MAPPING OF GLOBAL PUBLICATIONS ON ARTIFICIAL INTELLIGENCE: A SCIENTOMETRIC ANALYSIS

MAPEO DE PUBLICACIONES GLOBALES SOBRE INTELIGENCIA ARTIFICIAL: UN ANÁLISIS CIENCIOMÉTRICO

Madhukar Togam
ILS Law College, Pune, India
madhukar.togam@ilslaw.in
https://orcid.org/0000-0001-9294-8779

Satishkumar Naikar **
Badruka School of Management, Hyderabad, India
satish.naikar1432@gmail.com
https://orcid.org/0000-0002-7621-5388

C. Krishnamurthy
Karnatak University, Dharwad, India
jrfkrishna@gmail.com
https://orcid.org/0000-0002-3741-8764

Shashikumar Hatti
Navodaya Medical College Hospital and Research Centre, Raichur. Karnataka, India
shashikumarhatti05@gmail.com
https://orcid.org/0000-0001-5223-7163

** Corresponding Author for Communication
Satishkumar Naikar
satish.naikar1432@gmail.com

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´ABSTRACT:

Objective: Artificial Intelligence (AI) has emerged as an innovative technology with the potential to revolutionize various industries. This study uses a scientometric methodology to evaluate the current research in artificial intelligence comprehensively. **Design/Methodology/Approach:** This study employed

scientometric indicators to identify key trends, patterns, and research gaps in the existing literature. A comprehensive dataset of 1803 academic papers on artificial intelligence, published between 2003 and 2023, was assembled and assessed using the Scopus database. Various scientometric instruments, such as Biblioshiny and VOSviewer, have significantly improved this study. **Results/Discussion:** The study's results provide substantial insights. The research indicated that the peak number of publications occurred in 2021, totaling 601 (33.33%), with the predominant document type being articles at 771 (42.76%), succeeded by conference articles at 428 (23.74%). Journal articles demonstrated the highest prevalence among various publication categories, comprising 771 (42.76%), followed by conference papers at 428. The United States emerged as the foremost contributor with 405 articles, followed by India with 234 publications. **Conclusions:** The University of Birmingham emerged as the most distinguished affiliation, boasting 17 publications and 1,670 citations. The "Lecture Notes in Computer Science (including the subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)" series is the most productive source, releasing 100 papers, of which 97 were cited. The author, Liu Xiaoxuan, is a distinguished figure with an h-index of 13 and a g-index of 14. **Contribution:** To assess the state of AI scientific production in the period 2021-2023, to contribute to scientific research.

KEYWORDS: Artificial Intelligence, Global Publication, Network analysis of co-authorship, Country-wise Analysis, Scientometric Study, Vosviewer, Biblishyni, Scopus

RESUMEN:

Objetivo: La inteligencia artificial (IA) se ha convertido en una tecnología innovadora con el potencial de revolucionar diversas industrias. Este estudio utiliza una metodología cienciométrica para evaluar exhaustivamente la investigación actual en inteligencia artificial. **Diseño/Metodología/Enfoque**: Se examinan indicadores cienciométricos para identificar tendencias clave, patrones y lagunas de investigación en la literatura existente. Se recopiló y evaluó un conjunto completo de datos de 1803 artículos académicos sobre inteligencia artificial, publicados entre 2003 y 2023, utilizando la base de datos Scopus. Diversas herramientas cienciométricas, como Biblioshiny y VOSviewer, han mejorado significativamente este estudio. **Resultados y Discusión:** Los resultados del estudio proporcionan información sustancial. La investigación indicó que el número máximo de publicaciones se produjo en 2021, con un total de 601 (33,33%), siendo los artículos el tipo de documento predominante con 771 (42,76%), seguidos por los artículos de conferencias con 428 (23,74%). Los artículos de revistas mostraron la mayor prevalencia entre las diversas categorías de publicación, con 771 (42,76%), seguidos de las ponencias en congresos con 428. Estados Unidos se posicionó como el principal contribuyente con 405 artículos, seguido de India con 234 publicaciones. **Conclusiones:** La Universidad de Birmingham se posicionó como la institución más destacada, con 17 publicaciones y 1670 citas. La serie "Lecture Notes in Computer Science (incluidas las subseries Lecture Notes in Artificial Intelligence y Lecture Notes in Bioinformatics)" es la fuente más productiva, con 100 artículos publicados, de los cuales 97 fueron citados. El autor, Liu Xiaoxuan, es una figura destacada con un índice h de 13 y un índice g de 14. **Aporte:** Valorar el estado de la producción científica de la IA en el período 2021- 2023, para contribuir a la investigación científica.

