

A COMPREHENSIVE SCIENTOMETRIC ANALYSIS FOR ARTIFICIAL INTELLIGENCE AND MANAGEMENT OF UNIVERSITY LIBRARIES

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Abstract

Artificial Intelligence (AI) technology has revolutionized several industries, including education to enhance research, teaching and learning. It serves as a key tool to automate library service and routine operations particularly in university contexts. The study conducted a comprehensive scientometric analysis to identify trends, patterns and mappings of research from a vast corpus of literature, focusing on publication year, document types, keywords, texts, and country. A seven-year Dataset was generated via a specialized tool - 'Dimensions AI' with a special search phrase and refined based on PRISMA-2020 guide for systematic review. A set of 244 eligible records were uploaded into VOSviewer for mapping and visualizations, Microsoft Excel and other tools for data analysis. The study revealed a significant increase in AI research in university libraries, with 61.07% publications in 2024; published peer-reviewed articles (34.02%) and conference paper (20.08%) populate the documents' type in the review; countries with collaborative research lead (34.43%) the number of the publications, followed by United States, China, United Kingdom on AI and library research. The study points to areas where AI research at university libraries is expanding, particularly in terms of inter-disciplinary utilization of AI technology, geographic coverage, and publications diversity. Finally, the study concludes and recommends to policy-makers and university library stakeholders and suggests for future research, the way to improve library

services.

Keywords: Artificial Intelligence; Management; University Libraries; Scientometric Analysis.

Introduction

Artificial Intelligence (AI) technology has tremendously enhanced various sectors, including higher education, where university libraries play an important role in supporting research, teaching, and learning (George & Wooden, 2023). Today, AI has emerged as a vital tool for modernizing library operations, offering innovative solutions to automate routine tasks, improve information retrieval, and enhance user services (Nachiappan, 2024). The technologies have enormous potential to streamline cataloguing, manage digital resources, and offer more interactive and personalized user experiences, thus fulfilling the changing demands of academic environments (Meesad & Mingkhwan, 2024a). Within African institutions, where libraries frequently confront constraints such as limited resources, personnel shortages, and rapidly growing information demands, adoption of AI brings both opportunities and complexities (Meesad & Mingkhwan, 2024b).

Pressure to publish, which has increased in recent years, may induce certain changes in the library literature as academic librarians work to meet this demand. The number of articles an author has written is the first criterion used to evaluate a researcher's output. scientometric studies are used to detect the pattern of publications, authorship, citations, and journal coverage with the intention of providing insight into the dynamics of the topic under examination (Enakrire & Oladokun, 2024; Lee, 2014).

Despite the potential of AI for academic libraries, its adoption in university libraries remains at an early stage, with varying levels of implementation across the continent. Existing research has mostly focused on AI in global library systems (Adetayo et al., 2025). The current study attempts to address this knowledge vacuum by undertaking a complete scientometric analysis of AI-related research in university libraries. Scientometric approaches are effective way to measure research outputs, identify significant authors and organizations, and track the thematic evolution of a study topic. To librarians and information management professionals - *"bibliometrics is a useful research method for selecting useful journals or evaluating authors."* (Adetayo et al., 2024).

This study examines scholarly publications to identify trends, collaborations, and research outcomes connected to AI's involvement in improving library services in Nigerian universities libraries. The study also looks at the keywords analysis and clusters in AI scholarly studies, indicating the field's underlying intellectual structure. The study aims to achieve the following objectives:

- i. To ascertain the global AI research trend in improving University Libraries.
- ii. To ascertain AI literature productivity (authorship, country and publications) University Libraries research.

A significant gap exists in exploring the specific patterns and impacts of AI in university library research, emphasizing the importance of this study.

