
IEEE/ACM Transactions on Networking during 2011-2016: A Scientometric Study

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Abstract

This paper presents a scientometric study of Journal of IEEE/ACM Transactions on Networking. A total of 1013 research articles and 3644 authors was examined by growth of contributions by year and volume, single and authorship collaboration, degree of collaboration. Length of articles, Country-wise distributions and observe the lotkas law of author productivity etc. all the study points towards the advantages and limitation of the journal which will be helpful for its further development. It reveals that the most prolific author Ness B. Shrof, the Ohio State University, and Columbus, OH, United States. The degree of collaboration in the IEEE/ACM Transactions on Networking is 0.98.

Keywords

Bibliometrics, scientometrics; Authorship pattern; Degree of Collaboration; Lotka's law.

Electronic access

The journal is available at www.jalis.in



Journal of Advances in Library and Information Science
ISSN: 2277-2219 Vol. 6. No.4. 2017. pp.370-375

INTRODUCTION

Scientometric is referred to as a science about science. It is one of the sub fields of Bibliometric. It is a distinct recognized and well-established scholarly field with its own identity, history, theories and methodologies. Scientometric analyses can reveal a lot about research trends. Ideally, such analyses should be performed on all journals covering a well defined field. When single journal is studied scientometrically it creates a portrait of the journal providing a description that offers an insight that is beyond the superficial. It can indicate the quality, quantity, maturity and productivity of the journal. ^[1] Bibliometrics is the quantitative analysis of research publications. Bibliometric analysis is used in the study of scholarly communication. bibliometrics study is used as an instrument in the collection building policy by providing the precise and much needed information to the managers to take the right decision at the right time as to what documents they should select and what documents they should discard from the existing collections of their respective libraries. ^[2] Single journal bibliometric studies help to identify the research trends of a particular field of research i.e. year wise distribution of papers, authorship pattern and the trends of research collaboration, subject wise distribution of contribution, most prolific authors and rank of journals etc.

The Journal of IEEE/ACM Transactions on Networking is one of the foremost research journals in the communication and networking field. It is published bimonthly online Electronic Journal. It is published cosponsored by the IEEE Communications society, IEEE computer society and the ACM (Association for computing Machinery). This journal covers the subject like network architecture and design, communication protocols, network software, network technologies, network services applications and network operation management. The scope of the journal includes all topics on communication and networking. ^[3]

REVIEW OF LITERATURE

Thanuskodi S. (2012) ^[4] have discussed with "Bibliometrics analysis of Indian Journal of Agricultural Research" This study aims at analyzing the research output performance of agricultural scientists on agricultural science subjects. The result showed that out of 602 articles multiple authors contributed 564 (93.69%) articles while the rest 38

(6.31%) articles were Contribute by single author. Study reveals that most of the contributions are from India with 98.67 % and the rest 1.33% only from foreign sources. Santhanakarhikeyan, Grace and Jeyshankar (2014) ^[5] were studied the Indian journal of cancer and they were analyzed 611 papers, 98.77 % of the papers were multi-authored. Out of 22 countries contributed 244 research papers during the study period. Of the 244 articles, 168 (68.85 %) were published from India. Kumaresan (etal..) (2014) ^[6] analyzed the Indian contribution in the Aquaculture journal during 1972 – 2011. During this period 374 publications were contributed by Indian authors. The percentage of Indian contribution was 2.74 during this study period. A. S. Sahul Hameed scored first rank with 27 publications. Suresh,C., Hema, R and Sankarsubramanian, N.(2015) ^[7] their study an attempt is made to investigate the scholarly communication in the source journal ‘Indian journal of Horticulture during 2010-2014. Scientometric analysis of the study the volume was taken into consideration of 714 articles published in source journal, out of 714 articles 233 (32.63%) of them published in 2010. 121(16.94%) of them published in 2014. Iqbalahmad U. Rajgoli (etal..) (2017) ^[8] have discussed with “ A Bibliometric Study of Journal of the Indian Society of Remote Sensing for the Period 1973-2014” . This study analyzed 1310 research articles published in 140 issues of the journal. An attempt has been made to study various bibliometric indicators such as year-wise distribution of articles, authorship pattern & productivity, ranked list of prolific authors, journals & institutions. Efforts have

also been made to test Lotka’s law of scientific productivity.

