

Bibliometric Analysis of Artificial Intelligence Applications in Library Science

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Abstract: The fast development of Artificial Intelligence technology has revolutionized library science and information management. The following work is an overview of bibliometric studies conducted on the use of Artificial Intelligence in Library Science from 2010 to 2024. Bibliometric data for this paper were obtained through the Dimensions database, with 2967 research articles being analyzed using Microsoft Excel and VOSviewer. The analysis focused on annual trends in publications, high-impact journals, prolific authors, countries' contributions, and citations. The findings showed an impressive growth in the number of publications during the period under consideration, especially after 2017. This trend indicates that there is an increased research interest in Artificial Intelligence technologies in library and information sciences. The major contributors to research on Artificial Intelligence technologies included China and the USA, while the main journal publications included *Scientometrics* and *Journal of the Association for Information Science and Technology*. Results indicate how Artificial Intelligence is becoming an integral part of libraries today and emphasize the worldwide growth of studies in this field. These results will be helpful to determine future research directions related to Artificial Intelligence within the scope of Library Science.

Index terms: Artificial Intelligence; Library Science; Bibliometric Analysis; Research Trends; Digital Libraries; Information Retrieval

I. INTRODUCTION

The fast growth of electronics has changed the basic idea of an old library system into what we refer to as a present library system. Presently, a library system acts as a place to efficiently obtain all types of information or knowledge that are available. One type of technology that is helping libraries achieve their goals of improving service levels, user experience, and the automation of processes is called artificial intelligence (AI). AI includes technologies such as machine learning, natural language processing and expert systems, which are used more and more in a library setting as a way to catalogue, classify, retrieve information and assist users of the library in finding their needed resources. [6] [24]

Globally, libraries are taking advantage of advancing technology including AI to enhance their levels of service and operate more efficiently. Library employees can use AI-based chatbots to quickly respond to patron inquiries [7]. Libraries are also using machine learning algorithms to make personalized recommendations for users in terms of physical materials available to them at their library location(s) or virtually. More broadly, the integration of AI into Library Science is providing new opportunities for innovative developments and for scholarly research in the field of Library and Information Science.

In recent times, the quantity of research articles regarding AI use in libraries has risen dramatically [23]. Researchers have been studying an array of areas related to AI, such as automating library services, managing digital libraries, and creating smarter ways of retrieving information. With so much growth in the field, we now need to look at the research trends within this area, as well as determine what new areas of study may arise.

A bibliometric analysis is one of the most often employed techniques for evaluating scientific publications [2] [14] [16] and identifying trends in research. This type of analysis provides quantitative measurements of the overall volume of publications, collaboration between authors, and the extent to which a researcher has been cited. Analysis of bibliographic data allows researchers to see how their area of study has progressed over time, identify major researchers in their field, and describe trends within the area of study.

This paper is aimed at providing a bibliometric analysis of the use of Artificial Intelligence within the field of Library & Information Science; specifically, it will examine the patterns in authorship, trends of publication, and look at new avenues of research between 2010 and 2024. A comprehensive view of the research being conducted in this area, which is continuously growing, will be provided by this paper.

II RESEARCH OBJECTIVES

Starting in 2010 and continuing through 2024 will be the focus of this study. The goal of the research is to determine the trends and patterns, the growth of research in Artificial Intelligence and its applications, the number of scholarly articles published and the journals, authors, and countries that produce this research. Bibliometrics will be used to perform the analysis of scientific research using citation patterns to determine the most important articles in Artificial Intelligence research in Library and Information Science. The research will further explore the distribution of research worldwide and provide guidance for future research in AI-related technologies and modern day library systems.

III METHODOLOGY

Using bibliometric analysis, this research explores trends in the use of Artificial Intelligence (AI) in Library Science from 2010 – 2024 [2]. All relevant keywords related to AI and Library Science were extracted from the Scopus database. Related records were exported to a CSV file and contained bibliographic information (author names, titles, keywords, institutions, and citations).

Using VOSviewer and Microsoft Excel, bibliometric indicators such as trends in publishing, authorship patterns, citation analysis, and co-occurrence (between keywords) were analyzed. Visualization techniques were utilized to identify patterns of research, cooperation networks, and emerging themes of research in the area.