Literature Review

AI is transforming a variety of industries, including university libraries, where it is increasingly being used to improve service delivery and satisfy the changing needs of academic research and learning (Enakrire & Oladokun, 2024; Okunlaya et al., 2022). AI applications in university libraries include online reference services, intelligent search engines, and chatbots, as well as the automation of mundane operations like classification, cataloguing and circulation (Praveenraj et al., 2025). These technologies enhance the speed of information processing and accuracy, minimize time spent on repetitive tasks scheduling and allow for effective information retrieval and management (Holtshouse, 2013; Kobayashi & Takeda, 2000). Similarly, the COVID-19 epidemic boosted the adoption of AI-driven solutions like as robots for book retrieval and AI-enhanced learning environments, emphasizing the need for AI integration in library systems (Ankamah et al., 2024; Hutson, 2024). Adoption of AI technology into university libraries in developing countries (Nigeria inclusive) still remains in infant stage, due to several internal and external environmental factors that militate its adoption.

Furthermore, the scholarly literature on the use of AI in boosting library services includes a variety of documents, mostly obtained from academic peer-reviewed journal articles, books and conference proceeding papers, published by reputable publication outlets, retrieved from specialized databases Scopus, Web of Science, PubMed, ScienceDirect (Rahmani, 2023). According to studies, journal articles as well as conference papers are now the most common sort of publication relating to AI adoption in university libraries research (Ankamah et al., 2024; Hossain et al., 2025; Milovanovic et al., 2025; Pinto et al., 2024).

Recent statistics show a large increase in AI-related publications in university libraries, especially since 2020. Bibliometric analyses suggest a growing interest in AI and machine learning applications in libraries, with an increasing number of research over the last several years (Jiang et al., 2025; Mupaikwa, 2025; Shahzad et al., 2024). It is evident that, almost 60% of articles on AI in library settings have been written in the last five years, indicating a rapid increase in academic output on this area (Budhwar et al., 2023; Hong et al., 2025; Maphosa & Maphosa, 2021; Yun et al., 2025).

The majority of AI publications in university libraries originate from the United States, India, and China, lead the world in AI research (Hong et al., 2025; Hossain et al., 2025; Islam et al., 2025). Studies confirm that Asia, in particular, makes a substantial contribution to the body of research on AI in libraries (Hossain et al., 2025; Jiang et al., 2025). Interestingly, despite 2022 having the highest number of publications (145,000 articles), 2018 still has the highest amount of citations (950,000), demonstrating that earlier efforts in AI-related library research have maintained substantial academic relevance (Islam et al., 2025; Meesad & Mingkhwan, 2024a). There exists the gap to explore more about the specific patterns and impacts of AI in university libraries.

This work attempts to address this knowledge gap by undertaking a complete bibliometric analysis of AI-related research in global university libraries. Scientometric approaches are an effective way to measure research outputs, identify significant authors and organizations, and track the evolution of this study. This study examines publications to identify trends, collaborations and

research outcomes connected to AI adoption and AI's involvement in improving library services. The study also looks at the most commonly used trends, document, keywords and country collaborations in AI research, indicating the field's underlying intellectual structure. This study targets to bridge the gap by providing a detailed bibliometric analysis on the role of AI in transforming library operations within universities.

Methodology

This study designed to conduct a scientometric analysis to examine trends, and the productivity of AI research in improving universities library offerings. Scientometric analysis is considered as a quantitative tool for investigating academic literature, identifies prominent publications, authors, as well as institutions and organizing the intellectual structure of an area of research (Ankamah et al., 2024; Schotten et al., 2017).

The robust AI tool 'Dimensions' for data generation was utilized to retrieve current scholarly publications for comprehensive coverage in the use of AI to improve operations of university libraries for global coverage. For precision, a special search phrase was framed using a Boolean operator (AND) to guide the data generation as: "Artificial Intelligence" and "University Librar*". Similarly, the advance search covered all areas of AI application in improving university libraries operation from the year 2018 to 31st December 2024. The search exercise was conducted on Saturday, 4th January, 2025 by 10:14 GMT+1. Because of the robustness of the research area that deals with AI in Universities as well as the data generation tool, publications of the year 2025 were also retrieved and used in this study.

A total of 318 publications were retrieved. After careful examination of the data to ensure perfection in the dataset for analysis 74 records were removed on account of duplication, incomplete information and non-English publications. Therefore, a total of 244 records were found to be relevant and ready for analysis. The details of the data generation and screening procedure was summarized and shown in Fig. 1 based on PRISMA_2020 (Preferred Reporting Items for Systematic reviews and Meta-Analyses) updated reporting guideline (Page et al., 2021). Finally, in the data processing, analysis and visualization, Microsoft Word, Microsoft Excel, Endnote X7 and VOSviewer software were utilized, effectively.

