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Deployment of Generative AI in Academic Research among Higher Education Students: A Bibliometric Approach

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Abstract

This study investigates the role and impact of generative artificial intelligence (AI) in academic research using a comprehensive bibliometric approach. A dataset of 515 documents, retrieved from the Scopus database spanning 2017 to 2025, was analyzed using various tools, including Vosviewer, Excel, Biblioshiny, and R Studio. The search string ("Generative AI AND academic research") guided the systematic exploration of the literature. The analysis reveals a significant increase in scholarly attention toward generative AI, highlighting its transformative potential across disciplines. Vosviewer facilitated network visualization, identifying key thematic clusters and collaboration patterns among authors, institutions, and countries. Excel provided detailed trend analysis, illustrating the growth trajectory and publication dynamics over the specified period. Biblioshiny and R Studio enabled deeper insights into citation patterns, thematic evolution, and research hotspots. Consequently, this study identifies thematic trends and key research clusters in generative AI within academic research from 2017 to 2025 using bibliometric analysis. It explores how generative AI technologies, such as ChatGPT, have influenced interdisciplinary research methodologies across Social Sciences, Computer Science, and Engineering. Additionally, it examines collaboration patterns among authors, institutions, and countries in generative AI research, highlighting opportunities to foster global innovation while addressing ethical concerns and algorithmic biases. Key findings suggest that generative AI has become a pivotal tool in advancing academic methodologies, fostering innovation, and enhancing productivity. However, the study also identifies challenges such as ethical concerns, algorithmic biases, and the need for sustainable practices in leveraging AI-driven technologies. It contributed to the

growing body of knowledge on generative AI in academia by offering a bibliometric overview and highlighting future research directions. It serves as a valuable resource for scholars and practitioners aiming to understand and harness the capabilities of generative AI in academic research.

Keywords: Generative AI, Academic Research, Bibliometric Analysis, Higher Education Students, BiblioShiny, R Studio

Literature Review

Introduction

Generative Artificial Intelligence (AI) has emerged as a transformative force in academic research, offering unprecedented opportunities for innovation. From content generation to predictive analytics, generative AI applications span diverse fields, including education, healthcare, and marketing. This section explores the integration of generative AI in academic research, focusing on its potential for enhancing digital marketing through Behavioral Reasoning Theory (BRT). The following are the research questions for the research.

1. What are the thematic trends and key research clusters in generative AI within academic research from 2017 to 2025, based on bibliometric analysis?
2. How have generative AI technologies, such as ChatGPT, influenced interdisciplinary research methodologies, particularly in Social Sciences, Computer Science, and Engineering?
3. What are the collaboration patterns among authors, institutions, and countries in the domain of generative AI, and how can these be leveraged to foster global innovation and address challenges like ethical concerns and algorithmic biases?

Generative AI in Academic Research

Generative AI, particularly models like Generative Adversarial Networks (GANs) and transformers such as GPT-4, has revolutionized how researchers approach data analysis and content creation. Recent studies have highlighted its capabilities in automating mundane tasks, thus allowing researchers to focus on higher-order thinking and creativity (Joshi et al., 2025).

Van Niekerk et al. (2025) discuss the ethical implications of using generative AI in academic writing, emphasizing the need for transparency and accountability. Similarly, Akpan et al. (2025) underscore the role of conversational AI in facilitating human and chatbot interactions for educational purposes. Generative AI's utility extends to knowledge organization, as seen in Xiao et al. (2025), where AI workflows are leveraged for synthetic biology research.

Behavioral Reasoning Theory and Digital Marketing

Behavioral Reasoning Theory (BRT) provides a robust framework for understanding consumer behavior, particularly the motivations and barriers that influence decision-making. Integrating generative AI within this framework can enhance digital marketing strategies by providing insights into consumer preferences through data-driven reasoning (Creely & Blannin, 2025).
For instance, Douard et al. (2025) explore interdisciplinary models where AI facilitates inter-domain information pairing, aligning with BRT's emphasis on contextual reasoning. Moreover, Jin et al. (2025) highlight the influence of AI on self-regulated learning, which can be extrapolated to consumer learning and adaptation in digital environments.

Applications of Generative AI in Academic Research

1. **Content Creation**: Generative AI has been pivotal in creating high-quality academic content. Tudino and Qin (2024) examine AI's role in generating academic texts in social sciences, revealing its potential to standardize and elevate research outputs.
2. **Data Analysis**: AI models like GANs have been instrumental in processing complex datasets. Kavyashree and Shidaganti (2025) illustrate the application of GANs in education, showcasing their adaptability in diverse academic contexts.
3. **Ethics and Integrity**: Addressing concerns about academic integrity, Revell et al. (2024) investigate the impact of generative AI on authorship and plagiarism, advocating for ethical guidelines to govern its usage.

