# Funding Research on IEEE Publication field of Computer Science in India

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*Abstract* - **This study is based on the publication output funding and un-funding research on computer science filed papers as indexed by Web of Science (WoS) database for the period from 2010 to 2020. The study uses ten years publications data on funding agencies research on IEEE journal publication in India, These 11 year's citations window has been used for computing the quality of the research. With a total of India 59,446 with 1,76,892 citations records were downloaded and analyzed. The Year-Wise Distribution of Funded and Unfunded Publications in India from the below table no. 1 we see that India has 59446 published papers and 53394 unfunded papers from the past 11 years. With compare to in the year 2010, 813 funded papers and 713 unfunded papers ,slowly raising from the year 2008 to 2012, with a maximum of 97 % during the period 2015 to 2017. The 11 years of data, we see that Funded papers increased in citations are in 2018, 1283 % 21.20 and the Unfunded highest citation are 2015, 22988 % 17.36.**

**In the Top Funded Agencies in IEEE Publications are the number one position is Department of Science Technology, India 693 papers, % 11.45 and the Citation wise Top is National Science Foundation NSF, 6211 citations, % 13.96 and the highest H Index is National Natural Science Foundation of China, i.e. 37. The Lowest in Consuelo National Desenvolviment i.e. 49 papers, % 0.81 and the citation wise is Ministry of Human Resource Development MHRD GOI, 228 papers % 0.51, The H-Index is, 8.**

**The Top Ten Journals in IEEE Publications Funding Agencies are IEEE Access, 596 papers, % 9.85. And Citation wise Top is the same i.e. 6995, % 15.72. and the ACPP Top is IEEE Transactions on Image Processing, % 31.43. And the Lowest is IEEE Wireless Communications Letters, 43 papers % 0.71 and the Citation wise, IEEE-ACM Transactions on Networking, 394 papers % 0.89.**

**In the Table. IV. Document Type-wise Distribution of Funding is in the Top is Proceedings Total Papers, 55778, and the Funded Papers is, 4171 % 68.91 and the Unfunded Top Papers is 51607, % 96.65. The Citation wise Top citations is Total Citations 109958 and Funded citations is 10548, % 23.71. The Unfunded papers is 51607, % 96.65 The Total Citations is 99410, % 75.08. The Lowest Document Type-wise Distribution Funding and Un-Funding publications is Letters, the Total Papers is 02 and funded is 01, % 0.02. The Total Citations is, 52 % 0.12. and the Unfunded Publications is Letters, O1 % 0.00. The Unfunded Citations is Correction, 01 % 0.00.**

*Index Terms* - **Funding and Unfolding Research, Publications, Distribution, Agencies, Citations, Distribition.**

## INTRODUCTION

IEEE Xplore is a research database for discovery and access to journal articles, conference proceedings, technical standards, and related materials on Computer Science, Electrical Engineering and Electronics and allied fields. It contains material published mainly by the Institute of Electrical and Electronics Engineers (IEEE) and other partner publishers. IEEE Xplore provides web access to more than 4.5-million documents from publications in computer science, electrical engineering, electronics and allied fields. Its documents and other materials comprise over 195 scholarly journals, over 1,800 conference proceedings, more than 6,200 technical standards, approximately 2,400 books, and over 425 online courses. Approximately 20,000 new documents are added each month. Anyone can search IEEE Xplore and find bibliographic records and abstracts for its contents, while access to full-text documents requires an individual or institutional subscription.

Computer science is the study of computers and computing as well as their theoretical and practical

applications. Computer science**,** the study of computer and computing, including their theoretical and algorithmic foundations Computer science applies the principles of mathematics, engineering, and logic to a plethora of functions, including algorithm formulation, software and hardware development, and artificial intelligence. Computer science also makes heavy use of hypothesis testing and experimentation during the conceptualization, design, measurement, and refinement of new algorithms, information structures, and computer architectures. Other system software elements known as linking loaders were developed to combine pieces of assembled code and load them into the computer's memory, where they could be executed. The concept of linking separate pieces of code was important, since it allowed "libraries" of programs for carrying out common tasks to be reused. This was a first step in the development of the computer science field called software engineering.

