with additional information sources and assist with patient education while lowering error frequencies according to Civaner et al. (2022). Research findings demonstrate that AI solution with GenAI technology provides decision support for medical staff and simultaneously enhances educational and guidance processes for patients.

The research of Bin-Nashwan et al. (2023) demonstrates how AI-based systems improve both self-esteem and academic self-efficacy aspects of researchers through saved work time. Researcher stress management along with psychological support strengthens through AI-enabled tools which creates a more favorable working atmosphere by decreasing researcher workload.

Changes in learning procedures result from AI technology that builds personalized educational paths to enhance individual learning according to Tapalova and Zhiyenbayeva (2022). The efficiency of learning processes meets individual student requirements through the production of customized educational content.

Emerging threats in the research processes of AI and GenAI

The integration of AI and GenAI into research processes introduces a range of emerging threats that can impact both the reliability of these technologies and their ethical, social,

and institutional implications. These threats can be broadly categorized into two main areas: algorithmic and technical risks, which pertain to the reliability and robustness of AI systems, and social, ethical, and institutional risks, which concern the responsible and fair use of AI in academic and professional settings.

Algorithmic and technical threats: risks to the reliability of artificial intelligence systems

The strong analytical power of AI and GenAI generates technical risks including algorithmic bias along with insufficient clarity and data flaws associated with these systems. Due to the Black Box limitation independent verification becomes impossible since we cannot trace the inner operations of systems. Predictive evaluations become unreliable due to incorrect conclusions that occur from data biases combined with model generalization challenges.

There exists a significant danger to scientific validity because GenAI yields flawed chemical compounds from limited or incorrect data inputs that cannot easily be synthesized. Standard threshold values in deep learning (DL) systems remain non-uniform which creates an obstacle to result comparison and minimizes model consistency.

The academic production methods of GenAI face the critical threat of presenting biased or incorrect information that reduces reliability within academic resources. The generation of false or"hallucinated"knowledge diminishes scientific accuracy but automation processes carry vital risks regarding manipulation. Every AI and GenAI system can achieve reliable and interpretable operations through better data quality management along with developed transparency methods and strengthened independent verification protocols.

Social, ethical and institutional threats: risks in the use of AI and GenAI

The implementation of AI and GenAI technologies improves business process efficiency but also generates substantial ethical and legal together with professional and social risks and limitations. The reliability of AI systems remains uncertain owing to secrecy among stakeholders as well as responsibility problems together with data privacy violations and unresolvable ethical concerns. The creation of ethical problems during decision-making processes along with AI-based exclusion of human intervention together with biased programs raise fundamental questions concerning ethical decision-making regarding AI systems.

The uncertainty about authenticating content created by GenAI along with risks of academic dishonesty and plagiarism threatens to destroy research integrity in academic and scientific production. AI produces flawed data which could trigger academic misconduct alongside its capacity to fool readers that machine-generated work belongs to human authors thus endangering academic moral practices. The automation of workforce processes together with professional role operations raises worries about employee skill degradation and specialized profession devaluation as well as professional confidentiality violations. Discussion about AI's effects on student learning processes plus its role transformation effects on faculty instructors and the consequent impacts on student cognitive development must take place for the educational environment.

RQ5: research integrity standards and practices

The study exists within two main sections that cover "Technical Standards, Verification and Quality Assurance" and "Ethical, Legal and Institutional Policies". The first theme stands for technical standards regarding AI and GenAI technology reliability verification quality assurance while the second theme investigates their ethical legal institutional regulatory structure.

Technical standards, verification and quality assurance: the importance of ethical and scientific standards in AI and GenAI research

The research establishes technical standards alongside validation procedures and quality standards regarding reliability combined with ethical practices and data integrity systems of AI and GenAI applications within scientific studies. Enhancing AI system reliability requires backing them with independent verification and data management and quality control mechanisms.

Wirtz et al. (2020) establish that verifying AI systems requires independent evaluation and standardized performance assessment as well as quality control measures for achieving reliability. Large-scale medical diagnostic AI model validation through experimental testing with external agencies ensures their dependable performance within real clinical settings according to Qin et al. (2019). The implementation of tenfold cross-validation and structural similarity analysis and threshold standardization as methodological approaches helps achieve better consistency when using AI-based diagnostic systems (Jha et al., 2018).