OBJECTIVES OF THE STUDY

The primary objective of this study was to understand the growth of IEEE/ACM Transactions on Networking and contributor’s research output in during the study period 2010 - 2015. The specific objectives are

1. To study the distribution of articles by year and Issues
2. To study the authorship Collaborations
3. To study of degree of collaborations
4. To study Year wise distribution of the Length of Articles
5. To Study Country-wise Distributions
6. To Study Ranking of prolific authors
7. To observed Lotka’s law of author productivity

METHODOLOGY AND DATA COLLECTION

The required data have been collected from the IEEE EXPLORE website of IEEE/ACM Transaction on networking pertaining to period from 2011-2016. 36 issues of 6 volumes from 2011-2016 have been selected for the study. These data were organized, calculated, tabulated, analyzed and presented by using simple arithmetic and statistical methods in order to arrive for its result.

DATA ANALYSIS AND INTERPRETATIONS

Table 1: Distribution of Article by Year and Issues

| Year | Distribution of Article by Year And Issues | | | | | | Total | Percent |
|-------|--|---------|---------|---------|---------|---------|-------|---------|
| | Issue-1 | Issue-2 | Issue-3 | Issue-4 | Issue-5 | Issue-6 | | |
| 2011 | 23 | 24 | 24 | 23 | 24 | 23 | 141 | 13.92 |
| 2012 | 24 | 23 | 26 | 25 | 26 | 25 | 149 | 14.71 |
| 2013 | 25 | 24 | 25 | 24 | 24 | 25 | 147 | 14.51 |
| 2014 | 25 | 25 | 25 | 25 | 23 | 25 | 148 | 14.61 |
| 2015 | 24 | 25 | 25 | 26 | 24 | 24 | 148 | 14.61 |
| 2016 | 47 | 46 | 46 | 47 | 48 | 46 | 280 | 27.64 |
| Total | 168 | 167 | 171 | 170 | 169 | 168 | 1013 | 100 |

Table 1 shows the number of contributions (i.e. research articles) and the number of Issues published by year. There have been 1013 articles contributed by 3644 authors were identified in last six years. The highest number of research articles 280 (27.64%)

were published in 2016. The smallest amount of research articles 141 (13.92%) were published in 2011.

Table 2: Authorship Collaborations

| Year | Authorship Collaborations | | | | | Total | Percent |
|-------|---------------------------|-----|-------|------|------------|-------|---------|
| | Single | Two | Three | Four | Five-above | | |
| 2011 | 2 | 31 | 59 | 30 | 19 | 141 | 13.92 |
| 2012 | — | 35 | 49 | 39 | 26 | 149 | 14.71 |
| 2013 | 1 | 38 | 36 | 35 | 37 | 147 | 14.51 |
| 2014 | 2 | 37 | 37 | 35 | 37 | 148 | 14.61 |
| 2015 | 3 | 34 | 44 | 28 | 39 | 148 | 14.61 |
| 2016 | 8 | 58 | 75 | 64 | 75 | 280 | 27.64 |
| Total | 16 | 233 | 300 | 231 | 233 | 1013 | 100 |

Table-2 reveals the authorship pattern of the articles published during the study period. The contribution published by scientists is calculated to 1013 over the study period. It has been proved from the analysis that single author papers have decaying trend and there by collective contributions have an increasing performance in scientific research activities.

Table 3: Degree Of Collaborations

| Degree Of Collaborations | | | | |
|--------------------------|---------------|-----------------|----------------------------|-------------------------|
| Year | Single Author | Multiple Author | Total (Nm+N _s) | Degree of Collaboration |
| 2011 | 2 | 139 | 141 | 1.01 |
| 2012 | 0 | 149 | 149 | 1 |
| 2013 | 1 | 146 | 147 | 1.01 |

Table 4: Year wise distribution of Length of the articles

| Year wise distribution of Length of the articles | | | | | | | | |
|--|------|------|------|------|------|------|-------|---------|
| Pages | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | Total | Percent |
| 1_10 | 14 | 9 | 4 | 4 | 7 | 5 | 43 | 4.24 |
| 11_15 | 126 | 134 | 137 | 138 | 135 | 260 | 930 | 91.81 |
| 16_20 | 1 | 6 | 6 | 6 | 6 | 15 | 40 | 3.95 |
| Total | 141 | 149 | 147 | 148 | 148 | 280 | 1013 | 100 |

The length of articles is shown in table-4 where it is found that 930 (91.81%) articles has a page length in the range 11_15 pages followed by 43 (4.24%) articles in the range of 1_10 pages. There are 40 (3.95%) papers having more than 16 -20 pages.

Table 5: Country-wise distributions

| Country-wise distributions | | | |
|----------------------------|---------|--------------------|---------|
| Sl:No | Country | No of Contribution | Percent |
| 1 | USA | 1854 | 50.89 |
| 2 | China | 423 | 11.61 |
| 3 | Canada | 142 | 3.89 |

| | | | | |
|-------|----|-----|------|------|
| 2014 | 2 | 146 | 148 | 1.01 |
| 2015 | 3 | 145 | 148 | 1.02 |
| 2016 | 8 | 272 | 280 | 1.03 |
| Total | 16 | 997 | 1013 | 1.02 |

Table 3 shows the degree of collaboration in the IEEE/ACM Transactions on Networking. To determine degree of author collaboration in quantitative terms, the formula given by K. Subramanyam (1982)^[9] was used.