Computer science emerged as an independent discipline in the early 1960s, although the electronic digital computer that is the object of its study was invented some two decades earlier. The roots of computer science lie primarily in the related fields of mathematics, electrical engineering, physics and management information systems.

Another program, known as an assembler translated these symbolic programs into an equivalent binary program whose steps the computer could carry out, or "execute."

India is a great country where people speak different languages but the national language is Hindi. India is full of different castes, creeds, religion, and cultures but they live together. That's the reasons India is famous for the common saying of unity in diversity.

India is a peninsula, bound by the Indian Ocean in the south, the Arabian Sea on the west and Bay of Bengal in the east. The coastline of India is of about 7,517 km (4,671 mi) long. India has the third largest military force in the world and is also a nuclear weapon state.

India is one of the oldest civilizations in the world with a kaleidoscopic variety and rich cultural heritage. It has achieved all-round socio-economic progress since its Independence. India has become self-sufficient in agricultural production and is now one of the top industrialised countries in the world and one of the few nations to have gone into outer space to conquer nature for the benefit of the people.

REVIEW OF LITERATURE

Robert Holzmann (1997) His plans for an unfunded to fund the paper reviews the need for reform and surveys the discussion and current plans before addressing, how to structure the unfunded, how to finance the transition toward the funded and what are the.

Robert K. Triest, Bo Zhao, (2014) In their analysis unfunded liabilities, the authors document that the public pension underfunding crisis during the 2000s developed largely as a consequence of portfolio returns that fell short of expectations. Public pension plans' assets portfolios have a relatively high share of equities and other risky assets, leaving the plans funded status vulnerable.

Praveen B Hulloli and Kiran P Savanu,(2020) They are analyzes the funded and non-funded Indian and Chinese thin-film research output published from 2001 to 2019. The study reveals the different aspects of thin-film literature in topmost five funding agencies in countries like India and China. China contributed the highest research publications with 41,809 records by the support of 30,523 funding agencies papers with 50, 8318 citation contributions. The countries funded papers were 73.01% and Un-Funded Papers were only 32.51%. India has contributed a total number of research publications in the field of a thin film with 16,308 by the support of 8,724 funding agencies papers with 1, 03,577 citation contributions, India has total funded papers of only 45.36% and Un-Funded total Papers of 54.64, India has 857 journals published and 646 journals supported by the funding agency., China has 1138 journals published supported by 995 funding agencies.

Caroline Henry, Nor Azura Md Ghani1, and Halilah Haron, others

Financial sustainability has been a continuous problem that Higher Learning Institutions (HLI) have to face. In addition, funding has always played a role in the process of research as many have proven that there is a relationship between funding and research impact. This study highlights the impact of funding on UiTM's research productivity. Publications published by UiTM in 2012 to 2016 from Web of Science (WoS) were used to compare the impact of both funded and unfunded publications. The findings showed that 32.53% of the publications published from 2007 to 2016 were funded. Funded publications published in

high impact journals have higher citations compared to unfunded publications particularly for Medical and Science & Technology related fields such as Clinical Medicine and Chemistry. This proves that financial assistance is key to drive quality research and produce impactful publications as it indirectly in-creases the institution's research productivity.

Brian A. Jacob and Lars Lefgren, the analysis presented below fits within a large literature on the economics of science is particularly related to prior studies on the determinants of research output and the impact of research funding on scientific publications.