Challenges and Opportunities

While generative AI offers numerous advantages, challenges such as bias, over-reliance, and ethical dilemmas persist. Nelson (2024) critiques the evolving academic identity in the age of AI, urging institutions to redefine their roles. Conversely, Singh et al. (2024) emphasize the potential of AI in achieving sustainable development goals, particularly in education. Additionally, generative AI is reshaping academic research, offering innovative solutions to long-standing challenges. By integrating AI within the BRT framework, researchers can unlock new dimensions in digital marketing. However, balancing its benefits with ethical considerations remains crucial.

The emergence of generative artificial intelligence (AI) tools such as ChatGPT has sparked significant interest and debate in academia. These tools, which rely on advanced natural language processing algorithms, are transforming academic writing, posing both opportunities and challenges. Several studies have explored the utility and implications of generative AI in education. Van Niekerk et al. (2025) emphasized that generative AI offers innovative approaches to academic writing but raises questions about authorship and intellectual property. Similarly, Radtke and Rummel (2024) examined how information about authorship influences students' revision behaviors, highlighting the potential of generative AI to enhance self-editing skills. Kostopolus (2025) raised concerns regarding intellectual property and academic honesty, discussing how students use generative AI as a supplementary composing tool. Gruenhagen et al. (2024) further investigated students' perceptions of generative AI, uncovering its dual role in aiding academic tasks and challenging academic integrity.

In the context of professional education, Mortlock and Lucas (2024) conducted a scoping review on generative AI in pharmacy education, revealing its implications for academic integrity and its potential as an educational tool. Cohen and Moher (2024) explored whether generative AI serves as a friend or foe to academic writing, arguing for balanced usage to maintain integrity. Generative AI's transformative impact on academic libraries in Africa, as explored by Adarkwah et al. (2024), demonstrated its role in reshaping information access and curation in the post-COVID-19 era (7). Wang (2024) investigated the cognitive and sociocultural dynamics of self-regulated use of generative AI in English as a Foreign Language (EFL) writing, underscoring its potential for personalized learning.

In the healthcare sector, Fleurence et al. (2024) addressed the applications of generative AI in health technology assessment, identifying opportunities and policy challenges. Dalalah and

Dalalah (2023) studied the limitations of generative AI detection tools, such as false positives and negatives, which complicate the evaluation of AI-generated content. Gao et al. (2024) introduced an ICAP self-determination perspective to explore how generative AI enhances business students' academic performance through interactive and constructive learning activities. The ethical implications of using generative AI were explored by Eke (2023), who highlighted its potential threat to academic integrity.

Creely and Blannin (2025) proposed creative partnerships between educators and generative AI, envisioning its role beyond traditional academic purposes. Issa and Hall (2024) developed a teamwork framework to prevent breaches of academic integrity in collaborative settings in the AI era.

Contrasting student and assessor evaluations of generative AI in assessments, Fischer et al. (2024) emphasized the need for clear guidelines and ethical use policies. Joshi et al. (2025) demonstrated how generative AI could be harnessed for digital marketing education using the Behavioral Reasoning Theory. Baek et al. (2024) surveyed college students' perceptions and usage of generative AI, revealing its perceived efficacy and concerns about overreliance. Kshetri (2024) analyzed the academic industry's response to generative AI, particularly large language models, through an institutional lens. Summers et al. (2024) explored nursing students' views on generative AI, identifying both challenges and opportunities in higher education. Kizilcec et al. (2024) compared educator and student perspectives on generative AI's impact on assessments, providing a global viewpoint.

Lee et al. (2024) conducted a high school survey on cheating behaviors associated with generative AI, emphasizing the need for proactive measures to uphold academic honesty. Li et al. (2024) examined copyright implications during the training of generative AI, advocating for international governance to balance industry and individual rights. Ngo and Hastie (2025) suggested integrating AI literacy into English for Academic Purposes (EAP) modules, emphasizing the importance of understanding generative AI's capabilities and limitations. Jin et al. (2024) discussed global institutional policies on generative AI in higher education, offering a comprehensive overview of adoption strategies. Finally, Kautonen and Gasparini (2024) proposed the B-Wheel framework for building AI competencies in academic libraries, highlighting its significance for institutional growth.

The reviewed literature underscores the transformative potential of generative AI in academia, while also emphasizing the need for ethical frameworks, clear policies, and enhanced AI literacy to navigate its challenges effectively.

Methodology

With a Bibliometric analysis methodology, the study employs inclusion and exclusion criteria to refine the dataset and ensure the relevance of analyzed documents. The Scopus database was queried using the search string ("Generative AI AND academic research"), resulting in 515 documents published between 2017 and 2025. Signifying that research in this area started around 2017 and there is a dearth of research in the Generative AI in academics The community. Hence, the documents were categorized based on subject area, document type, source title, publication stage, and keywords. Inclusion criteria prioritized documents from active disciplines like Social Sciences, Computer Science, and Engineering, focusing on peer-

reviewed articles, conference papers, and reviews published in reputable sources such as the Journal of Applied Learning and Teaching. Final-stage publications and keywords like Artificial Intelligence, ChatGPT, and Higher Education were also emphasized.