Shin et al. (2023) advocate that AI model adaptability toward different populations and contexts needs testing which follows international sensitivity and specificity standards from organizations including the World Health Organization (WHO). Méndez-Lucio et al. (2020) emphasize that performing tests on pilots together with population-based adjustments of model performance standards improves both scientific process reliability and methodological integrity.

According to Heer (2019) the accuracy and dependability of AI models depends directly on the data management and cleaning along with optimization processes used during system development. Standardization of medical images together with molecular analysis and gene expression signatures produces accurate model outputs when dealing with high-quality data.

AI-enabled diagnostics and decision support systems require clinical standards compliance for maintaining their reliability as quality assurance measures. Wirtz et al. (2020) argues that quality assurance integrated with risk management forms an essential base to establish proper and ethical system operations. Reliable functioning of AI systems requires external oversight systems that perform assessments based on diverse stakeholder viewpoints as described by Munoko et al. (2020).

Research institutions together with universities need to develop their ethical standards based on technical accountability and integrity to maintain research compliance as Cao et al. (2021) recommend. The implementation of standards in research integrity produces AI as an accountable trustworthy tool during scientific processes through maintaining high-quality research standards.

Ethical, legal and institutional policies: regulatory frameworks and accountability mechanisms in artificial intelligence research

The research investigates guidelines for ethically sound and dependable GenAI and Artificial Intelligence technology implementation practices. The study shows that AI together with GenAI need regulatory structures and accountability systems along with academic integrity principles to guide their use.

Wirtz et al. (2020) argue that new regulatory frameworks along with accountability systems need creation to achieve ethical and responsible implementation of AI and GenAI.

Moreover, artificial intelligence and generative AI, in particular, provide a vast amount of ethical concerns, such as; control of human behaviour, determination in decision-making processes, ethical dilemmas and biased systematics (Tlili et al., 2025). The fact that AI can set a normative regulation of human behaviour in this case is not only a technical problem of competence, but also an ethical and legal problem of legitimisation. In decision making cases involving human discretion and constitutional personality the use of systems, which are devoid of human traits like emotion, consciousness and intuition is problematic along the lines of ethical responsibility and social balance. The issue of how machine and human value judgements can be congruent becomes further-confused with the fact that some AI systems have the ability of coming up with self-created ethics reference frames due to their self-learning abilities. Human beings usually use their morally charged ethical intuition when making decisions, but the fact that an AI system lacks contextual sensitivity risks further chances of ethical conflict when it comes to dealing with humans. The moral dilemmas that may occur in the field of research ethics expose this incompatibility as far as ethical principles are concerned. When the damage is unavoidable, like in the case of healthcare or transportation systems using autonomous systems, it is necessary to go through a value-based reasoning process that cannot be limited to technical calculations to define which action would imply fewer ethical compromises. Nevertheless, AI can still only grasp and analyze these values priorities ethically in a certain and limited context. On the other hand, the fact that AI systems replicate inequalities due to the usage of biased data structures also brings the problem of bias in the context of ethics in the form of discrimination. Algorithms have a potential to accidentally incorporate the values and biases of developers, and they can contradict with such ethical principles as justice and equality. Thus, it is highly needed to ensure the design of AI systems based on such premises of technical sufficiency, ethical consumer visibility, accountability and non-discrimination, the concept that comprises the core idea of this thesis.

AI governance stability requires two-party cooperation between government entities and corporate enterprises as necessary stakeholder support. According to Henman (2020) the adoption of international organization recommendations like WHO standards into national strategies aids in developing standardized ethical norms for AI utilization.

Cao et al. (2021) propose that companies can responsibly place AI in business by developing employee support measures and eliminating workforce anxiety through strategic planning. For the ethical application of artificial intelligence to become possible it

needs both regulatory standards and transparency-based accountability systems which prioritize clarity.

Social cohesion of AI-powered systems requires three main components according to Gansser and Reich (2021): ethical training programs for staff and managers and risk management system development and balanced human-AI teamwork. Evidence points to the need for AI technology to receive ethical evaluation in addition to technical development centered on human elements.

The ethical evaluation of GenAI content takes precedence within academic integrity along with established citation procedures and specific AI verification mechanisms as per Bin-Nashwan et al. (2023). Academic integrity and research credibility support demands from higher education institutions and research organizations require formal ethical guidelines defining how artificial intelligence should be implemented (Tapalova & Zhiyenbayeva, 2022).