## OBJECTIVES OF THE STUDY

1. Year wise funding and un-funding IEEE paper publications
2. To analyze the top Funding Agencies
3. Find out the top ten journals IEEE Publications
4. To analyze document type-wise distribution funding and un-funding publications

Methodology and Source of Data:

This study is based on the publication output funding and un-funding research on computer science filed papers as indexed by Web of Science (*WoS*) database for the period from 2010 to 2020. The study uses ten years publications data on funding agencies research on IEEE journal publication in India, these 11 year's citations window has been used for computing the quality of the research. With a total of India 59,446 with 1,76,892 citations records were downloaded and analyzed by using the "*MS Excel*" and "*Histcite*" software application as per the objectives of the study.

Scope and Limitation of the Study:

The present study deals with the Funding Research on IEEE Publication field of Computer Science in India from2010 to 2020, which is available in Web of Science bibliographical Database. Thus, the study is restricted to 11 years of data.

## RESULTS AND DISCUSSION

Year wise funding and un-funding IEEE paper publications:

ANALYSIS AND DISCUSSION: Year-Wise Distribution of Funded and Unfunded Publications in India from the below table no. 1 we see that India has 59446 published papers and 53394 unfunded papers from the past 11 years. With compared to in the year 2010, 813 funded papers and 713 unfunded papers, slowly raising from the year 2008 to 2012, with a maximum of 97 % during the period 2015 to 2017.

TABLE I THE NUMBER AND PERCENTAGE OF FUNDED AND UNFUNDED PUBLICATIONS OF India Year No. of Publication Funded Paper % Unfunded Paper % The Highest Papers in the year 2015 i.e.9708, and the highest Funded Papers in the year,2018 i.e. 1283, % 21.20. And Unfunded Highest papers in the year 2015, i.e. 9502, %17.80. The Citation wise highest total citations in the year 2014, i.e. 26761 and highest Funded Papers cited in the year, 2018, 1283, % 21.20 the total Funded Citations,7229, % 16.25. The Unfunded Total highest papers in the year 2015 i.e. 9502 % 17.80 and the Total Unfunded Citations in the year, 2015, i.e. 22988, 17.36 % from the above 11 years of data, we see that Funded papers increased in citations are in 2018, 1283 % 21.20 and the Unfunded highest citation are 2015, 22988 % 17.36.

Table-1: Year wise funding and un-funding IEEE paper publications

| Year | TP | TC | FP | % | TC | % | UFP | % | TC | % |
|---|---|---|---|---|---|---|---|---|---|---|
| 2010 | 813 | 4913 | 100 | 1.65 | 1283 | 2.88 | 713 | 1.34 | 3630 | 2.74 |
| 2011 | 877 | 9254 | 124 | 2.05 | 3988 | 8.96 | 753 | 1.41 | 5266 | 3.98 |
| 2012 | 2854 | 12133 | 221 | 3.65 | 2681 | 6.03 | 2633 | 4.93 | 9452 | 7.14 |
| 2013 | 5993 | 20887 | 337 | 5.57 | 3766 | 8.47 | 5656 | 10.59 | 17121 | 12.93 |
| 2014 | 7948 | 26761 | 294 | 4.86 | 3818 | 8.58 | 7654 | 14.33 | 22943 | 17.33 |
| 2015 | 9708 | 26122 | 206 | 3.40 | 3134 | 7.04 | 9502 | 17.80 | 22988 | 17.36 |
| 2016 | 8641 | 21650 | 643 | 10.62 | 3511 | 7.89 | 7998 | 14.98 | 18139 | 13.70 |
| 2017 | 8617 | 21482 | 1037 | 17.13 | 5954 | 13.38 | 7580 | 14.20 | 15528 | 11.73 |
| 2018 | 7591 | 17816 | 1283 | 21.20 | 7229 | 16.25 | 6308 | 11.81 | 10587 | 8.00 |
| 2019 | 2178 | 8001 | 568 | 9.39 | 4506 | 10.13 | 1610 | 3.02 | 3495 | 2.64 |
| 2020 | 4226 | 7873 | 1239 | 20.47 | 4618 | 10.38 | 2987 | 5.59 | 3255 | 2.46 |
| | 59446 | 176892 | 6052 | | 44488 | | 53394 | | 132404 | |