The formula is where

C = Degree of collaboration

Nm = Number of multi authored papers

Ns = Number of single authored papers

$C = \frac{Nm}{Nm + Ns}$

$$C = \frac{997}{16 + 997} = 0.98$$

In the present study the average value of C is = 0.98

As a result, the degree of author collaboration in the IEEE/ACM Transactions on Networking is 0.98, which clearly indicates its dominance upon multiple author contributions.

| | | | |
|----|-----------|-----|------|
| 4 | Italy | 137 | 3.76 |
| 5 | Hong Kong | 105 | 2.88 |
| 6 | Spain | 90 | 2.47 |
| 7 | France | 87 | 2.38 |
| 8 | Korea | 76 | 2.09 |
| 9 | Israel | 74 | 2.04 |
| 10 | Singapore | 69 | 1.89 |
| 11 | Germany | 65 | 1.78 |
| 12 | India | 54 | 1.48 |
| 13 | U.K. | 51 | 1.4 |
| 14 | Tiwan | 40 | 1.09 |
| 15 | Greece | 38 | 1.04 |
| 16 | Australia | 34 | 0.93 |
| 17 | Ireland | 33 | 0.91 |

| | | | |
|----|--------------|----|------|
| 18 | Sweedan | 33 | 0.91 |
| 19 | Switzerland | 33 | 0.91 |
| 20 | Belgium | 32 | 0.88 |
| 21 | Hungary | 28 | 0.77 |
| 22 | Japan | 19 | 0.52 |
| 23 | Turkey | 17 | 0.47 |
| 24 | Finland | 15 | 0.41 |
| 25 | Netherlands | 13 | 0.36 |
| 26 | Norway | 11 | 0.3 |
| 27 | South Korea | 11 | 0.3 |
| 28 | Portugal | 10 | 0.27 |
| 29 | Brazil | 9 | 0.25 |
| 30 | Cyprus | 6 | 0.16 |
| 31 | Austria | 5 | 0.14 |
| 32 | Jordon | 5 | 0.14 |
| 33 | Poland | 4 | 0.11 |
| 34 | Saudi Arabia | 3 | 0.08 |
| 35 | Slovenia | 3 | 0.08 |

| | | | |
|-------|------------|------|------|
| 36 | UAE | 3 | 0.08 |
| 37 | Bangladesh | 2 | 0.05 |
| 38 | Denmark | 2 | 0.05 |
| 39 | Vietnam | 2 | 0.05 |
| 40 | Argentina | 1 | 0.03 |
| 41 | Croatia | 1 | 0.03 |
| 42 | Iceland | 1 | 0.03 |
| 43 | Prague | 1 | 0.03 |
| 44 | Purdue | 1 | 0.03 |
| 45 | Russia | 1 | 0.03 |
| Total | | 3644 | 100 |

Table-5 shows that on the whole 3644 authors belonging to 45 countries contributed a total of 1013articles. It shows that 1854 (50.89%) of the authors are geographically affiliated to country of the USA followed by China with 423 (11.61%).And least amount 1 articles, affiliated to gradually six following countries are Argentina,Croatia, Iceland,Prague,Purdue and Russia.

Table 6: Ranking of prolific authors

| Ranking of prolific authors | | | | | |
|-----------------------------|--------------------------|--|---------------|--------------------|---------|
| Sl.No | Author | Institution | Country | No of Publications | Percent |
| 1 | Ness B. Shroff | The Ohio State University, Columbus, OH,United States | United States | 24 | 2.37 |
| 2 | Alex X. Liu | Michigan State University,East Lansing,United States | United States | 20 | 1.97 |
| 3 | R. Srikant | University of Illinois at Urbana-Champaign, United States | United States | 14 | 1.38 |
| 4 | Shigang Chen | University of Florida, Gainesville ,United States | United States | 14 | 1.38 |
| 5 | Eytan Modiano | Lincoln Laboratory, Massachusetts Institute of Technology, Cambridge, MA,United States | United States | 13 | 1.28 |
| 6 | Xiaojun Lin | Purdue University,West Lafayette, IN,United States | United States | 12 | 1.18 |
| 7 | Yunhao Liu | Hong Kong University of Science and Technology, Kowloon, Hong Kong | Hong Kong | 12 | 1.18 |
| 8 | Srikanth V.Krishnamurthy | University of California, Riverside | United States | 11 | 1.09 |
| 9 | Xinbing Wang | Shanghai Jiao Tong University, China | China | 11 | 1.09 |
| 10 | Atilla Eryilmaz | The Ohio State University, Columbus, OH, USA | United States | 10 | 0.98 |

