

## Measuring Research Trends and Ranking of UGC-CARE List Journals in the Subject Computer Science through Informative Indicator h-index

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### Structure Abstract:

**Purpose:** This study attempts to apply an open citation database (Goggle Scholar), an open citation formula (h-index) and an open source tool (PoP software) to examine Computer Science (CS) journals in the UGC-CARE list in category I for ranking as per h-index and attempts to identify the research trends for the second decade (2010 - 2019) of the 21st century.

**Design / Methodology / Approach:** For retrieving bibliometric data, selected journals in the field of computer science used open information metrics such as the h-index, open bibliography databases such as Google Scholar, and front-end tools such as PoP.

**Findings:** The results showed that the 'International Journal of Computer Theory and Engineering' ranked first with a maximum h-index value of 40, followed by journals such as 'International Journal of Digital Curation' and so on. The main research trend in CS is 'Neural Networks'.

**Research Limitations / Implications:** Due to space and time constraints, all results of h-index derivatives are ignored and only applied to open debase 'Google Scholar' and not to commercial databases such as 'Scopus' or 'WoS.'

**Practical Implications:** This study will help scholars, researchers, publishers, and an institute to measure the quality of an author, journal, and publisher.

**Originality / Value:** The major findings may be helpful to the UGC in its evaluation of a particular journal's quality for incorporation into the CARE list.

**Keywords:** Citation, Computer science (CS), h-index, Informatics, Research trends.

**Paper Type:** Research Paper.

## **Introduction**

The last few years of 20<sup>th</sup> Century i.e., after the 1990s and the first decade of the 21st Century have been transformative for ground and space based observational astronomy due to new observing facilities, access to digital archives, and growth in use of the Internet for communication, collection, processing and dissemination of information as well as access to the archives by the application of ICT (Froegel, 2010). Measuring research trends and ranking the important journals in different fields of study are interesting and popular research areas. Naturally, research trends in Computer Science (CS) help to determine the present scenario of the subject. Similarly, ranking of CS journals on the basis of well-known bibliometric indicators (like journal impact factor) is a popular area of investigation for many researchers. In particular, concentrating on journal papers to measure research trends in CS under the UGC-CARE and ranking of CS journals by emerging informetrics indicators (like h-index) has so far not been explored by researchers. Everything is possible because of the vast development in CS and ICT. UGC plays a mother role in the development and formulation of subject knowledge through the confirmation of research and development as qualitative publication. The UGC-CARE list plays an important role for any discipline publication. As on October 4, 2021, the UGC-CARE list groups provided 37 journals, out of which 3 have been discontinued (UGC-CARE List, 2021).

It aims to analyse thirty-four selected journals and report trends in CS research for the second decade of the twenty-first century (2010–2019), as well as develop a methodology for ranking journals based on emerging informetric indicators and highlighting research trends in this subject using open tools and databases.

## **Literature Review**

Ranking journals one measures are Impact Factor adopted by ISI (the Institute for Scientific Information, Philadelphia) for calculating Impact Factor (If), JCR (Journal Citation Reports) Impact Factors, Model of journal Impact Factor (Garfield, 1994). Approaches to ranking journals are stated preference and revealed preference (Tahai, 1999). Hirsch (2005) proposed a new measure, h-index as a criterion to quantify the scientific output of a single researcher (Hirsch, 2005). As per (Vanclay, 2008) ranking of forestry journals was compared with journal impact factors and h-indices computed from the ISI Web of Science and internet-based data. Incorporate citation count, which can be viewed as the impact of articles,

into trend analysis to shed a new light on the understanding of research trends (Lee, 2020).

As per the literature review, no one ranked or analysed research trends of UGC-CARE list category I journals in the subject of Computer Science (CS) in the second decade of the 21st century.

## **Objectives**

The objectives of this investigation are given below:

- To rank the UGC-CARE list of 'CS' journals by h-index (an emerging and comprehensive informetric indicator);
- To measure subject research trends in the domain of CS through analysing the top most cited papers from each selected journal with a minimum citation of fifty.
- To explore the possibility of open citation (use of the open bibliographic database and open bibliometric indicators) in the CS field;

## **Methodology**

The methodology framework in this study has been organised into sections and subsections as follows:

### **1. Selection of Journals**

A total of thirty-four journals (hundred percent) have been considered for this study (UGC-CARE List, 2021).