*TP: Total Papers, TC: Total Citations, FP: Funded Papers and UFP: Un-Funded Papers*

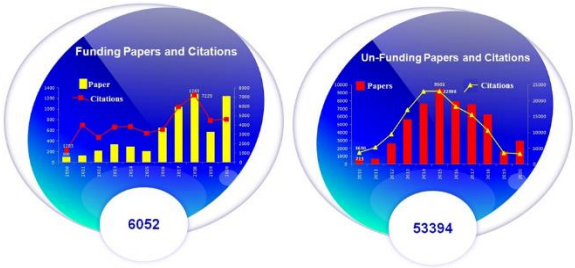


Figure-1: Year wise funding and un-funding IEEE paper publications

Top Funding Agencies:

In the Table. II, Top Funded Agencies in IEEE Publications are the number one position is Department of Science Technology, India 693 papers, % 11.45 and the Citation wise Top is National Science Foundation NSF, 6211 citations, % 13.96 and the highest H Index is National Natural Science Foundation of China, i.e. 37. The Lowest in Consuelo National Desenvolviment i.e. 49 papers, % 0.81 and the citation wise is Ministry of Human Resource Development MHRD GOI, 228 papers % 0.51, The H-Index is, 8.

Table-2: Top Funding Agencies IEEE Publications

| SL. No. | Funding Agencies | Papers | % | Citation | % | H-Index |
|---|---|---|---|---|---|---|
| 1 | Department of Science Technology India | 693 | 11.45 | 4328 | 9.73 | 31 |
| 2 | National Science Foundation NSF | 353 | 5.83 | 6211 | 13.96 | 36 |
| 3 | National Natural Science Foundation of China | 205 | 3.39 | 4498 | 10.11 | 37 |
| 4 | University Grants Commission India | 202 | 3.34 | 706 | 1.59 | 10 |
| 5 | European Commission | 155 | 2.56 | 2280 | 5.12 | 24 |
| 6 | Council of Scientific Industrial Research CSIR India | 146 | 2.41 | 1845 | 4.15 | 19 |
| 7 | Defence Research Development Organization DRDO | 81 | 1.34 | 341 | 0.77 | 8 |
| 8 | Science Engineering Research Board Serb India | 79 | 1.31 | 173 | 0.39 | 6 |
| 9 | UK Research Innovation UKRI | 66 | 1.09 | 1423 | 3.20 | 17 |
| 10 | United States Department of Defense | 66 | 1.09 | 1474 | 3.31 | 17 |
| 11 | Engineering Physical Sciences Research Council EPSRC | 61 | 1.01 | 1402 | 3.15 | 17 |
| 12 | Ministry of Human Resource Development MHRD GOI | 56 | 0.93 | 228 | 0.51 | 8 |
| 13 | Ministry of Electronics and Information Technology Meity GOI | 52 | 0.86 | 281 | 0.63 | 9 |
| 14 | Natural Sciences and Engineering Research Council of Canada | 50 | 0.83 | 664 | 1.49 | 15 |
| 15 | Conselho Nacional De Desenvolvimento | 49 | 0.81 | 872 | 1.96 | 19 |
| 16 | Others Funding Agencies | 3738 | 61.76 | 17762 | 39.93 | 39 |
| | Total | 6052 | | 44488 | | 48 |

