DESIDOC Journal of Library & Information Technology, Vol. 44, No. 6, November 2024, pp.402-408, DOI : 10.14429/djlit.44.6.20273

Indian Contribution to Artificial Intelligence in the Field of Social Sciences during 2014 - 2023

Seema Parmar[1*], Rajive K. Pateria[1], Dinesh Kumari[2] and Shallu[3]

[1]*Nehru Library, CCSHAU, Hisar - 125 004, Haryana, India*
[2]*BPSMV, Khanpur Kalan, Sonipat -131 305, Haryana, India*
[3]*CGC, Jhanjheri, Mohali - 140 307, Punjab, India*
[*]*E-mail: seemaparmar9@gmail.com*

ABSTRACT

The present study intends to identify and analyse the Indian research output on AI in the field of social sciences from 2014 to 2023. This paper showcases the publication types, yearly distribution of publications, prolific authors and preferred sources for publications; highlights contributing institutions and collaborating countries. The data source is the 'Scopus' database, refining through key terms and different filters. The findings of the study emphasise Indian authors' contributions, listing of top authors, and continuous increase in AI publications and citations with occasional fluctuations. Indian writers are remarkably productive, especially those from universities such as the Symbiosis Institute of Technology and Uttranchal University Dehradun. The leading affiliation in contributing research on AI is Symbiosis International Deemed University in terms of citations and publications, while the leading collaborative countries are the United States, the United Kingdom, Saudi Arabia, and China.

Keywords: Artificial intelligence; Bibliometrics; Scientometrics; Research output; Research contribution; India

1. INTRODUCTION

Artificial Intelligence (AI) is a rapidly expanding field with many uses in finance, intelligent transportation, healthcare, education, manufacturing, and agriculture. The word "intelligence" is increasingly used to describe services in a variety of industries that represent technology-driven intelligence and have integrated artificial intelligence. The smooth integration of AI functions as a testbed for the development of Intelligent Information Services (IISs) in conjunction with related techniques like "machine learning", "natural language processing", and "deep learning". This integration significantly affects many different domains. The swift advancement of computing and communication technology has made it possible to integrate cross-domain and cross-organisational applications, especially in networked environments. Virtual Reality, robotics, cloud computing, analytics, the "Internet of Things (IoT)", and big data are some of the technological areas that are closely related to intelligent information services (IISs). AI-driven services are continuously advanced by the synergy between these technologies.

"Artificial Narrow Intelligence (ANI)", strong "Artificial Intelligence (AGI)", and "Artificial Super Intelligence (ASI)" are the three categories under which AI falls. Facial recognition and voice assistants are two common examples of ANI, or weak AI. While ASI goes beyond human intellect and has the ability to self-awareness, AGI replicates human cognition. Although exciting, the ASI is still a long way off, raising questions about its potential effects.

The present paper intends to determine the total research productivity of AI by Indian authors in the fields of social sciences and humanities and to map the impact of this work around the globe. Different definitions are given by different authors or sources. John Macarthy defines AI in 1997 as "Intelligence is the computational part of the ability to achieve goals in the world"[1]. Oxford English Dictionary defines "AI as the capacity of computers or other machines to exhibit or simulate intelligent behaviour"[2]. Merriam-Webster Dictionary defines it as a "branch of computer science dealing with the simulation of intelligent behaviour in computers"[3]. Thus, the artificial intelligence may be defined as a human-made intelligent computer program that behaves in accordance with a provided set of instructions.

Various past studies on bibliometrics have been conducted for different periods. Similar kind of studies have been conducted from time to time by various researchers such as Bircan and Salah[4] , Gencer[5], Guo[6], *et al.*, Ismail Adakawa and Balachandran[7], Jimma[8], Kumar[9], *et al.*, Mariani[10], *et al.*, Nur'aeni and Zalsahra[11], Priyanka[12], *et al.*, Romero-Riaño[13], *et al.*, Votto[14], *et al.*

Received : 30 May 2024, Revised : 11 July 2024
Accepted : 16 July 2024, Online published : 12 November 2024

2. OBJECTIVES

- To identify the type of publications published on AI between 2014 and 2023
- To assess the impact of the total research output in terms of total and average citations per paper
- To identify the top productive authors
- To find out the preferred sources for publications
- To identify the specific institutions that contributed highest literature on AI
- To know the highest collaborative countries with India in terms of publications on AI
- To show most occurred keywords in publications on AI.

