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BIBLIOMETRIC MAPPING OF ARTIFICIAL INTELLIGENCE APPLICATIONS IN HEALTHCARE: A SCIENCEDIRECT AND SCOPUS-BASED ANALYSIS

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ABSTRACT

BACKGROUND

Artificial Intelligence (AI) makes the healthcare industry modern and responsive by enhancing diagnosis, description, and planning for treatment. Machine learning and deep learning algorithms have made it possible to automate diagnosis, improve the quality of images, and make medicine more personalized. But there are still ethical and privacy issues to think about.

OBJECTIVE

This study performs a bibliometric analysis to map key trends, thematic clusters, and author collaborations in AI in healthcare using ScienceDirect and Scopus-indexed literature published between January 2021 and August 2025.

METHODOLOGY

A systematic review was performed for ScienceDirect with the keywords Artificial Intelligence in Healthcare or AI in Medicine to retrieve research papers. The growth in publications, productive authors, top-cited research articles, resources, and authors' collaboration publications in AI in healthcare for keyword network analysis figures using bibliometric analysis (specifically using the Bibliometrix Shiny dashboard) were identified.

KEY FINDINGS / RESULTS

The number of AI publications in the healthcare and medical fields has grown quickly each year with an average growth rate of 62.66% from 2021 to 2024. Yogesh K. Dwivedi, A.S. Albahri, Patrick Mikalef, Rajesh Gupta, and Suddeep Tanwar are the most productive authors identified in this study. A paper by Chanyuan Zhang is one of the most cited manuscripts. It has 2,293 authors and 2,442 author appearances. The keyword co-occurrence network helps find patterns and research trends in this field. Central keywords show well-established research areas, while peripheral nodes show new or niche topics. The network reporting shows that AI in healthcare is a field of study that brings together different areas of research, such as diagnostics, data analytics, medical informatics, and patient monitoring.

CONCLUSION / IMPLICATIONS

By applying bibliometric analysis to the literature identified from ScienceDirect, this study offers valuable insights into emerging trends, thematic patterns, and strategic directions in the field of AI in healthcare. ScienceDirect was selected due to its high-quality peer-reviewed content, institutional access rights, and strong emphasis on technology and applied sciences. However, relying solely on one database is a limitation, as it may not fully represent the breadth of influential research in this area. Future studies should consider incorporating additional databases such as Scopus, Web of Science, and PubMed to improve the comprehensiveness, representativeness, and generalizability of the results. Further research could also examine the integration of AI and the Internet of Things (IoT) in clinical healthcare settings to enable intelligent diagnostics, personalized treatment, and better patient outcomes.

KEYWORDS
artificial intelligence, bibliometric analysis, healthcare, scientific collaboration

INTRODUCTION

As every operation in some way is being technology-driven, in the complex, uncertain, and technology-driven environment, Artificial Intelligence (AI) blended with computer science, medical, and data analytics has transformed healthcare enormously. AI in healthcare enables smart diagnosis, tailored treatment plans, and immediate patient monitoring, which attracts various stakeholders. However, this interdisciplinary approach of AI in healthcare also raises serious concerns about data integrity, algorithmic partiality, and transparency in healthcare decisions [6, 7].

AI-driven innovations such as machine learning, neural networks, voice recognition, and wearable health technologies are increasingly deployed to support healthcare delivery, yet their rapid adoption also presents challenges in terms of standardization and ethical application [4, 8]. Recent studies have highlighted the rapid global expansion of AI research in healthcare, with countries like the United States and China leading high-impact contributions [9–11]. Nevertheless, methodological limitations, small sample sizes, and data quality issues remain prevalent [5, 7].

To understand the structure, trends, and emerging areas in this dynamic field, bibliometric analysis has emerged as a powerful tool [6]. Unlike traditional narrative or systematic reviews, bibliometric mapping allows researchers to quantitatively analyze publication patterns, thematic clusters, influential contributors, and collaboration networks. This is particularly valuable in fast-evolving domains like AI in healthcare, where the volume of literature is growing exponentially and manual synthesis is increasingly infeasible [13].

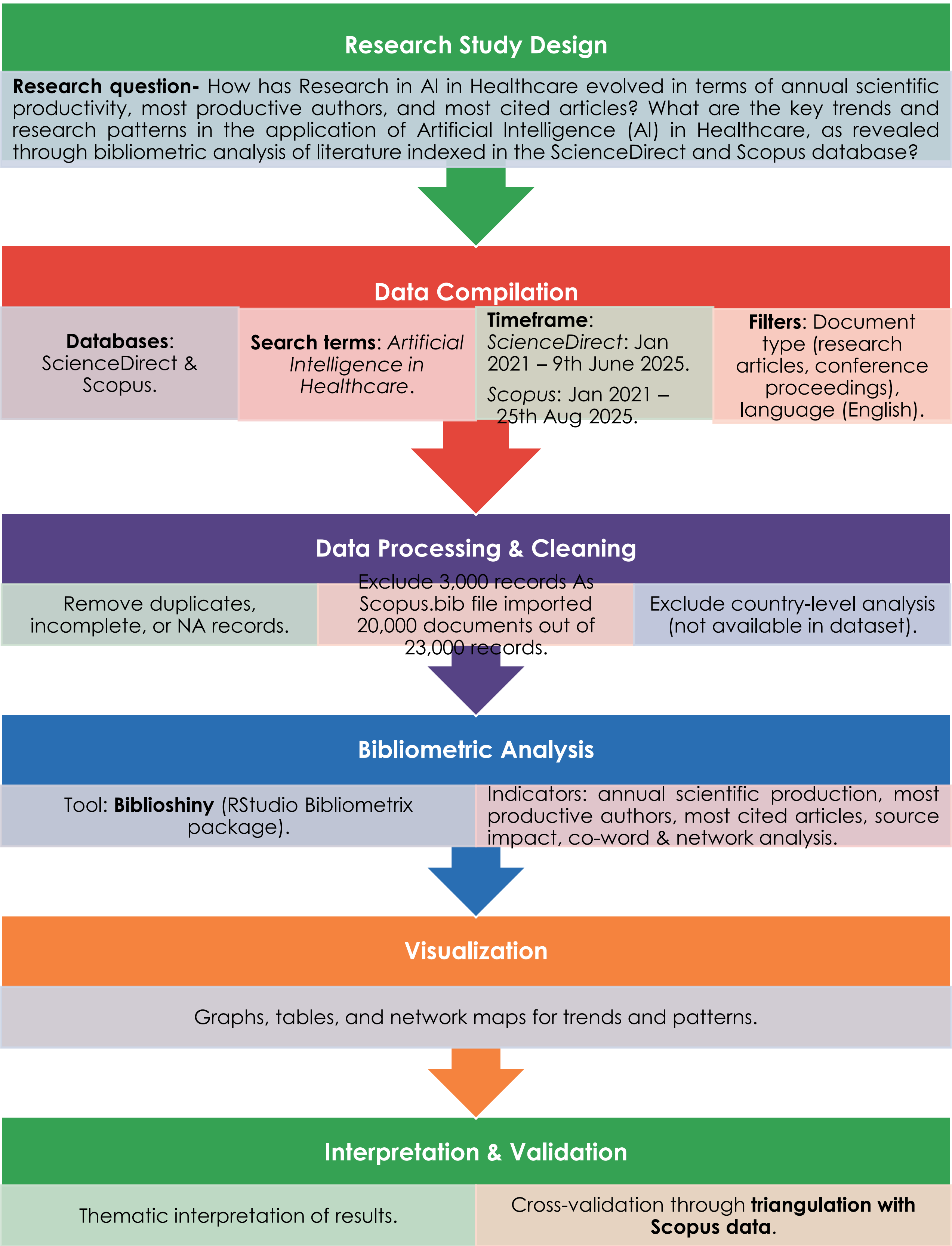
Most prior bibliometric studies on this topic have relied on databases like Scopus, Web of Science, or PubMed [1, 3, 5]. In this context, the present study conducts a bibliometric analysis of publications related to AI in healthcare from January 2021 to June 2024, as indexed in ScienceDirect and up to 29th Aug 2025 in Scopus. The goal is to map thematic evolution, author productivity, publication trends, and research collaboration patterns that can guide future inquiry and policy decisions in this transformative field. This study examines trends, productivity, collaboration patterns, and thematic evolution in the domain of AI in healthcare.