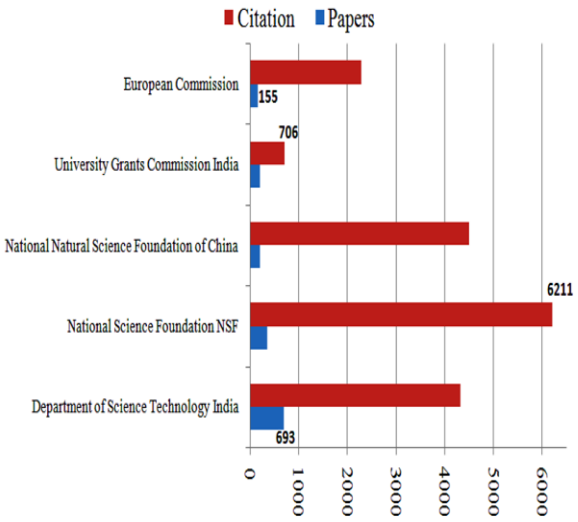


Figure-2: Top Funding Agencies IEEE Publications

Top Ten Journals IEEE Publications Funding Agencies:

In the Table. III. The Top Ten Journals in IEEE Publications Funding Agencies are IEEE Access, 596 papers, % 9.85. And Citation wise Top is the same i.e. 6995, % 15.72. and the ACPP Top is IEEE Transactions on Image Processing, % 31.43. And the Lowest is IEEE Wireless Communications Letters, 43 papers % 0.71 and the Citation wise, IEEE-ACM Transactions on Networking, 394 papers % 0.89.

Table-3: Top Ten Journals IEEE Publications

| SL. No. | Name of the Journal | Funded Papers | % | Citation | % | ACPP |
|---|---|---|---|---|---|---|
| 1 | IEEE Access | 596 | 9.85 | 6995 | 15.72 | 11.74 |
| 2 | IEEE Transactions on Information Theory | 138 | 2.28 | 1913 | 4.30 | 13.86 |
| 3 | IEEE Transactions on Industrial Informatics | 112 | 1.85 | 2566 | 5.77 | 22.91 |
| 4 | IEEE Systems Journal | 107 | 1.77 | 1544 | 3.47 | 14.43 |
| 5 | IEEE Transactions on Very Large Scale Integration (VLSI) Systems | 80 | 1.32 | 472 | 1.06 | 5.90 |
| 6 | IEEE Internet of Things Journal | 66 | 1.09 | 1305 | 2.93 | 19.77 |
| 7 | IEEE Transactions on Computer-Aided Design of Integrated Circuits & Systems | 54 | 0.89 | 465 | 1.05 | 8.61 |
| 8 | IEEE Transactions on Image Processing | 49 | 0.81 | 1540 | 3.46 | 31.43 |
| 9 | IEEE-ACM Transactions on Networking | 48 | 0.79 | 394 | 0.89 | 8.21 |
| 10 | IEEE Wireless Communications Letters | 43 | 0.71 | 439 | 0.99 | 10.21 |
| 11 | Others Journals | 4759 | 78.64 | 26855 | 60.36 | 5.64 |
| | **Total** | **6052** | | **44488** | | **7.35** |

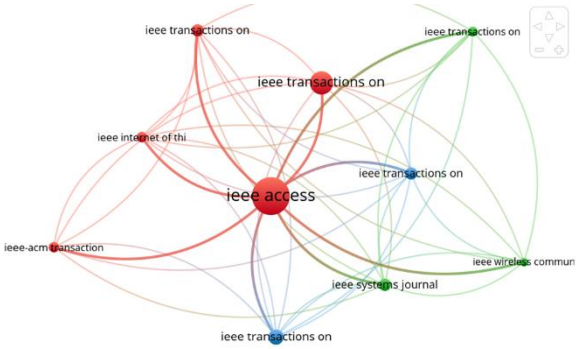


Figure-3: VOS Viewer Top Ten Journals IEEE Publications Network Mapping

Document Type-wise Distribution of Funding:

In the Table. IV. Document Type-wise Distribution of Funding is in the Top is Proceedings Total Papers, 55778, and the Funded Papers is, 4171 % 68.91 and the Unfunded Top Papers is 51607, % 96.65. The Citation wise Top citations is Total Citations 109958 and Funded citations is 10548, % 23.71. The Unfunded papers is 51607, % 96.65 The Total Citations is 99410, % 75.08. The Lowest Document Type-wise Distribution Funding and Un-Funding publications is Letters, the Total Papers is 02 and funded is 01, % 0.02. The Total Citations is, 52 % 0.12. and the Unfunded Publications is Letters, O1 % 0.00. The Unfunded Citations is Correction, 01 % 0.00.

