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Scientometric Study on the Research Output of Computer Society Transactions on IEEE

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Abstract

This paper presents a Scientometric study on the Research Output of "Computer Society Transactions on IEEE" for the period 2007-2016 (Ten Years). The study is focused on the following areas for the research such as list of journals published by IEEE Computer Society and its impact factors, year of inceptions, periodicity and also the distribution of contributions year wise, volume wise, journals wise and subjects dispersion has been analyzed. Thirty journals have been selected for research from IEEE Computer Society. The journals have been identified based on their citations reports, quality of papers, review systems of papers, trends, authors' profile and their affiliations and the journals impact factors etc. The study reveals that the total papers published on IEEE Computer Society were 29258 during the period 2007-2016 (Ten Years). Of these, the journal of IEEE Transactions on Very Large Scale and Integrated Systems (VLSI) has published the highest number of papers 2357 (8.05%). The journal of IEEE transactions on Network Science and Engineering has published the lowest number of papers 36 (0.12%). Most of the IEEE Computer Society journals published their papers on the subject "ICT: Information Communication Technology and Others" 10, which amounts to 33%.

Keywords: Computer Society, Scientometric Study, Transactions on IEEE

1. Introduction

The 21st century may be described as the century of the development of metric sciences like librametrics, bibliometrics, Scientometrics, cybermetrics or webometrics and lastly informatics. The objective is to use quantitative techniques and methods to assess the knowledge domain. Scientometrics has become prominent day by day because of the need to measure and evaluate the huge investments in Science and Technology (S&T) sectors, especially in research and development activities. Journals are the primary communication channels in disseminating research and scholarly information and publishing papers in high impact journals and good quality national as well as international journals are strongly related to gaining prestige, reputation and academic achievement in higher education environment.

Scientometrics is the study of measuring and analyzing Science, Technology and Innovation. Major research issues include the measurement of impact reference set of articles to investigate the impact of journals and institutes, understanding of scientific citations, mapping scientific field and the production of indicators for use in policy and management contexts.

1.1 Web of Science

Previously known as Web of Knowledge is an online subscription based scientific citation indexing service orig inally produced by the Institute for Scientific Information (ISI), later maintained by Clarivate Analytics (previouslythe intellectual property and science business of Thomson Reuters), that provides a comprehensive citation search. It gives access to multiple databases that reference cross-disciplinary research, which allows for

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in-depth exploration of specialized sub-fields within an academic or scientific discipline.

1.2 Scopus

A product of Elsevier both the largest abstract and citation database of peer reviewed literature: scientific journals, books and conference proceedings. It gives a comprehensive overview of the world's research output in the field of Science, Technology, Medicine, Social Sciences and Arts and Humanities. It also offers author profiles which cover affiliations, number of publications and their bibliographic data references and details on the number of citations each published document has received. It has a facility to calculate the H-index of authors and institutions.

1.3 IEEE Xplore

IEEE Xplore provides access to more than four-million full text documents from some of the world's most highly cited publications in Electrical Engineering, Computer Science and Electronics.

The content in IEEE Xplore Comprises:

195 + journals, 1800 + conference proceedings, 6200 + Technical Standard, Approximately 2400 ebooks, 425 + educational courses, approximately 20,000 new documents are added to IEEE Xplore each month. Access to full-text documents in IEEE Xplore can be obtained from:

A broad range of institutional subscriptions options.

Exclusive subscriptions available to IEEE Members and IEEE Society Members.

Online purchase of individual documents (at discounted prices for IEEE Member).

Computer Society Transactions on IEEE The Computer Society is a leading society and publisher of technical material in Computing. Its publications includes

13 peer reviewed technical magazines and 20 scholarly journals called Transactions, as well as conference proceedings, books and a variety of digital products.

The Computer Society Digital Library (CSDL) provides subscriber access to all computer publications. In 2008, the Computer Society launched computing now, a web portal featuring free access to a rotation of CSDL articles, along with technical news, computer society blogs, and multime- dia content.

As most publications were delivered digitally in 2014, the computer society launched the complementary monthly digest computing edge magazine, which consists of curate articles from its magazines.

2. Review of Literature

Some of the relevant studies are worth mentioning here to give the complete insight into the present research topic in a perspective.

Mukhtiar Singh, Nabi Hasan also made a study to figure out the trend of research output of the business group countries, known as the BRICS (Brazil, Russia, India, China and South Africa) on the basis of research papers/ articles indexed in Web of Science online database for the 20 year period from 1994-2013.