IV DATA COLLECTION

The bibliographic information used in this research was gathered from the Dimensions database, which is an established source for academic articles covering all areas of scholarship [8]. This source was selected because of the breadth of peer-reviewed literature available, as well as its ability to serve as a reliable source for conducting bibliometric analysis. The search terms used to generate the list of articles are: the terms “artificial intelligence,” “machine learning,” and “library,” and all articles published from 2010 to 2024 were included in the search results. Due to the limitations placed on exporting files from Dimensions, the data were downloaded from Dimensions in multiple batches based on a successive series of publication years. Once all files had been downloaded, the files were combined into one file and duplicate articles were eliminated through the use of the DOI and title records. Following this process, a total of 2967 articles were used for the final analysis. The collected data were analyzed using Microsoft Excel and VOSviewer to assist in identifying areas of research, networking and citation impact studies.

V. RESULTS AND ANALYSIS OF BIBLIOMETRIC INDICATORS

Table 1: Annual Publication Trend

Year	No. of Publications
2010	91
2011	90
2012	122
2013	112
2014	123
2015	120
2016	130
2017	192
2018	175
2019	195
2020	211
2021	289
2022	311
2023	371
2024	430
PubYear	5
Grand Total	2967

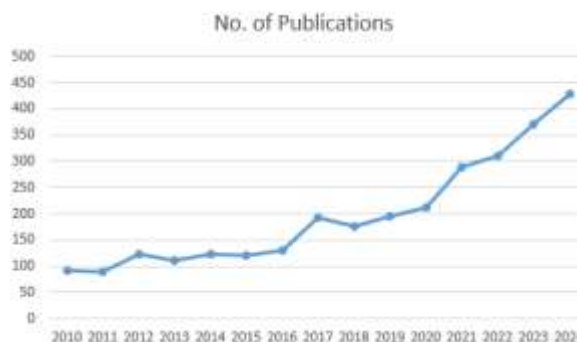


Figure 1: Year-wise Distribution of Publications (2010–2024)

The number of things written about Artificial Intelligence in libraries is going up every year. From 2010 to 2024 people have written more and more about using Artificial Intelligence in Library Science. In the few years there has been a big jump in the number of publications about Artificial Intelligence. This shows that libraries are starting to use Artificial Intelligence a lot for things like digital libraries and helping people find information. It is clear that people are getting more interested, in Artificial Intelligence and that the technology is getting better and better in this field of Artificial Intelligence.

Table 2. Top 10 Journals Publishing Research on Artificial Intelligence Applications in Library Science (2010–2024)

Rank	Journal Name	Number of Publications
1	Scientometrics	275
2	Journal of the Association for Information Science and Technology	131
3	Knowledge Organization	95
4	Journal of Informetrics	92
5	Library Hi Tech	82
6	Journal of Documentation	81
7	Information Processing & Management	75
8	The Electronic Library	67
9	Journal of Information Science	66
10	International Journal on Digital Libraries	59

Table 2 shows the journals that published research on Artificial Intelligence in Library Science from 2010 to 2024. The results show that Scientometrics published the articles, 275 to be exact. The Journal of the Association for Information Science and Technology came second with 131 publications. Other notable journals in this field are Knowledge Organization, Journal of Informetrics and Library Hi Tech. Artificial Intelligence research in Library and Information Science is spread across journals, [4] which shows how it draws from different fields. Scientometrics and Artificial Intelligence are areas here with many journals contributing to Artificial Intelligence applications, in Library Science.

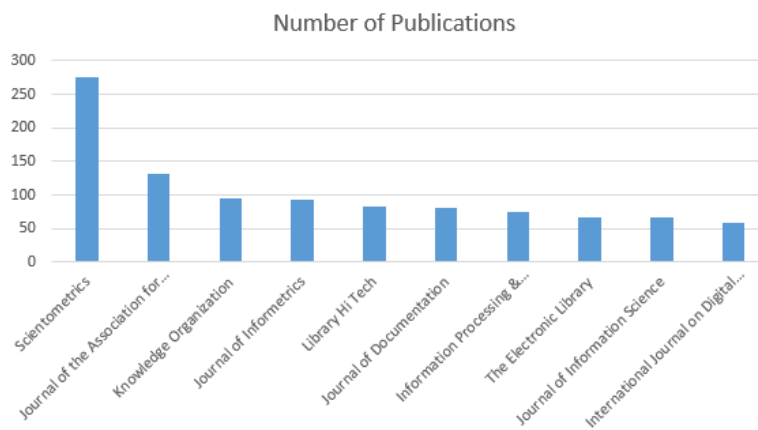


Figure 2. Leading Journals in AI Applications in Library Science (2010–2024)

