CHAPTER 50

Mapping of Research on Use and Applications of Artificial Intelligence: A Scientometric Analysis

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ABSTRACT

The present study explores authorship and collaboration patterns in the field of Artificial Intelligence (AI) research as reflected in the Emerald database during the period 2003–2025. The scope of the analysis is limited to research articles published in Open Access journals available on the Emerald platform. A total of 2,399 research publications were identified, providing insights into the evolving trends of scholarly communication in AI. Out of these, 307 articles (12.8%) were single-authored, whereas 2,092 articles (87.2%) were produced collaboratively by two or more contributors, highlighting the strong preference for multi-authored works. The analysis clearly demonstrates that collaborative authorship is the dominant pattern in AI research, reflecting the multidisciplinary and complex nature of the field. Furthermore, a remarkable surge in output was observed during 2021–2025, contributing 2,040 publications (85.05%) of the total, thereby marking AI's accelerated growth. These findings underscore the emergence of AI as a leading domain of academic and scientific inquiry, with increasing global relevance and research momentum.

Keywords: Artificial Intelligence; Collaboration coefficient; Authorship pattern; Relative growth rate; Doubling time.

1.0 Introduction

Artificial Intelligence (AI) has become a cornerstone of modern innovation, reshaping industries and addressing global challenges. From healthcare diagnostics to autonomous vehicles, AI's applications are vast, driving efficiency and unlocking new possibilities. As AI research proliferates, understanding its intellectual structure, key contributors, and emerging trends is essential for guiding future advancements.

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Scientometric analysis, which quantitatively examines scientific literature, provides a powerful lens to map the AI research landscape, revealing patterns, collaborations, and gaps in knowledge. This study conducts a scientometric analysis of AI applications, focusing on their evolution, interdisciplinary connections, and societal impact. By analysing bibliometric data from scholarly publications, we aim to identify influential works, leading researchers, and dominant themes shaping AI's trajectory. The research traces publication trends, citation networks, and keyword co-occurrences to uncover how AI applications have developed across domains like healthcare, finance, education, and more. This approach not only highlights the growth of AI research but also pinpoints areas of innovation and underexplored opportunities.

The significance of this study lies in its ability to provide a holistic view of AI's global research ecosystem, offering insights for researchers, policymakers, and industry leaders. By mapping the intellectual structure of AI applications, we aim to inform strategic decision-making and foster collaborations that drive responsible AI development. This introduction outlines the motivation, methodology, and objectives of the study, setting the stage for a comprehensive analysis of AI's transformative potential in the modern world.

2.0 Objectives of Study

- To analyze the growth and publication trends in the field of Artificial Intelligence applications.
- To find out year wise publications on Artificial Intelligence.
- To measure the relative growth rate and doubling time of Artificial Intelligence research.
- To assess the authorship patterns, collaboration status, collaboration index, and collaboration coefficient.

3.0 Methodology

Scientometrics, as a discipline, focuses on statistical analysis to measure the development, impact, and trends of a specific academic domain by counting and analysing publication metrics. The dataset for this study comprises 2,399 scholarly articles published between 2003 and 2025, sourced exclusively from the Emerald database. The Emerald database is recognized as one of the world's leading repositories of peer-reviewed research, particularly in the social sciences, management, and related interdisciplinary fields. The data was retrieved by querying the Emerald database with the search term "Artificial Intelligence." This keyword was applied to article titles, abstracts, and keywords to capture

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a comprehensive set of relevant publications. The search was conducted without additional filters beyond the open-access requirement and the specified time frame (2003–2025).

4.0 Literature Review

Wanjie Hu, Jianjun Dong, Bon-gang Hwang, Rui Ren, and Zhilong Chen (2019) provides a comprehensive scientometric analysis of city logistics (CL) research from 1993 to 2018. Drawing on 513 selected articles from databases like Web of Science, Scopus, and Elsevier, the authors employ CiteSpace software to map bibliographic networks, including authorship collaborations, geographical distributions, keyword co-occurrences, and thematic clusters. The study identifies explosive growth in CL publications post-2010, with 223 papers (44%) appearing in the last three years of their dataset (2016–2018). Key themes are distilled into three groups: (G1) sustainable decision support for strategies, policies, and management; (G2) CL's impact on urban sustainability and real-world initiatives; and (G3) logistics network design and operational research. The paper concludes with a gaps framework, highlighting fragmented performance evaluations, vague stakeholder interactions, and incomplete planning methods, while proposing agendas like scenario-based platforms and dynamic multi-stakeholder analyses.