From a business perspective, Munoko et al. (2020) suggest that increasing the potential of AI to create value in business processes will be possible by integrating stakeholder relations and data security policies with corporate strategies. Furthermore, Chidepatil et al. (2020) state that companies and academic institutions should build public trust and encourage stakeholder engagement by developing ethical guidelines and policies for the use of AI.

Discussion and conclusion

This study addresses the lack of empirical studies on AI, GenAI, and research integrity by producing a balanced examination of scholarly development in this domain.

The general outlook of academic publications on AI, GenAI, and research integrity

Recent years have seen a sharp increase in research ethics and GenAI investigations in academia. Three major developments are responsible for this growing trend: the emergence of large language models like ChatGPT, Bard, and Claude; the increasing focus on ethical transgressions as major subjects in scholarly discourse; and the publication of new GenAI usage guidelines by scholarly journals (Heaven, 2023).Though these countries show different patterns of international cooperation and regulatory frameworks, China, the US, and India are the main locations for research on GenAI and research ethics. While the United States and European nations prefer international collaboration (MCP) as a research strategy, China mostly conducts research at the national level (SCP). Because they take part in European Union programs that aim to set the standard for ethical research integrity and artificial intelligence worldwide, European countries in particular maintain high MCP rates (European Commission, 2023). The discussion of GenAI ethics demands national regulatory harmonization due to cultural differences in ethical frameworks between countries (Jobin et al., 2019).

Research on GenAI and research ethics is still primarily published in open-access, transdisciplinary journals. Nonetheless, the field is quickly growing into specialized publications for educational technologies and other fields. Engineering, applied science, and educational technology journals are becoming more and more popular, even though Scientific Reports and PLOS ONE are still the two most popular publication platforms.

Future studies will look into the creation of international research networks, the incorporation of ethical concepts into educational systems, and how academic regulations should control general AI. Countries all around the world must create uniform regulatory frameworks for AI governance as the standardization of international laws and regional customs continues to advance.

The core research foci in AI, GenAI, and research integrity

Ongoing research on GenAI and research integrity integrates technical, ethical, and social components, forming a comprehensive and interdisciplinary field of study. The literature identifies five key research areas in AI-supported academic studies: the creation of ethical standards, data security, liability principles, human–machine collaboration, and research transparency (Bryson & Winfield, 2017; Hagendorff, 2020; Mittelstadt, 2019; Tlili et al., 2025). As AI technologies rapidly expand across education, healthcare, and digital governance, there is a pressing need for robust ethical frameworks to ensure their responsible and effective management.

Machine learning, deep learning, and AI-driven educational technologies have played a central role in advancing EdTech. However, emerging themes such as reinforcement learning, morality in AI, and AI-generated art visualization have gained increasing significance in the 2023–2024 period. Research on GenAI ethics highlights the strong interconnections between technical advancements, ethical considerations, and pedagogical structures, reinforcing the necessity of interdisciplinary collaboration to drive meaningful progress in the field.

Thematic map evaluations reveal that while certain aspects of GenAI and research ethics remain foundational, new areas of interest are emerging in scholarly discourse. Concepts such as *"artificial intelligence,""learning,"* and *"machine learning"* exhibit high centrality and density measures, indicating their core relevance to the field. Meanwhile, topics such as *"data mining,""social media,"* and *"higher education"* appear as more specialized research domains. The trajectory of studies on *"decision-making"* and *"digital transformation"* remains dynamic, shaped by evolving academic priorities and research agendas.

The field of GenAI research ethics now requires more diverse analytical approaches, with ethical evaluation becoming an increasingly critical focus. Interdisciplinary methodologies are essential for fostering a more holistic understanding of AI's impact. Future research should strengthen connections between these thematic areas while advancing the best ethical and methodological practices and promoting global AI governance coordination to ensure the field's sustainable development.

The disciplinary and sectoral distribution of AI and GenAI research

AI together with GenAI technology has entered multiple fields including science and industry and education and creativity for their versatile applications. GenAI technology through health and medical research demonstrates its substantial value across clinical assessment and healthcare system decisions and drug development and molecular model development as well as operational healthcare management (Qin et al., 2019; Shin et al., 2023). The debate regarding ethical and legal responsibilities of AI usage in

healthcare grows stronger because it demands a complete governance system for maintaining dependable and sustainable implementation of these technologies (Wirtz et al., 2020).