Exclusion criteria removed non-peer-reviewed materials, non-English publications, duplicates, and unrelated subject areas. Dominance of Social Sciences and Computer Science indicated interdisciplinary applications of generative AI. Articles and conference papers formed the majority, sourced from leading journals and proceedings to ensure data credibility. The growing use of bibliometric tools to analyze scientific research has provided researchers with comprehensive methodologies to map the evolution and dynamics of various fields. Aria and Cuccurullo (2017) introduced "bibliometrix," an R-based tool designed for thorough science mapping analysis, enabling users to perform bibliometric analysis with greater precision. This tool has become a cornerstone in bibliometric studies, offering advanced techniques for network analysis and data visualization.

Expanding on bibliometric tools, Aria et al. (2023) developed "openalexR," an R package tailored to collect bibliometric data from OpenAlex, a free and open-source scholarly database. This package facilitates data retrieval and analysis, further broadening the scope of bibliometric research.

In addition, Aria, Misuraca, and Spano (2020) demonstrated the potential of bibliometric methods to map the development of interdisciplinary research. Their study on the evolution of social research and data science over 30 years of Social Indicators Research highlighted the interplay between traditional social science methods and emerging data science approaches. These contributions underscore the significance of bibliometric tools in tracking and analyzing the evolution of academic disciplines. Similar method of bibliometric analysis was used by Abdullahi et al., (2024) in their study on social media addiction (SMA) as it affects academic performance over a decade.

The methodological framework guarantees a robust dataset, facilitating comprehensive bibliometric analysis. The PRISMA diagram in Figure 1. below elucidates on the various inclusion and exclusion criterias for the research.