PALABRAS CLAVE: Inteligencia Artificial, Publicación Global, Análisis de Redes de Coautoría, Análisis por País, Estudio Cienciométrico, Vosviewer, Biblishyni, Scopus

INTRODUCTION

The advent of Artificial Intelligence (AI) has transformed numerous fields, from healthcare to finance, and continues to be a driving force in technological advancements and scientific research. Artificial intelligence has given various learning opportunities through its personalized content interface, guidance, etc. (Rastegarmoghadam & Ziarati, 2017). Over the last two decades, information technology companies have changed and generated new dimensions in artificial intelligence (Amankwah-Amoah, 2017; You et al., 2019). As a multifaceted and rapidly evolving discipline, AI encompasses many subfields, including machine learning, neural networks, natural language processing, and robotics, each contributing to its expansive growth and application. Technology integration has shifted tremendously in recent years and has been considered an

integral part of the educational ecosystem (Huang et al., 2020). Libraries can benefit from artificial intelligence by using cutting-edge technologies that allow robots to recognize, understand, behave, learn, and carry out administrative tasks (Naikar et al., 2023). This rapid evolution and broad applicability have led to an exponential increase in academic and industrial research outputs, making it imperative to understand the landscape of global AI research comprehensively (Tang et al., 2023). Therefore, the responsibilities of library professionals have evolved to assist researchers in locating necessary information. They must evaluate the productivity of research publications by utilizing various metrics formulas developed by information specialists, including Alfred J. Lotka (1926), S. R. Ranganathan (1930), Broadford (1934), Derek John De Solla Price (1961), and Pitchard (1969) (Durgannavar et al., 2022). Additionally, various authors have developed distinct metrics for analyzing information and research productivity, marking our era as a period of advancement in metrics science. The metrics encompass bibliometrics, scientometrics, informetrics, econometrics, techno metrics, biometrics, sociometrics, psychometrics, and educametrics (Dutta, 2014).

Artificial intelligence has broad applications across several healthcare data types, both organized and unorganized, primarily concentrating on cancer treatment, neurology, and cardiology as the three principal domains of illness. The discussion regarding the potential replacement of human doctors by artificial intelligence (AI), which is exceedingly improbable, has been genuine. However, AI will likely supplement human physicians in some functional areas of healthcare (like radiography) or even assist them in making the best judgments. The use of AI in healthcare has been made more accessible by the quick development of big data analysis techniques and the availability of more generations of healthcare data. Robust artificial intelligence (AI) can extract therapeutically relevant information from vast amounts of data, facilitating clinical decision-making (Borgohain et al., 2024; Dilsizian & Siegel, 2014; Jiang et al., 2017; Kolker et al., 2016; Murdoch & Detsky, 2013). In the 1950s, physicians attempted to use computer-aided programs to refine their diagnosis, marking the beginning of the use of AI in the medical industry. One significant example is examining abdominal pain using computer analysis, which Gunn did in 1976 (Gunn, 1976; Ramesh et al., 2004).

The study's relevance and significance stem from its extensive mapping and analysis of global artificial intelligence (AI) articles over the last two decades (2003-2023). As artificial intelligence continues transforming industries, healthcare, education, and everyday life, academia and industry must grasp the evolution, trends, and collaboration networks in AI research. This study uses advanced scientometric tools like Biblioshiny and VOSviewer to systematically and quantitatively evaluate AI research outputs, collaboration patterns, and emerging topics. Doing so provides a comprehensive picture of the worldwide AI research scene, which is critical for detecting research gaps, stimulating interdisciplinary collaborations, and guiding future research orientations.

This study's significance is amplified by its emphasis on essential scientometric markers such as prolific writers, institutions, highly cited publications, and keyword co-occurrence analysis. These findings are helpful for academics, policymakers, and stakeholders who want to understand the dynamics of AI research and its ramifications across multiple disciplines. For example, the study emphasizes the increasing importance of machine learning, AI literacy, and chatbots as new research fields that will likely determine the future of AI applications. Furthermore, examining collaboration networks across countries and institutions gives a road map for expanding global research partnerships and solving common obstacles in AI development.

This study aims to map the global publication trends in AI research from 2003 to 2023 and identify the most prolific authors, institutions, and countries contributing to AI research. Subsequently, it analyzes the co-authorship networks and keyword co-occurrence patterns to uncover emerging research themes; it also provides actionable insights for researchers, policymakers, and industry stakeholders to enhance AI research and applications. The present study is significant because it bridges the gap between quantitative bibliometric analysis and qualitative interpretation, providing a more nuanced perspective of the AI research environment. This report advances AI research and practical applications across multiple sectors by emphasizing major trends, collaboration patterns, and upcoming themes.