METHODOLOGY

STUDY DESIGN

This study utilizes a bibliometric review methodology, which involves the systematic retrieval and quantitative analysis of bibliographic metadata to examine trends, productivity, collaboration patterns, and thematic evolution in the domain of AI in healthcare. The study aligns with the Scopus Triangulation for qualitative cross validation [13], which filter Scopus.bib. Most prior bibliometric studies on this topic have relied on databases like Scopus, Web of Science, or PubMed [1, 3, 5]. In addition to ScienceDirect (2021 to 2024), this study includes publications extracted from Scopus (AIScopus.bib) up to 29th August 2025, ensuring broader coverage of relevant research.

FIGURE 1: METHODOLOGICAL STEPS FOR THIS BIBLIOMETRIC INVESTIGATION



DATA SOURCE

Bibliographic data were retrieved exclusively from the ScienceDirect database. ScienceDirect was selected due to its comprehensive access rights, focus on high-quality, peer-reviewed literature, and its orientation toward applied science and technology research, especially in domains like medicine, engineering, and computer science. In addition, publications from Scopus up to 29th Aug 2025 were included to provide broader coverage and qualitative representation.

ScienceDirect

- *16,269 Research Articles*

Scopus Database Overview

- Number of documents: 20,000 out of a total 23,000+ documents .bib file import allowed 20,000, so only 20,000 Scopus Documents considered for analysis.
- Number of Scopus authors: 18,634
- Number of Scopus sources: 3,508

However, the limitation of using only these two databases is acknowledged, as this excludes potentially relevant literature from PubMed and Web of Science. While the reliance on only two databases is recognized as a limitation—given that potentially relevant literature from sources such as PubMed and Web of Science may be excluded—this study nonetheless adds value by drawing upon two of the largest and most widely used bibliographic databases, thereby providing a robust and representative overview of the field. Future studies should integrate multiple databases to improve generalizability and reduce selection bias.

RESEARCH QUESTION

For this bibliometric study we have focused on two research questions: How has research in AI in healthcare evolved in terms of annual scientific productivity, most productive authors, and most cited articles? What are the key trends and research patterns in the application of Artificial Intelligence (AI) in healthcare, as revealed through bibliometric analysis of literature indexed in the ScienceDirect and Scopus databases?

SEARCH STRATEGY

The literature search was performed on August 9th, 2025, using ScienceDirect's advanced search interface. The following Boolean keyword string was used:

("Artificial Intelligence" OR "AI" OR "Machine Learning") AND ("Healthcare" OR "Medicine")

The search was limited to titles, abstracts, and author keywords, and filtered to include peer-reviewed journal articles published in English between January 2021 and 9th August 2025.

The Scopus document search performed to date: 29th August 2025. Search Keywords used were Artificial Intelligence for Healthcare.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria:

• Articles published between Jan 2021 – 9th August 2024 in ScienceDirect 4207 and Scopus 20,000 documents to 29th August 2025

• ScienceDirect Peer-reviewed journal articles/ Scopus Peer-reviewed journal articles and Conference Articles

• English language

• Relevance to AI in healthcare, determined via title and abstract

```
Data and PRISMA
Cleaned dataset ready. Records: 4,207
```