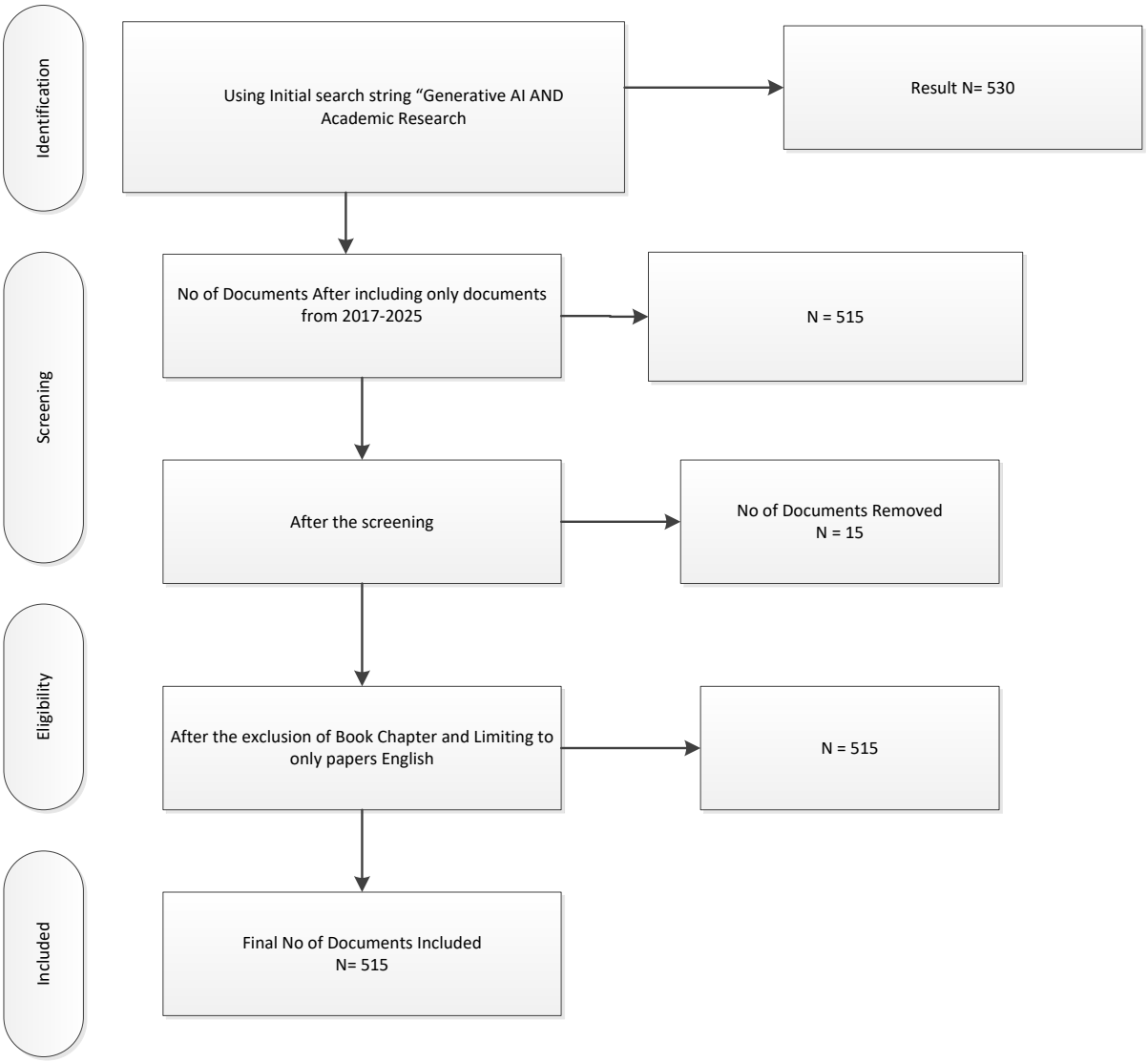

Figure 1. PRISMA diagram of the data inclusion and Exclusion flow.

Analysis

The co-authorship analysis revealed contributions from 1,234 organizations, although only 34 of these met the threshold of producing at least two documents. Despite this, the organizations were not interconnected, as illustrated in Figure 2, which highlights the limited collaboration among institutions. This finding underscores the current state of generative AI research, which primarily involves academic institutions such as universities, colleges and polytechnics, while revealing significant untapped potential for increased collaborative efforts. These gaps present an opportunity for fostering deeper partnerships and expanding research networks to accelerate advancements in AI applications.

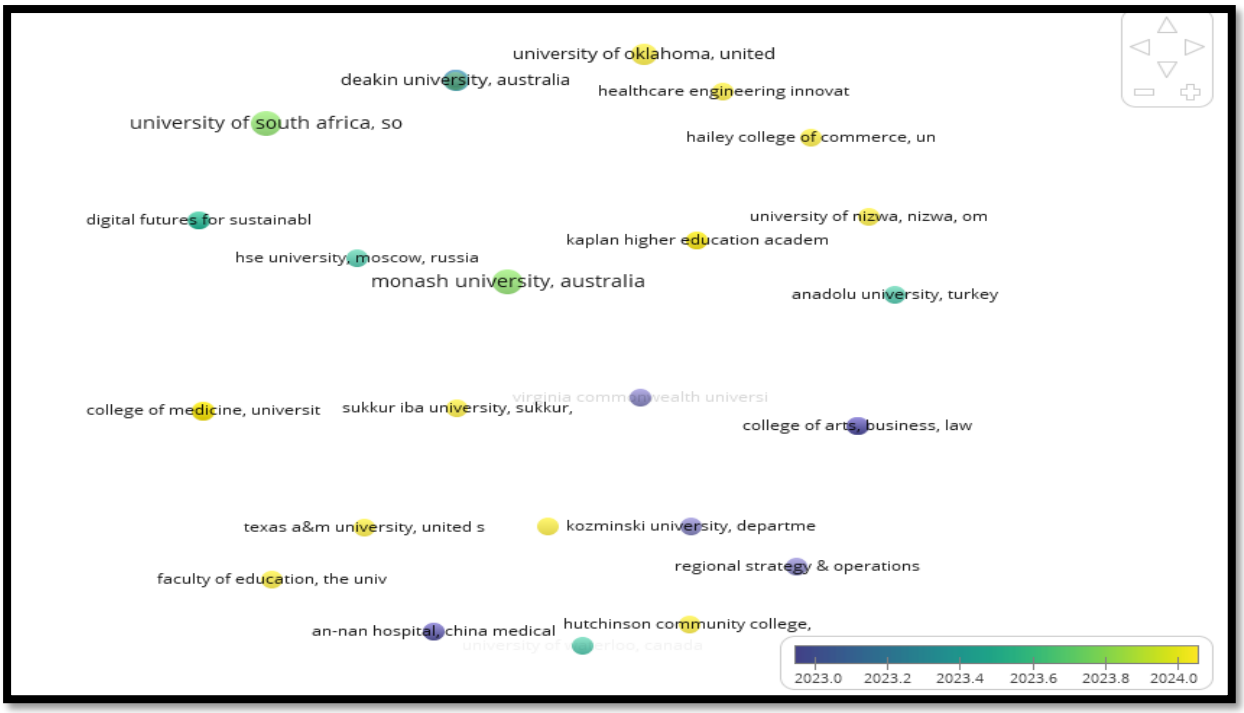

Figure 2. Co- authorship and Organization for Generative AI in Academic Research

C-authorship and Country

The analysis of Figure 2 depicts the 15 countries with the highest number of documents reveals varying levels of academic contributions, citation impact, and collaborative strength. The United States dominates with 122 documents and 1,197 citations, showcasing its leadership in generative AI research. Its total link strength of 61 highlights robust international collaboration. The United Kingdom follows with 54 documents and 858 citations but exhibits limited link strength (4), indicating less connectivity. India contributes 51 documents with 622 citations, alongside a link strength of 7, reflecting moderate collaboration.