LITERATURE REVIEW

Numerous studies on the use of AI in various public sectors have been published in research publications, including clinical medicine, cancer research, online e-learning, education, medicine, health care, and agribusiness. Specific research focused exclusively on Indian articles and international publications on artificial intelligence. Here, a few relevant publications examine the use of AI in the disciplines mentioned above to pinpoint any gaps in their understanding. The study examines AI integration in library systems by mapping research papers on AI applications in libraries (AAIL) from 2012 to 2021 using bibliometric tools like Biblioshiny R and VOSviewer. It finds AI in libraries under-researched compared to fields like medicine and education, with 1462 papers by 5400 authors, mostly in open-access journals. The Journal of Chemical Information and Modelling and the Journal of Machine Learning Research are key contributors, with prominent authors like J Chen. The USA leads in publications, while China dominates institutionally. Trending topics include machine learning and high-level languages, highlighting AI's potential to enhance information systems (Borgohain et al., 2024). This study analyzes global output in artificial intelligence research, comprising 152,655 publications recorded in the Scopus database for 2007-2016. This study examines India's publication output in artificial intelligence research. These 24 highly cited papers involved the participation of 109 authors from 70 organizations, published in 15 journals (Gupta & Dhawan, 2018). Another study carried out the first descriptive bibliometric analysis to assess the most prominent journals, institutes, and countries within the domain of artificial intelligence in textiles. Bibliometric mapping analysis was employed to investigate various research subjects related to artificial intelligence in textiles. VOSviewer has been used to analyze 996 articles from the Web of Science Core Collection spanning 2007 to 2020. This research will unfold new research domains for researchers in computer science, electronics, material science, imaging science, and optics and will benefit academic and industrial circles (Halepoto et al., 2022). A separate study examined the attributes of artificial intelligence-related papers in the Science Citation Index Expanded (SCIEXPANDED) from 1991 to 2018. The examined elements encompassed the distribution of yearly publications, citations per publication, journals, Web of Science categories, countries, institutions, research focuses, and trends. Results from word cluster analysis showed that models, neural networks, learning, and prediction were the most popular topics, and features, classification, and optimization might be focused on in artificial intelligence research (Ho & Wang, 2020). Bibliometric study of an International Journal "Applied Artificial Intelligence (AAI)" examining research hotspots of authors, companies, and nations, as well as publication trends, authorship patterns, collaboration networks, and citation practices. It comprehensively reviews the journal's current content structure and development process. It was also valuable for researchers in artificial intelligence to identify the research hotspots in this field (Loan et al., 2021)—scientometric study of publications about 'Artificial Intelligence' research in India from 2009 to 2018. The study uses an appropriate search query to examine bibliographic data from the Scopus database. The study examined the chronological growth of research publications, relative growth rate, doubling time, scientometric profiles of authors, types of documents, source profiles, keyword analysis, distribution of publications by institution, and distribution by funding agency. The paper indicates that India must enhance its competitiveness in artificial intelligence research relative to global leaders. To get more returns from AI applications, the stakeholders must play a catalytic role in building and strengthening research capacity in the nation by paving a quality research environment, adequate funding, research incentives, and IT infrastructure development (Pandey et al., 2021). A study conducts a scientometric analysis of this field utilizing text mining, encompassing a review of 18,955 publications about AI and COVID-19 from the Scopus database, covering the period from March 2020 to June 2021. It provides an overview of the current status of research on the application of AI to the pandemic (Rodríguez-Rodríguez et al., 2021).

Research articles on artificial intelligence in Brazil from 2011 to 2020, sourced from the SCOPUS online database, total 4,350. It concludes that the distribution of the journal's contributions to artificial intelligence research publications in Brazil does not match Bradford's Law of Scattering (Subramanyam et al., 2021). The study must present a comprehensive and historical overview of research on artificial intelligence in health and medicine. A total of 27,451 papers published from 1977 to 2018 were retrieved from the Web of Science platform, with 84.6% dated between 2008 and 2018. It offers a first and comprehensive picture of the global

efforts directed towards this increasingly essential and prolific field of research. It suggests the development of international and national protocols and regulations on the justification and adaptation of medical AI products (Tran et al., 2019).

Researchers and practitioners have utilized artificial intelligence (AI) to analyze, evaluate, and comprehend big data, analytics, and data intelligence for efficient decision-making (Di Vaio et al., 2022). Conducting a bibliometric analysis of publications on AI that examine the collaboration between human and artificial intelligence in enhancing decision-making efficiency within the public sector has necessitated meticulous investigation. The study acknowledges that human intelligence is not a factor in public sector decision-making; somewhat, it is restricted to the intelligence capacities of developing technologies. The report also emphasizes how crucial it is to use data analytics and intelligence and how effective they are. A greater understanding of the research on AI's involvement in decision-making is required to provide appropriate space in organizations. Since the output of AI research has been growing at an exponential rate over the past 20 years and the majority of papers are published in AI academia, followed by AI competition, the phenomenon of "research convergence" has been apparent in the current state of AI research (Shao et al., 2022).

Considering published literature on AI research, a more rigorous study and mapping of the scientific productivity of global publications indexed in SCOPUS for the last two decades should be conducted. i.e., 2003 to 2023. AI is applied in several domains, including agriculture, e-learning, health care, education, and cancer research (Borgohain et al., 2024). To provide an overview of the collaboration style of the researchers working in this field, an attempt has been made to use VOSviewer to evaluate the co-authorship of authors and nations. They are analyzing global papers indexed in Scopus from 2003 to the latest 2023 to assess artificial intelligence's quantitative and qualitative features.

