

# Scientometrics Analysis of Contributions to Journal of Artificial Intelligence Research During 2010-2016

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(Received 24 February 2018; Revised 15 March 2018; Accepted 10 April 2018; Available online 19 April 2018)

**Abstract** - The paper presents a Scientometric analysis of papers published in Journal of Artificial Intelligence Research, during 2010 to 2016 as reflected in Web of Science database. It attempts to analyze the growth and development of publications output of Journal of Artificial Intelligence Research as reflected. Data for a total of 402 have been downloaded and analyzed according to objectives. The study reveals that the year wise growth of literature in terms of total papers, most preferred authorship pattern was two authors, highly prolific authors and their publications reveal that Jennings NR, published highest numbers of papers, the geographical distribution contributions (International) is reveal that USA is in the top with no. of publications is 138 (34.33%), followed by England 56 (13.93%) as a second position and Germany with no. of publication is 42 (10.45%) in third position and institution-wise distribution of papers shows that highest contributed institutions was University of Oxford with 17 Publications (04.23%) is placed at 1<sup>st</sup> rank.

**Keywords:** Research output, Scientometrics analysis, publication output of Journal of Artificial Intelligence Research

## I. INTRODUCTION

Journal of Artificial Intelligence Research (JAIR) (ISSN 1076 - 9757), is established in 1993 as one of the first scientific journals on the Web, it is open access journal and articles are published for free distribution on the internet by the AI Access Foundation, 326 Loma Vista St., El Segundo, CA, 90245, USA. It is publishing refereed research articles, survey articles, and technical notes and covers all areas of artificial intelligence (AI). JAIR is indexed by INSPEC, Science Citation Index, and MathSciNet. JAIR reviews papers within approximately three months of submission and publishes accepted articles on the internet immediately upon receiving the final versions. JAIR has been supported by many individuals and organizations, who have donated money and facilities i.e. AAAI, IJCAI, David Smith, NASA Ames Research Center, InferLink Corporation, Carnegie-Mellon University, the University of Michigan, the University of Washington, Google, Microsoft, USC/ISI, Fetch Technologies, NSF, Michael Wellman, IISI, Shlomo Ziberstein, and Dan Weld etc.

## II. REVIEW OF LITERATURE

Few quantitative studies have been carried to analyzing institutions research outputs of the country by using scientometrics analysis. The following study has been

reviewed in view of better understanding of research productivity using scientometrics analysis

Imran Khan, (2016)<sup>1</sup> made study of DESIDOC Journal of Library & Information Technology from 2010 to 2014 of the publication of 307 contributions in the five volumes (from Volume No. 30 to 34) The study shows a trend of gradual growth in contributions, with an average number of 61 contributions per volume of the journal. Maximum number of contributions/research papers (70) were found to be published in the year 2012, whereas the minimum (50) in the year 2010. Maximum number of contributions during the period of study is from joint authors, with a total of 188 (61.24 per cent). A maximum number of contributions are from India, with a total of 273 (88.93 per cent).

Jayendra Kumar Singh, (2014) "This study focus on 657 papers of the journal "Indian Journal of Pure and Applied Physics" 2006 to 2010 period taken for this study" The study reveal that most of the papers (93.46%) were contributed jointly CSIR is a top collaborative institution. 1.87 was an average citation per paper and overall 5.37 mean page length of the papers.

Madhu Bala, and Mahender Pratap Singh (2014)<sup>3</sup> this study coverage of 316 scholarly communications of the Indian Journal of Biochemistry and Bio-Physics. Study find that Multi authors published 162 (51.3%) articles. The contributions from the India are in top.

Gayatri Paul and Swapan Deoghuria (2014)<sup>4</sup> made study of Indian Journal of Physics to analyses different scientometric data for a period of ten years 2004-2013 study reveal that that almost all physics journals (total 163) cite articles published in IJP. Notable among them are Physical Review.