3. METHODOLOGY

For this study, data was extracted from the renowned indexing and abstracting database named the 'Scopus' database. The data was extracted in January 2024 using the search Query Your query (title-abs-key(artificial and intelligence) and pubyear > 2013 and pubyear < 2024 and (limit-to (subjarea,"soci") or limit-to (subjarea,"arts") or limit-to (subjarea,"busi") or limit-to (subjarea,"envi") or limit-to (subjarea,"math") or limit-to (subjarea,"econ") or limit-to (subjarea,"psyc") and (limit-to (affilcountry,"india") . The data was refined from generic to specific using filter years, countries and subjects. To analyse the data, the percentages and frequencies of each category were calculated, and descriptive statistics was used to summarise the findings. The study is limited to publications indexed in this database only. For calculation the data was imported in CSV file and necessary calculations and charts were made in Excel file. VOS viewer software has been used to visualise some data through figures.

4. DATA ANALYSIS

4.1 Category of Documents

The different kinds of publications in which research on AI has been published during the last 10 years are reflected in Table 1 and Figure 1. Of the 1814 publications, 800(44.1 %) are research articles, and 634 (34.95 %) are conference papers, 220(12.13 %) are book chapters, 97 (5.35 %) are reviews, 28(1.54 %) are books, 13(0.72 %) are editorials, 12(0.66 %) are notes, 5(0.28 %) are letters, 2(0.11 %) are data papers, 2(0.11 %) are errata and 1(0.07 %) is retracted.

4.2 Yearly Distribution of Publications and Citations

Table 2 shows that there was a continuous increase in publications on AI during the decade from 2014 to 2023, except for 2016. Similarly, the citation count during the period also increased, except in 2019. The impact of this can be seen in the annual growth rate in Figure 2. ACPP was highest for the most recent year (14.18), followed by the preceding years (2022 and 2021). It has also been observed that during the years 2017 and 2018, there was a decrease in the productivity of research papers on AI, but this increased much more than double in the following years. The lowest ACPP was noted in the starting year of 2014.

4.3 Indian Authors' Productivity on AI

Table 3 lists the top ten Indian authors' productivity on AI. These ten authors contributed 5.46 % of the total research output by Indian authors. Ketan V Kotecha from the Symbiosis Institute of Technology, Pune published 14 papers on AI, followed by Rajesh Singh from Uttranchal University, Dehradun who contributed 13 papers on AI. Authors at the 9th and 10th positions- Shaik Vaseem Akram

Table 1. Type of documents published on AI in India

Category	Article	Conference paper	Book chapter	Review	Book	Editorial	Note	Letter	Data paper	Erratum	Retracted	Total
TP	800	634	220	97	28	13	12	5	2	2	1	1814
%	44.1	34.95	12.13	5.35	1.54	0.72	0.66	0.28	0.11	0.11	0.06	100