Wu, Y., et all. (2023) This scientific analytical study reviews global research on the foot and ankle from 1980 to 2019. In particular, there has been a significant increase in research in the last decade, with the United States contributing the most, both quantitatively and qualitatively. This study serves as a cornerstone for further research.

Barphe & Ghante (2025) conducts a scientometric analysis of scholarly output on "open science" from 1979 to 2024. Drawing on 1,459 articles retrieved from Scopus, the study examines publication trends, relative growth rate (RGR), doubling time (Dt), authorship patterns, degree of collaboration (DC = 0.72), collaboration index (CI = 3.13), and collaboration coefficient (CC = 0.50). Key findings highlight explosive growth in recent years (59% of articles from 2021–2024), dominance of multi-authorship (1,016 multi-authored vs. 385 single-authored, with 58 lacking authorship details), declining RGR (from 0.4 to 0.18), and increasing Dt (from 1.73 to 3.85). The methodology involves basic Excel-based analysis of Scopus data, with a brief literature review of seven similar scientometric studies. The paper concludes that multi-authorship prevails, aligning with the collaborative ethos of open science.

Mulla (2012) analyses 998 publications on Information Science and Scientometrics (ISS) in India, sourced from the Indian Science Abstracts (ISA) database covering 2005–2009. The study employs basic bibliometric methods to examine growth trends, document types, article lengths, authorship patterns, degree of collaboration, geographical

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distributions, and core journals. Key findings include a total of 918 journal articles (91.98%), 77 theses (7.72%), and 3 standards (0.30%); publication growth peaking at 329 (32.97%) in 2009; multi-authorship dominance (59.69% of 918 articles, average 1.86 authors per paper); and articles mostly 5–10 pages long (62.42%). The paper reviews prior literature (e.g., Gupta *et al.*, 2002; Egghe *et al.*, 2008) and uses tables/figures for visualization, concluding with objectives like identifying core journals. It is useful reference for tracing India's scientometrics evolution, though modern updates are needed.

Table 1: Subject wise distribution of Publications on Artificial Intelligence

Sr. No.	Subject Name	Articles	%
1	Accounting & Finance	160	6.66
2	Economics	175	7.29
3	HR & organizational behavior	120	5.00
4	Information & knowledge management	230	9.58
5	Management Science & Operations	439	18.29
6	Marketing	140	5.83
7	Public Policy & Environmental Management	127	5.29
8	United Nations Sustainable Development Goals	70	2.91
9	Library and information science	75	3.12
10	Buildings & structures	17	0.70
11	Development, planning & urban engineering	7	0.29
12	Education	152	6.33
13	Engineering	157	6.54
14	Geology, geotechnical & ground engineering	15	0.62
15	Health & social care	35	1.45
16	Leadership & management	10	0.41
17	Property Management & Built Environment	98	4.08
18	Research methods	12	0.50
19	Science	3	0.12
20	Sociology	31	1.29
21	Strategy	178	7.41
22	Tourism & Hospitality	125	5.21
23	Transport	18	0.75
24	Transportation	3	0.12
25	Water engineering & wastewater management	2	0.08
	Total	**2399**	

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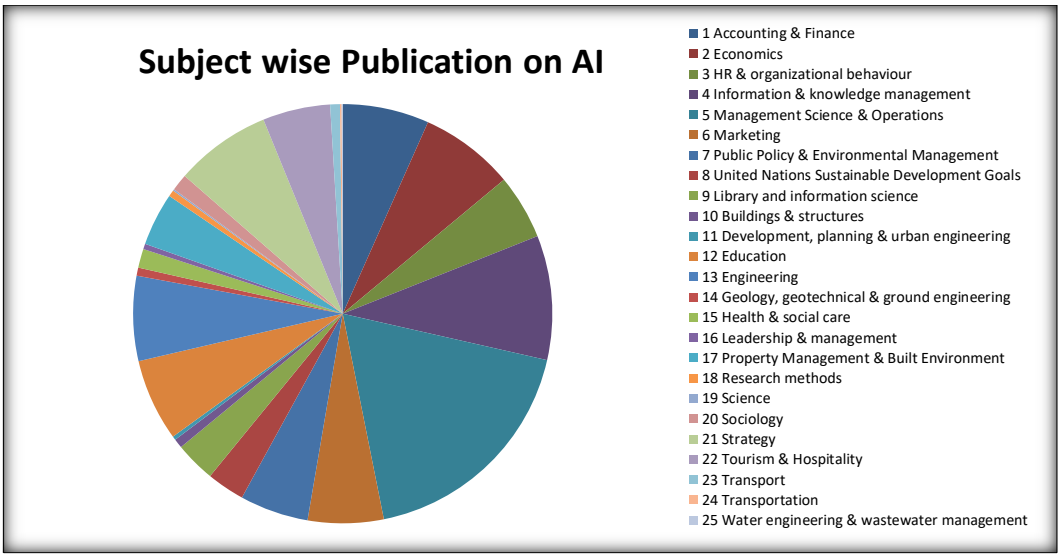