Table 3. Top 10 Authors Publishing Research on Artificial Intelligence Applications in Library Science (2010–2024)

Rank	Author Name	Number of Publications
1	Song, Min	32
2	Ding, Ying	25
3	Zhang, Chengzhi	21
4	Afzal, Muhammad Tanvir	18
5	Lu, Wei	17
6	Bu, Yi	16
7	Hjørland, Birger	15
8	Mayr, Philipp	14
9	Liu, Xiaozhong	13
10	Yan, Erjia	13

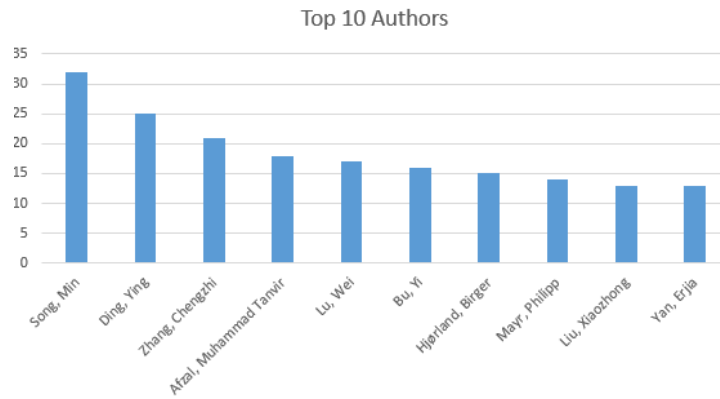


Figure 3. Leading Authors in AI Applications in Library Science (2010–2024)

Table 3 shows us the authors who have written the most about Artificial Intelligence applications in Library Science from 2010 to 2024. We can see that Song Min is the author who has written the most with 32 papers then comes Ding, Ying with 25 papers and Zhang, Chengzhi with 21 papers. When we look at how papers each author has written we find that just a few researchers are doing a lot of the work on Artificial Intelligence research in Library and Information Science and Artificial Intelligence is really important, in this field. Artificial Intelligence is a part of what these authors are studying.

Table 4. Top 10 Countries Contributing to Research on Artificial Intelligence Applications in Library Science (2010–2024)

Rank	Country	Number of Publications
1	China	1516
2	USA	1136
3	Germany	396
4	India	395
5	Spain	301
6	Pakistan	250
7	Italy	221
8	Iran	186
9	Canada	156
10	Taiwan	151

Figure 4: Leading Countries in AI Applications in Library Science (2010–2024)



The way research on Artificial Intelligence is spread across the world shows that people over the globe are working on Artificial Intelligence applications in libraries. When we look at the countries where this research is being done China and the United States are doing the work on Artificial Intelligence applications in Library Science. They are followed by India, the United Kingdom and Germany who are also doing a lot of research on Artificial Intelligence. This tells us that people from countries are working together on Artificial Intelligence projects. It also shows that libraries everywhere are starting to use Artificial Intelligence technologies in their work and research, on Library Science and Artificial Intelligence.