The objective of the study:
1.   To study the global publications of artificial intelligence from 2003-2023.
2.   To trace the annual scientific productions on artificial intelligence
3.   To study quantitative analysis and Type of documents on artificial intelligence.
4.   To reveal the prolific affiliations and co-occurrence with author keywords analysis.
5.   To analyze the co-occurrence of the author's keywords analysis.
6.   To identify the top ten leading sources.
7.   To examine the Lotka's of scientific productivity in Artificial Intelligence.
8.   To reveal the most productive authors and top-cited documents in AI.

METHODOLOGY AND RESULTS

The research data used in this study utilized the Scopus database, an abstract and citation of the database, to extract information regarding the application of Artificial Intelligence from January 2003 to December 2023. A total of 1803 papers were identified during the search, and this study's analysis encompasses the period from 2003 to 2023. The search query is structured as follows: (TITLE (artificial AND intelligence) AND TITLE (ai)) AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE, "English")) – CVS. This query was employed to locate pertinent material about artificial intelligence. The inquiry was performed within the title, abstract, keywords, and author sections.

Data analysis and interpretation

The analysis of global AI publications reveals several key trends and patterns that provide valuable insights into the evolution of AI research. However, interpreting these findings is crucial to understanding their broader implications. Below, we discuss the results with a focus on their significance and potential impact.

Year-wise growth of publications:

Figure 1 reveals the number of research documents published from 2003 to 2023. It was observed that from 2003 to 2008, document production on 'artificial intelligence' was significantly less; only one to two publications have been produced. However, from 2009 onwards, production gradually increased to 12 (0.66

%). Again, it was found that since 2015, research on artificial intelligence has improved tremendously. i.e., 10 (0.55% share), 2017 – 27 (1.50%); after that uptrend, a production pattern was observed, and the highest number of publications was produced in 2023 – 601 (33.33%).

Figure 1: *Year-wise growth of documents*
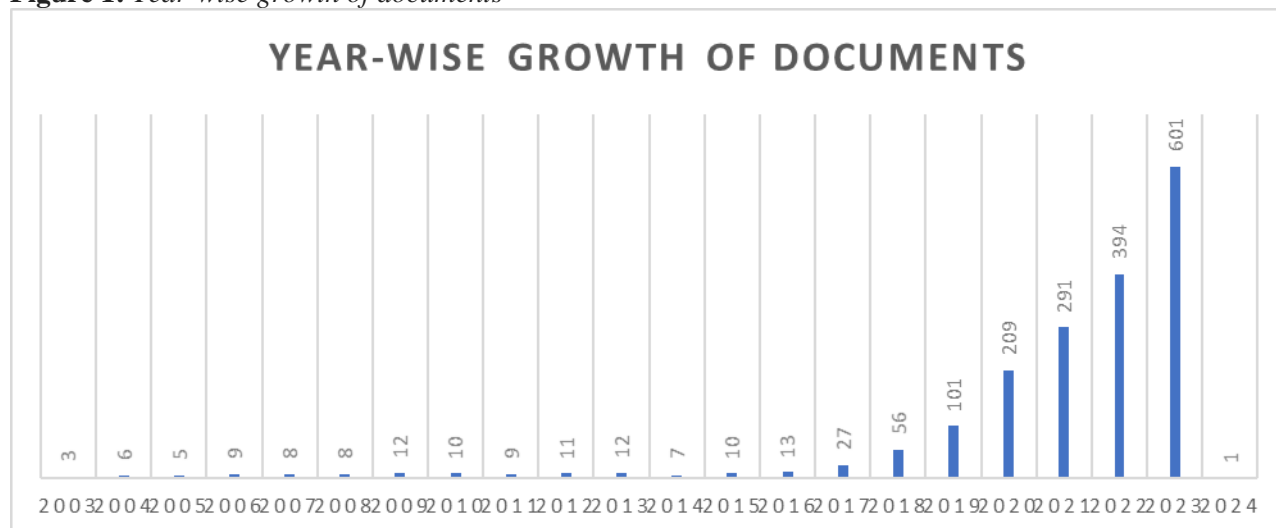
Distribution of Production as per Type of documents:

Table 1 provides data on the total number and categories of publications about Artificial Intelligence from 2003 to 2023. The information is classified by publication type, including conference papers, articles, conference reviews, book chapters, books, editorials, and retracted papers. The findings indicate that articles constituted the predominant form of publication (42.76%), followed by conference papers (23.74%). Additionally, the data reveal that conference reviews and books had a comparatively low publication count, with only 134 conference reviews and 26 books published during the analyzed period. The data imply that articles and conference papers are the most prevalent AI-related publications.