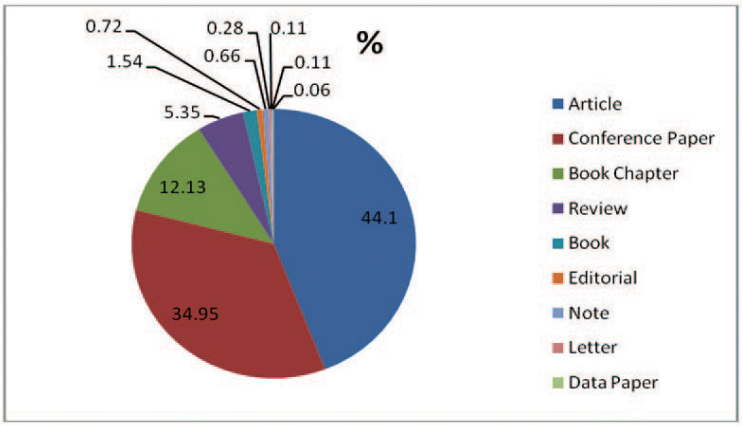
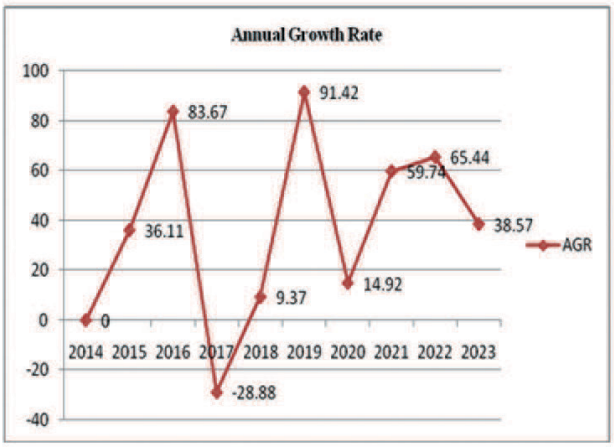


Figure 1. Category of documents.



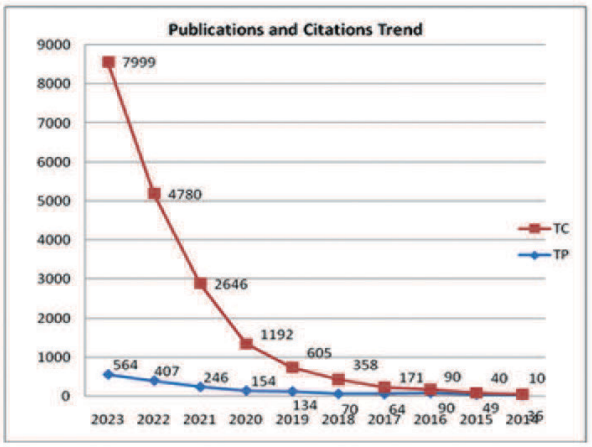


Figure 2 & 3. Annual research growth rate and publication trend.

TP=Total Publications, TC=Total Citations, ACPP=Average Citations Per Paper
CO=Cumulative Output; AGR Annual Growth Rate = Final Value-Start Value/Start Value *100

Table 2. Yearly research productivity on artificial intelligence in India

Year	TP	TC	% of TP (N=1814)	% of TC (N=17891)	CO	AGR	ACPP
2014	36	10	1.98	0.06	36	-	0.28
2015	49	40	2.7	0.22	85	36.11	0.82
2016	90	90	4.96	0.5	175	83.67	1
2017	64	171	3.53	0.96	239	-28.88	2.67
2018	70	358	3.86	2	309	9.37	5.11
2019	134	605	7.39	3.38	443	91.42	4.51
2020	154	1192	8.49	6.66	597	14.92	7.74
2021	246	2646	13.56	14.79	843	59.74	10.76
2022	407	4780	22.44	26.72	1250	65.44	11.74
2023	564	7999	31.09	44.71	1814	38.57	14.18
Total	1814	17891	100.00	100.00	-	-	9.86