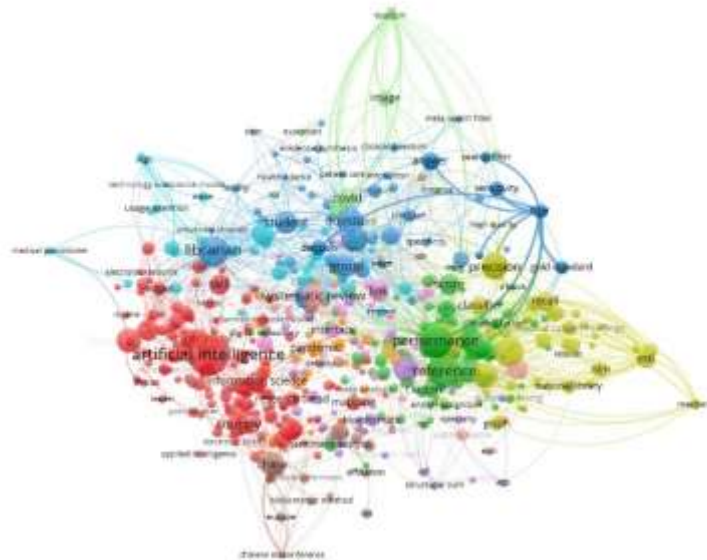


Figure 6: Keyword co-occurrence analysis

Looking at figure 6 we can see that the keyword co-occurrence analysis found some groups of research that are about artificial intelligence, information science, performance evaluation and information retrieval. The term artificial intelligence is, in the middle, which shows that artificial intelligence plays a part in the research area. Artificial intelligence is the thing that connects all these groups.

VI. DISCUSSION

The bibliometric study conducted for this paper has explored the research area of Applications of Artificial Intelligence in Library Science between the years 2010 and 2024. From the results obtained through the research, there has been substantial growth in terms of publications during the years considered in the study. There has been an increase in the number of publications from 91 publications in 2010 to 430 publications in 2024. This shows that there has been significant research focus on the use of Artificial Intelligence technologies in libraries.

Analysis of leading journals reveals that the studies conducted in this area are largely published in leading Library and Information Science and information science journals. These journals include *Scientometrics*, *Journal of the Association for Information Science and Technology*, and *Library Hi Tech*. The pattern of publications suggests that the field of study in Artificial Intelligence is highly interdisciplinary in nature, integrating concepts from library science, information science, and computer science.

Author productivity analysis reveals that only a few researchers contribute to the majority of the published papers in the field. The finding corroborates bibliometric laws that state that productive scientific activity lies within a smaller number of researchers. The collaborative author network also highlights the increasing need for cooperation among various researchers in AI technology.

The country-wise analysis reveals that the publications are spread throughout the world. Two prominent countries identified from the study are China and the USA, which emerge as the most prolific in publishing papers on Artificial Intelligence. Besides China and the USA, other nations like India, Germany, and Spain also contribute significantly to research activities.

Through citation analysis, it was found out that there are several publications that played important roles in forming the current status of the application of Artificial Intelligence in Library Science. These well-cited papers provide a solid foundation for future research and prove the academic maturity of the subject area.

Thus, it can be stated that Artificial Intelligence is an inevitable part of contemporary libraries.

VII. CONCLUSION

In this bibliometric research, a comprehensive examination of scientific literature associated with the use of Artificial Intelligence in Library Science for the time frame ranging from 2010 to 2024 was performed using the information retrieved from the Dimensions database. The sample consisted of 2967 scholarly papers to determine the dynamics of research, author productivity, journal productivity, country participation, and citations.

According to the results of this research, there has been a considerable increase in scientific output within the time frame of interest, particularly towards its end. The cause of this phenomenon can be attributed to the major significance of Artificial Intelligence technologies in transforming library practices and information management.

The present study highlights the global application of Artificial Intelligence in library operations and the need for more research in collaboration among scholars, librarians, and information scientists. AI technology can help in improving productivity, enhancing customer satisfaction, and decision-making processes based on evidence in information services.

Potential research areas for future researchers may include intelligent digital libraries, automated cataloguing, recommender systems, and library management using data analysis. The current paper provides a great deal of insight into future studies on AI in library science.

Limitations of the Study

Some limitations were identified for this study, and these should be considered while interpreting the results. Firstly, the data utilized for conducting the analysis was collected from just one bibliographic database, and thus there could have been studies published in other bibliographic databases. The second limitation refers to the bibliometric indicators used for this purpose (e.g., number of publications and citations), as these cannot assess the quality of scientific research. Nonetheless, the findings reveal the research trends related to AI in Library Science.

Data Availability

The information analyzed in this paper was obtained from the Dimensions database. The data set used can be provided by the corresponding author upon reasonable request.