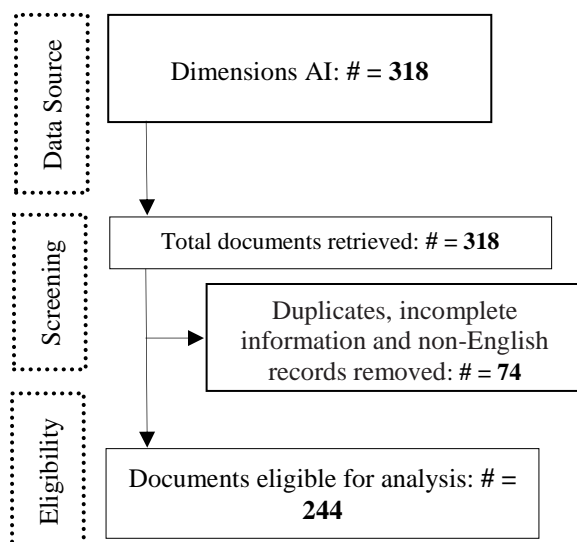


Fig. 1: PRISMA_2020 Framework

Results

The organization of this study is presented as follows: yearly publication trend, document type analysis, keyword analysis, Text analysis and country analysis.

Yearly Publications

Figure 2 portrayed the distribution of yearly publications from 2018 to 2025. The graph showed an increasing proliferation in publications within the most recent years, indicating the continuous adoption of AI technology for information dissemination and management within the University context. The most significant year that recorded high number of publications is 2024 with frequency and percentage of 149 (61.07%) publications, followed by 2023, 2025 then 2022 with corresponding frequency and percentage of 32 (13.11%), 29 (11.89%) and 24 (9.84%). On the other end, the earlier four years recorded the lower number of publications in 2021, 2018 followed by 2019. The three active years, have recorded the publication frequency of 5, 4 and 1 with percentages of 2.05%, 1.64% and 0.41% respectively. Surprisingly, the year 2020 remained inactive, according to the study review.

Overall, the yearly publications distribution reflects a positive and accelerating trend in AI research, which is helping to improve services that university libraries offered to users. This significant growth did not only represent improved academic output, but also demonstrates university libraries' continuous interest in adopting AI-driven solutions to deliver quality services.

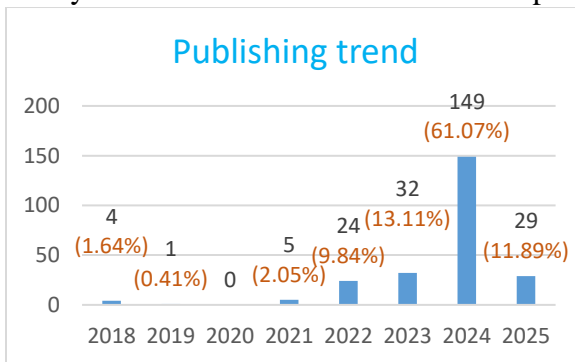


Fig. 2: Yearly Publishing trend

Document type analysis

Table 1 holds the account of different categories of publications from the sourced data. The records showed that peer-review articles recorded the highest (83) number and frequency (34.02%) of publications. Similarly, the frequency and percentage of the publications was followed by Proceeding 49 (20.08%), Edited Book 46 (18.85%), Chapter 34 (13.93%), Monograph 19 (7.79%), Thesis 9 (3.69%) and Preprint 4 (1.64%).

This arrangement of distribution of the document highlighted how researchers participate actively in a range of scholarly activities, with a particular focus on articles and conference

presentations. It is obvious that conference publications, edited books, chapter contribution, monographs, thesis or dissertations and preprints were published than peer-reviewed journal articles.