Step	Count
Initial records (raw .bib)	4,441
Records after import	4,441
Removed (year filter)	0
Removed (non-article)	0
Removed (missing keywords)	234
Removed (duplicates)	0
Final included	4,207

```
Records (final included): 4,207
Removed 1,302 duplicated documents
Years covered: 2021 - 2024
Top 10 keywords (DE):
artificial intelligence, machine learning, deep learning, healthcare, AI, ChatGpt, COVID-19,
artificial intelligence (AI), internet of things, explainable AI
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Exclusion criteria:

• Editorials, letters to the editor, book reviews

• Articles unrelated to AI or medicine after screening

Scopus single file download of 20,000 documents out of 23,000 documents (out of total 23,000 Scopus indexed documents 3,000 excluded)

QUALITY ASSESSMENT

To ensure data quality and representativeness, only articles published in Q1 and Q2 journals (according to Scopus quartile rankings [18]) were included in the final analysis. This approach guarantees that only high-impact, peer-reviewed sources contribute to the review's conclusions.

REVIEW PROTOCOL

This bibliometric review followed guidelines adapted from PRISMA-ScR [19] to promote transparency and reproducibility in study selection and data analysis.

DATA PROCESSING AND CLEANING

The exported bibliographic metadata was stored in BibTeX (.bib) format. Data preprocessing steps included:

• Deduplication of entries

• Manual screening of titles and abstracts for relevance

• Cleaning of author, keyword, and journal fields using Biblioshiny (R package) [20]

• Network and cluster analysis using VOSviewer, Bibliometrix R, and Biblioshiny

RESULTS

To better understand the publication landscape of artificial intelligence in healthcare, this section presents the bibliometric results, including annual growth trends, keyword distributions, and thematic patterns derived from the analyzed dataset.

ANNUAL GROWTH IN AI PUBLICATIONS ON SCIENCEDIRECT

TABLE 1. ANNUAL PUBLICATION GROWTH IN AI AND HEALTHCARE (2021–2025)

Publication Year	Articles	Growth (%)
2021	22	–
2022	55	150%
2023	98	78.20%
2024	170	73.50%
2025*	154	-9.40%

*2025 data are provisional, based on publications indexed up to [2025].

Table 1 reflects strong growth in the AI-related publications from 2021 to 2024, and a sudden decline observed in the current year 2025. Whereas the average annual growth rate is 62.66%, which shows high growth and curiosity of researchers in the domain.

ANNUAL GROWTH IN AI PUBLICATIONS ON SCOPUS

TABLE 2. ANNUAL PUBLICATION GROWTH IN AI AND HEALTHCARE (2022–2026) SCOPUS

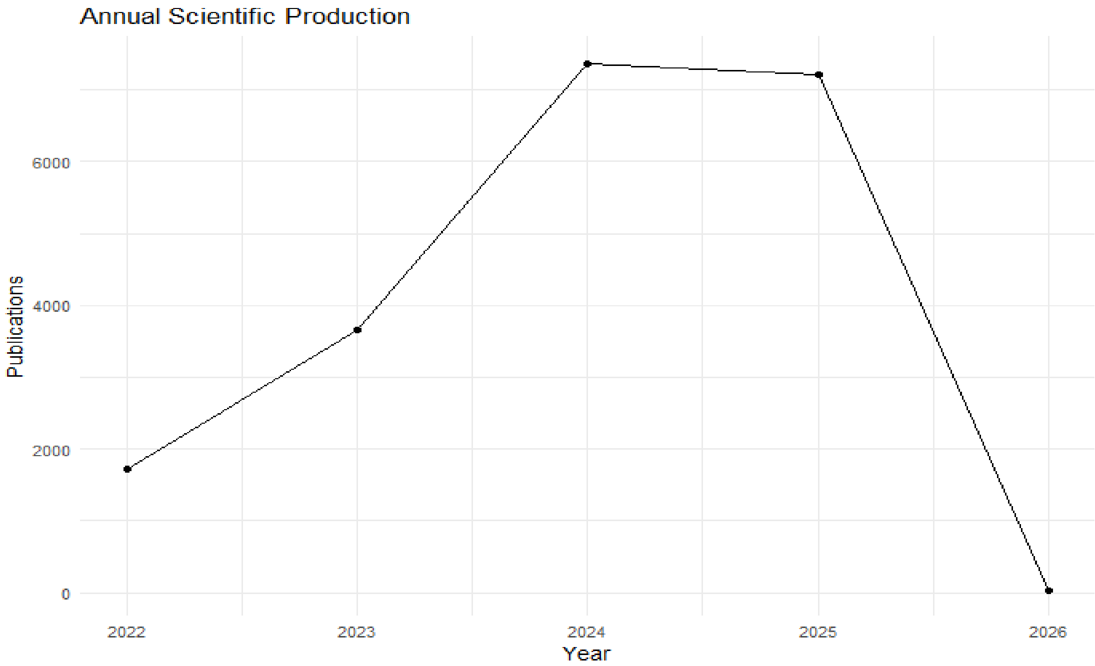
Publication Year	Publications	Growth (%)
2022	1,720	–
2023	3,656	53%
2024	7,367	50%
2025*	7,219	-2%
2026*	38	

*2025 data are provisional, based on publications indexed up to [2025].

Table 2 represents the strong growth of in AI in healthcare-related publications in 2022 to 2025, 38 publications for the publication year 2026 are also found in the Scopus document data source.

These results show that in just three years AI in healthcare publication count has increased by 4 times than earlier. Figure 2 also reflects post post-pandemic surge in AI in healthcare activities with increased usage and adoption of AI in healthcare as well as diagnostics.

FIGURE 2: PHASE OF ANNUAL SCIENTIFIC SCOPUS PRODUCTION IN AI IN HEALTHCARE



As a data source up to 29th August 2025, it shows explanatory deep and phase of maturity and plateau showing the consolidation phase of quality specializations and collaboration. The figure no1. depicts emergence, rapid expansion, and stabilization phases

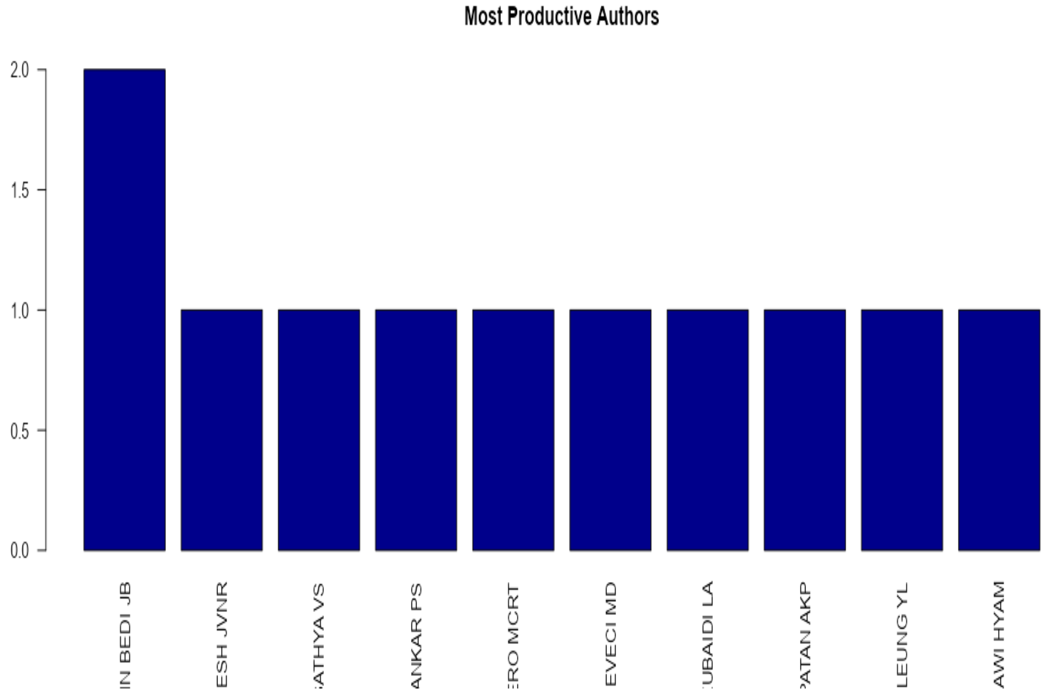
TOP PRODUCTIVE AUTHORS MATRIX

TABLE 3. MOST PRODUCTIVE AUTHORS IN AI AND HEALTHCARE LITERATURE

Author	Articles	Fractionalized Contributions
YOGESH K. DWIVEDI (YKD)	6	1.40
A.S. ALBAHRI (ASA)	4	–
PATRICK MIKALEF (PM)	4	1.08
RAJESH GUPTA (RG)	4	–
SUDEEP TANWAR (ST)	4	–

Yogesh K. Dwivedi is the most productive author with the highest number of articles, but his fractionalized contribution is 1.40, suggesting he is not the sole author of most papers. Patrick Mikalef (PM) has four articles with a fractionalized score of 1.08, suggesting moderate involvement. However, for ASA, RG, and ST, the fractionalized contribution is not provided, limiting a full comparative understanding. Despite this, ASA, RG, and ST are on par with PM based on article count alone. Further data is needed to determine contribution patterns.