Table-4: Document Type-wise Distribution Funding and Un-Funding publications

| Document Type | TP | TC | FP | % | TC | % | UFP | % | TC | % |
|---|---|---|---|---|---|---|---|---|---|---|
| Proceedings Paper | 55778 | 109958 | 4171 | 68.91 | 10548 | 23.71 | 51607 | 96.65 | 99410 | 75.08 |
| Article | 3457 | 6536 | 1845 | 30.48 | 3328 | 74.81 | 1612 | 3.02 | 3208 | 24.23 |
| Editorial Material | 89 | 521 | 7 | 0.12 | 20 | 0.04 | 82 | 0.15 | 501 | 0.38 |
| Review | 52 | 949 | 23 | 0.38 | 587 | 1.32 | 29 | 0.05 | 362 | 0.27 |
| Correction | 19 | 1 | 5 | 0.08 | 0 | 0.00 | 14 | 0.03 | 1 | 0.00 |
| Letter | 2 | 87 | 1 | 0.02 | 52 | 0.12 | 1 | 0.00 | 35 | 0.03 |
| Meeting Abstract | 49 | 8 | 1 | 0.02 | 0 | 0.00 | 48 | 0.09 | 8 | 0.01 |
| Total | 59446 | 17689 | 6053 | | 44488 | | 53393 | | 13240 | |

*TP: Total Papers, TC: Total Citations, FP: Funded Papers and UFP: Un-Funded Papers*

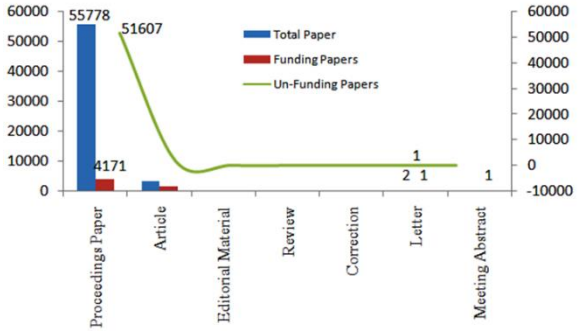


Figure-4: Document Type-wise Distribution Funding and Un-Funding publications

## CONCLUSION

In the Funding Research on IEEE Publications in the Field of Computer Science in India, compare to Fund and Unfunded Papers and Citations are the Total Papers Unfunded are high. And the Citation wise the 4% are less in Unfunded Citations, i.e. funded are 21.20% and Unfunded 17.36%. The overall the period of 11 years the total papers are 59,446 and the Citations are 1,76,892, highest in the year 2015, total papers 9708 highest citations in the2014, 26,761 Funded papers highest in the year 2018, % 21.20. And the Unfunded highest papers are in the year 2015, 9502 % 17.80 and the Highest Citations of Unfunded is 22988, %17.36. The Funding Agencies of Publications the Top is Department of Science and Technology, India i.e. % 11.45 and the Citation wise Top is National Science Foundation NSF, % 13.96. The Top Journal is the out of 10 (Ten) is IEEE Access, % 9.85 and Citation wise also Top is IEEE Access,% 15.72.

The Document wise distribution of the Publications Funded Papers, Proceedings is % 68.91 Unfunded is % 96.65. in top. And Citation wise also top in Proceedings, Funded % 68.91, Unfunded,% 75.08. In overall in the field of Computer Science in India is Proceedings are very high paper are publishing in IEEE Publication.

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