### **2. Selection of informetric indicators for the study**

This study uses the h-index as informetric indicator. The h-index was developed by J.E. Hirsch in 2005 defines as 'A scientist has index h if h of his/her  $N_p$  papers have at least h citations each, and the other  $(N_p-h)$  papers have no more than h citations each (Hirsch, 2005).' Because of the popular usage of the h-index in diverse knowledge areas, it has been used as an indicator for ranking journals, and the total number of citations received by an article in the second decade has been used to measure trends in the subject.

### **3. Selection of bibliography databases**

Google Scholar provides a simple way to broadly search for scholarly literature (UGC-

CARE List, 2021). The open 'Google Scholar' databases have been used in this study.

#### **4. Selection of front-end tools / software for retrieving bibliometric data from the selected database**

Publish or Perish is a software program that retrieves and analyzes academic citations. It uses Google Scholar to obtain the raw citations, then analyzes these and calculates a series of citation metrics (About Publish or Perish) and its selected as data extraction tool.

#### **5. Ranking and Research Trends**

This study is using relatively new journal rankings and author's contribution indicators, such as Hirsch's h-index. The top cited papers for each selected journal have been identified from the Google Scholar database by using PoP software. The major research focus of the highly cited paper (published between 2010 and 2019) is based on important keywords used in the title and abstract, with the application of library classification schemes to predict research trends in the CS subject.

### **Bibliometric Profile of Journals**

This area is dedicated to the development of a database for each of the selected journals. The data elements that constitute the core database are divided into two groups: i) the bibliographical data elements; and ii) the citation data elements from the Google Scholar. Due to lack of space, one example is given below:

#### **Bibliographical data elements group**

##### **Title: Data Science and Engineering**

##### Bibliographical details

ISSN: 2364-1185 E-ISSN: 2364-1541

Publisher: Springer

First publication Volume 1: 2016

Latest publication Volume 6: 2021

Frequency: Quarterly

Access type: Open

Language: English

URL: <https://link.springer.com/journal/41019/volumes-and-issues/>

**Dataset: Google Scholar Database**

Number of papers (2010-2019): 109

Number of citations (2010 to 2019): 1614

**Citation Statistics (2010-2019):**

Cites/year	Citation/paper	Authors/paper
322.80	14.81	3.66

Table 1: Citation Statistics

**Bibliometric Index**

h-index	g-index	hI,norm	hI,annual	hA-index
21	33	11	2.20	12

Table 2: Bibliometric Index

**Ranking of journals**

To know the relative position among others, it is very important to rank journals on the basis of some criteria and values. All selected journals are covered by the Google Scholar database to rank journals as per h-index.

**Ranking of journals according to h-index (Period: 2000-2009; Database: Google Scholar)**

Ranking of CS journals (UGC-CARE List, 2021) using Google Scholar database based on h-index retrieved from 2010 to 2019. Search and cache date on October 7, 2021 are shown in table 3.

Rank	Name of the journal	Publisher	ISSN	E-ISSN	h-index
1	International Journal of Computer Theory and Engineering	International Journal of Computer Theory and Engineering	1793-8201	NA	40
2	International Journal of Digital Curation	Digital Curation Centre, University of Edinburgh	NA	1746-8256	36
3	The Journal of Community Informatics	The Journal of Community Informatics	1712-4441	NA	29

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<b>Rank</b>	<b>Name of the journal</b>	<b>Publisher</b>	<b>ISSN</b>	<b>E-ISSN</b>	<b>h-index</b>
4	Journal on Systemics, Cybernetics and Informatics	International Institute of Informatics and Cybernetics	1690-4532	1690-4524	28
5	International Journal of Data Science and Analytics	Springer	2364-415X	2364-4168	26
6	Karbala International Journal of Modern Science	University of Karbala	2405-609X	2405-6103	24
7	Vietnam Journal of Computer Science	World Scientific Publishing	2196-8888	2196-8896	22
8	Data Science and Engineering	Springer	2364-1185	2364-1541	21
9	International Journal of Information Technology	Springer	2511-2104	2511-2112	20
10	IET Cyber- Physical Systems: Theory and Applications	Institution of Engineering and Technology	NA	2398-3396	18
11	Journal of Digital Forensics, Security and Law	Association of Digital Forensics, Security and Law	1558-7215	1558-7223	17
12	International Journal of Operations Research	Department of Management Sciences, TamKang University	1813-713X	1813-7148	16
13	ICTACT Journal on Soft Computing	ICT Academy	0976-6561	2229-6956	15
14	International Journal of Next-Generation Computing	Perpetual Innovation	2229-4678	0976-5034	14
14	The Electronic International Journal Advanced Modeling and Optimization	Research Institute for Informatics	NA	1841-4311	14
15	INFOCOMP Journal of Computer Science	Department of Computer Science,	NA	1982-3363	13