Australia and China demonstrate significant impact with 50 documents (875 citations, link strength 35) and 43 documents (177 citations, link strength 42), respectively. Canada stands out with fewer documents (21) but high citations (592) and strong collaboration (31 link strength). Emerging contributors like Saudi Arabia and Spain show limited collaboration with 18 documents each and lower link strengths of 2 and 1, respectively. Singapore has notable academic impact with 15 documents, 761 citations, and a strong link strength of 30. Germany and Hong Kong, despite smaller document counts (13 each), demonstrate considerable collaboration (26 link strength each). South Africa (13 documents, 150 citations) excels in connectivity with a link strength of 37. Malaysia shows moderate academic engagement (13 documents, 204 citations, and link strength 4).

Consequently, this analysis highlights the dominance of North America, Europe, and Asia in generative AI research, with opportunities for strengthening collaborations among emerging regions in Africa.

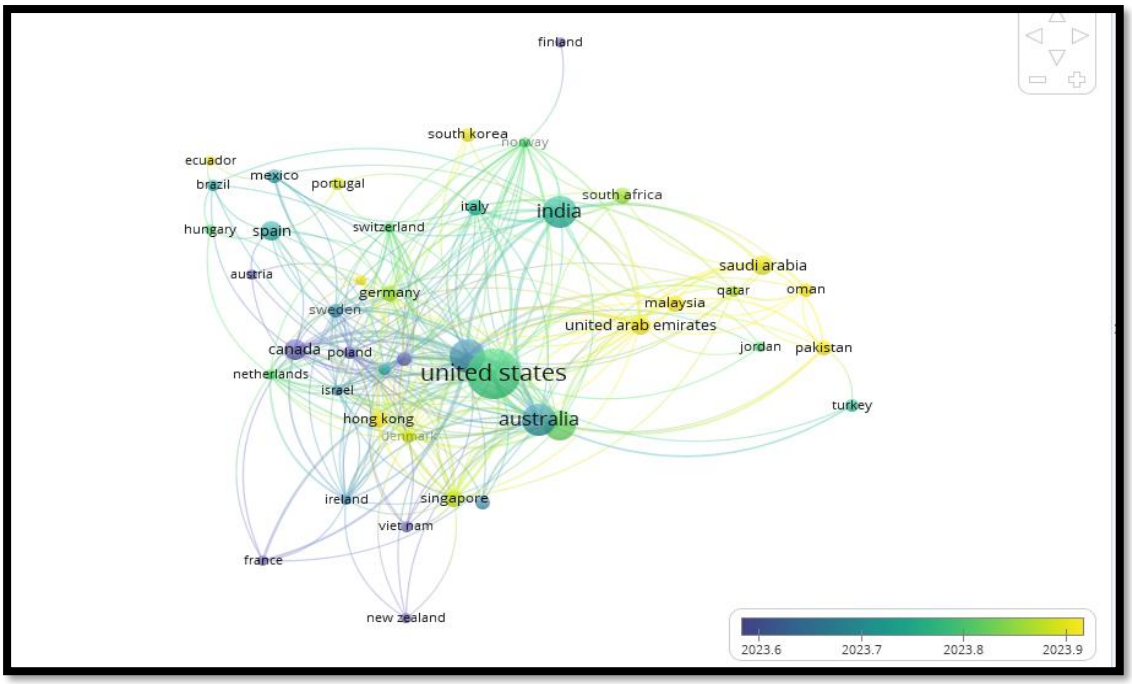

Figure 3. C-authorship and Country in AI Generative in Academic Research

Annual Scientific Production in Generative AI in Academic Research

Figure 4. outlines the yearly scientific production of articles related to Generative AI in academic research topic, spanning from 2017 to 2025. Initially, there were minimal publications, with only 1 article each in 2017 and 2019, and no publications in 2018, 2020, and 2022. A modest increase was observed in 2021 with 4 articles. However, a significant surge occurred in 2023 with the launch of ChatGPT and other generative AI tools, with 109 articles, followed by an exponential rise in 2024, reaching 383 articles. The trend shows a sharp decline in 2025, with only 12 articles recorded since it is just the beginning of the years. This data highlights a rapid growth phase in recent years, particularly between 2023 and 2024, reflecting heightened academic interest in the research area during that period.