Table 3. Contribution of the top ten Indian authors to AI in social sciences

Author	Affiliated institute	TP	% of (1814)	TC (10 years)	% of (17891)	ACPP	H-index (10 years)
Ketan V. Kotecha	Symbiosis Institute of Tech, Pune	14	0.77	152	0.85	10.86	6
Rajesh Singh	Uttranchal University Dehradun	13	0.72	153	0.86	11.77	7
Yogesh .K. Dwivedi	Symbiosis Institute of Tech, Pune, India	12	0.66	2783	15.56	231.92	8
Anita N. Gehlot	Uttranchal University Dehradun	12	0.66	153	0.86	12.75	7
Sheshadri Chatterjee	IIT, Kharagpur	11	0.61	596	3.33	54.18	8
Arpan.Kumar Kar	IIT Delhi	9	0.50	1537	8.59	170.78	6
Shruti S. Patil	Symbiosis Institute of Tech, pune, India	8	0.44	49	0.27	6.13	4
RamakrishnanRaman,	Symbiosis Institute of Buisness Mgt Pune	7	0.39	2358	13.18	336.86	4
Shaik Vaseem Akram	SR University Wrangal	6	0.33	43	0.24	7.17	3
Rupak Chakravarti	Panjab University	6	0.33	20	0.11	3.33	2
Total	-	98	5.40	7844	43.84	80.04	

from S.R University Warangal and Rupak Chakravarti from Panjab University contributed an equal proportion of papers, i.e., 6 papers each. Yogesh .K Dwivedi at the 3rd position in terms of productivity and Sheshadri Chatterjee at the 5th position. Ramakrishnan Raman from the Symbiosis Institute of Business Management Pune received the most ACPP (336.86), followed by Yogesh K. Dwivedi (2783) received the highest citations than did Ramakrishnan Raman (2358).

4.4 Research Output of Top Affiliations

The institutions that produced the highest research outputs on AI during the period under study are listed in Table 4. These 10 affiliations together contributed 19.95 % of the total research output and received 27.22 % of the total citations received during the period. The ACPP for these ten institutes is 13.45. It is also apparent that among the top ten affiliations contributing the highest research papers on AI, Symbiosis International Deemed University took the lead in publishing 79 publications, followed by the Vellore Institute of Technology with 51 research publications. Amity University and the Indian Institute of Technology Kharagpur produced more than 30 research papers on AI, while the other five top contributing affiliations contributed more than 20 papers.

In terms of citations, Symbiosis International Deemed University received highest citations, with 2689 of 79 total research publications, followed by the Vellore Institute of Technology, with 782 of 51 research papers, and the Indian Institute of Technology Kharagpur, with 413 citations of 29 papers. Symbiosis International Deemed University has the highest ACPP (34.04), followed by the Vellore Institute of Technology (ACPP 15.33) and the Indian Institute of Technology Kharagpur (ACPP 14.24). The ACPPs of the Symbiosis Institute of Technology and University of Petroleum and Energy Studies are 7.15 and 7.03, respectively.

4.5 International Collaboration on AI

Research collaboration of the top ten countries with India in terms of AI is indicated in Table 5. India has 1814 publications and collaborated on a total of 425 papers with other countries, representing 23.43 % of the total collaboration. Among all the top collaborative countries, the United States has collaborated on the most papers (5.51 %). The next most contributing countries are the UK (3.91 %), Saudi Arabia (3.25 %), China (2.59 %), and Australia (2.15 %). All other countries published less than 2 % of their research papers on AI with India. Germany, at the 10th position, published 1.05 percent of papers on AI with Indian authors.

4.6 Sources Favoured for Publications

A total of 433 publications on AI from 2014-2023 appeared in 160 different sources. The top ten sources favoured for publications on AI are listed in Table 6. These contributed 23.86 % of the total research papers during the ten-year period. The Journal Sustainability Switzerland has published the highest (81) number of papers on AI by Indian authors, followed by Proceedings of the 3rd International Conference on Computing for Sustainable Global Development (55). It is evident from Table 6 that out of the top ten favoured sources for publications, four sources are proceedings of conferences organised by a reputed publisher, IEEE, in which 143 papers (33.02 %) papers were published out of a total of 433. The remaining six sources are reputed journals of different publishers, such as Springer (3 journals),