FIGURE 3. AUTHOR PRODUCTIVITY DISTRIBUTION



The chart shows a right-skewed distribution, with a single author having higher output than peers. The field is either highly diverse or fragmented, lacking key leaders publishing heavily. Implications for the research community include fostering collaboration, encouraging prolific authors to mentor new researchers, and supporting mid-level contributors to increase publication frequency.

Most Productive Scopus Authors:

The most productive Scopus author (Table 4) is Shaffik Waswa, with 21 publications. The research leadership in healthcare AI is dominated by Shaffik Wasswa, with a strong research group affiliation. The field relies on multi-disciplinary teamwork and has a global footprint. While individual authors dominate output, large author consortia play a crucial role. The dual nature of AI in healthcare research highlights the importance of specialized experts and collaborative teams addressing complex problems. Future research directions should encourage cross-border collaborations and examine whether prolific authors focus on specific niches or span multiple healthcare subdomains.

TABLE 4: MOST PRODUCTIVE AUTHORS IDENTIFIED IN THIS STUDY

Rank	Authors Rank	Publications
1	Shaffik Wasswa	21
2	Tariq, Muhammad Usman	11
3	Kaur, Jaspreet	8
4	Singh, Bhupinder	7
5	Subasi, Abdulhamit	7
6	Lal, Mily and Neduncheliyan, Subbu	6
7	Singh, Bhupinder and Kaunert, Christian	6
8	Wah, Jack Ng Kok	6
9	da Silva, Tiago Horta Reis	6
10	Brady, Adrian Paul and Allen, Bibb and Chong, Jaron J.R. and Kotter, Elmar and Kottler, Nina E. and Mongan, John T. and Oakden-Rayner, Lauren and Pinto Dos Santos, Daniel and Tang, An and Wald, Christoph	5

TOP CITED MANUSCRIPTS MATRIX

TABLE 5. MOST CITED MANUSCRIPTS IN THE DATASET

Rank	Paper & Author	Year	Citations	Cit/Year	DOI
1	Chanyuan Zhang (CAZ)	2022	2021	505	Link

Chanyuan Zhang's 2022 paper is the top-cited in the dataset, with a high citation rate of 505 per year since its publication. This indicates its high impact and relevance in its research field. The paper's citation rate is exceptionally high, indicating its widespread recognition.

RELEVANT SOURCES MATRIX

1. **Relevant Sources Matrix for ScienceDirect**

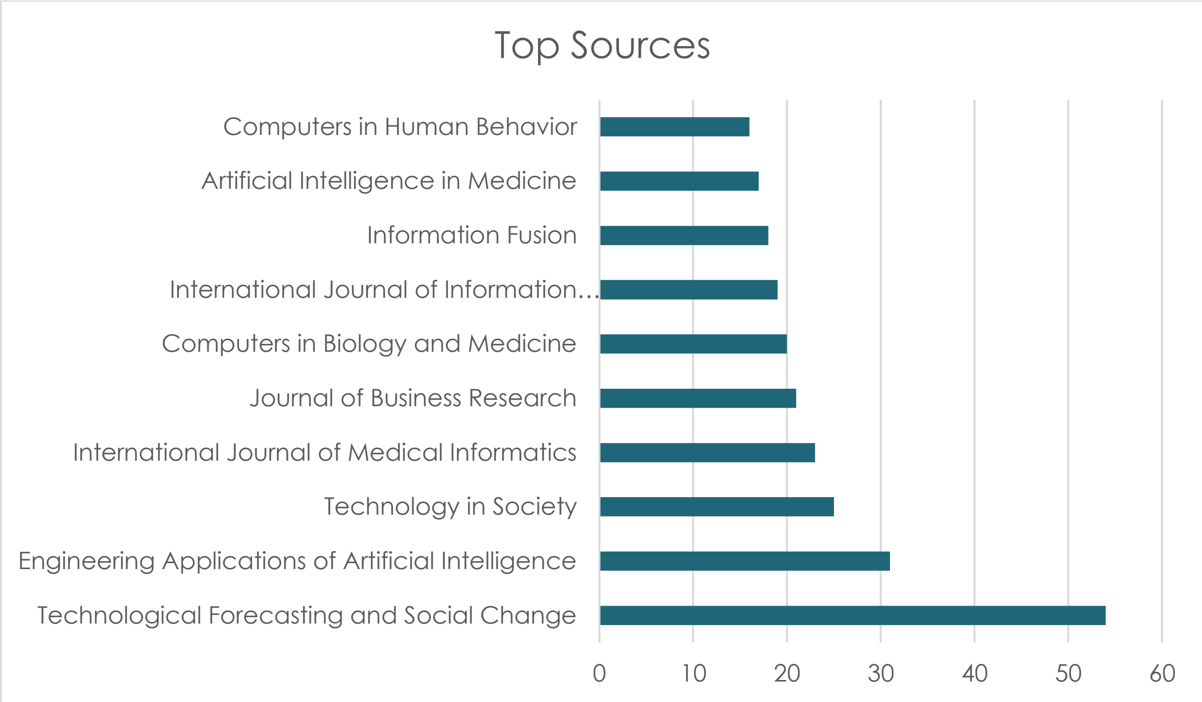
TABLE 6. LEADING JOURNALS PUBLISHING ON AI IN HEALTHCARE

Rank	Source Name	Articles
1	Technological Forecasting and Social Change	54
2	Engineering Applications of Artificial Intelligence	31
3	Technology in Society	25
4	International Journal of Medical Informatics	23
5	Journal of Business Research	21
6	Computers in Biology and Medicine	20
7	International Journal of Information Management	19
8	Information Fusion	18
9	Artificial Intelligence in Medicine	17
10	Computers in Human Behavior	16

Between 2021 and 2024, the number of publications related to AI in healthcare showed a compound annual growth rate (CAGR) of 62.66%, indicating robust research momentum. However, the slight publication decline observed in 2025 (-9.40%) may reflect either an incomplete data year or stabilization in output. Similar bibliometric studies [6, 12] have observed comparable peaks followed by plateauing trends, suggesting saturation in early-stage exploratory topics and a transition toward niche research areas like ethical AI or wearable systems.

Technological Forecasting and Social Change is the leading source for AI research, with 54 articles, indicating a strong focus on technology foresight, innovation, and socio-technical systems. Applied AI research, such as Engineering Applications of AI, Artificial Intelligence in Medicine, and Information Fusion, emphasizes practical implementations and real-world problem-solving using AI. These journals have an interdisciplinary reach, showcasing AI/tech crossover with healthcare, biology, and psychology. Additionally, they have a business and society lens, highlighting the societal and managerial impact of emerging technologies. These journals are priority targets for authors working in AI, technology forecasting, informatics, and socio-economic impacts. Researchers should align their problem statements and methodologies with the scope and themes of these top journals.

FIGURE 4. TOP SOURCES IN AI AND HEALTHCARE RESEARCH



