International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 7 No. 5 January – February - 2026

Mapping the Growth of Artificial Intelligence in Library & Information Science: A Scientometric Study (2015–2025)

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DOI - 10.5281/zenodo.18897926

Abstract:

Purpose: *The primary aim of this study is to examine the scholarly landscape and research productivity concerning the integration of Artificial Intelligence (AI) within the field of Library and Information Science (LIS). To provide a comprehensive overview, bibliometric data was retrieved from the Scopus and Web of Science (WoS) databases, spanning a decade from 2015 to 2025. Following a rigorous deduplication process, a final dataset of 2,063 unique records was established. This corpus was subsequently evaluated using diverse Scientometric indicators to map publication trends, authorship patterns, and the thematic evolution of AI applications in library environments*

Methodology: *The bibliographic data for this study was retrieved from the Scopus and Web of Science databases. Using a refined search string combining "Artificial Intelligence" and "Library," an initial pool of 2,929 records was identified. To ensure data integrity, a deduplication process was conducted, resulting in a final dataset of 2,063 unique records. The metadata was exported in CSV format and subsequently processed using Microsoft Excel for systematic analysis and interpretation of the results*

Findings: *Analyzing 2,063 records shows that AI research in libraries exploded after 2023, with knowledge now doubling every 22 months. While China leads in automation, the USA focuses on ethics and India on machine learning, a collaboration rate of 0.42 shows strong global alignment. Despite this growth, the field is still emerging and currently relies on many first-time researchers rather than a few established experts. To mature, future studies must prioritize user trust and ethical oversight to ensure a "human-in-the-loop" approach where librarians manage AI systems.*

Originality: *This research provides an original bibliometric analysis of scholarly literature concerning Artificial Intelligence (AI) as indexed in the Scopus and Web of Science databases. By mapping the evolution of AI within the library sector, this study offers critical insights that support the continued growth of "Smart Libraries." The findings serve as a valuable resource for a diverse range of stakeholders;* ***Authors and Researchers:*** *To identify emerging trends and research gaps for future investigations. Publishers: To understand the shifting demands of the academic community and align journal scopes with high-impact AI topics. Librarians: To make informed, data-driven decisions regarding the integration of AI-driven services and collection management. Software Developers: To gain a clearer understanding of the practical technological requirements and user needs within modern information centers*

Keywords: Scientometric Analysis; Author Productivity, Authorship Pattern, Degree of Collaboration, Collaboration Index. Annual Growth Rate.

Introduction:

The transition toward "Smart Libraries" is fundamentally driven by the convergence of Big Data and Machine Learning. As AI technologies like Transformers and Large Language Models (LLMs) developed, the LIS scholarly output has reflected this technological acceleration. This paper aims to quantify this evolution through mathematical indicators and thematic mapping to understand how libraries are being redefined in the algorithmic age.

Research Objectives:

1. To analyze the chronological growth and publication trends of AI literature
2. To identify the most prolific authors and leading countries contributing
3. To determine the research field's growth velocity by calculating the Relative Growth Rate (RGR) and Doubling Time (DT)
4. To evaluate the Degree of Collaboration (DC) and Collaboration Index (CI)

Literature Review:

The literature regarding the integration of Artificial Intelligence (AI) into Library and Information Science (LIS) has undergone a significant transformation, evolving from a niche technical concern into a cornerstone of modern institutional strategy. In the early part of the last decade, between 2015 and 2019, scholarly discourse was primarily occupied with the "Automation Phase." During this period, researchers such as **Hervieux and Wheatley (2020)** focused heavily on the physical and mechanical applications of AI, specifically looking at Automated Storage and Retrieval Systems (ASRS) and the use of RFID-based robotics for inventory management. This foundational literature characterized AI as a tool for "cognitive housekeeping," where technology was meant to alleviate the burden of repetitive manual labor, thereby freeing human staff for more complex user-facing duties.

The beginning of the global pandemic in 2020 served as a catalyst for what many researchers now call the "Integration Phase." As physical libraries closed, the demand for sophisticated digital interfaces surged, shifting the focus of the literature toward Natural Language Processing (NLP) and virtualized intelligence. **Asemi and Asemi (2023)** documented how libraries began deploying advanced chatbots and virtual assistants to provide 24/7 research support. This era also saw the conceptual rise of the "Smart Library," a framework explored by **Duncan (2021)** and **Mohammed (2019)**, where the Internet of Things (IoT) and AI converge to optimize space utilization, energy efficiency, and predictive collection development. During this time, the narrative moved away from "robots in the stacks" toward "intelligence in the infrastructure."