A total of 2552490 records were retrieved for BRICS, which is 10.67% of the global records for the twenty-year period. A maximum of 12.43% papers have been indexed in 2013 against 1.51% in 1994. A Scientometric assessment of the trend of research papers have been presented in the study by way of analyzing; annual output of research papers of BRICS countries to the global share, growth trend of the publications, country-wise individual share, collaboration pattern with global countries and amongst/within the BRICS; top ranked institutions, subject dispersion and top ranked journals.

The study may be useful to subject specialists, analysts, researchers, students, policy-makers, institutions administrators, Faculty and the administrators of the BRICS countries to understand the trends and make effective policies, future collaboration, citation pattern, etc. on the basis of inferences drawn in this paper.

Sumit Kumar Banshal, Ashraf Uddin, Khushboo Singhal and Vivek Kumar Singh also did a study of Scientometrics and text-based analysis of computer science research output from India during the last 15 years. We have collected the data for research output indexed in Web of Science and performed a detailed computational analysis to obtain important indicators, such as total research output, citation impact, collaboration patterns, thematic area of research. The analytical results present a detailed and useful picture of status and competence of computer science domain research in India.

2.1 Statement of the Problem

This title was selected for the study because "IEEE Computer Society" is a leading publication in the field of Computer Science and Technology. It is available all over

Table 1. Overall distribution pattern of contributions

S. No	No. of Journals	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total	%
1	30	1918	1979	2183	2279	2587	3006	3416	3835	3844	4211	29258	100

the world both on print medium as well as in the form of electronic journals.

2.2 Objectives of the Study

The present study assesses the authorship pattern, articles publishing pattern, subject dispersion, etc. The objectives of the study are as follows:

- To examine the overall, volume wise and year wise publication output.
- To understand the authorship pattern and collaboration pattern with global countries.
- To identify the impact factor, year of inceptions and periodicity of the journals.
- To identify the types of publications.
- To find out the emerging research areas/subject areas preferred by authors.
- To examine the subject dispersion of articles.
- To find out the journals which have been indexed with data bases.

2.3 Scope of the Study

The study covers a period of Ten Years from 2007 to 2016. Thirty journals have been selected for research from "IEEE Computer Society" and data for research have been retrieved from the indexed journals of different databases such as Web of Science (27 journals), Scopus (7 journals) and IEEE Xplore (1 Journal). A total of 29258 papers were published.

It consists of 9 (30%) journals that are published on a monthly basis, 14 (47%) are on quarterly basis and 7(23%) journals are on bimonthly basis.

3. Methodology

Data on the research output of computer society Transactions on IEEE were extracted from three different databases such as Web of Science (23 journals), Scopus (6 journals) and IEEE Xplore (1 Journal) from the year 2007 to 2016 (Ten Years). The following inferences were drawn from each database of concerned journals of IEEE Computer Society.

Overall, year wise and volume wise distribution pattern of contributions, impact factor, year of inception, periodicity, emerging areas of research, types of publications, authorship pattern and database with journals concerned which are indexed.

The output of 29258 was exported as 'Microsoft Office Excel for getting appropriate results about distribution pattern of contributions, emerging areas of research, types of publications, authorship pattern and database with indexed journals concerned etc.

4. Data Analysis and Results

It was found that 29258 papers were published on IEEE Computer Society during the period 2007-2016. Most of the papers have been published on the journal of IEEE Transactions on Very Large Scale and Integrated System (VLSI) 2357 (8.05%) and the lowest number of papers have been published in the journal of IEEE Transactions on Network Science and Engineering 36 (0.12%).

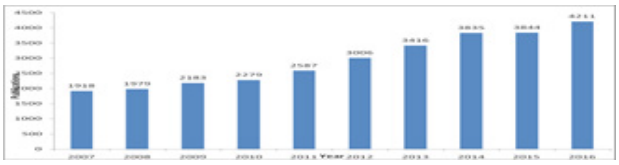

Figure 1. Pattern of publications.

Table 1 and Figure 1 show the number of journals published in "IEEE Computer Society" during the period 2007-2016 (Ten Years). The total number of contributions in the 10 years was 29258. The maximum papers (2357, 8.05%) were published on IEEE Transactions on Very Large Scale and Integrated System (VLSI) and minimum papers (36,0.12%) were published on IEEE Transactions on Network Science and Engineering.