Table 4. Contributions of the top affiliations to AI

Affiliation name	TP	%	TC	h-index	ACPP
Symbiosis International Deemed University	79	21.82	2689	13	34.04
Vellore Institute of Technology	51	14.09	782	13	15.33
Symbiosis Institute of Technology	39	10.77	279	8	7.15
Amity University	32	8.84	158	6	4.94
Indian Institute of Technology Kharagpur	29	8.01	413	10	14.24
University of Petroleum and Energy Studies	29	8.01	204	8	7.03
K L Deemed to be University	28	7.73	62	5	2.21
SRM Institute of Science and Technology	26	7.18	33	3	1.27
Indian Institute of Technology Bombay	25	6.91	125	6	5.00
Chandigarh University	24	6.63	125	8	5.21
Total	362	(19.95)	4870	-	13.45

Table 5. Top collaborative countries with India

Country	USA	UK	Saudi Arab	China	Australia	Malaysia	Spain	Canada	South Korea	Germany	Total
TP	100	71	59	47	39	27	23	20	20	19	425
%	5.51	3.91	3.25	2.59	2.15	1.49	1.27	1.1	1.1	1.05	23.43

Table 6. Preferred sources for publication

Journal title	Publisher	TP	ISBN/ISSN
Sustainability Switzerland	Multidisciplinary Digital Publishing Institute (MDPI)	81	2071-1050
Proceedings of 3rd International Conference on Computing for Sustainable Global Development	Institute of Electrical and Electronics Engineers (IEEE)	55	9781467394178
International Journal of Scientific and Technology Research	Amazedia Solutions	54	2277-8616
Intelligent Systems Reference Library	Springer	45	1868-4394
Artificial Intelligence Review	Springer	44	0269-2821
Library Philosophy and Practice	University of Nebraska-Lincoln	36	1522-0222
Proceedings of 3rd International Conference on Pervasive Computing and Social Networking	IEEE	34	979-8-3503-2285-9
Studies in Systems Decision and Control	Springer	30	2198-4182
Proceedings of International Conference on Computer Communication and Informatics	IEEE	28	979-8-3503-4822-4
Proceedings of International Interdisciplinary Humanitarian Conference For Sustainability	IEEE	26	978-1-6654-5688-
Total		433	
%		23.86	

Table 7. Keyword occurrence on AI

Artificial intelligence	Machine learning	Learning systems	Deep learning	Learning algorithms	Internet of things	Machine-learning	Decision making	Forecasting	Big data
1085	348	219	199	122	118	104	88	82	72