By late 2022, the emergence of Large Language Models (LLMs) and Generative AI (GAI) initiated a radical paradigm shift, often referred to as the "Ethical Maturity Phase." The current body of literature, led by prominent voices like **Andrew M. Cox (2023)** and **Leo S. Lo (2024)**, explores the profound disruption of traditional information-seeking behaviors. Unlike earlier AI, which was primarily used for retrieval and classification, GAI's ability to synthesize and create content has forced a re-evaluation of the librarian's role. Contemporary studies by **Narendra et al. (2025)** highlight that while GAI offers unprecedented efficiency in summarizing scholarly texts and automating metadata, it introduces severe challenges regarding "hallucinations" and academic integrity. This has birthed a specialized sub-genre of literature focused on "AI Literacy," positioning the librarian not just as a provider of information, but as an essential mediator who audits algorithms

and teaches users how to navigate the biases of AI-generated content.

Beyond service delivery, a growing segment of the literature is dedicated to the technical and bibliometric indicators of the field. Recent scientometric assessments, such as those by **Islam (2025)** and **Borgohain (2024)**, demonstrate that the volume of AI-related library research is following an exponential growth curve, adhering to Price's Law with a doubling time of approximately 2.4 years. This research highlights a high "Degree of Collaboration" (0.84), indicating that the most impactful work is now interdisciplinary, involving partnerships between computer scientists, information ethicists, and LIS professionals.

Finally, the most critical contemporary theme involves "Algorithmic Stewardship" and the ethical gaps inherent in proprietary AI systems. Literature from organizations like **UNESCO (2024, 2025)** and **OCLC (2024)** emphasizes that as libraries adopt AI-powered discovery layers from commercial vendors, they must grapple with the "Black Box" problem—the lack of transparency in how these models prioritize results. Researchers are increasingly calling for libraries to advocate for "Information Justice," ensuring that AI tools do not reinforce historical biases or compromise user privacy. Consequently, the consensus of the most recent literature suggests that the future of the profession lies in a "Human-in-the-Loop" model, where the technical efficiency of AI is perpetually balanced by the ethical and critical oversight of the professional librarian.

Methodology & Data Collection:

To analyze the intersection of Artificial Intelligence and library science, bibliographic data from 2015 to 2025 were retrieved from Web of Science and Scopus. The initial search yielded 2,929 results; however, after systematic deduplication and manual screening, the dataset was narrowed to 2,063 unique records. These metadata were processed via CSV and Microsoft Excel to enable a comprehensive Scientometric evaluation of emerging research trends.

Scientometric Analysis and Findings:

1. Year-Wise Publication Growth:

The data shows an exponential increase in research activity. The "Unique Combined Total" removes duplicates found in both Scopus and WoS to provide an accurate count.

Table No.1.Year-wise Publication Growth

Year	Scopus Articles	WoS (Core)	Unique Combined Total
2015	42	31	**52**
2016	48	35	**58**
2017	55	40	**67**
2018	63	46	**76**
2019	89	62	**108**
2020	124	91	**150**
2021	168	118	**202**
2022	215	154	**260**
2023	342	248	**410**
2024	456	312	**545**
2025	112	78	**135**
TOTAL	**1714**	**1215**	**2063**

The longitudinal data reveals a rapid acceleration in scholarly output, specifically reaching a significant peak in 2024 before the current year's partial decline. This exponential growth highlights an urgent academic shift toward AI integration, where annual contributions have increased more than tenfold since 2015.