R. Poonkothai (2012)<sup>5</sup> this study focus on Journal of Biosciences, coverage of 394 articles for the period of 2001 to 2010. The highest Contributions from Single Author and from India found highest Contributions.

B. D. Kumbar, Rohit R. Patil & Manohar B. Lamani (2015)<sup>6</sup> the paper deal with the publications of New England Journal of Medicine. A total of 43694 publications were published during 1989-2014, with 3262469 citations with 74.68 average citations per paper. Out of the total publication majority 24280 (55.56%) publications published

in the form of letters. Mark E. J. has highest publications (266) to his credit, whereas Yusuf, S. received highest (29777) citations. Highest publications from United States i.e. 28820 (65.95%)

**III. OBJECTIVES OF THE STUDY**

1. To study and analyze year wise research output in terms of total paper.
2. To find out the top most productive authors and authorship pattern.
3. To know degree of collaborations amongst authors.
4. To find out the top participant institutions national and international levels.
5. To study and analyze global distribution pattern of papers according to number of papers
6. To find out year wise distribution of citations and average

**IV. DATA COLLECTION**

For collection of the publication data, the source Web of Science (WoS) a bibliographic and citation database was used which covers a selected group of journals and conferences. The data was collected for the period 2010-

2016. The 7 years period is a good period to know publication output of a journal. The search has been made for the collection of data was: [OG = "Journal of Artificial Intelligence Research" Timespan=2010-2016]. The data was obtained in 2017. The full record downloaded in the excel format i.e. article, proceedings paper, editorial material, titles, author records, affiliation and citation references etc.

**V. METHODOLOGY**

For Scientometrics analysis of publication data of Journal of Artificial Intelligence Research, the standard form of methodologies were used to analysis of various parameters like year wise growth rate of papers, geographical distribution of Papers, Institutions-wise distribution of papers, Highly Prolific Authors, authorship pattern of papers, Degree of collaborations, the top productive authors were find out and their performances were analysis based on their publications productivity. The most contributive institutions and countries have been recognized using extraction of information from affiliation text.