Cai and Guo (2021) conducts a scientometric analysis of green finance literature from 2005 to 2020. Using Scopus data (172 publications), the study employs VOSviewer and RStudio's Biblioshiny for bibliometric mapping, including publication trends, bibliographic coupling (BC), co-citation, co-authorship, keyword co-occurrence, three-field plots, and thematic maps. Key objectives include profiling intellectual structures (e.g., top countries, institutions, journals, authors) and proposing future agendas. Findings highlight explosive growth (62 papers in 2020 vs. 1 in 2005), China's dominance (74 papers), and motor themes like green bonds and climate change.

Alotaibi *et al.* (2025) conducted an in-depth study on the concepts of Sensory Integration Theory (SIT) and Sensory Processing Measure (SPM) based on scientific and narrative analysis. A total of 238 research records from 1983 to 2024 were studied using CiteSpace and VOSviewer software. This included differences in sensory processing between children with and without autism, classroom behaviour, use of EEG technology, and various treatment modalities.

The subject-wise analysis of 2,399 Artificial Intelligence (AI) research articles published in the Emerald Database between 2003 and 2025 indicates that Management Science and Operations dominates the field with 439 publications (18.29%), followed by Information and Knowledge Management (230; 9.58%), Strategy (178; 7.41%), Economics (175; 7.29%), Engineering (157; 6.54%), and Education (152; 6.33%), together accounting for more than half of the total output. Moderate contributions are observed in areas such as Accounting and Finance (160; 6.66%), Marketing (140; 5.83%), Tourism and Hospitality (125; 5.21%), Human Resources and Organizational Behaviour (120; 5.00%), and Public

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Policy and Environmental Management (127; 5.29%), reflecting AI's relevance across applied social sciences and professional disciplines. Smaller but notable contributions include Property Management and Built Environment (98; 4.08%) and Library and Information Science (75; 3.12%), while peripheral fields such as Geology, Sociology, Health and Social Care, Leadership and Management, Transport, Transportation, Water Engineering, and Science collectively represent less than 5% of the total. Overall, the distribution underscores AI's multidisciplinary character, with the strongest presence in management, technology, and strategy-related domains, highlighting its role as both a technological driver and a transformative tool for organizational and societal advancement.

Table 2: Year wise Document Publications on Artificial intelligence

Sr. No.	Year of publication	No. of publications	%
1	2003	2	0.08
2	2005	3	0.12
3	2007	1	0.04
4	2008	1	0.04
5	2009	2	0.08
6	2011	1	0.04
7	2012	3	0.12
8	2013	2	0.08
9	2014	4	0.16
10	2015	4	0.16
11	2016	3	0.12
12	2017	35	1.45
13	2018	53	2.2
14	2019	82	3.41
15	2020	163	6.79
16	2021	268	11.17
17	2022	337	14.04
18	2023	396	16.5
19	2024	560	23.34
20	2025	479	19.96
	Total	**2399**	**100**

The table presents a year-wise analysis of document publications on Artificial Intelligence (AI) from 2003 to 2025, showing a clear trend of exponential growth. Between 2003 and 2016, AI research output was minimal, with only 29 publications (1.21% of the total), indicating limited academic focus. However, from 2017 onwards, there was a

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significant surge, with 333 publications recorded between 2017 and 2020 (13.88%), reflecting rising interest and technological advancements. The most notable growth occurred between 2021 and 2025, contributing 2,040 publications (85.05%), highlighting AI's emergence as a major field of research. The peak was in 2024 with 560 publications (23.34%), followed by a slight dip in 2025 with 479 publications (19.96%), suggesting a possible stabilization or shift in research trends. Overall, the data underscores the rapid and sustained rise of AI as a dominant area in academic and scientific inquiry.