Table 1
Distribution of Production as per Type of documents

Document Types	Total	Percentage (%)
Article	771	42.76%
Conference Paper	428	23.74%
Review	151	8.37%
Book Chapter	142	7.88%
Conference Review	134	7.43%
Editorial	78	4.33%
Note	37	2.05%
Book	26	1.44%
Letter	22	1.22%
Erratum	11	0.61%
Article in Press	1	0.06%

Retracted	1	0.06%	
Short Survey	1	0.06%	
Total	1803	100.00%	

Prolific Affiliations:

Table 2 describes the ten most prolific authors according to their publication frequency. These institutions collectively produced 120 papers, accounting for 6.65% of the total publication count 1803, and amassed 6075 citations, resulting in citations per paper (CPP) 50.63. The top five publications on the list yielded a CPP exceeding the group average, indicating a skewed data distribution (68.46). The University of Birmingham is ranked first, while the University Hospitals Birmingham NHS Foundation Trust is placed second, based on the number of publications, with citation per paper (CPP) scores of 98.23 and 98.46, respectively. The University of Oxford and University College London Hospital scored 3rd and 4th, with CPP scores of 53 and 49.25, respectively.

Table 2
Top 10 Affiliations Regarding documents, citation, and CPP

| Rank	Name of the Organization	TP	TC	CPP
1	University of Birmingham	17	1670	98.23
2	University Hospitals Birmingham NHS Foundation Trust	15	1477	98.46
3	University of Oxford	13	689	53
4	University College London Hospitals	12	591	49.25
5	National University of Singapore	11	228	34.36
6	The University of Sydney	11	83	25.73
7	University of California Los Angeles (UCLA)	11	378	7.54
8	Imperial College London	10	500	50
9	Mayo Clinic College of Medicine and Science	10	55	40.4
10	University of Toronto	10	404	5.5

Co-authorship of Countries:

Figure 2 was created to visualize the co-authorship among countries. The circles in the figure represent individual countries, with the size of each circle proportional to the number of documents associated with that country. The minimum document threshold is set at 5 out of 120 countries engaged in artificial intelligence research, with 57 countries meeting this criterion. The network visualization map is generated using a complete counting algorithm and weights for document creation. The 57 interconnected countries are categorized into 9 clusters. Cluster 1 (Red) comprises 12 countries: India, Malaysia, Saudi Arabia, Thailand, and the United Arab Emirates. Cluster 2 (Green) has 9 countries; some are Brazil, France, Italy, Mexico, Spain, etc. Cluster 3 (Blue) has 8 countries: China, Greece, Hong Kong, Ireland, Rasia, and Sweden, among

others. Cluster 4 (Yellow) has 6 countries: Iran, Morocco, Nigeria, the Philippines, Poland, and the United States. Cluster 5 (Violet) has 5 countries: Austria, Canada, Columbia, Czech Republic and Israel. The 6 Cluster (Shallow blue) has 5 countries: Indonesia, Singapur, South Korea, Taiwan, and Vietnam. Cluster 7 (Orange) and Cluster 8 (Brown) have 4 countries: Belgium, Denmark, Germany, and the Netherlands: Australia, Japan, New Zealand, and Switzerland, respectively. 9th Cluster (Purple) has 3 countries: South Africa, Turki, and the United Kingdom.

Figure 2
Co-authorship of countries considers a minimum number of documents of a country as 5
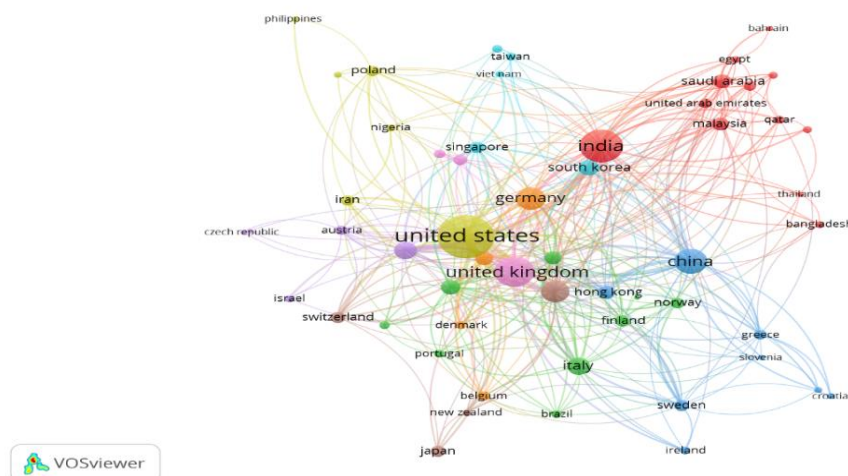

Analysis of Co-occurrence of Author Keywords:

Keyword analysis has been performed to evaluate the most frequently appeared keywords and their co-occurrence network in artificial intelligence research. "The most frequently used keywords give an idea about the trending research topic in a particular domain. It helps to identify hot research topics that have been studied and trending research areas for further investigation" (Basumatary et al., 2023). Figure No. 3 The VOSviewer program was used to visualize the keywords, with a complete counting method and a minimum of 10 occurrences of keywords. Out of a total of 4052 keywords, only 34 keywords meet the threshold for analysis. They are divided into 6 colored clusters connecting with lines and circle nodes. The more significant nodes in the cluster represent the most substantial number of occurrences. The first cluster consists of 10 prominent keywords, followed by the second cluster, composed of 7 keywords. The third and fourth clusters have 6 and 5 keywords, respectively. The fifth cluster – has only 4 keywords, and the Sixth cluster has only 2 keywords. The analysis revealed that researchers commonly used keywords such as "artificial intelligence," "ai," "ai literacy," "chatbot," "machine learning," and "ChatGPT." The figure shows six different clusters of keywords, with each cluster representing a different area of research.

Figure 3
Analysis of Co-occurrence of author keywords.
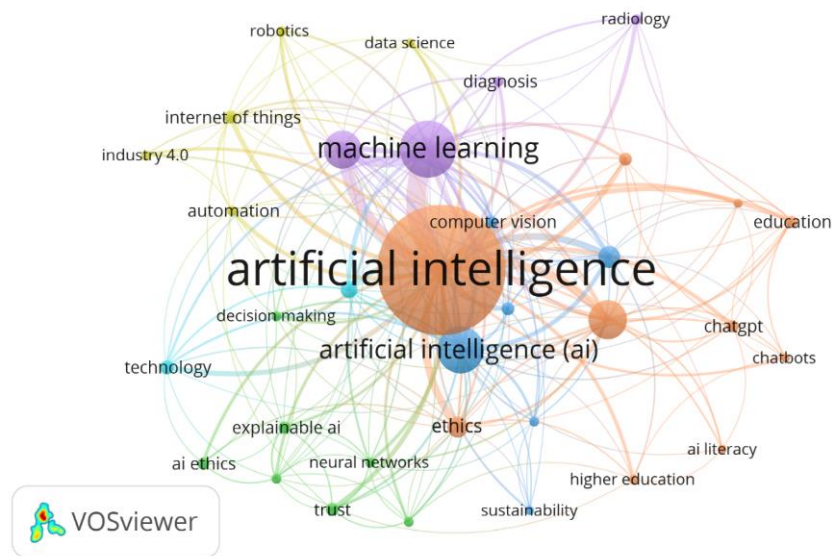
Top Ten Leading Sources

Table 3 reveals the top leading sources in the field of AI. It identifies that *Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* has produced higher numbers of documents (100) with 97 citations, followed by *CEUR Workshop Proceedings* (48) documents with 9 citations only. *AI and Society* have produced 19 papers with the citations 426. Thus, as per impact, *AI and Society and Sustainability (Switzerland)* have the highest impacts (426 and 184), ranked 1st and 2nd respectively in citation count.

Table 3
Top Ten Leading Sources

Sl. No	Sources	Documents	Citations
1	Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	100	97
2	CEUR Workshop Proceedings	48	9
3	AI and Society	19	426
4	ACM International Conference Proceeding Series	18	69
5	Lecture Notes in Networks and Systems	17	30
6	Sustainability (Switzerland)	14	184
7	ZYGON	12	41
8	Advances in Intelligent Systems and Computing	11	97
9	Applied Sciences (Switzerland)	11	62

| 10 | IFIP Advances in Information and Communication Technology | 11 | 9 |

Authorship Productivity through Lotka's Law

As per (Farooq, 2023) Lotka's law, the frequency of publication by authors on a specific subject is represented as an inverse square law, wherein the number of writers who publish a particular number of pieces is a fixed ratio to the number of authors who publish a single piece. Scientific Productivity through Lotka's Law has been applied to collected data, and the result is indicated in Table 4 below. A total of 5831 authors contributed articles on AI, and Figure No. 4 depicts the frequency distribution of scientific productivity, as shown by Lotka's Law. Here, Lotka's law reveals that 0.903% of the authors (5263 authors) have one publication, and 0.072% (420 authors) have two publications.

Table 4
Authorship Productivity through Lotka's Law

Documents written	N. of Authors	Proportion of Authors
1	5263	0.903
2	420	0.072
3	65	0.011
4	38	0.007
5	18	0.003
6	13	0.002
7	6	0.001
8	5	0.001
13	2	0
14	1	0