**VI. DATA ANALYSIS AND INTERPRETATION**

*A. Growth of Literature*

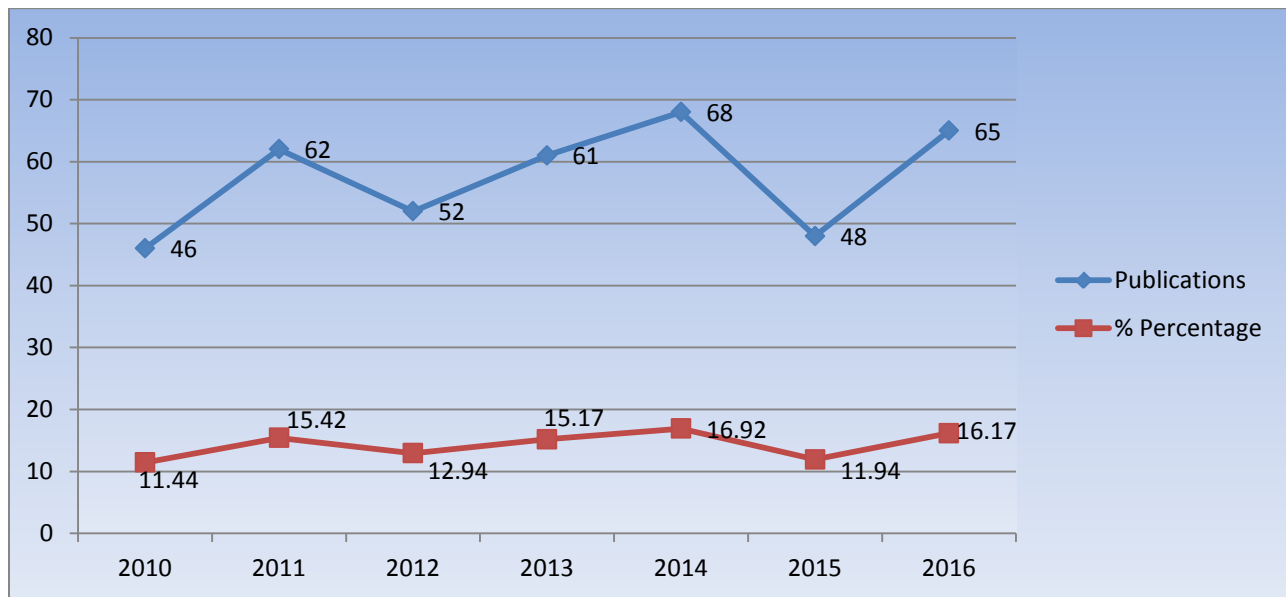


Fig. 1 Year-wise research growth in terms of Total papers

The year wise research growth in terms of TP (Total papers) are given in figure 1, it is shows that no. of research papers are decreasing & increasing year to year basic from 2010 to

2016. It revel that highest no. papers published in 2014, No. of Papers: 68 (16.92%) and lowest in 2010 total No. of papers: 46(11.44%).

TABLE I AUTHORSHIP PATTERN OF PAPERS PUBLISHED

Year	One Author	Two Author	Three Author	Four Author	Five Author	Six Author	Seven Author	Eight Author	Nine =+	Total
2010	0	24	15	5	2	0	0	0	0	46
2011	3	25	21	8	5	0	0	0	0	62
2012	2	22	14	11	3	0	0	0	0	52
2013	2	21	17	11	5	3	2	0	0	61
2014	4	21	23	14	3	0	3	0	0	68
2015	5	12	20	6	4	1	0	0	0	48
2016	1	20	23	13	3	2	0	1	2	65
7 year	17	145	133	68	25	6	5	1	2	402
%>	4.23	36.07	33.08	16.92	6.22	1.49	1.24	0.25	0.50	100.00

Table I shows the authorship pattern of papers in Out of 402 papers, the maximum number of papers were 145 (36.07 %) from two authors followed by three authors 133 (33.08 %),

four authors 68 (16.92), and so on. Data reveals that most of the authors like to publish papers in collaborations and most preferred authorship pattern was two authors.

### B. Degree of Collaboration (DC)

TABLE II DEGREE OF COLLABORATION MEASURES (DC)

	No. of publications	Percentage (%) of total publications	Nm+N <sub>s</sub>	DC
Total number of Single/Multi-Authored Publications	402	100.00		
No. of Co-Authored Publication (NM)	385	95.77	402	0.96
No. of Single-Authored Publication (NS)	17	4.23		
No. of two-Authored Publication(NM)	145	36.07	162	0.90
No. of three-Authored Publication(NM)	133	33.08	150	0.89
No. of four-Authored Publication(NM)	68	16.92	85	0.80
No. of five-Authored Publication(NM)	25	6.22	42	0.60
No. of six-Authored Publication(NM)	6	1.49	23	0.26
No. of seven-Authored Publication(NM)	5	1.24	22	0.23
No. of eight-Authored Publication(NM)	1	0.25	18	0.06
No. of nine & above Authored Publication(NM)	2	0.50	19	0.11

In order to better understanding of degree of collaboration, it necessarily to use the formula suggested by Subramanyam<sup>9</sup> (1982) and used by Subhodip Bid<sup>10</sup> (2016), has been applied for this study, the Degree of Collaboration calculates the proportion of co-author publications among total publications an indicator, and results are formulated in above table-2. The formula is  $DC = Nm / Nm + Ns$  in which C is degree of collaboration in a discipline, "Nm" is number of multi-authored publications during specific period in some discipline, "Ns" is number of single authored publications in a discipline during the same period of time. The data given in the column of the Table-2 shows 0.96 as the highest degree of collaboration (2010-16) and second highest of 0.90 two-authored publications followed by 0.89 three-author publications. The value of Degree of Collaboration is lowest among eight authored publications that are 0.25, indicating the trend towards multi-authorship pattern papers as specified time of period

in this study. Calculation:  $DC = Nm / (Nm + Ns)$  as data given in Table-2, Degree of Collaboration (DC) for two authors publications;  $Nm = 145$  &  $Ns = 17$   $DC = 145 / (145+17) = 0.90$ .