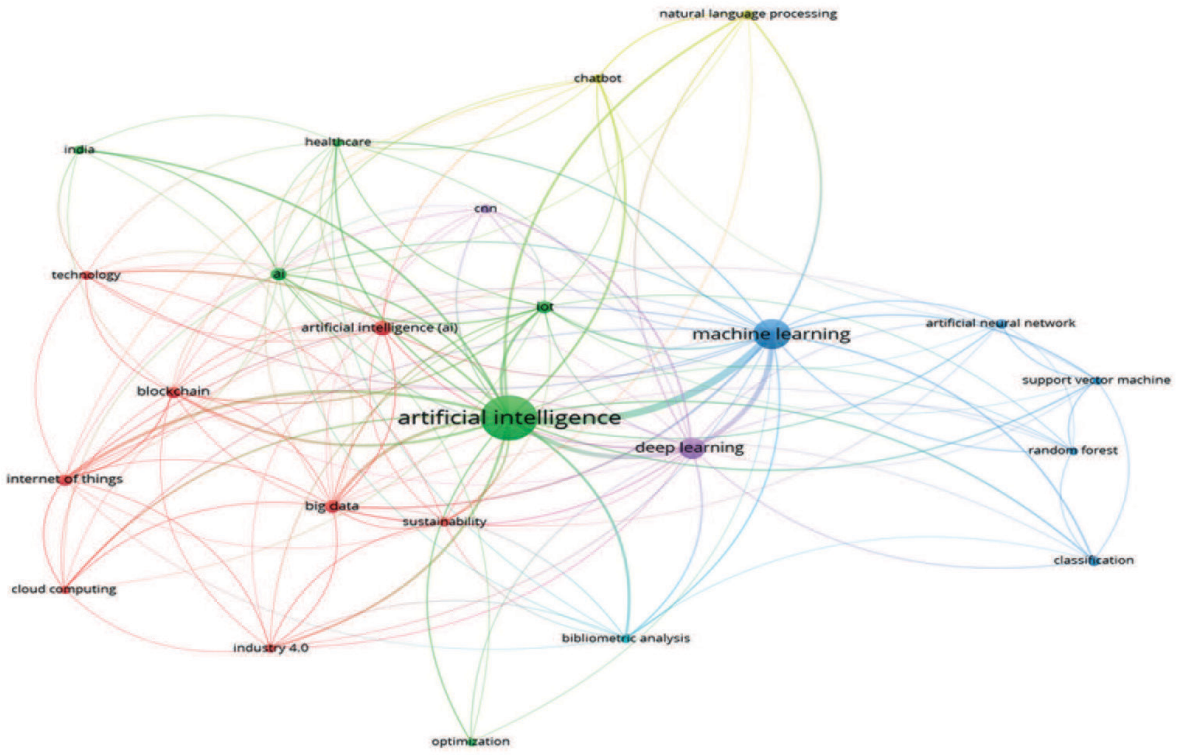


Figure 4. Keyword occurrence in the literature.

MDPI (1), and the University of Nebraska-Lincoln (1), and one journal is published by Amazedia Solutions.

4.7 Key Words Appeared in Publications

Table 7 shows the top ten key words occurred in that published literature on 'AI', which is also reflected in Fig 4. Artificial intelligence was used in 1085 papers, and machine learning was used by 412 (348+104) research papers published during the last 10 years. These were followed by learning systems, which appeared in 219 papers; deep learning, which appeared in 199 papers; and learning algorithms, which appeared in 122 papers. The internet of things (118), decision making (88), forecasting (82) and big data (72) were other highly used keywords in the literature published on AI.

5. CONCLUSIONS

The study "Indian Contribution to Artificial Intelligence in the Field of Social Sciences during 2014-2023: A Bibliometric Analysis" highlights a significant increase in AI research by Indian authors, with notable contributions from institutions such as Symbiosis International Deemed University and Uttranchal University Dehradun. The research uses data from the Scopus database to identify top authors, publication kinds, preferred sources, and collaboration countries, emphasising the United States, the United Kingdom, Saudi Arabia, and China as major collaborators. The survey demonstrates a steady increase in AI publications and citations, demonstrating India's expanding influence in AI research in the social sciences.