Figure 4
Authorship Productivity through Lotka's Law

Author Productivity through Lotka's Law
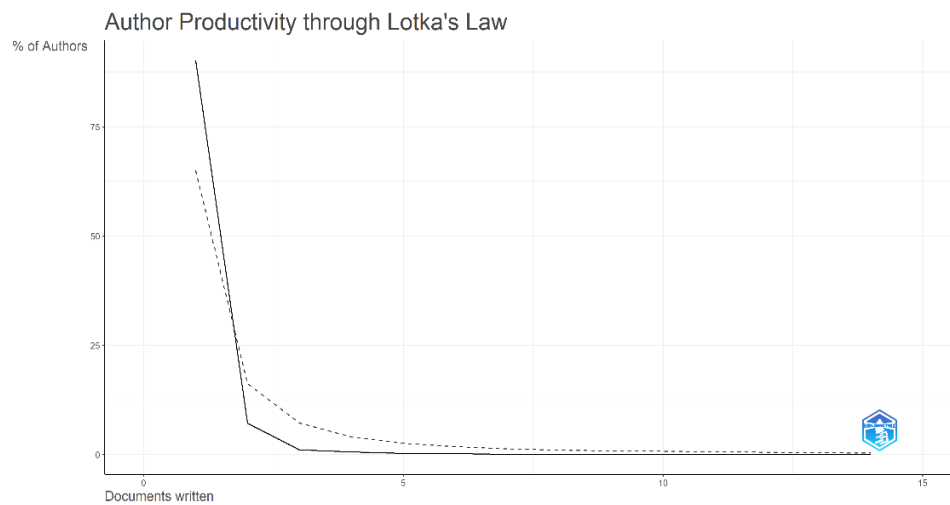
Most Productive Authors

The authors' scientific productivity is measured by analyzing the h-index, g-index, m-index, and total citations received. Table 5 depicts the most productive authors with their h-index, g-index, m-index, and total citations in producing literature on AI. Table 5 shows that Liu Xiaoxuan is the most prominent author with the highest h-index of 13, g-index of 14, and TC 1400. Then Denniston Alastair K. secured second rank with h-index 12, g-index 13, and TC 1324, followed by Collins Gary S. with h-index 11, g-index 13, and TC 1312.

Table 5
Most productive authors

Authors	h_index	g_index	m_index	TC
Liu Xiaoxuan	13	14	2.6	1400
Denniston Alastair K.	12	13	2.4	1324
Collins Gary S.	11	13	2.2	1312
Moher David	8	8	1.6	1010
Ashrafian Hutan	7	7	1.167	977
Calvert Melanie J.	7	7	1.4	1006
Chan An-Wen	7	7	1.4	1129
Cruz Rivera Samantha	7	7	1.4	1006
Faes Livia	7	8	1.4	900
Mccradden Melissa	7	8	1.4	859

Top cited documents

A bibliographic database's "total number of citations" from sources that are indexed is referred to as "Global Citations" (TC). Citations received by a selected article are therefore tallied. Table 6 summarizes and analyzes the most globally cited papers in artificial intelligence. The table below depicts that the most globally cited document is Barredo Arrieta A, 2020, Information Fusion, with a Total Citation of 3027 and a normalized TC of 64.46. This paper has a total citation of 605.40 per year. Then, the second most cited paper was published by Dwivedi YK, 2021 in the International Journal of Information Management, TC 845 and TCPY 211.25 and normalized TC 52.25, followed by Vaishya R, 2020, published paper in Diabetes & Metabolic Syndrome: Clinical Research & Reviews, TC 813, TCPY 162.60 and Normalized Total Citations 17.31.

Table 6
Top Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
Barredo Arrieta A, 2020, Inf Fusion	10.1016/j.inffus.2019.12.012	3027	605.40	64.46
Dwivedi Yk, 2021, Int J Inf Manage	10.1016/j.ijinfomgt.2019.08.002	845	211.25	52.25
Vaishya R, 2020, Diabetes Metab Syndr Clin Res Rev	10.1016/j.dsx.2020.04.012	813	162.60	17.31
Makridakis S, 2017, Futures	10.1016/j.futures.2017.03.006	692	86.50	16.35
Jarrahi Mh, 2018, Bus Horiz	10.1016/j.bushor.2018.03.007	633	90.43	18.46
Mata J, 2018, Opt Switching Networking	10.1016/j.osn.2017.12.006	299	42.71	8.72
Allam Z, 2020, Healthcare (Basel)	10.3390/healthcare8010046	295	59.00	6.28
Liu X, 2020, Nat Med	10.1038/s41591-020-1034-x	285	57.00	6.07
Nadarzynski T, 2019, Digit Health	10.1177/2055207619871808	255	42.50	12.56
Pelau C, 2021, Comput Hum Behav	10.1016/j.chb.2021.106855	250	62.50	15.46

DISCUSSION

Bibliometrics is a valuable tool for assessing current knowledge and anticipating future growth in any study area (Borgohain et al., 2024; Grant & Booth, 2009; Moller & Myles, 2016). Mathematical and statistical methods are used in this interdisciplinary science to analyze relevant articles in a discipline (Small, 1973), journal information sources (Garg & Tripathi, 2017), author-related relationships (White & McCain, 1998), and keywords (Wang, 1992). Co-authorship is a type of collaboration in which researchers publish their findings as papers (Katz & Martin, 1997). Co-authorship networks are created for several units of analysis, such as authors, institutions, and nations (Perianes-Rodriguez et al., 2016). A co-authorship network represents a social network where members share information through social interactions. Such networks have

been shown to enhance knowledge creation and diffusion (Zhang et al., 2019). The co-authorship of the author's relationship diagram shows the line that indicates the collaborative relationships between the two connected authors, the size of the node that shows the number of articles the authors have published after applying a standard algorithm, and the label of the shortened version of each author's name. The authors' cooperation is broader in scope, their link strength is higher, and their collaboration is closer when the node distance is closer (Zhang et al., 2022).