From Table 2 and the accompanying Figure 2 inferences were drawn by the research scholars as from the 30 journals of IEEE Computer Society, four journals have got papers which have been published by more than 2000 followed by seven journals whose papers have been published by 1500-2000 and 3 journals have got

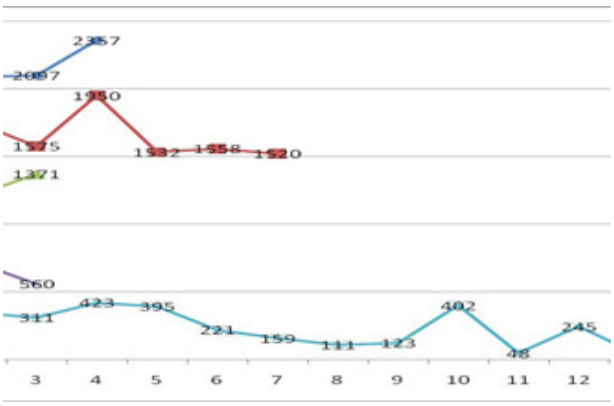

Figure 2. Volume wise distribution pattern of contributions.

their articles by published 1000-1500 and also another 3 journals have got their papers published by 500-1000 at last, 13 journals have got their papers published by below 500.

Table 2. Volume wise distribution pattern of contributions

No. of Papers Published	No. of Journals	Total Articles	%
Papers published more than 2000	4	8583	29.3%
1500-2000	7	11796	40.3%
1000-1500	3	3695	12.6%
500-1000	3	1924	6.5%
Below 500	13	3260	11.1%
	30	29258	100%

Table 3. Year wise distribution pattern of contributions

S. No	Year	No. of Publications	%
1	2007	1918	6.55%
2	2008	1979	6.76%
3	2009	2183	7.46%
4	2010	2279	7.78%
5	2011	2587	8.84%
6	2012	3006	10.2%
7	2013	3416	11.6%
8	2014	3835	13.1%
9	2015	3844	13.1%
10	2016	4211	14.3%
10 Years		29258	100%

Figure 3. Pattern of publications.

Table 3 and the accompanying Figure 3 shows a significant increase of papers published on IEEE Computer Society every year. For the year 2007 it published just 1918 papers and we could see the growth of papers published in order of hierarchies.

Table 4. Impact factor of the journals - IEEE Computer Society

S. No	Impact Factor	No. of Journals	%
1	0.5-1.5	2	7%
2	1.5-2.5	5	17%
3	2.5-3.5	11	37%
4	3.5-4.5	3	10%
5	4.5-5.5	0	0%
6	5.5-6.5	0	0%
7	6.5-7.5	3	10%
8	7.5-8.5	1	3%
9	No Impact Factor	5	17%
Total		30	100%

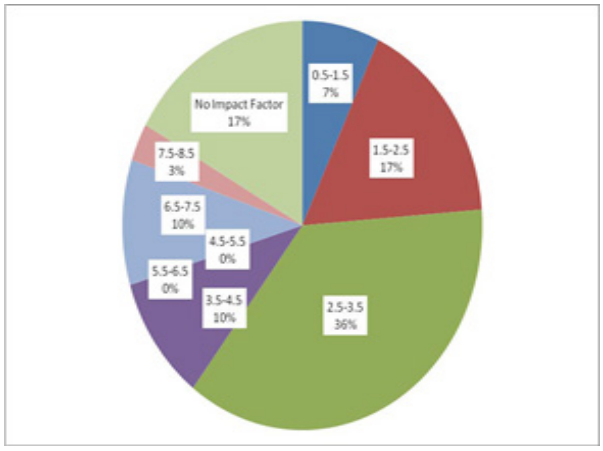

Figure 4. Impact factor of the journals.

*Data were extracted from the database of IEEE Xplore as on February 3, 2018.

Table 4 and the accompanying Figure 4 shows the impact factors of the journals of IEEE Computer Society. 37% of the journals were seen in the impact factor range of 2.5-3.5 fol- lowed by 17% of the journals in the range of 1.5-2.5. 10% of each of two different journals were seen in the impact factor range of 3.5-4.5 and 6.5-7.5 respectively and 7% of the journals were seen in the impact factor range of 0.5-1.5 and 3% of the journals were in the impact factor range of 7.5-8.5. It was found that no journal has the impact factors of 4.5-5.5 and 5.5-6.5. Apart from these reports there were 17% of the journals were having no impact factors.