### C. Most Productive/Highly Prolific Authors and their Publications

Table II shows a list of most productive/ prolific authors was from 2010 to 2016. It has been reveal that Jennings NR, published highest numbers of papers, i.e. 07 followed by Hoffmann J, published 06 papers with second position, Grau BC published 05 papers with third position and others.

### D. Geographical distribution contributions (International)

Table-4 shows that geographical distribution contributions (International) in Journal of Artificial Intelligence Research. It is reveal that USA is in the top with no. of publications is

138 (34.33%), followed by England 56 (13.93%) as a second position and Germany with no. of publication is 42 (10.45%) in third position and top 25 author is given in table-4.

TABLE III HIGHLY PROLIFIC AUTHORS AND THEIR PUBLICATIONS

S. No.	Authors	Publications	Percentage
1	Jennings NR	7	1.74
2	Hoffmann J	6	1.49
3	Grau BC	5	1.24
4	Ruml W	4	1.00
5	Motik B	4	1.00
6	Horrocks I	4	1.00
7	Halpern JY	4	1.00
8	Fern A	4	1.00
9	Felner A	4	1.00
10	Faliszewski P	4	1.00
11	Elkind E	4	1.00
12	Domshlak C	4	1.00
13	Yuan Ch	3	0.75
14	Wu Jh	3	0.75
15	Whiteson S	3	0.75
16	Tambe M	3	0.75
17	Silver D	3	0.75
18	Sanchez-Martinez F	3	0.75
19	Rogers A	3	0.75
20	Ng V	3	0.75
21	Mohammad SM	3	0.75
22	Markakis E	3	0.75
23	Long D	3	0.75
24	Jonsson P	3	0.75
25	Hernandez C	3	0.75

*E. Institutions-wise distribution of papers published during 2010-2016*

Table V shows the Institution-Wise Distribution of Papers Journal of Artificial Intelligence Research. It is find from the above Table 5 that authors/contributors of many Institutions are publishing their papers in this journals, It has been found that from 2010 to 2016 highest contributed institutions was University Of Oxford with 17 Publications

(04.23%) is placed at 1st rank, Centre National De La Recherche Scientifique CNRS with 16 Publications (3.98%) place at 2nd rank & University of California System with 13 Publications (3.23%) placed at 3rd rank, total 25 institutions rank with publication and percentages are given above table.

TABLE IV COLLABORATION OF PAPERS WITH OTHER COUNTRIES

S.No.	Name of the Country	Publications	Percentage	Rank
1	USA	138	34.33	1st
2	England	56	13.93	2nd
3	Germany	42	10.45	3rd
4	Israel	35	8.71	4th
5	Canada	30	7.46	5th
6	Australia	29	7.21	6th
7	France	28	6.97	7th
8	Spain	27	6.72	8th
9	Italy	25	6.22	9th
10	Netherlands	23	5.72	10th
11	Peoples R	18	4.48	11th
12	Austria	13	3.23	12th
13	Ireland	11	2.74	13th
14	Singapore	10	2.49	14th
15	Belgium	9	2.24	15th
16	Greece	8	1.99	16th
17	Switzerland	7	1.74	17th
18	Scotland	7	1.74	17th
19	Qatar	7	1.74	17th
20	Japan	7	1.74	17th
21	Czech	6	1.49	18th
22	Poland	5	1.24	19th
23	Brazil	5	1.24	19th
24	Turkey	4	1.00	20th
25	Sweden	4	1.00	20th

*F. Year wise distribution of Citations of papers published during 2010-2016*

Figure2 it is revel that citations were highest in 2016 as no. of citations 832 and lowest in 2010 and it is find that the average of citations from 2010 to 2016 per year was 357.00 and citations are in increasing trends year to year basis.