Co-authorship reflects a network of countries involved in AI research. Countries that collaborate are grouped, color-coded, and linked by a line. Each node represents a country whose size is determined by the number of papers in its name. The circle becomes more significant as the number increases. The United States and the United Kingdom have the most prominent circles and are central to Figure 2, indicating their considerable research in AI. Table No. 5 depicted Liu Xiaoxuan as the most distinguished author with the highest h-index of 13, g-index of 14, and TC 1400, followed by Denniston Alastair K and Collins Gary S. with h-index 12 & 11, g-index 13 each and TC 1324 & 1312 respectively.

The study's production, impact, and consistency variation add interest to the bibliometrics field—artificial intelligence in libraries. The same criteria are used to analyze prolific journals as they are for prolific authors. This analysis shows similar results. Lecture Notes in Computer Science had more documents (100) with 97 citations, followed by CEUR Workshop Proceedings (48) with 9 citations only.

Keyword analysis is a crucial component of bibliometric research. The examination of keywords is an essential component of studies that support the development of scientific policy. This indicates a subject's hotspot categories and potential directions for development. Here, a thorough examination of keywords is conducted. VOSviewer was used to show keyword co-occurrence, and Biblioshiny was used to depict trending subjects and notable terms. The link strength between co-occurring keywords is determined by examining the co-occurrence relationship. This helps clarify the internal relationships and structure of a specific academic topic and exposes the research front of a subject. In addition to fundamental research challenges, theoretical trends, and unexpectedly emerging fields, the research front encompasses the idea of a transient research topic. The utilization of co-occurrence in VOSviewer is demonstrated in Figure 3, a network map of terms that occur together in the research articles on AI.

Artificial intelligence research has traditionally focused on computer programs, pattern recognition, statistical models, image processing, and algorithms. Still, it has recently expanded to include machine learning, Turing machines, and massive data sets. This means that academics are attempting to improve the accuracy of AI applications across multiple disciplines. The rise of the concept of big data cannot be overlooked. Today's Society relies heavily on information and data to function. Large amounts of data from various research projects require accurate analysis and interpretation. AI-enabled tools and strategies aim to support this process. Focusing on AI beyond human intelligence characteristics will be helpful in the future. The use of AI in domains such as medicine, health, genetics, and chemical modeling has led to extensive experimental studies, which are projected to continue.

CONCLUSION

The research carried out in the Scientometric study on Artificial intelligence has provided valuable insights into the current literature. The research found that artificial intelligence is a growing field, as it has been applied in every domain since the invention of information and communication technology (ICT). The study emphasized global publication on artificial intelligence from 2003-2023.

The study makes it clear that conducting more in-depth, qualitative research will take time to thoroughly understand AI's applications in various fields, including gaming, education, healthcare, agriculture, and cancer research. It is possible to predict that as new themes emerge, they will investigate novel fields such as deep neural networks, machine learning, high-level languages, and deep learning, pointing to steady study subjects and future trends in AI.

To sum up, there are more and more studies on artificial intelligence. Evaluation and assessment, AI benefits, service personalization and profiling, and adaptive systems are the researchers' primary areas of attention. Additionally, the results showed that interdisciplinary research is needed because AI research is still in its early stages. This study aims to give policymakers and stakeholders a comprehensive understanding of the relationship between authors, countries, and keywords.

LIMITATIONS OF THE STUDY

Despite its substantial contribution to knowledge, this study has limitations. The study relied solely on the Scopus database to gather data, which may not be sufficient to comprehensively analyze research patterns on a subject. There may be comparison research with data from top databases like Web of Science. This does not go into the proportions and partnerships of the connected issues. The study did not delve deeply into the altmetric perspective of AI research, nor did it include substantial citation mapping such as thematic evolution analysis. Some analyses are left to control the paper's length and preserve future study opportunities. Furthermore, not all research articles on this topic can be fully contained in the search keywords used for data retrieval, which only represent the research in this area. Regarding visualization techniques, various goals derived from analyzing multiple methods may be considered for subsequent research.

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AUTHOR CONTRIBUTION STATEMENT

Madhukar Togam: Conceptualization, Formal analysis and investigation, Writing - review and editing
Satishkumar Naikar: Data curation and analysis, Formal analysis and investigation, Writing - review and editing
C. Krishnamurthy: Framing methodology, proof reading the final versión of the study
Shashikumar Hatti: Literature Research, Writing - original draft preparation