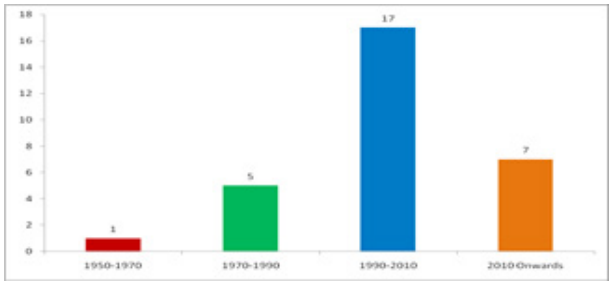

Figure 5. Year of inception of the journals - IEEE Computer Society.

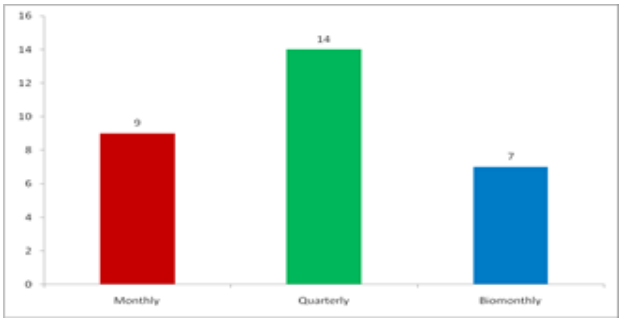

Figure 6. Periodicity of the journals - IEEE Computer Society.

Figure 5 depicts the inceptions of journals year wise, which are published by IEEE Computer Society during the period 2007-2016 (Ten Years). There was a journal which is published and came into existence for access between the years 1950-1970.

5 (17%) Journals came into existence for access between the years 1970-1990 followed by 17 (57%) journals that came into existence for access between 1990 and 2010 which is the most productive period in the history of IEEE CS. And also 7 (23%) journals came into existence for access since 2010.

Figure 6 shows the periodicity of the journals published by IEEE Computer Society. There were 9 (30%) journals published on monthly basis followed by 14 (47%) and 7 (23%) journals that were published on the basis of quarterly and bimonthly respectively. Therefore a maximum number of journals (14, 47%) are being published on quarterly basis.

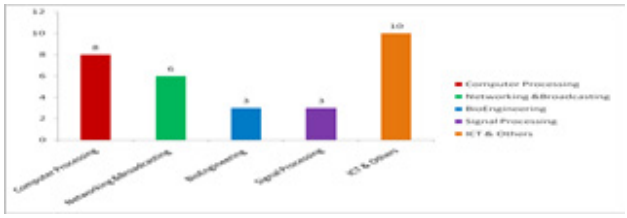

Figure 7. Subjects areas of periodicals – IEEE Computer Society.

Figure 7 shows that 8 (27%) journals were published on the subject "computer processing" followed by 6 (20%) and 3 (10%) journals that were published on Networking and Broadcasting and Bioengineering.

And also 3 (10%) and 10 (33%) journals were published on signal processing and on the subject ICT respectively.

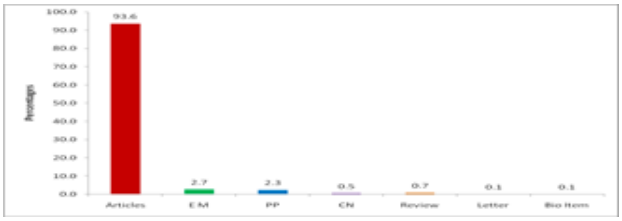

Figure 8. Types of publications.

Table 5 and Figure 8 shows the papers which were contributed to the organizations of IEEE Computer Society. Most of the papers were published in the form of articles their total up to 27389 (93.6%), followed by Editorial Materials 779 (2.6 %), Proceeding Papers 683 (2.3%) and

also published 143 (0.48%) Corrections and 216 (0.73%) Review Papers as well. Remaining forms like letter, biographical item contain very less number of articles that are 32 (0.10%) and 16 (0.05%) respectively.