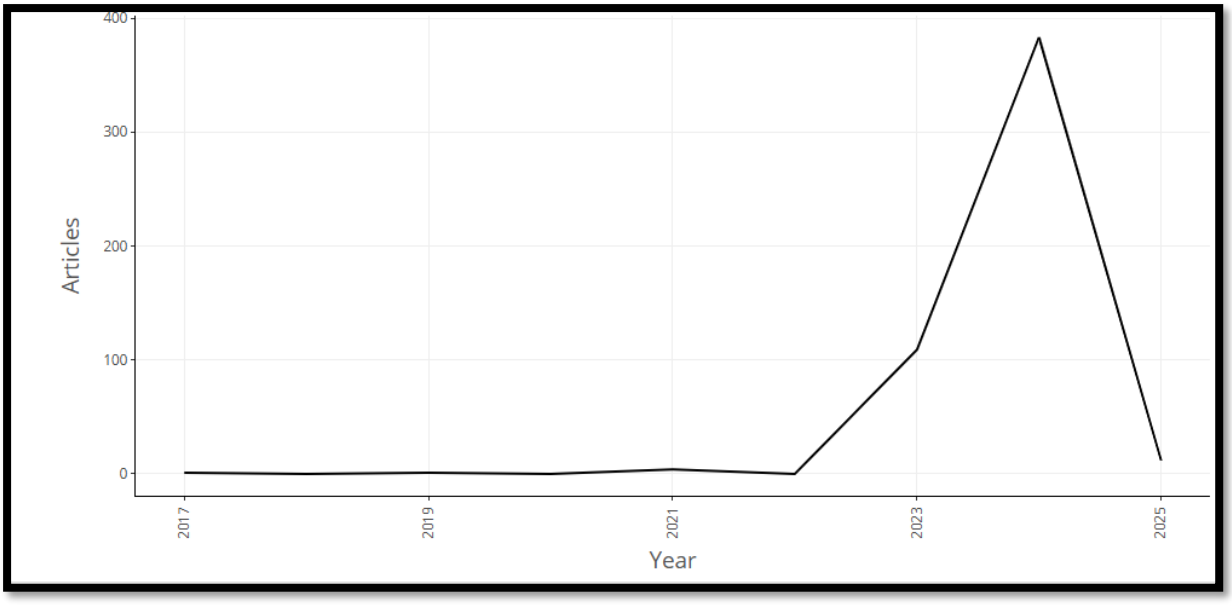

Figure 4. Annual Scientific Production in Generative AI in Academic Research

Average Citation per Year

The study provides insights into the academic performance of articles over the years from 2017 to 2025. It includes metrics such as the average number of citations per article (MeanTCperArt), the total number of articles (N), the average citations per year (MeanTCperYear), and the number of citable years for each publication year. In 2017, a single article had a high MeanTCperArt of 46.00, with 8 citable years, reflecting sustained impact. In 2019, the MeanTCperArt dropped to 4.00 with 6 citable years. By 2021, 4 articles achieved a MeanTCperArt of 10.00, with 4 citable years. A significant increase in publications occurred in 2023, with 109 articles averaging 38.90 citations per article and 19.45 citations per year over 2 citable years. In 2024, despite 383 articles being published, the MeanTCperArt dropped to 2.83 with only 1 citable year. By 2025, the metrics showed a steep decline, with a MeanTCperArt of 0.17 for 12 articles and no citable years. This data highlights fluctuations in academic output and impact, with a peak in 2023 followed by a decline in citation influence in subsequent years.