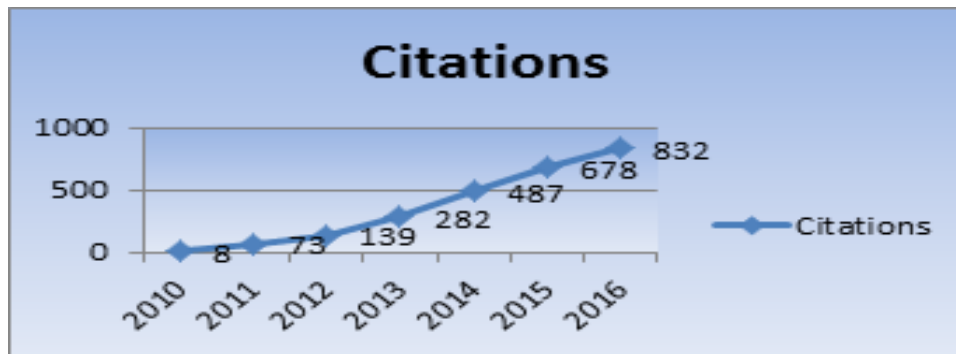


Fig. 2 Year wise distribution of Citations of papers

TABLE V INSTITUTION-WISE DISTRIBUTION OF PAPERS IN JOURNAL OF ARTIFICIAL INTELLIGENCE RESEARCH

S. No.	Name of the Institution/ establishment	No. of papers	%	Rank
1	University of Oxford	17	4.23	1st
2	Centre National De La Recherche Scientifique Cnrs	16	3.98	2nd
3	University of California System	13	3.23	3rd
4	Vienna University of Technology	12	2.99	4th
5	Technion Israel Institute of Technology	12	2.99	5th
6	Microsoft	12	2.99	5th
7	Australian National University	12	2.99	5 <sup>th</sup>
8	University of London	11	2.74	6th
9	Massachusetts Institute of Technology MIT	11	2.74	6th
10	Carnegie Mellon University	10	2.49	7th
11	Ben Gurion University	10	2.49	7th
12	University of Liverpool	8	1.99	8th
13	University of Amsterdam	8	1.99	8th
14	Cornell University	8	1.99	8th
15	Bar Ilan University	8	1.99	8th
16	University of Southern California	7	1.74	9th
17	University of Southampton	7	1.74	9th
18	University of New South Wales Sydney	7	1.74	9th
19	University of Alberta	7	1.74	9th
20	University College Cork	7	1.74	9th
21	Qatar Foundation	7	1.74	9th
22	University System of New Hampshire	6	1.49	10th
23	University of New Hampshire	6	1.49	10th
24	Universite Toulouse Iii Paul Sabatier	6	1.49	10th
25	Universite Paris Saclay Comue	6	1.49	10th

### VII. FINDINGS AND CONCLUSION

The study analyze that Journal of Artificial Intelligence Research has published 402 papers in the period of 2010 to 2016. The year wise growth rate revel that highest no. papers published in 2014, No. of Papers was 68 (16.92%) and lowest in 2010 total No. of papers was 46(11.44%). Authorship pattern data reveals that most of the authors like

to publish papers in collaborations and most preferred authorship pattern was two authors. The Degree of Collaboration (DC) revel that DC is found highest in 0.90 two-authored publications. The highly prolific authors and their publications revel that Jennings NR, published highest numbers of papers, the geographical distribution contributions (International) in Journal of Artificial

Intelligence Research, is reveal that USA is in the top with no. of publications is 138 (34.33%), followed by England 56 (13.93%) as a second position and Germany with no. of publication is 42 (10.45%) in third position and it is found from institution-wise distribution of papers that highest contributed institutions was University of Oxford with 17 Publications (04.23%) is placed at 1st rank, Centre National De La Recherche Scientifique CNRS with 16 Publications (3.98%) place at 2nd rank & University of California System with 13 Publications (3.23%) placed at 3rd rank, the average of citations per year (2010-2016) was 357.00.

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