Table 1: Document type

| Document | Frequency | Percentage |
|-----------------|------------------|-------------------|
| Article | 83 | 34.02 |
| Proceeding | 49 | 20.08 |
| Edited | 46 | 18.85 |
| Book | | |
| Chapter | 34 | 13.93 |
| Monograph | 19 | 7.79 |
| Thesis | 9 | 3.69 |
| Preprint | 4 | 1.64 |
| Total | 244 | 100.00 |

Authors, 2025

Keywords analysis

Table 2 summarizes the keyword analysis on the utilization of AI amongst university libraries. The keywords were grouped into thirty-two (32) sub-themes. Libraries keyword was found to be most popular category, as appeared up to 257 times and took 15.06 percent of the total keywords frequency, followed by university libraries and AI with frequencies and percentage of 195 (11.42%) and 121 (7.09%) respectively. The frequency of less than hundred and single digit percentage were accounted by Academic Libraries 96 (5.62%), Machine Learning 72 (4.22%), University Library 71 (4.16%), GPT 68 (3.98%), Library 67 (3.93%), Reinforcement Learning 61 (3.57%), Chatbot 53 (3.10%), Information Services 51 (2.99%), Open AI 46 (2.69%), Students 43 (2.52%), Library Services 42 (2.46%), Information Management 41 (2.40%), Algorithm 41 (2.40%), Natural Language Processing 39 (2.28%), Generative AI 37 (2.17%), Learning Systems 37 (2.17%), Recommender Systems 36 (2.11%), Supervising Learning 32 (1.87%), Data Mining Technology 31 (1.82%), Image Processing 26 (1.52%), Data Science 25 (1.46%), AI Ethics 21 (1.23%), Big Data 21 (1.23%), Sentiment Analysis 19 (1.11%), Cognitive Computing 16 (0.94%), Deep Learning 16 (0.94%), Digital Libraries 11 (0.64%), Computer vision 8 (0.47%) and Neural Network 7 (0.41%).

Table 2: Keyword analysis

| Keyword | Publication | Percentage |
|----------------------|--------------------|-------------------|
| Libraries | 257 | 15.06 |
| University Libraries | 195 | 11.42 |
| AI | 121 | 7.09 |
| Academic Libraries | 96 | 5.62 |
| Machine Learning | 72 | 4.22 |
| University Library | 71 | 4.16 |
| GPT | 68 | 3.98 |
| Library | 67 | 3.93 |

| | | |
|---|--------------|---------------|
| Reinforcement Learning | 61 | 3.57 |
| Chatbot Information Services | 53 | 3.10 |
| Open AI Students | 51 | 2.99 |
| Library Services Information Management | 46 | 2.69 |
| Algorithm | 43 | 2.52 |
| Natural Language Processing | 42 | 2.46 |
| Generative AI Learning Systems | 41 | 2.40 |
| Recommender Systems | 41 | 2.40 |
| Supervising Learning | 39 | 2.28 |
| Data Mining Technology | 37 | 2.17 |
| Image Processing | 37 | 2.17 |
| Data Science | 36 | 2.11 |
| AI Ethics | 32 | 1.87 |
| Big Data | 31 | 1.82 |
| Sentiment Analysis | 26 | 1.52 |
| Cognitive Computing | 25 | 1.46 |
| Deep Learning | 21 | 1.23 |
| Digital Libraries | 21 | 1.23 |
| Computer vision | 19 | 1.11 |
| Neural Network | 16 | 0.94 |
| Total | 1,707 | 100.00 |

Authors, 2025

Text analysis

Figure 3 portrayed network visualization of title and abstract texts that indicates comprehensive relationship analysis amongst popular texts to describe the AI technology adoption research in the management universities libraries. The network visualization also presents the trends of linkages (co-occurrence) texts with the cornucopia of literature. Furthermore, the network map aggregates a disperse of 89 texts, organized into three (3) clear clusters highlighted colours (red, green and blue). The network nodes were interconnected based on research relationships with 1,967 total links and total link strength of 4,348. The network density indicates the strength of the

relationships amongst different components of research in the area of artificial intelligence applicable to the university libraries resource management.