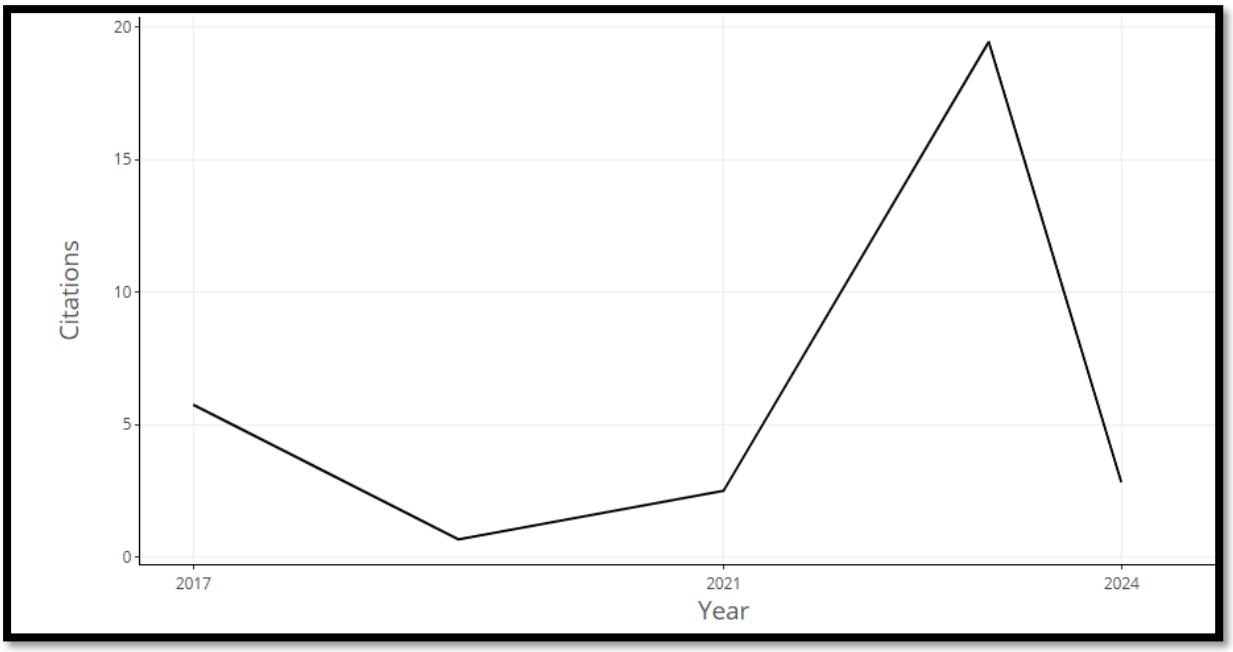

Figure 5. Average Citation per Year for Generative AI in Academic Research

Analysis of the Top 10 Most Productive Article Source in Generative AI Academic Research

The analysis of the top 10 sources of articles in generative AI academic research reveals a diverse set of journals and conference proceedings contributing significantly to the field. The Journal of Applied Learning and Teaching leads with 12 articles, showcasing its commitment to integrating innovative technologies into academic practices. Following closely is the ASEE Annual Conference and Exposition, Conference Proceedings, with 10 contributions, highlighting the importance of generative AI in engineering education. The ACM International Conference Proceeding Series and Education and Information Technologies each published 9 articles, emphasizing their role in advancing technology-driven educational strategies. Similarly, Computers and Education: Artificial Intelligence contributed 8 articles, focusing on AI applications in education. Other notable sources include Communications in Computer and Information Science with 7 articles, reflecting its influence in computational methodologies, and JMIR Medical Education, which adds 6 articles exploring AI in healthcare education. The

Australasian Journal of Educational Technology and Lecture Notes in Computer Science each provided 5 articles, contributing to interdisciplinary research. Lastly, Discover Education, with 4 articles, rounds out the list, showcasing its emerging role in the dissemination of AI-related educational research. This distribution indicates a rich, interdisciplinary interest in generative AI, particularly in education and technological innovation, fostering robust academic discourse.

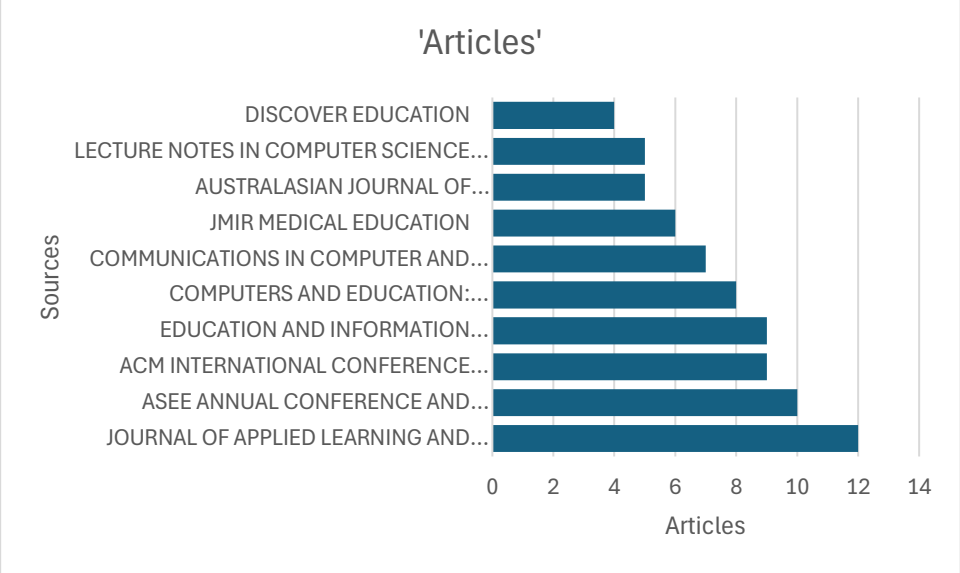

Figure 6. Most Relevant Source of Article for Generative AI in Academic Research

Most Relevant Authors

The dataset highlights the contribution of authors to research articles, showcasing their productivity in a specific domain. TAN S leads with the highest number of articles (7), demonstrating significant contributions to the research field. DE SILVA D and RUDOLPH J follow with 5 articles each, indicating strong engagement. DWIVEDI YK and MILLS N each contributed 4 articles, reflecting notable productivity. A group of five authors, including ALAHAKOON D, CHAN CKY, EL-AYOUBI M, GUPTA N, and KITTUR J, contributed 3 articles each, signifying a consistent but moderate level of output. This distribution suggests that a small number of authors are driving a majority of the research output, which is a common pattern in academic publishing.