AI along with GenAI applies to significant influence on environmental sustainability and data management operations and industrial applications. Critical tasks employ AI-based models to evaluate environmental change procedures and develop sustainable land use planning as well as enhance decision systems for tackling climate change (Gharaibeh et al., 2020). AI provides crucial operations including large data processing and decision support system optimization and workflow efficiency enhancement to data analysis and process automation fields (Heer, 2019; Tong et al., 2021).

The educational, governance and creative spheres rely on AI for essential roles that include process personalization and academic development with performance improvements (Tapalova & Zhiyenbayeva, 2022). Research demonstrates that AI-supported educational technologies can both meet specific learning requirements of students and enhance teaching efficiency while improving their academic results (Bin-Nashwan et al., 2023; Mustafa et al., 2024). Academic integrity and moral AI educational tool usage along with their research implications are topics that continue undergoing research investigation (Civaner et al., 2022).

Art production in creative industries shows technical and conceptual changes due to AI while experiencing new challenges about originality and ethics in creative work (Hertzmann, 2018). The solutions offered by AI in areas such as data security, process management and protection of intellectual property rights, combined with blockchain technology, stand out as important developments that increase the reliability of digital ecosystems (Chidepatil et al., 2020). Research needs to advance in order to establish regulations for AI-based content as well as ethical control mechanisms and legal frameworks which defend the original creative rights of artists (Wirtz et al., 2020).

AI along with GenAI promises to reshape multiple industries including science research as well as manufacturing processes and academic learning alongside government management while their effects will grow stronger over time. Sustainable and dependable application of these technologies depends on the solution of crucial matters including ethical AI practices as well as protection of data and establishment of governance frameworks. Upcoming research will concentrate on creating extensive regulations to address the ethical aspects together with methodological and operational elements of AI and GenAI implementation across different sectors.

Opportunities and threats of GenAI in the knowledge production process

AI and GenAI not only enhance knowledge production through efficiency and objectivity, but also introduce various ethical reliability and accountability risks. These technologies offer chances for faster data analysis in both science and business. They also improve systems that help people make decisions and make research operations more organized and efficient (Munoko et al., 2020; Wirtz et al., 2019). Artificial intelligence's small neural networks and generative AI models help speed up pharmaceutical research with molecular invention and improve the delivery of healthcare (Garbuio & Lin, 2019; Méndez-Lucio et al., 2020). AI-powered systems are also thought to boost creativity,

personalize learning, and make digital ecosystems more reliable in the arts, education, and government (Hertzmann, 2018; Tapalova & Zhiyenbayeva, 2022).

The implementation of AI and GenAI technology creates multiple opportunities, yet researchers discover several ethical, technical, and social dangers that arise during knowledge production stages. Algorithmic biases, data security violations, and insufficient transparency capabilities primarily compromise the reliability of AI-based systems. The black box issue creates problems for independent verification because it makes it difficult to properly understand how AI models work (Chholak et al., 2019). While researchers argue about how reliable AI-generated content is in terms of academic ethics, the act of creating false or biased information raises the risk of academic dishonesty.

AI, along with GenAI, produces workforce effects that are crucial matters for examination. The increasing automation systems create worries about worker skill degradation while causing a value reevaluation of professional positions and adverse effects on specialized decision-making processes. Educational researchers identify the need for more investigation into how student–teacher interactions change because of AI since this field remains a strong focus area (Civaner et al., 2022).

Based on the information we have now, researchers need to find a good balance between the benefits of AI and GenAI in creating new knowledge and their moral and social risks. As time goes on, research should focus on developing ethical ways to use AI and GenAI technologies, as well as open and honest ways to deploy these technologies and better ways for institutions and universities to manage these technologies. GenAI needs ethical rules and strong, independent checking systems to build a trustworthy presence in knowledge development activities that will last for a long time.