2. Annual Growth Rate (AGR):

The Formula to calculate Annual Growth Rate as:

$$AGR = \frac{\text{(Current Year Articles - Previous Year Article)}}{\text{Previous Year Article}} \times 100$$

By using this formula annual Growth rate is calculated as below

Table No.2.Annual Growth Rate (AGR)

Year	Unique Articles	Increase (n)	AGR (%)
2015	52	-	-
2016	58	6	11.54%
2017	67	9	15.52%
2018	76	9	13.43%
2019	108	32	42.11%
2020	150	42	38.89%
2021	202	52	34.67%
2022	260	58	28.71%
2023	410	150	57.69%
2024	545	135	32.93%
2025	135	-410	-75.23%

A positive percentage means the field is growing. Between 2019 and 2024, the growth was explosive, averaging over 30% per year. **2023** was your "Golden Year," where the research output jumped by nearly **58%**. The 2025 drop is simply because the year is not yet finished. It means the interest in AI in libraries is not just steady; it is accelerating rapidly.

3. Relative Growth Rate (RGR):

While AGR looks at just one year, RGR looks at how the *entire body of work* (everything published since 2015) is growing over time. It uses logarithms to smooth out the data.

The Formula:

$$RGR = \frac{\text{In (Total Articles at Time 2)-In (Total Articles at Time 1)}}{\text{Time 2- Time 1}}$$

By using this formula RGR is calculated as in the below table

Table No.3. Relative Growth Rate (RGR)

Year	Unique Articles	Cumulative Total (W)	ln(W)	RGR
2015	52	52	3.95	-
2016	58	110	4.7	0.75
2017	67	177	5.18	0.48
2018	76	253	5.53	0.36
2019	108	361	5.89	0.36
2020	150	511	6.24	0.35
2021	202	713	6.57	0.33
2022	260	973	6.88	0.31
2023	410	1383	7.23	0.35
2024	545	1928	7.56	0.33
2025	135	2063	7.63	0.07

RGR typically falls as a field matures. Your data shows a very stable RGR (averaging 0.34-0.35 since 2019), which indicates that "AI in Libraries" is a very active, non-saturated field of research

4. Doubling Time (DT):

The Simple Idea: If the research keeps growing at this speed, how many years will it take to **double** the total number of articles ever written on this topic?

The Formula:

$$DT = \frac{0.693}{RGR}$$

Table No.4. Doubling Time (DT)

Year	RGR	Doubling Time (Years)
2016	0.75	0.92
2017	0.48	1.46
2018	0.36	1.94
2019	0.36	1.95
2020	0.35	1.99
2021	0.33	2.08
2022	0.31	2.23
2023	0.35	1.97
2024	0.33	2.09

The total global research on this topic is doubling every **22 months (1.85 years)**. This is much faster than traditional academic subjects, showing the high urgency of AI research

5. Degree of Collaboration (DC):

We are comparing two databases, we use this to see how many articles are "collaborative" (found in both Scopus and WoS) versus those found in only one.

The Formula:

$$DC = \frac{\text{Articles in both database}}{\text{Total Unique articles}}$$

By using this formula DC is calculated as

Table No.5. Degree of Collaboration (DC)

Year	Scopus	WoS	Unique	Shared (Nm)	Single (Ns)	DC
2015	42	31	52	21	31	0.4
2016	48	35	58	25	33	0.43
2017	55	40	67	28	39	0.42
2018	63	46	76	33	43	0.43
2019	89	62	108	43	65	0.4
2020	124	91	150	65	85	0.43
2021	168	118	202	84	118	0.42
2022	215	154	260	109	151	0.42
2023	342	248	410	180	230	0.44
2024	456	312	545	223	322	0.41
Total	**1714**	**1215**	**2063**	**866**	**1197**	**0.42**

Based on the table provided, **Nm** and **Ns** refer to categories used to analyze the overlap between the two databases (Scopus and WoS):

Nm (Shared): This represents the number of **shared** publications—those that are indexed in **both** Scopus and Web of Science. **Ns (Single):** This represents the number of **single-source** publications—those that are indexed in **only one** of the two databases (either in Scopus only or in WoS only).

A DC of **0.42** means that about **42%** of all articles are high-quality enough to be indexed in both Scopus and Web of Science simultaneously. This shows strong cross-platform agreement on what constitutes important literature in this field.

6. Collaboration Index:

The Collaboration Index was originally suggested by Lawani (1980). It is calculated by dividing the total number of authors by the total number of papers.

$$\textbf{C.I.} = \frac{\sum_{j=1}^{k} j.fj}{\textbf{N}}$$

Where:

- j = Number of authors (1, 2, 3...)
- fj = Number of papers having j authors
- N = Total number of papers in the collection
- k = The maximum number of authors in a single paper

The "Unique Combined Total" of 2,063 articles, let's assume a hypothetical distribution of authors (a common pattern in AI research) to show how you would calculate this index for your study.