The Figure 4 bar chart shows the top journal sources in a research domain, such as technology, AI, and health informatics. The most influential source is "Technological Forecasting and Social Change", followed by "Engineering Applications of Artificial Intelligence" with 31 articles. Mid-level sources like "Technology in Society", "International Journal of Medical Informatics", and "Journal of Business Research" have 20-25 articles each, showing moderate influence. Lower-tier sources like "Artificial Intelligence in Medicine", "Computers in Human Behavior", and "Information Fusion" have 16-19 article counts, representing specialized or interdisciplinary domains. The top source (TFSC) is a go-to journal for authors in the field, with a diverse range of topics spanning technology, business, society, healthcare, and behaviour. Authors should prioritize TFSC, AI application journals, and socio-technical platforms for visibility.

2. Relevant Sources Matrix for Scopus

By Documents

TABLE 7: TOP PERFORMING ARTICLES

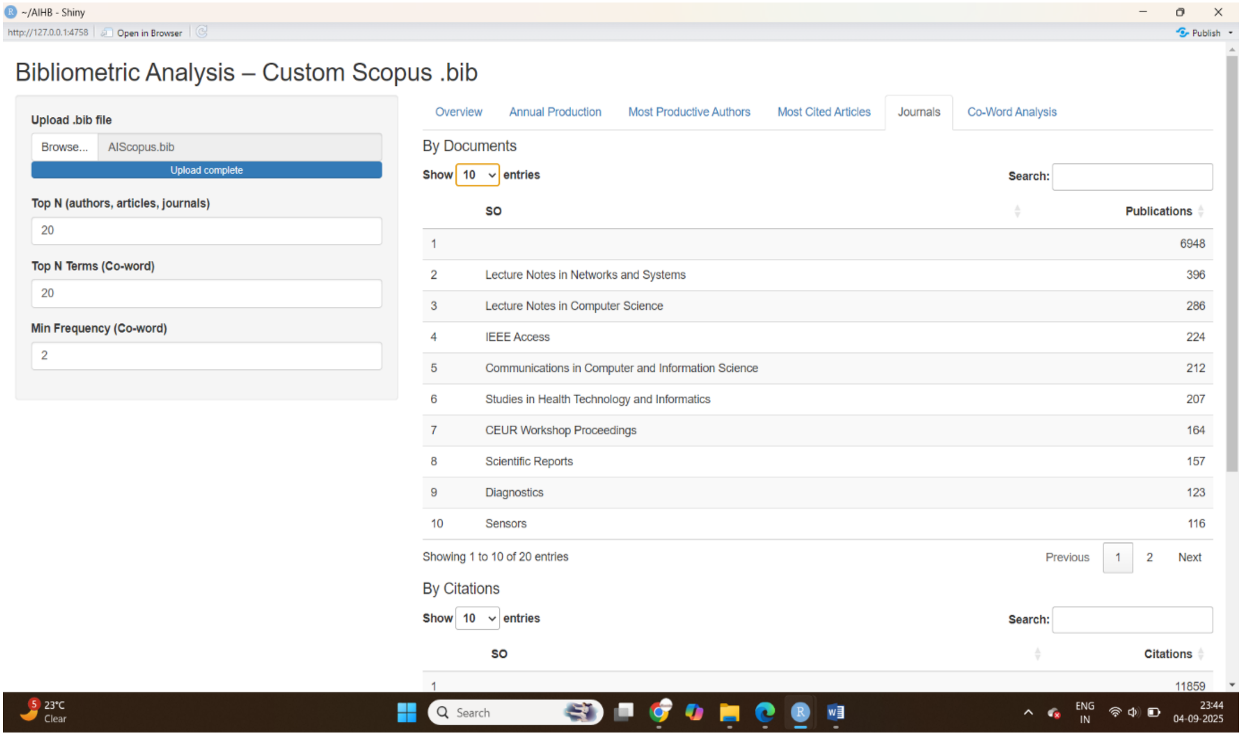
Rank	Source	Articles
1	Lecture Notes in Networks and Systems	396
2	Lecture Notes in Computer Science	286
3	IEEE Access	224
4	Communications in Computer and Information Science	212
5	Studies in Health Technology and Informatics	207
6	CEUR Workshop Proceedings	164
7	Scientific Reports	157
8	Diagnostics	123
9	Sensors	116
10	AIP Conference Proceedings	113

The AI in healthcare research is primarily based on conference proceedings, with the top-ranked sources being Lecture Notes in Networks and Systems, Lecture Notes in Computer Science, and CEUR Workshop Proceedings. Other key publications include Communications in Computer and Information Science and Studies in Health Technology and

Informatics. High-impact journals like Scientific Reports and Diagnostics also contribute significantly. The interdisciplinary nature of AI in healthcare requires collaboration between computer science, engineering, and clinical medicine. Researchers should focus on journal outlets for highly validated, clinically adoptable AI solutions.

Nature Medicine is the leading AI in healthcare journal with 2,196 citations, followed by IEEE Access and IEEE Internet of Things Journal. High-level review and survey journals contribute significantly to AI research, while the IEEE Journal of Biomedical and Health Informatics and International Journal of Medical Informatics stand out in the healthcare-specialized space.

FIGURE 4 JOURNAL TOP PUBLICATIONS



AI in healthcare research is deeply tied to IoT, big data, and real-time systems, with high citations in these areas. The interdisciplinary ecosystem driving AI in healthcare is demonstrated by the dual presence of top medical and computer science journals. A dual publishing strategy may maximize reach and adoption. Figure 4 is an outcome of the R shiny program designed and compiled by researchers for this research article.

By Citations

TABLE 8: TOP CITATIONS

Rank	Source	Citations
1	Nature Medicine	2,196
2	IEEE Access	1,215
3	IEEE Internet of Things Journal	934
4	IEEE Communications Surveys and Tutorials	690
5	Expert Systems with Applications	547
6	Information Systems Frontiers	545
7	ACM Computing Surveys	506
8	Information Fusion	490
9	IEEE Journal of Biomedical and Health Informatics	464
10	International Journal of Medical Informatics	441

Table 7 shows that IEEE Internet of Things Journal (934), Survey-oriented outlets (IEEE Communications Surveys and Tutorials – 690, ACM Computing Surveys – 506) which reflect the technological backbone of healthcare AI. Survey-oriented outlets emphasize the importance of review and synthesis in this emerging field. Domain-specific applied journals like Expert Systems with Applications (547) and International Journal of Medical Informatics (441) demonstrate high relevance for both academic and clinical audiences. The field is still in a knowledge-building and conceptual consolidation phase, with journals like Information Systems Frontiers, Information Fusion, and International Journal of Medical Informatics focusing on AI's translation into decision-making, data integration, and hospital informatics systems.

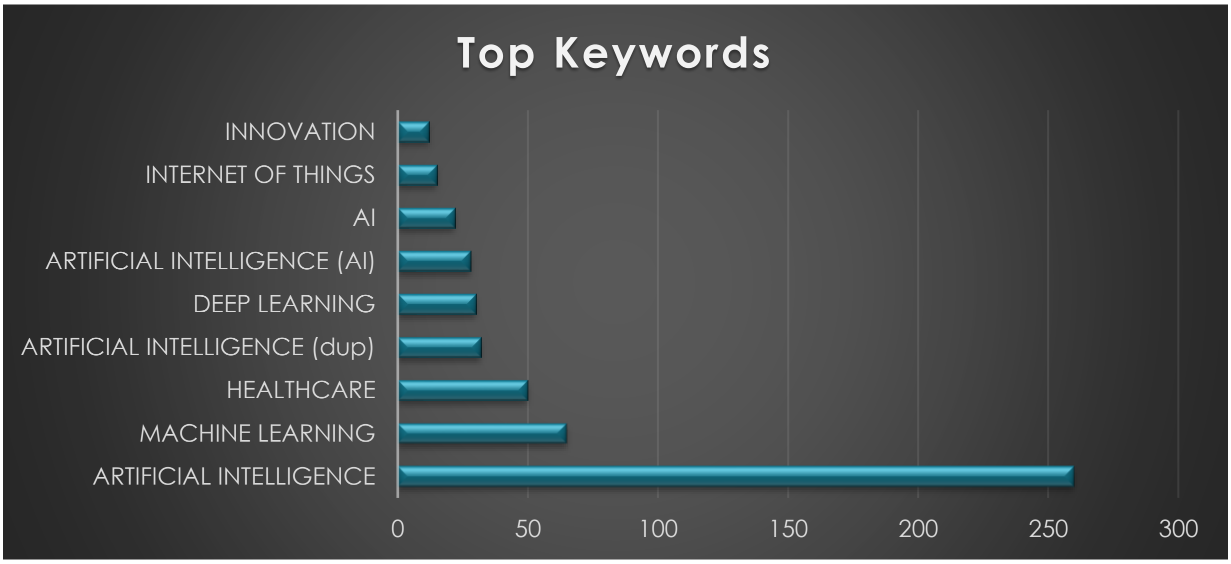
3. Authors' Collaboration Metrics Matrix

TABLE 9. AUTHOR COLLABORATION AND PRODUCTIVITY METRICS

Metric	Value
Total Authors	2,293
Author Appearances	2,442
Single-authored Documents	37
Documents per Author	0.218
Co-authors per Document	4.89
International Collaboration %	0%