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<b>Rank</b>	<b>Name of the journal</b>	<b>Publisher</b>	<b>ISSN</b>	<b>E-ISSN</b>	<b>h-index</b>
		Federal University of Lavras			
15	International Journal of Applied Pattern Recognition	Inderscience Publishers	2049-887X	2049-8888	13
15	Review of Science, Mathematics and ICT Education	Department of Educational Science and Early Childhood Education, University of Patras	1791-261X	1792-3999	13
16	ICTACT Journal on Communication Technology	ICT Academy	0976-0091	2229-6948	12
16	International Journal of Information Security Science	Department of Computer Engineering, Gazi University	NA	2147-0030	12
17	International Journal of Artificial Intelligence and Soft Computing	Inderscience Publishers	1755-4950	1755-4969	11
17	International Journal of Computational Intelligence Studies	Inderscience Publishers	1755-4977	1755-4985	11
18	International Journal of Applied Logistics	IGI Global	1947-9573	1947-9581	10
18	Isecure- The ISC International Journal of Information Security	Iranian Society of Cryptography	2008-2045	2008-3076	10
19	Fuzzy Systems and Soft Computing	Tver State University	1819-4362	NA	9
20	Science and Technology Journal	Mizoram University	2321-3388	NA	5
21	Big Data and Society	Sage Publications	2053-	NA	4

Rank	Name of the journal	Publisher	ISSN	E-ISSN	h-index
			9517		
22	International Journal of Creative Interfaces and Computer Graphics	IGI Global	1947-3117	1947-3125	3
22	International Journal of Digital Literacy and Digital Competence	IGI Global	1947-3494	1947-3508	3
23	International Journal of Advanced Pervasive and Ubiquitous Computing	IGI Global	1937-965X	1937-9668	1
23	International Journal of Computer Vision and Image Processing	IGI Global	2155-6997	2155-6989	1
23	International Journal of Green Computing	IGI Global	1948-5018	1948-5026	1
23	International Journal of Information Communication Technologies and Human Development	IGI Global	1935-5661	1935-567X	1
23	International Journal of Interdisciplinary Telecommunications and Networking	IGI Global	1941-8663	1941-8671	1

Table 3: Ranked Journals

### Research Trends

The top articles published in a selection of 34 CS journals from 2010 to 2019 have been used to assess the trends in CS research. The following steps have been followed to determine the various subject categories:

- Top ten highly cited articles from each journal, with at least fifty citations;



- Analyzed to determine the major focus (if multifaceted, the primary area of discussion is determined by using different classificatory principles)
- Grouped the various sub facets into different broad fields.

As a whole, measuring trends in the context of subject coverage (facets under CS) includes a total of ninety-six highly cited articles. Here, the ranks of the papers are calculated on the basis of ‘total number of citations’ they received from those articles up to the 7th of October 2021.

### **Findings**

As shown in table 3, the journal entitled ‘International Journal of Computer Theory and Engineering’ ranked first with a maximum h-index value of 40, followed by journals such as "International Journal of Digital Curation", "The Journal of Community Informatics," and so on. The last five ranked journals with an h-index of one are all in the same place, at rank 23, on the list. Out of thirty-four, this study has been able to rank twenty three. In many places, ties occurred due to the same h-index value.

After analyzing the titles and abstracts of the articles, it is found that the present trends in CS. This classification of journal papers is largely based on Ranganathn's principles of classification. The topmost research trends in CS are ‘Neural Network’ followed by ‘Cybersecurity’, ‘Edge Computing", ‘Data mining and management, etc.".

### **Conclusion and Recommendations**

The UGC plays a vital role in the higher education system in India. It oversees all the activities related to research and development, including research publications. Therefore, the journal chosen for publication is the most important factor. Finally, this study came to an end. The objectives as framed in section 3 have been achieved through analytical work carried out by sections four to section eight. Journals are ranked by applying the h-index value. The ranked articles were analysed based on several primary foci and finally grouped into broad facets related to CS. Consequently, this study determines CS research trends based on the most demanding papers published during 2010–2019 in a set of ninety-six selected CS journals. This relates to some limitations to explore for future studies, such as:

- The results of h-index derivatives are ignored when ranking journals.
- Google scholar for this study, but ignored other databases such as ‘Scopus’ and ‘Web

of Science’;

- Research trends are measured based on a few articles that are widely cited, not considering all articles, even the full text of the article; etc.

Based on the above limitations, this study will explore and help investigate journals in a particular subject domain or discipline to rank them with various informetric indicators and measure research trends.

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