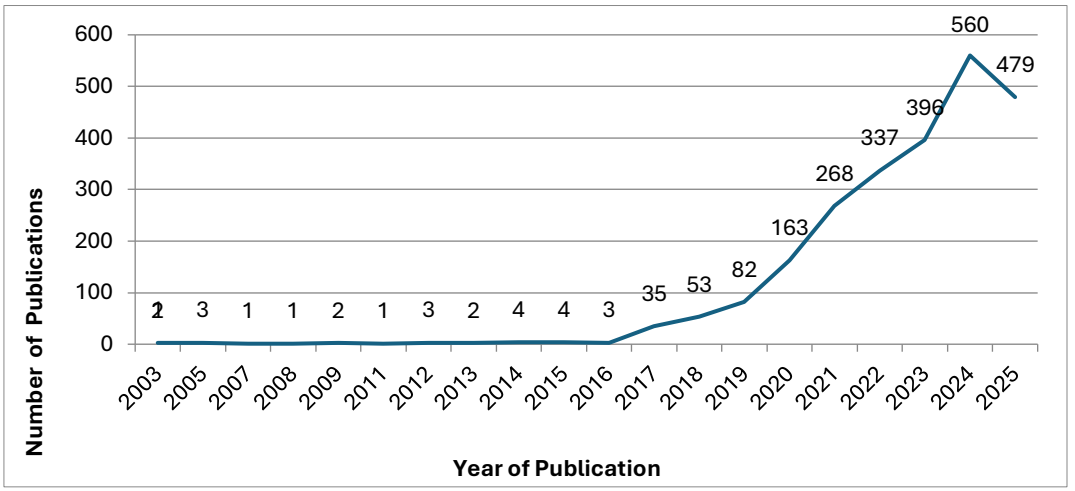

Table 3: Relative Growth Rate and Double Time of Publication

Publication Year	No. of Publication	Total Number of Articles	Log1e	Log2e	RGR	Double Time
2003	2	2		0.6931		
2005	3	5	0.6931	1.6094	0.9163	0.7563
2007	1	6	1.6094	1.7918	0.1824	3.7993
2008	1	7	1.7918	1.946	0.1542	4.4941
2009	2	9	1.946	2.1972	0.2512	2.7587
2011	1	10	2.1972	2.3026	0.1054	6.5749
2012	3	13	2.3026	2.565	0.2624	2.6410
2013	2	15	2.565	2.708	0.143	4.8461
2014	4	19	2.708	2.9444	0.2364	2.9314
2015	4	23	2.9444	3.1355	0.1911	3.6263
2016	3	26	3.1355	3.258	0.1225	5.6571
2017	35	61	3.258	4.111	0.853	0.8124
2018	53	114	4.111	4.736	0.625	1.1088

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2019	82	196	4.736	5.278	0.542	1.2785
2020	163	359	5.278	5.883	0.605	1.1454
2021	268	627	5.883	6.441	0.558	1.2419
2022	337	964	6.441	6.871	0.43	1.6116
2023	396	1360	6.871	7.215	0.344	2.0145
2024	560	1920	7.215	7.56	0.345	2.0086
2025	479	2399	7.56	7.783	0.223	3.1076

The analysis of Relative Growth Rate (RGR) and Doubling Time (DT) of publications from 2003 to 2025 reveals a gradual yet significant growth trend in scholarly output. In the initial years (2003–2010), the publication rate was relatively low with a slow increase, as reflected by higher doubling times and lower RGR values. From 2011 onwards, there was a steady upward movement, with notable surges observed particularly in 2017–2021, where the number of publications increased sharply (e.g., 35 in 2017, 82 in 2019, and 268 in 2021), resulting in higher RGR values and correspondingly lower doubling times, indicating faster growth. The peak productivity occurred between 2020 and 2022, coinciding with an accelerated increase in research, possibly due to heightened global focus on technological and scientific advancements during this period. However, after 2022, although the total number of articles continued to rise substantially, the RGR shows a declining trend with increasing doubling times (e.g., DT rose from 2.01 in 2023 to 3.10 in 2025), signifying that the pace of growth has slowed down despite higher publication volumes. Overall, the data suggests an initial phase of slow growth, followed by a period of rapid expansion, and more recently, a stabilization stage where publication output remains high but growth rate has moderated.