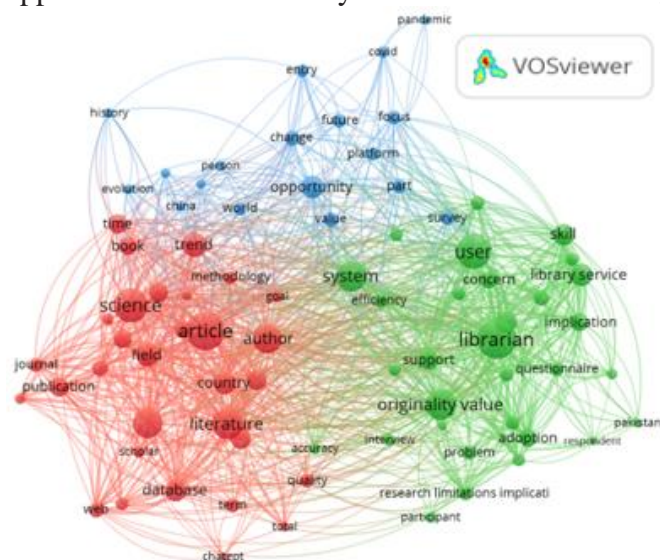


Fig. 3: Network visualization of title and abstract texts

Publication country analysis

Table 3 portrayed population distribution by countries with respect to AI adoption and management of libraries amongst universities, globally. Research collaborations amongst authors from different countries, account for highest number of publications with the total frequency and percentage of 84 and 34.43 percent respectively. Among the prominent researches by stand-alone countries, United States 34 (13.93%), China 22 (9.02%), United Kingdom 14 (5.74%) and India 13 (5.33%) accounted for reasonable number of publications. Australia and Iran have both accounted for 6 (2.46%) publications, followed by Canada, Nigeria and Pakistan that accounted for 5 (2.05%) publications. Consequently, Poland and Thailand have 4 (1.64%) publications higher than Indonesia, South Africa and Tanzania that each recorded 3 (1.23%) number of publications.

On the other hand, countries that recorded 2 (0.82%) publication are; Germany, Italy, Norway, Philippines, Russia, Taiwan and Turkey. Finally, the study data revealed that nineteen (19) countries only had stand-alone AI research on the management of university libraries which include Austria, Bangladesh, Brazil, Bulgaria, Chile, Denmark, Finland, Ghana, Hungary, Ireland, Jamaica, Jordan, Malaysia, Paraguay, Qatar, Slovenia, Spain, Sri Lanka and Ukraine with only 1 (0.41%) publication.

The results demonstrate that collaborative AI research is highly embraced on the management of universities than individual research by counties. This might not be unconnected to the fact that universities are trying to exhibit their roles to maintain globe visibility. Finally, the visibility is upheld mostly by developed as well as developing countries.

Table 3: Publications by countries

| Country | Publication | Percentage | Country | Publication | Percentage |
|----------------|-------------|------------|--------------|-------------|---------------|
| Others | 84 | 34.43 | Turkey | 2 | 0.82 |
| United States | 34 | 13.93 | Austria | 1 | 0.41 |
| China | 22 | 9.02 | Bangladesh | 1 | 0.41 |
| United Kingdom | 14 | 5.74 | Brazil | 1 | 0.41 |
| India | 13 | 5.33 | Bulgaria | 1 | 0.41 |
| Australia | 6 | 2.46 | Chile | 1 | 0.41 |
| Iran | 6 | 2.46 | Denmark | 1 | 0.41 |
| Canada | 5 | 2.05 | Finland | 1 | 0.41 |
| Nigeria | 5 | 2.05 | Ghana | 1 | 0.41 |
| Pakistan | 5 | 2.05 | Hungary | 1 | 0.41 |
| Poland | 4 | 1.64 | Ireland | 1 | 0.41 |
| Thailand | 4 | 1.64 | Jamaica | 1 | 0.41 |
| Indonesia | 3 | 1.23 | Jordan | 1 | 0.41 |
| South Africa | 3 | 1.23 | Malaysia | 1 | 0.41 |
| Tanzania | 3 | 1.23 | Paraguay | 1 | 0.41 |
| Germany | 2 | 0.82 | Qatar | 1 | 0.41 |
| Italy | 2 | 0.82 | Slovenia | 1 | 0.41 |
| Norway | 2 | 0.82 | Spain | 1 | 0.41 |
| Philippines | 2 | 0.82 | Sri Lanka | 1 | 0.41 |
| Russia | 2 | 0.82 | Ukraine | 1 | 0.41 |
| Taiwan | 2 | 0.82 | Total | 244 | 100.00 |