Table 5 shows that prolific authors of the articles during the period under study. It is clear from the table that Ness B. Shroff The Ohio State University, Columbus, OH,United States were contributed highest number of articles for the study period with 24(2.37%)records, next author, namely Alex X. Liu

20 (1.97%) with affiliated institute and geographical area united states, Atilla Eryilmaz National Research Institute in Computer Science and Control (INRIA), Sophia-Antipolis, France were published the lowest number of articles for the study period with 10 (0.98 %) respectively.

Table:7 Lotkas law of author productivity

| No of Publication | Observed no of authors with n(an) or F | observed % of authors 100* (an/al) | expected no of authors (1/n ²) | Expected percentage of author predicate by lotka's 100/n ² (P) | (F-P) ² /P |
|-------------------|--|------------------------------------|--|---|-----------------------|
| 1 | 1749 | 100 | 100 | 1749 | 0 |
| 2 | 313 | 17.89 | 25 | 437.25 | 35.307 |
| 3 | 132 | 7.55 | 11.11 | 194.31 | 19.98 |
| 4 | 72 | 4.15 | 6.25 | 109.31 | 12.73 |
| 5 | 26 | 1.49 | 4 | 69.96 | 27.62 |
| 6 | 21 | 1.2 | 2.77 | 48.45 | 15.55 |
| 7 | 11 | 0.63 | 2.04 | 35.68 | 17.07 |
| 8 | 8 | 0.46 | 1.56 | 27.28 | 13.63 |
| 9 | 3 | 0.17 | 1.23 | 21.51 | 15.93 |
| 10 | 3 | 0.17 | 1 | 17.49 | 12 |
| 11 | 2 | 0.11 | 0.83 | 14.52 | 10.49 |
| 12 | 2 | 0.11 | 0.69 | 12.07 | 8.4 |
| 13 | 1 | 0.06 | 0.59 | 10.32 | 8.42 |
| 14 | 2 | 0.11 | 0.51 | 8.92 | 5.37 |
| 20 | 1 | 0.06 | 0.25 | 4.37 | 2.6 |
| 24 | 1 | 0.06 | 0.17 | 2.97 | 1.3 |
| | 2347 | | | | 206.397 |

Table-7 that is appropriate to examine and analyze the implications of Lotka's Law in relation to author productivity on publication of research articles. It describes the frequency of publication by authors in a give field. It states, "the number of authors making 'n' contribution is about 1/n² of those making one; and the proportion of all contributors, that make a single contribution, is about 60 percent" (Lotka 1926, cited in potter 1988)^[10]. This means that out of all the authors in a given field, 60 percent will have just one publication, and 15 percent will have two publications (1/2² times.60). 7 percent of the authors will have three publications (1/3² times.60), and so on.

The Lotka's law was tested by the application of scientific productivity Chi-square model in relation to a number of authors who contributed 'n' number of publications. It can be expressed by the equation.

$$an = a1/n2 \quad n=1,2,3,\dots\dots$$

In other words, for every 100 authors making one contribution each, there would be 25 authors contributing two articles each (100/2² = 25) about 11 contributing articles each (100/3² = 11.1) and so on.

Where 'an' is the number of authors contributing 'n' papers and a1 is the number of authors contributing each one paper.

The Chi-square can be computed as (F-P) 2 / P

F= Observed number of authors with 'n' publications

P= Expected number of authors

From the above table, it is observed that single paper contributed authors contribute 74.52% of the total authors. And only 0.06 percent of authors have contributed more than 4 papers. Table 7 obeys the Lotka's law of scientific productivity.

Conclusion

The journal aims to provide an opportunity for interactions between networking in computer science technology especially within the communications group to introduce new concepts, methodologies, systems and technology in the field. It is one of the most extensive journals that appear in the IEEE society. This study has highlighted quantifying the contributions made by the researcher the year 2011-2016. the journal published 1013 articles and total number of authors 3644 during the study period. The year 2016 shows the highest number of contributions 280 (27.64%) more than three authored papers (300) occupied first rank. it is found that 930(91.81%) articles have page length in the range of 11-15 pages. it is observed for the majority of contributors were from the United States with 1854 (50.89 %) occupied the first position. It reveals that the most prolific author Ness B. Shrof, the Ohio State University, and Columbus, OH, United States. The degree of collaboration in the IEEE/ACM Transactions on Networking is 0.98, which clearly indicates its dominance upon multiple author contributions. Lotka's law of scientific productivity is also tested and obeys with the present data set.

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