Research integrity strategies and standards in AI and GenAI research

The research investigated standards and practices that deal with AI and GenAI technologies in both scientific and industrial processes regarding reliability as well as ethical use and regulatory frameworks. The moral environment of AI and GenAI is full of ambiguous incompatibilities between machine agency and human ideals. The main question that emerges is whether AI systems can be moral and create rules about human conduct (Krausova, 2017) or whether they (at least in areas where a human opinion is required), can be granted personhood status under the constitution (Solum, 1992). Matching machine and human value judgments is questionable because AI does not have an emotional and conscious aspect of human decision-making (Banerjee et al., 2018). The lack of correspondence poses a danger of the divergence of values, particularly as self-learning algorithms gain the ability to work out their own ethical theories (Mittelstadt et al., 2016; Turilli, 2007). Moral ambiguity also makes AI ethics more complicated (Tlili et al., 2025), especially when handling high-stakes cases such as healthcare and autonomous motor vehicles, which would require the system to eventually solve no-win scenarios that involve conflicting ethical implications (Ditto & Liu, 2012). On top of that is pervasive AI bias when technologies reproduce and enhance training sets or biases that are still in place in humans (Citron & Pasquale, 2014), violating ideals of fairness (Thierer et al., 2017). Even though efforts towards detecting and eliminating discriminatory outcomes have increased, it is an imperative that is yet to be firmly addressed (Mittelstadt et al., 2016).

The findings demonstrate that precise technical standards and ethical guidelines need to be established to guarantee scientific research benefits from accuracy and accountability and quality control assurance in both AI and GenAI systems. The scientific validity of AI systems increases by means of independent verification while better data management processes and stronger quality control mechanisms help endorse this improvement (Wirtz et al., 2020). In particular, research on medical diagnostics, molecular data analysis and large-scale artificial intelligence models shows that methodological integrity must be maintained to ensure the adaptability of AI to different contexts and populations (Qin et al., 2019; Shin et al., 2023).

Research has focused on determining the correct ethical and institutional and legal guidance for AI and GenAI technologies. Professional governance of these technologies must comply with ethical standards through the creation of accountability systems combined with regulatory structure implementations alongside strengthened multi-stakeholder participations (Wirtz et al., 2020). AI's ethical placement in business needs support through workplace adaptation programs while maintaining social adaptation measures among professionals (Cao et al., 2021). GenAI academic content needs ethical control systems alongside clear citation instructions for compliance with academic moral standards (Bin-Nashwan et al., 2023).

Researchers acknowledge that AI systems should receive analysis that consists of technical evaluation alongside examination of ethical and legal and social implications. Training that emphasizes ethics should be established for managers alongside academics and industry professionals to secure honest and equitable AI implementation (Gansser & Reich, 2021). Higher education institutions together with research organizations need strict policies that back academic integrity with specific ethical guidance about AI usage (Tapalova & Zhiyenbayeva, 2022).

Theoretical and practical implications

This study has considerable theoretical implications in the following way: it provides an interdisciplinary framework based on ethical, technical, and social aspects of AI/GenAI (Bryson & Winfield, 2017). It illuminates such important concepts as black box problem and algorithmic bias (Bender et al., 2021) and broadens normative ethical discussions of the morality of AI (Solum, 1992) and questions of deontological ethical dilemmas (Ditto & Liu, 2012). Some of the emerging agendas of research discussed in the study are the effects of culture in the ethics of AI (Jobin et al., 2019) and the comparative approaches of governances of specific countries in the world (European Commission, 2023). In practice, the results help policymakers operate in regulative environments (OECD, 2019; Wirtz et al., 2020) and instruct educators in the approaches to ethical AI incorporation practices (Tapalova & Zhiyenbayeva, 2022). At industrial levels, it offers directives on healthcare (Shin et al., 2023) and artistic industries (Zhu et al., 2024) and technical specifications of bias prevention (Citron & Pasquale, 2014). The study especially highlights the effort toward reinforcement of academic integrity via AI plagiarism detection (Bin-Nashwan et al., 2023) and article authorship directives (Bozkurt, 2024).

Abbreviations

AI	Artificial intelligence
GenAI	Generative AI

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With the introduction of AI and Generative AI technologies to the sphere of research, global leading institutions have developed several important guidelines that can make the development of such technologies ethically neutral in the terms of transparency and reliability. Important models include the Principles on Artificial Intelligence of the OECD (2019), the AI Act that has been proposed by the European Commission (2024) and COPE recommendations that focus on responsible invocation of AI in production of scientific knowledge. These recommendations can guide through some of the fundamental issues, including the responsibilities of the researchers, the validity of the data, the threats of plagiarism, and the prevention of the biases introduced by the algorithms. The current research is consistent with these institutional initiatives when it comes to the necessity to implement the AI technologies on the ethical level without threatening the research integrity. With an integration of these conventional frameworks, the entertainment places an emphasis on the importance of striking a balance between innovation and responsible use in academia.

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Publisher's Note

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