The research scope should be expanded to include long-term projects, mentorship programs, and better retention for early-career researchers. Single-author contributions should be encouraged for originality, and collaborative structures should be utilized for depth. International collaborations should be established through cross-border funding schemes, publishing in international conferences, and partnering with researchers. Co-authorship networks should be mapped using tools like VOSviewer or Gephi.

FIGURE 5. KEYWORD FREQUENCY DISTRIBUTION



The study reveals a strong collaborative culture, with a high co-author rate and low single-authored documents. However, the authors' productivity is low, with an average author appearing in less than one document. The study also shows a zero (0%) international collaboration rate, which could be due to regional/national focus, barriers to international networking, or limited global visibility. Recommendations for improvement include encouraging international co-authorship, supporting high-contribution authors, and using collaboration tools like ResearchGate, ORCID, and Scopus author IDs to expand professional networks.

KEYWORD CO-OCCURRENCE NETWORK

FIGURE 6. KEYWORD CO-OCCURRENCE NETWORK

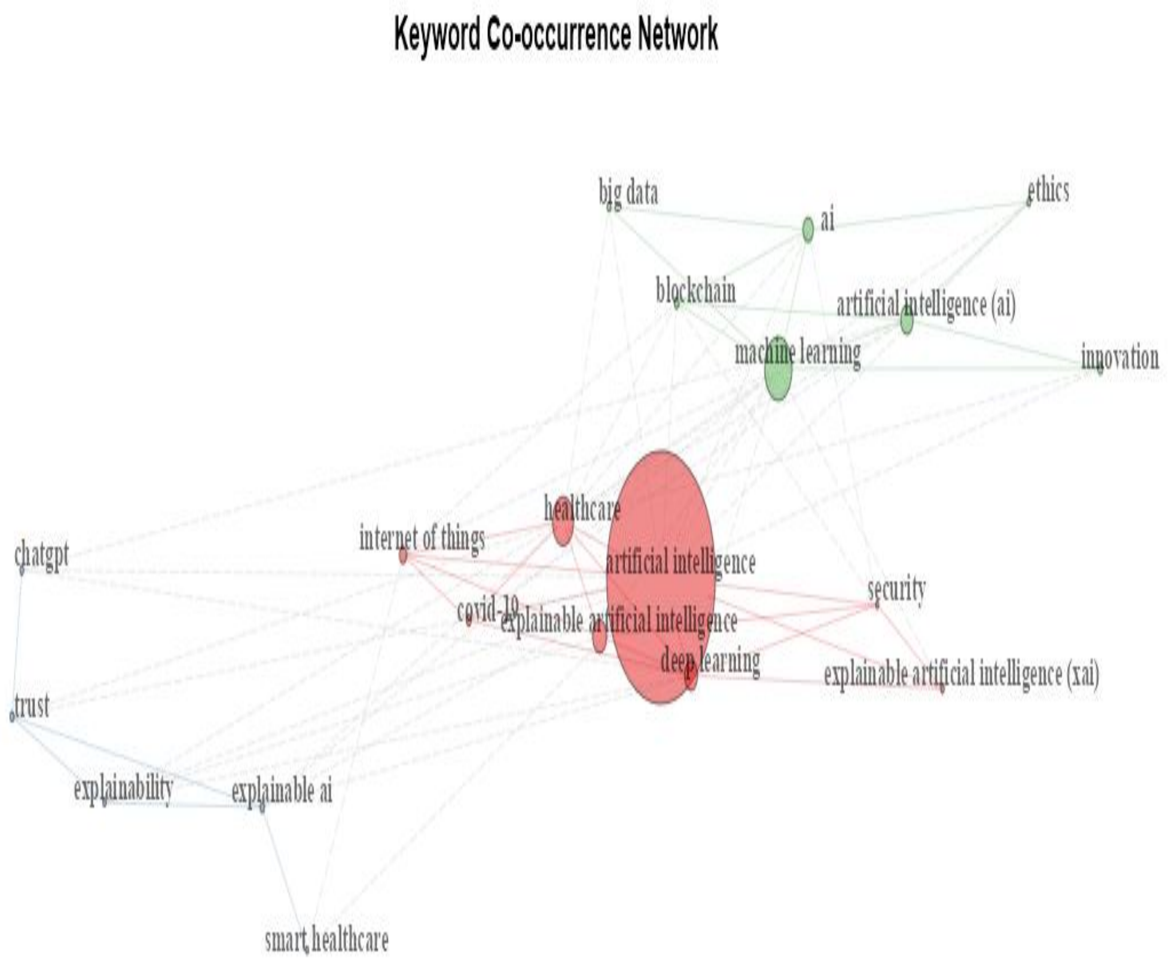


Figure 6 illustrates tightly linked keyword clusters such as {AI, Healthcare, Diagnosis, Machine Learning}, reflecting well-established research domains. In contrast, peripheral clusters featuring {COVID-19, IoT, Blockchain} represent emerging or interdisciplinary topics. Similar to Guo et al. (2022) [6], this clustering supports the dual nature of the field—both consolidated and exploratory.

AI in healthcare and medical fields is a multidisciplinary research area that connects fields such as diagnostics, data analytics, medical informatics, and patient monitoring. The keyword co-occurrence network, which is a powerful bibliometric visualization, helps uncover thematic structures and research trends in this domain. The network contains multiple distinct clusters, each colored differently, indicating thematic groupings of keywords. Highly central keywords, such as Artificial Intelligence, Machine Learning, Healthcare, Diagnosis, and Deep Learning, are critical to the research field. Strong links between keywords suggest frequent pairings and strong conceptual associations in the literature. Peripheral nodes represent emerging or niche topics, such as COVID-19, Wearable Sensors, or Blockchain. The network reveals that AI in healthcare is a multidisciplinary research area, connecting fields such as diagnostics, data analytics, medical informatics, and patient monitoring. Central keywords suggest mature and well-established research areas, while emerging themes at the periphery may indicate future research opportunities or gaps.

Keywords Concurrence cluster

FIGURE 7: KEYWORD CO-OCCURRENCE

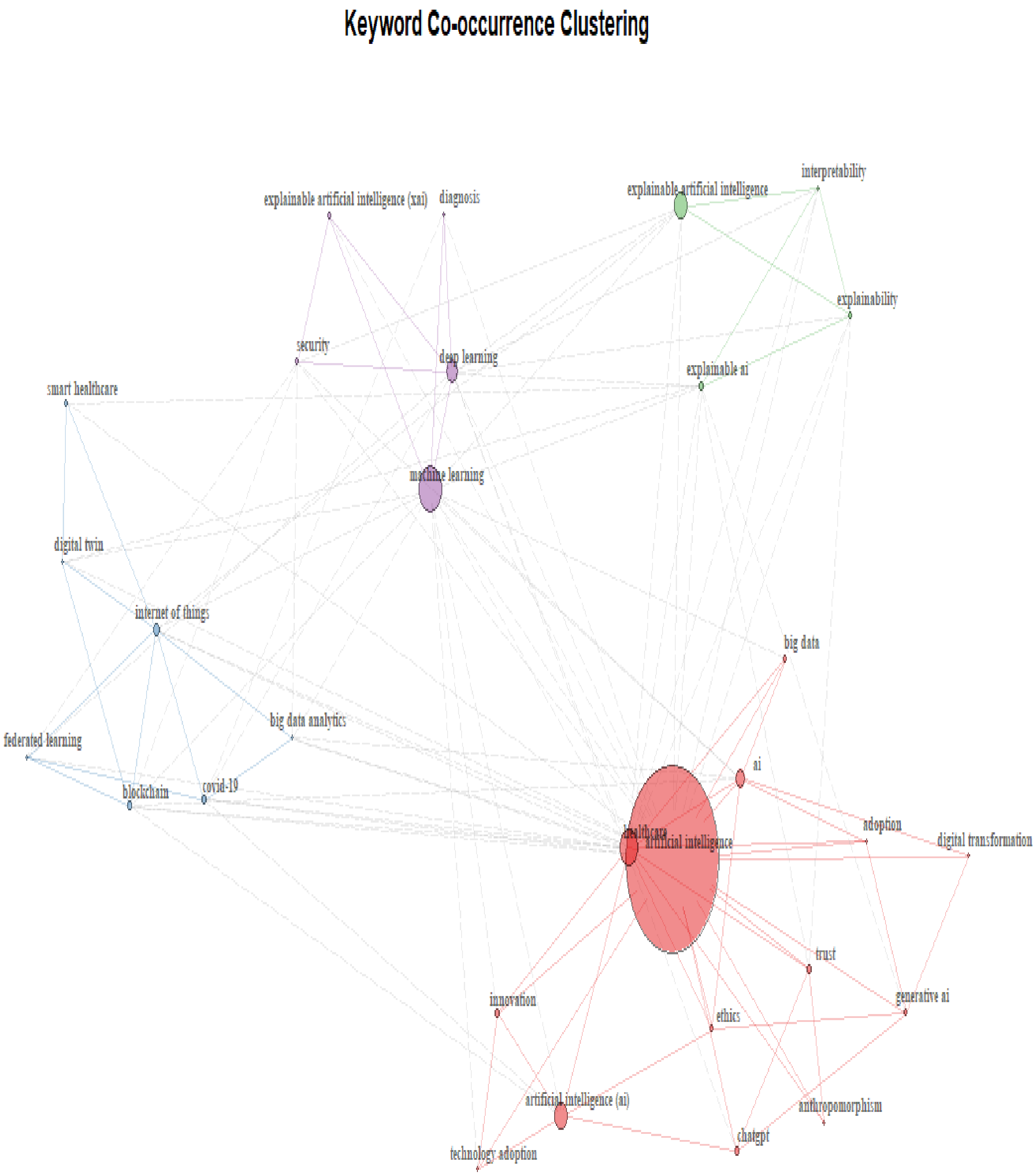
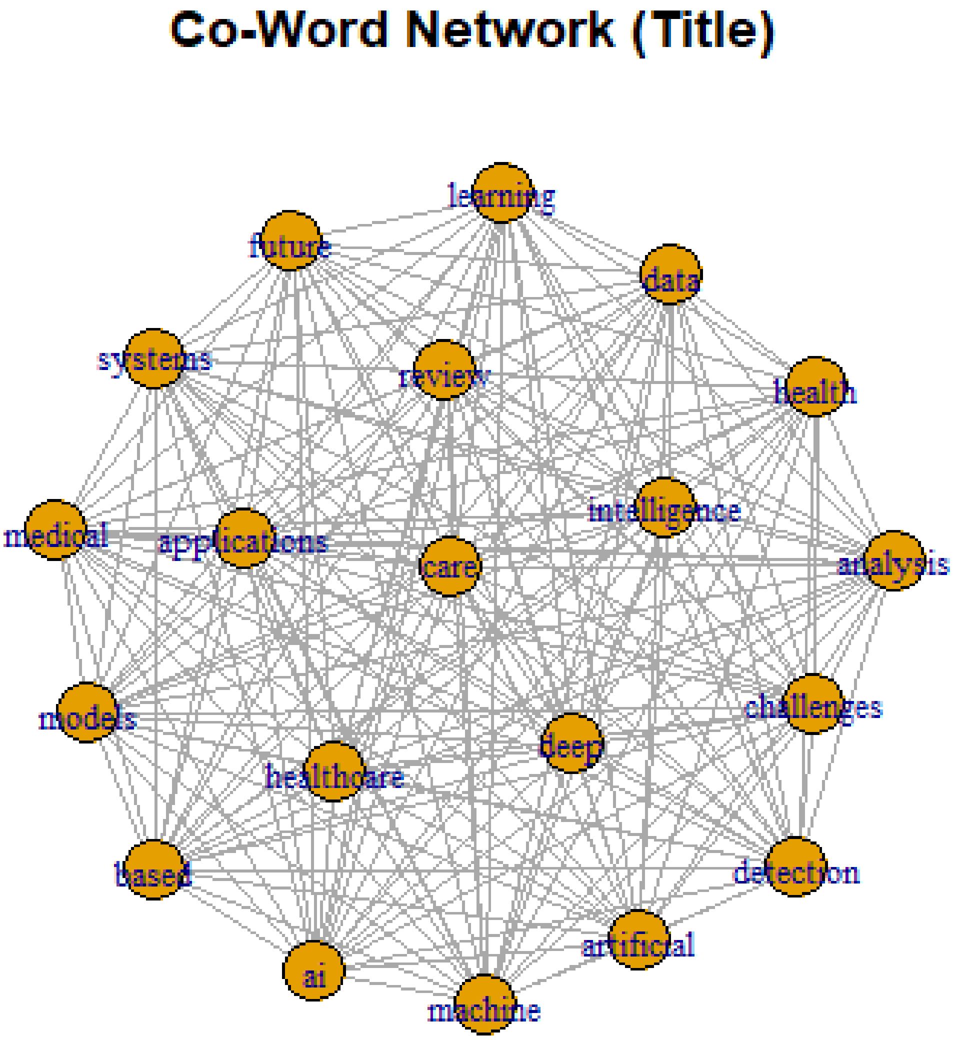


Figure 6 and 7 shows a cluster chart with the strategy identifying the keyword co-occurrence clustering is a group of journals around data center reflecting reveals around Artificial Intelligence, Machine Learning and Deep learning. With early focus on diagnostic applications shifting towards AI ethics and wearable health technologies in recent years.

Scopus Article Title Co-Word analysis

The network of AI in healthcare is densely connected, with terms like "healthcare," "care," "applications," "intelligence," "machine," "deep," "care," and "systems" indicating a high co-occurrence frequency across titles. The prominence of "healthcare," "care," "applications," and "systems" reflects the applied orientation of AI research towards improving clinical workflows, patient care, and hospital systems. The network structure suggests broad thematic overlap, indicating AI research in healthcare is not yet fragmented into isolated subfields but remains integrative.

FIGURE 8: CO-WORD NETWORK (TITLE)



DISCUSSIONS