Table 5. Types of publications

Subjects	Articles	EM	PP	CN	Review	Letter	Bio Item	Total
Computer Processing	9825	365	321	77	133	17	14	**10752**
Networking and Broadcasting	5371	74	94	12	20	4	0	**5575**
Bio-Engineering	2114	82	150	14	20	2	0	2382
Signal Processing	2760	101	31	21	17	6	0	**2936**
Others	7319	157	87	19	26	3	2	7613
Total	27389	779	683	143	216	32	16	29258

EM: Editorial Materials, PP: Proceeding Paper, CN: Correction, Bio-Item: Biographical Item

The types of publications are almost common in all the journals published on IEEE Computer Society.

Table 6 describes the authorship pattern of IEEE Computer Society that has been calculated from the sample of top 10 ranked publications (citations) of each journal. Therefore, 300 papers have been evaluated and reported.

There were 71 (24%) papers that have been written by two authors. This is the one which is standing on the first in a row of authorship pattern of IEEE Computer Society.

Table 6. Authorship pattern

S.No	Authorship Pattern	No. of Papers	%
1	Two Authors	71	24%
2	Three Authors	70	23%
3	Four Authors	51	17%
4	Five Authors	42	14%
5	Single Author	20	7%
6	Six Authors	17	6%
7	Seven Authors	14	5%
8	Eight Authors	4	1%
9	Nine Authors	4	1%
10	More than NineAuthors	7	2%
TOTAL		300	100.00%

70 (23%) and 51(17%) papers have been written by three authors and four authors respectively. These are standing on the second and third positions respectively of authorship pattern of IEEE Computer Society.

42 (14%) and 20 (7%) papers have been written by five authors and single author respectively. These are standing on the fourth and fifth positions respectively followed by 17 (6%) and 14 (5%) papers that have been written by six authors and seven authors respectively that hold positions of sixth and seventh on the IEEE Computer Society.

4 and 4 (1%) papers have been written by eight authors and nine authors respectively. These are standing on the eighth and the ninth positions of authorship pattern of IEEE Computer Society.

7 (2%) papers have been written by more than nine authors. This is standing on the positions of tenth on IEEE Computer Society.

Table 7. Data extracted from the sources (WoS/ Scopus/ IEEE Xplore)

S.No	Particulars	No. of Journals	%
1	Web of Science	23	77%
2	Scopus	6	20%
3	IEEE: The World's LargestTechnical Professional Organization	1	3%
Total		30	100%

Table 7 and the accompanying Figure 9 shows that the data were extracted from the sources of Web of Science, Scopus and IEEE Xplore. 23 (77%) journals were indexed with Web of Science database followed by 6 (20%) journals that were indexed with Scopus database and 1 (3%) journal was indexed with online journal of IEEE Xplore.

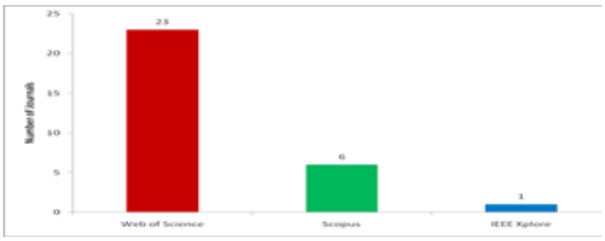

Figure 9. Data extracted from the Sources (WoS/Scopus/IEEE Xplore).

4.1 Limitation of the Study

- In depth knowledge of Scientometric techniques are not applied in this study.
- Selected Journals have been taken for the research.

4.2 Major Findings

- 29258 papers were published in the organization of computer society Transactions on IEEE during the period 2007-2016.
- The highest number of papers published on the Journal of IEEE Transactions was on Very Large Scale and Integration System (VLSI) 2357 (8.05%).
- The lowest number of papers published on the Journal of "IEEE Transactions were on Network Science and Engineering" 36 (0.12%).
- Most of the research papers were published on the subject "Information Communication Technology (ICT) and Computer Processing.

5. Conclusion

The reputation of any journal can be measured on the basis of its citations and publication output. The quantity of citation and quality of publications should be measured through Scientometric studies by means of quantitative (citation) as well as qualitative (papers) analysis. It is the responsibility of the LIS Community to study and notify the faculty, scientists and scholars of a particular country to make known the research trend of their organization and the subject areas of research through a variety of bibliometric/Scientometric analysis and help them to do further research in their field. This study has been carried out with the above aim for analyzing the quantity and quality of publication output of IEEE Computer Society and the findings show that they have largely contributed to the research in the fields of ICT and Computer Processing.

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