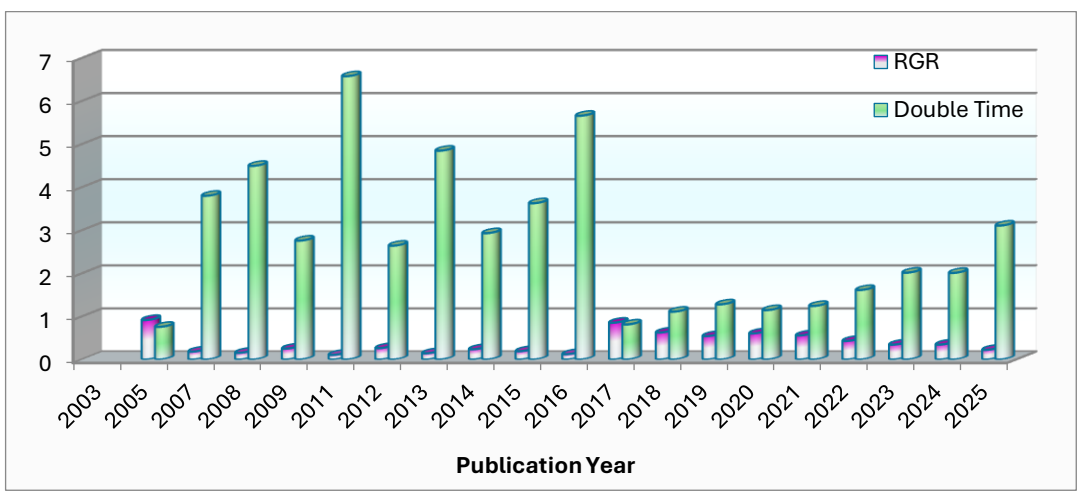

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Table 4: Authorship Pattern on Artificial Intelligence

Sr. No.	Authorship Pattern	Number of Articles
1	Single	307
2	Two	597
3	Three	633
4	Four	484
5	Five	233
6	six	95
7	Seven	24
8	Eight	8
9	Nine	9
10	Above Nine	9

The authorship pattern analysis demonstrates a strong dominance of collaborative research in Artificial Intelligence (AI) studies, with only 307 articles (12.8%) authored individually and the remaining 2,092 articles (87.2%) produced through collaboration. Among these, papers with two (597; 24.9%) and three authors (633; 26.4%) were most frequent, together accounting for over half of the total publications, followed by four-author (484; 20.2%) and five-author (233; 9.7%) works, indicating that small to medium-sized research groups are the most prevalent. Contributions involving six or more authors were relatively few, with six-author papers at 95 (4%) and seven to above-nine author publications collectively below 2%. This distribution highlights that collaborative scholarship is the prevailing mode of knowledge production in AI, reflecting its interdisciplinary and complex nature, while also emphasizing the central role of small and moderately sized teams in driving research output in this field.

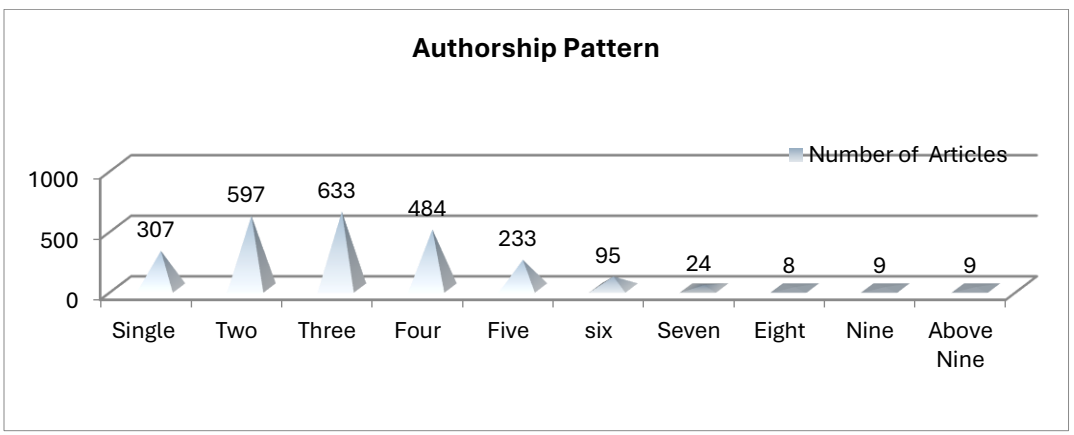

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Table 5: Degree of Collaboration