Authors, 2025

Findings

The findings from the results of this study is consistent to the existing body of literature that complement both the knowledge and characteristics in several folds. The study reveals a significant increase in AI research in university libraries, with 61.07% publications in 2024, indicating a positive trend in AI research and a continuous interest in adopting AI-driven solutions for quality services (Arwanto & Wigati, 2024; Hutson, 2024; Song & Wang, 2020). This is caused by COVID-19 pandemic that has accelerated the adoption of AI tools in libraries, leading to a surge in AI research and publication outputs, indicating a rapidly evolving field with increasing academic interest.

Secondly, the study found that, published peer-reviewed articles (34.02%) and conference paper (20.08%) populate the documents' type in the review. This finding is enormously consistent with previous findings (Enakrire & Oladokun, 2024; Jiang et al., 2025; Jiddah et al., 2024; Yun et al., 2025).

Thirdly, with respect to the publications country analysis, countries with collaborative research lead (34.43%) the number of the publications, followed by United States, China, United Kingdom on AI and library research. This is consistent to the findings of (George & Wooden, 2023; Islam

et al., 2025). However, global collaboration is needed to improve AI research in underrepresented regions.

Finally, the findings of this study not only confirm much of the current literature, but also point to areas where AI research at university libraries is expanding, particularly in terms of interdisciplinary utilization of AI technology, geographic coverage and publications diversity.

Conclusions

This study conducts an exhaustive bibliometric review of the role of artificial intelligence (AI) in improving library services in university libraries, with a particular emphasis on yearly trends, document types analysis, keyword analysis, text analysis and country contributions. The findings show that journal articles and conference papers dominate scholarly outputs, with a clear increase in AI-related publications with the recent six years. Furthermore, the findings demonstrate the increased interest and investment in AI technology to improve the efficiency and quality of university library services, particularly in automating repetitive jobs, simplifying information retrieval, and assisting academic research. Authors on collaboration and from the United States, and China were among the most influential contributors to AI research in libraries, underlining the global nature of this emerging field.

Consequently, the Study sharpen understanding of AI utilization amongst university libraries, aimed at providing a comprehensive dataset that maps development of research in this area. The study provides valuable insights into the publications trends and types, keywords analysis and global spread of authorships on AI research with the goal to transforming university libraries. The study finally highlighted the importance of AI in addressing the evolutionary needs of university libraries, in developing countries like Nigeria, where the pace for harnessing AI driven potential is gradual.

Recommendations

The study is characterized to have covered the period of seven-years (2018-2024) for data generation, use of specialized AI tool (Dimensions AI) to generate data for the analysis and VOSviewer and other Microsoft tools for data processing. On the premise of this, the study offered the following recommendations

The scientometric analysis was conducted on the utilization of AI tools and management of university libraries, clears the ground for future studies. Firstly, future studies should be conducted on a specific AI technology impact such as user behaviours on information retrieval within libraries of universities. Studying the efficiency and effectiveness of AI technology tools such as open AI, AI ethics, recommender systems, machine learning, deep learning, supervising learning, natural language processing, chatbots etc, can go a long way in providing quality services and effective management of university libraries.

Secondly, amongst the leading challenge of digital technology today, is lack of comprehensive laws governing the infringement of rights that occur from borderless locations. Therefore, a comparative study is needed on the level of AI adoptions and management of university libraries of developed and developing countries that could lead to robust fertilization, synchronization and collaborations of technology and idea.

Finally, future studies can expand the time coverage beyond the seven years covered by this study, utilize AI technology tools for data generations and different/more software tools for data

analysis. This could help to leverage on the shortcoming on this study that can lead to more robust findings of scientometric study of this nature.

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