REFERENCES

1. McCarthy, John. A proposal for the dartmouth summer research project on artificial intelligence. *AI Magazine*, 2006, **27(** 4), 12–14.
2. Oxford English Dictionary. Artificial Intelligence, 2024. https://www.oed.com/dictionary/artificial-intelligence_n?tl=true
3. Merriam Webster Dictionary. Artificial intelligence, 2024. https://www.merriam-webster.com/dictionary/artificial%20intelligence
4. Bircan, T. & Salah, A.A.A. A bibliometric analysis of the use of artificial intelligence technologies for social sciences. *Mathematics*, 2022, **10**(23), 1-17. doi: 10.3390/math10234398
5. Gencer, A. Bibliometric analysis and research trends of artificial intelligence in lung cancer. *Heliyon*, 2024, **10**(2), 1-13. doi: 10.1016/j.heliyon.2024.e24665
6. Guo, Y.; Hao, Z.; Zhao, S.; Gong, J. & Yang, Fa. Artificial intelligence in healthcare: Bibliometric analysis. *J. Medical Internet Res.*, 2020, **22**(7), 1-12. https://www.jmir.org/2020/7/e18228/
7. Ismail Adakawa, M.; Balachandran, Chikku & Harinarayana N.S. Applications of artificial intelligence in libraries: A bibliometric analysis. *In* Smart Libraries: Emerging trends and technologies, edited by Meeramani N, Manjunath N,Chaithra N,,Prithviraj & Shobha Patil. Jain University Press, Ramanagara, 2023, 111-121. URL: https://www.researchgate.net/publication/36917058.
8. Jimma, B.L. Artificial intelligence in healthcare: A bibliometric analysis. *Telematics and Informatics Reports,* 2023*,* **9**, 1-8. doi: 10.1016/j.teler.2023.100041
9. Kumar, S.; Lim, W.M.; Sivarajah, U. & Kaur, J. Artificial intelligence and blockchain integration in business: Trends from a bibliometric-content analysis. *Information Systems Frontiers*, 2023, **25**(2), 871–896. doi: 10.1007/s10796-022-10279-0
10. Mariani, M.M.; Machado, I.; Magrelli, V. & Dwivedi, Y.K. Artificial intelligence in innovation research: A systematic review, conceptual framework, and future research directions. *Technovation*, 2023, **122**, 1-25. doi: 10.1016/j.technovation.2022.102623
11. Nuraeni, R. & Zalsahra, R. Bibliometric analysis of artificial intelligence. West Science Interdisciplinary Studies, 2024, **2**(01), 119-12. doi: 10.58812/wsis.v2i01.563
12. Priyanka, Azad, S. & Chakravarty, R. Artificial Intelligence (AI) literature in patents: A global landscape. *Libr. Hi Tech News,* 2021, **38**(7), 24-28. doi: 10.1108/LHTN-09-2021-0062
13. Riano, E.R.; Bautisa, D.R.; Toro, M.M.; Cardenas, Y.M. & Bautisa, N.R. Artificial intelligence theory: A bibliometric analysis. *J. Physics: Conference Series*, 2021, **2046**(1)**,** 12078**.** doi: 10.1088/1742-6596/2046/1/012078
14. Votto, A.M.; Valecha, R.; Najafirad, P. & Rao, H. Artificial intelligence in tactical human resource management: A systematic literature review. *Int. J. Infor. Manage. Data Insights*, 2021, **1**(2), 100047. doi: 10.1016/j.jjimei.2021.100047

CONTRIBUTORS

Dr Seema Parmar has done her MA (English) and PGDT from Panjab University, Chandigarh and MLISc and PhD from Kurukshetra University, Kurukshetra. She is presently working as Assistant Librarian at Nehru Library, CCS Haryana Agricultural University, Hisar. She has to her credit 03 edited books and many journal articles and conference papers. Her areas of interest include IT and Electronic resources.
Her contribution to the study is towards selection of topic, data tabulation and data analysis.

Dr Rajive Kumar Pateria is presently working as Professor at Chaudhary Charan Singh Haryana Agricultural University, Hisar. He has served the university library system for more than 17 years. After completing his BLISc and MLISc from Jiwaji University, Gwalior, he obtained his PGDCA from Kurukshetra University, Kurukshetra. He was awarded a PhD from Jiwaji University, Gwalior. He has published approximately 25 articles in prominent

journals, books, and national and international conferences His areas of interest are Library automation, Digital collection development and Management.
His contribution to the study is towards data extraction from scopus, analysis and conclusion part of the paper.

Dr Dinesh Kumari has done her BLISc and MLISc from Kurukshetra University, Kurukshetra and PhD from Maharishi Dayanand University, Rohtak She is presently working as Deputy Librarian at BPSMV, Khanpur Kalan, Sonipat, Haryana. She has to her credit 15 journal articles and conference papers. Her areas of interest include IT and Bibliometrics.
Her contribution is towards introduction part of the paper, objectives, methodology and data analysis.

Ms Shallu has done her MLISc from Punjab University, Chandigarh. She is presently working as Assistant Librarian at Chandigarh Group of Colleges, Jhanjheri, Mohali, Punjab. She has to her credit 4 journal articles and conference papers.
Her contribution is towards introduction and formatting of references.