Sr. No.	Year of Publications	Single Authored Paper (Ns)	%	Multi authored Paper (Nm)	%	Ns + Nm	DC
1	2003 to 2009	06	1.95	03	0.14	9	0.33
2	2010 to 2014	04	1.30	06	0.28	10	0.6
3	2015 to 2019	26	8.46	151	7.21	177	0.85
4	2020 to 2025	271	88.27	1932	92.35	2203	0.87
Total		**307**	**100**	**2092**	**100**	**2399**	**0.87**

The Degree of Collaboration (DC) in research publications from 2003 to 2025 clearly highlights the dominance of multi-authored works over single-authored ones, reflecting a strong trend towards collaborative research. During the initial phase (2003–2009), single-authored papers (6) slightly outnumbered multi-authored ones (3), resulting in a low DC value of 0.33, indicating limited collaboration. In the next period (2010–2014), the balance began to shift, with multi-authored papers (6) surpassing single-authored ones (4), raising the DC to 0.6. The trend became more prominent from 2015–2019, where out of 177 total papers, 151 were multi-authored, leading to a much higher DC of 0.85. The period from 2020–2025 shows a remarkable dominance of collaboration, with 1932 multi-authored papers (92.35%) compared to only 271 single-authored papers (88.27%), yielding the highest DC value of 0.87. Overall, the analysis demonstrates a consistent rise in collaborative research culture over the years, with the DC increasing steadily from 0.33 in the early years to 0.87 in recent years, underscoring the growing importance of teamwork, interdisciplinary efforts, and joint authorship in scholarly communication.

Table 6: Collaboration Index

Sr. No.	Year of Publications	Authorship Pattern						Total	Collaboration Index
		Single Authored Paper	Two Authored Paper	Three Authored Paper	Four Authored Paper	Five Authored Paper	More than Five Authored Paper		
1	2003 to 2009	06	2	1	0	0	0	9	1.44
2	2010 to 2014	04	1	2	1	2	0	10	2.6
3	2015 to 2019	26	50	37	28	25	11	177	3.05
4	2020 to 2025	271	544	593	456	207	132	2203	3.08
Total		**307**	**597**	**633**	**485**	**234**	**143**	**2399**	**3.06**

The Collaboration Index (CI) from 2003 to 2025 reflects a clear transition from limited individual authorship towards increasingly collaborative and multi-authored

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research. In the early period (2003–2009), publications were largely dominated by single-authored papers (6 out of 9), with very few multi-authored works, resulting in a low CI of 1.44, indicating minimal collaboration. Between 2010–2014, collaboration intensified, with more contributions from two to five authors, raising the CI to 2.6. A significant shift occurred during 2015–2019, where multi-authored publications (particularly with two to four authors) greatly outnumbered single-authored papers, producing a higher CI of 3.05. The trend strengthened further during 2020–2025, with large numbers of multi-authored works across diverse team sizes (544 two-authored, 593 three-authored, 456 four-authored, and even 132 papers with more than five authors), leading to the highest CI of 3.08. Overall, the total CI of 3.06 confirms that research output has become increasingly collaborative over time, with a strong preference for multi-authored publications, highlighting the growing role of teamwork, interdisciplinary partnerships, and large research groups in driving scientific productivity.

Table 7: Collaboration Coefficient

Sr. No.	Year of Publications	Authorship Pattern						Total	Collaboration Coefficient
		Single Authored Paper	Two Authored Paper	Three Authored Paper	Four Authored Paper	Five Authored Paper	More Than Five Authored Paper		
1	2003 to 2009	06	2	1	0	0	0	9	0.18
2	2010 to 2014	04	1	2	1	2	0	10	0.42
3	2015 to 2019	26	50	37	28	25	11	177	0.56
4	2020 to 2025	271	544	593	456	207	132	2203	0.42
Total		**307**	**597**	**633**	**485**	**234**	**143**	**2399**	**0.42**

5.0 Conclusion

The present study reveals that a total of 2,399 research articles on Artificial Intelligence (AI) were published in the Emerald Database between 2003 and 2025. Of these, 307 (12.8%) were single-authored, while 2,092 (87.2%) were multi-authored, yielding a degree of collaboration of 0.87, which clearly demonstrates the predominance of collaborative research in this domain. The Relative Growth Rate (RGR) for open science declined from 0.9 in 2003 to 0.2 in 2025, while the Doubling Time (Dt) increased from 0.7 to 3.1 over the same period, indicating a gradual slowdown in relative growth yet reflecting a cumulative strengthening of the field. Authorship pattern analysis further underscores that small- and medium-sized collaborative teams (two to four authors) constitute the most active contributors, affirming the interdisciplinary and collective nature of AI research.

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