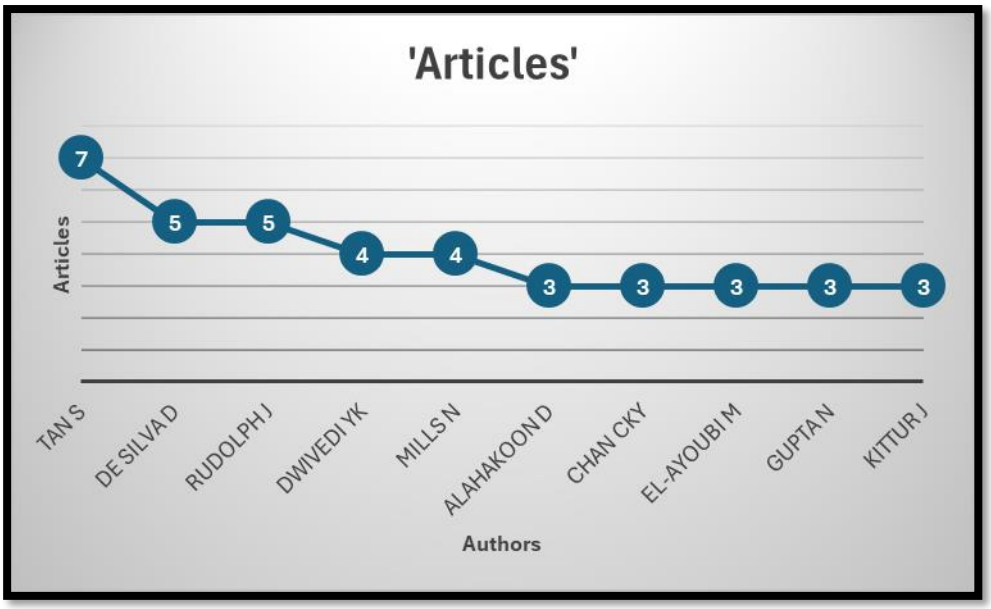

Figure 7. Most Relevant Authors in Generative AI in Academic Research

Conclusion

This study underscores the transformative impact of generative AI on academic research, as evidenced by its increasing prominence in scholarly discourse. The bibliometric analysis, utilizing tools such as Vosviewer, Excel, Biblioshiny, and R Studio, has revealed the multifaceted applications and research trends surrounding generative AI. The findings highlight a substantial growth trajectory from 2017 to 2025, emphasizing the pivotal role of generative AI in fostering innovation, enhancing academic productivity, and enabling interdisciplinary collaboration. However, the analysis also revealed critical gaps, including limited global collaboration among institutions and ethical challenges associated with algorithmic biases and data privacy. Addressing these issues is essential to fully realize the potential of generative AI in academia.

The study contributes to the literature by offering a comprehensive overview of the research landscape, identifying key thematic areas, and outlining collaboration patterns. These insights provide a foundation for future research efforts, equipping scholars and practitioners with a better understanding of the evolving academic ecosystem shaped by generative AI.

Similarly, it offers significant theoretical and contextual contributions to the academic discourse surrounding generative AI. By applying a bibliometric approach, it provides a systematic mapping of thematic trends and collaboration patterns, thereby deepening the theoretical understanding of how generative AI influences interdisciplinary research methodologies. The research contextualizes generative AI's role in reshaping academic practices, emphasizing its transformative potential in fostering innovation and enhancing productivity across domains such as Social Sciences, Computer Science, and Engineering. Furthermore, it identifies existing challenges such as ethical concerns and limited global collaboration while highlighting the opportunities for fostering international partnerships and sustainable practices. This dual focus on theoretical insights and contextual applications ensures that the findings enrich the body of knowledge and serve as a strategic guide for

future research and policy development, underlining the pivotal role of generative AI in advancing academic ecosystems.

Recommendations

To further advance the field, the following recommendations are proposed:

1. Promote Global Collaboration: Institutions and researchers should foster international partnerships to bridge gaps in global collaboration. Establishing interdisciplinary networks can facilitate knowledge sharing and innovation, leveraging diverse perspectives on generative AI applications.
2. Address Ethical Challenges: Researchers and policymakers must prioritize addressing ethical concerns such as algorithmic biases, data security, and privacy. Developing robust guidelines and ethical frameworks will ensure the responsible use of generative AI in academia.
3. Encourage Open Access and Data Sharing: Greater emphasis should be placed on open-access publications and data-sharing practices to democratize knowledge and foster inclusivity in AI research.
4. Expand Research Funding: Policymakers and funding agencies should increase investment in generative AI research to support exploratory studies, real-world applications, and the development of sustainable practices.
5. Focus on Interdisciplinary Applications: Scholars should explore the integration of generative AI in underrepresented fields to uncover novel applications and expand its impact beyond traditional domains.

By addressing these areas, the academic community can unlock the full potential of generative AI, driving innovation and ensuring its responsible integration into research and education.

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