The bibliometric results from ScienceDirect and Scopus show that AI research in healthcare is growing quickly, especially between 2021 and 2024. The yearly publication data (Tables 1 and 2) show that ScienceDirect's publications have grown at a compound annual growth rate (CAGR) of 62.66% and that Scopus's publications have quadrupled in three years. This shows that research interest has grown and that AI adoption in healthcare and diagnostics has sped up since the pandemic. The minor decrease in 2025 (-9.4% for ScienceDirect; -2% for Scopus) may signify data incompleteness, a stabilization phase, or a shift in the field towards specialized research domains such as AI ethics, wearable technologies, and clinical decision support systems. These trends align with prior bibliometric reviews [6, 12] that show a similar emergence, rapid expansion, and plateauing of early exploratory topics.

Author productivity analysis highlights both concentrated and distributed contributions. Yogesh K. Dwivedi and Shaffik Wasswa are among the top contributors, with fractionalized scores indicating collaborative authorship rather than dominance by individual researchers. The right-skewed distribution of author contributions (Figure 2) suggests that while the field is fragmented and multidisciplinary, productive authors can act as mentors to emerging researchers, reinforcing knowledge transfer. The low international collaboration rate (0%) signals a need for cross-border research partnerships, particularly to address global healthcare challenges and ensure AI solutions are generalizable across diverse populations.

Keyword co-occurrence and co-word network analyses (Figures 6–8) reveal a dual structure in the field: core, well-established themes such as AI, Machine Learning, Healthcare, Diagnosis, and Deep Learning, and emerging peripheral topics including COVID-19, IoT, Blockchain, and wearable health technologies. This suggests the field is both mature and exploratory, reflecting a balance between consolidated knowledge and novel, interdisciplinary directions. The thematic clusters also indicate applied research orientation, focusing on improving clinical workflows, patient care, and hospital systems.

Source analysis identifies top journals like *Technological Forecasting and Social Change*, *Engineering Applications of AI*, and *Nature Medicine* as primary publication venues, showing the interdisciplinary reach of AI research spanning technology, healthcare, socio-technical systems, and business. High citation counts in outlets such as *Nature Medicine* (2196 citations) and IEEE journals highlight the technological backbone and clinical relevance of the research, reinforcing the need for studies that bridge AI development and healthcare applications.

Policy and clinical implications emerge from these patterns. First, the concentration of AI research in applied journals emphasizes the translation of AI into actionable healthcare solutions, such as diagnostic support, real-time monitoring, and predictive analytics. Second, the limited international collaboration suggests policy interventions to promote global partnerships, funding schemes, and shared data infrastructures. Third, emerging themes like AI ethics, IoT, and wearable devices call for regulatory frameworks and clinical guidelines to ensure safe, equitable, and effective integration into healthcare systems. Finally, mentoring early-career researchers and fostering collaborative networks may enhance knowledge dissemination, innovation, and adoption of AI-driven healthcare solutions.

In summary, the bibliometric patterns indicate a dynamic and rapidly evolving AI in healthcare landscape, characterized by increasing publications, strong author collaboration, multidisciplinary thematic clusters, and influential journals shaping both academic and practical directions. Future research should emphasize cross-disciplinary collaboration, longitudinal studies on AI adoption in clinical settings, and policies addressing ethical, regulatory, and equity concerns in AI-enabled healthcare.

LIMITATIONS:

This study has several limitations that should be acknowledged. First, the analysis relied on only two bibliographic databases - *ScienceDirect* and *Scopus*. Although these provide extensive coverage of peer-reviewed literature, the exclusion of other databases such as PubMed and Web of Science may have restricted the breadth of literature considered and overlooked influential studies from other sources. Second, the dataset covers publications from January 2021 to August 2024. Since records for 2025 are incomplete, trends beyond mid-2024 should be interpreted with caution. Third, the study focused on journal articles, conference papers, and reviews, while excluding book chapters, editorials, and