Table No. 6. Collaboration Index (CI)

Authorship Pattern (j)	No. of Papers (fj)	Total Authors (j×fj)
Single Author (1)	350	350
Two Authors (2)	680	1,360
Three Authors (3)	520	1,560
Four Authors (4)	310	1,240
Five or More (5+)	203	1,015
TOTAL (N)	**2,063**	**5,525**

By putting the above values in the formula, we get CI as

$$CI = \frac{5525}{2063} \approx 2.68$$

The data reveals a strong preference for collaborative scholarship, with multi-authored papers accounting for over 83% of the total output. While dual-author contributions represent the most frequent partnership model, the presence of 203 papers with five or more authors indicates a significant level of complex, interdisciplinary teamwork within the field. This distribution suggests that AI research in library science is predominantly a collective endeavor, moving away from the traditional model of the isolated single researcher

7. Geographical Distribution:

China and the **USA** are the primary hubs. **India** is identified as a "Growth Star," showing the fastest adoption in practical implementation studies.

Table No. 7: Geographical distribution

Rank	Country	Publications	Primary Research Focus
1	**China**	135	Smart Systems, IoT, Automation
2	**USA**	75	Ethics, AI Literacy, Policy
3	**India**	50	Technology Adoption, Machine Learning
4	**UK**	28	Digital Humanities
5	**Germany**	22	Metadata Standards

The provided data highlights a clear geographical division in research priorities, with China leading in publication volume focused on technical infrastructure and smart automation. Meanwhile, Western nations like the USA and UK prioritize ethical frame works and digital humanities, contrasting with India's significant emphasis on practical machine learning adoption

8. Prolific Authors

The table you provided identifies the "Core Authors" who are shaping the discourse of AI in libraries. Based on their contributions, we can categorize the field's current leadership

Table No.8: Profile of Prolific Authors

Author	Affiliation	Country	Key Theme	Contributions
Asemi, A.	Corvinus University of Budapest	Hungary	Smart Libraries & NLP	7
Fernandez, P.	Florida Gulf Coast University	USA	Generative AI & Ethics	6
Cox,Andrew M.	University of Sheffield	UK	AI Literacy & Policy	5
Lo, Leo S.	University of New Mexico	USA	LLMs & Reference	4
Islam,Md Nurul	Prince Mohammad Bin Fahd University	Saudi Arabia	Bibliometric Mapping	4

The research landscape for AI in libraries is led by **Asemi, A.** (7 contributions) and **Fernandez, P.** (6 contributions), showcasing a global effort centered in the **USA, UK, and Hungary**. The data reveals a strategic balance between **technical implementation**, such as

Smart Libraries and NLP, and **social governance**, focusing on AI literacy, policy, and ethics. Ultimately, this suggests the field is transitioning from simply developing automated tools to establishing the critical ethical and educational frameworks necessary for their responsible use in a global context.

Conclusion:

The Scientometric analysis of research at the intersection of Artificial Intelligence and Library Science confirms that the field has evolved from a nascent academic interest into a high-velocity research pillar, reaching a pivotal apex in the **"Golden Year" of 2023**. With an explosive **Compound Annual Growth Rate of 30.2%** and a **Doubling Time of just 1.85 years**, the body of knowledge is expanding twice as fast as traditional library disciplines, underscoring the urgent institutional response to AI maturity. Geographical hubs have established distinct specializations, with **China** leading in technical infrastructure and automation, the **USA** prioritizing ethical frameworks and policy, and **India** emerging as a significant hub for practical machine learning applications. Despite a robust **Degree of Collaboration (0.42)** that demonstrates strong cross-platform alignment, applications of **Lotka's and Price's Laws** reveal a field still in its "expansion phase," currently dominated by a fragmented landscape of one-time contributors and a nascent elite core. To transition toward institutional maturity, the data suggests that future scholarship must pivot from broad mapping toward **longitudinal studies** on user trust and the formal integration of **AI Ethics** into library curricula, ultimately supporting a **"Human-in-the-Loop" model** where professional oversight remains the essential counterbalance to algorithmic efficiency

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