REFERENCES

1. Chen, C. (2017). Science mapping: A systematic review of the literature. *Journal of Data and Information Science*, 2(2), 1–40.
2. Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296.
3. Ellegaard, O., & Wallin, J. A. (2015). The bibliometric analysis of scholarly production: How great is the impact? *Scientometrics*, 105(3), 1809–1831.
4. Hjørland, B. (2013). Citation analysis: A social and dynamic approach to knowledge organization. *Information Processing & Management*, 49(6), 1313–1325.
5. Hood, W. W., & Wilson, C. S. (2001). The literature of bibliometrics, scientometrics, and informetrics. *Scientometrics*, 52(2), 291–314.
6. Khan, A., Alotaibi, F. M., & Hussain, S. (2022). Applications of artificial intelligence in libraries: A systematic review. *Library Hi Tech*, 40(2), 451–468.
7. Kumar, S., & Singh, M. (2020). Artificial intelligence in libraries: A new approach to information services. *The Electronic Library*, 38(5/6), 1047–1063.
8. Liu, W. (2015). The changing role of the Web of Science in the evaluation of scholarly output. *Scientometrics*, 106(1), 1–13.
9. Liu, Z., Yin, Y., Liu, W., & Dunford, M. (2015). Visualizing the intellectual structure and evolution of innovation systems research. *Scientometrics*, 103(1), 135–158.
10. Moral-Muñoz, J. A., Herrera-Viedma, E., Santisteban-Espejo, A., & Cobo, M. J. (2020). Software tools for conducting bibliometric analysis in science: An up-to-date review. *El Profesional de la Información*, 29(1), e290103.
11. Noruzi, A. (2006). Application of RSS to library services: A review of the literature. *The Electronic Library*, 24(4), 563–568.
12. Pal, A., & Das, S. (2021). Artificial intelligence applications in digital libraries: A bibliometric study. *Journal of Information Science*, 47(6), 837–852.
13. Persson, O., Danell, R., & Schneider, J. W. (2009). How to use Bibexcel for various types of bibliometric analysis. In F. Åström et al. (Eds.), *Celebrating scholarly communication studies* (pp. 9–24). International Society for Scientometrics and Informetrics.
14. Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation*, 25(4), 348–349.
15. Rousseau, R., Egghe, L., & Guns, R. (2018). *Becoming metric-wise: A bibliometric guide for researchers*. Chandos Publishing.
16. Small, H. (1973). Co-citation in the scientific literature: A new measure of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4), 265–269.
17. Song, M., & Ding, Y. (2018). Topic modeling and bibliometric analysis of information science research. *Scientometrics*, 115(2), 1229–1250.
18. Sugimoto, C. R., & Larivière, V. (2018). *Measuring research: What everyone needs to know*. Oxford University Press.
19. Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538.
20. Van Eck, N. J., & Waltman, L. (2017). Citation-based clustering of publications using CitNetExplorer and VOSviewer. *Scientometrics*, 111(2), 1053–1070.
21. Waltman, L., Van Eck, N. J., & Noyons, E. C. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics*, 4(4), 629–635.
22. White, H. D., & McCain, K. W. (1998). Visualizing a discipline: An author co-citation analysis of information science. *Journal of the American Society for Information Science*, 49(4), 327–355.
23. Xu, F., & Du, J. T. (2019). Research trends in artificial intelligence applications in libraries: A bibliometric analysis. *Library Hi Tech*, 37(3), 523–539.
24. Yoon, J., & Kim, K. (2020). Intelligent information retrieval systems in digital libraries: A review. *Information Processing & Management*, 57(6), 102375.
25. Zhang, Y., & Wildemuth, B. M. (2017). Qualitative analysis of content. In B. M. Wildemuth (Ed.), *Applications of social research methods to questions in information and library science* (2nd ed., pp. 318–329). Libraries Unlimited.
26. Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472.
27. Alonso, S., Cabrerizo, F. J., Herrera-Viedma, E., & Herrera, F. (2009). h-index: A review focused on its variants, computation, and standardization. *Journal of Informetrics*, 3(4), 273–289.
28. Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). Science mapping software tools: Review, analysis, and cooperative study among tools. *Journal of the American Society for Information Science and Technology*, 62(7), 1382–1402.