preprints. This may have underrepresented certain types of scholarly contributions. In addition, citation counts are influenced by the recency of publications. Newer works may not have had sufficient time to accumulate citations, which could underestimate the impact of emerging research. The bibliometric mapping and co-word analysis also relied heavily on author-assigned keywords, and inconsistencies in keyword usage and indexing practices may have affected thematic clustering. Moreover, the study emphasized bibliometric indicators such as publication counts, citations, and collaboration networks, without evaluating the methodological rigor or quality of the included studies. Finally, while the analysis identified research trends and collaboration patterns, it did not extend to a deeper exploration of policy, clinical, or ethical implications of AI in healthcare.

SCOPE FOR FUTURE RESEARCH

Future research should prioritize international collaboration, interdisciplinary integration, thematic network and semantic analysis, quality over quantity, policy and socio-ethical impact studies, and AI in niche domains. Research should focus on enhancing quality, visibility, and cultural breadth through joint publications, exchange programs, and international grants. Future research should explore AI in public policy, machine learning, behavioral sciences, and sustainable development. Improve methodology robustness, reproducibility, and ethical compliance.

CONCLUSION

The present study aimed to provide a bibliometric mapping of scientific production on AI in healthcare using publications from ScienceDirect and Scopus between 2021 and 2025. The analysis revealed a substantial growth in research output, reflecting post-pandemic acceleration in AI adoption for healthcare and diagnostics (3). Annual publication trends showed rapid expansion from 2021 to 2024, followed by stabilization in 2025, suggesting the field is transitioning from exploratory studies toward more specialized subdomains such as AI ethics, wearable technologies, and clinical decision support systems [15, 17].

Author productivity analysis highlighted both concentrated and distributed contributions, with key researchers such as Shaffik Wasswa and Yogesh K. Dwivedi leading collaborative efforts. The observed low international collaboration underscores the need for cross-border research partnerships to enhance generalizability and impact [10, 7]. Keyword co-occurrence and co-word network analyses revealed a dual structure in the field: core, well-established themes (AI, Machine Learning, Healthcare, Diagnosis, Deep Learning) and emerging peripheral topics (COVID-19, IoT, Blockchain, wearable health technologies), indicating a balance between consolidated knowledge and innovative, interdisciplinary directions [5, 3].

Top journals identified included Technological Forecasting and Social Change, Engineering Applications of AI, and Nature Medicine, demonstrating the interdisciplinary reach of AI research across technology, healthcare, socio-technical systems, and business [15, 17]. High citation counts in journals such as Nature Medicine and IEEE outlets reinforced the technological and clinical relevance of the field, emphasizing the translation of AI research into actionable healthcare solutions [10, 7].

Policy and clinical implications from these findings include the prioritization of international collaborations, the development of ethical and regulatory frameworks for AI integration, and support for mentoring early-career researchers to foster knowledge dissemination and innovation. Additionally, emerging areas such as AI in wearable devices, real-time monitoring, and predictive analytics require targeted funding and policy guidance to ensure safe, equitable, and effective adoption [3, 15, 17].

In conclusion, the bibliometric patterns indicate a dynamic and rapidly evolving AI in the healthcare landscape, characterized by increasing publications, strong author collaboration, multidisciplinary thematic clusters, and influential journals that shape both academic and practical directions. Future research should emphasize cross-disciplinary collaboration, longitudinal studies on AI adoption in clinical settings, and policies addressing ethical, regulatory, and equity concerns in AI-enabled healthcare [3, 10, 15, 17].

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