Publications and Citations Analysis of Twitter Research output from SCOPUS Database: A Scientometric Analysis

S. Ravichandran[1*]; Dr.S.Vivekanandhan[2]; Dr. N. Siva[3]

Library Assistant Grade-1, SRM Institute of Science and Technology, Kattankulathur, Chengalpet, Tamilnadu, India[1]; Deputy Librarian, SRM Institute of Science and Technology, Kattankulathur, Chengalpet, Tamilnadu, India [2,3]

* Corresponding Author

ravichas2@srmist.edu.in, vivekans@srmist.edu.in, sivan@srmist.edu.in

ABSTRACT

The 10-year present study period of Twitter research publications between 2011 and 2020, A Scientometric analysis from the Scopus Database with 32014 research publications and 451247 citations. A maximum of 5110(15.96%) research publications are contributed in the year 2020, A maximum of 61648(13.66%), citations are received 2310 publications in the year 2013. The maximum of citations per paper is 52.36 in the year 2011. The maximum RCI is 3.71 in the year 2011, the average RCI is 1.38. The CAGR is 29.64. The RGR is 0.93 in the year 2012 and 0.17 in the year 2020. This study confirmed that the RGR is decreasing trend. At the same time doubling time was found that 0.75 in the year 2012 and 3.99 in the year 2020 and it is confirmed that doubling time is an increasing trend. A maximum of 64 (13.01%) research publications are contributed by Liu, H. The United States. A maximum of 8030 research publications are contributed by two authors, and the average degree of collaboration is 0.83, the average CC is 0.54, the average CI is 2.96, average MCC is 2.96. The time series analysis statistical application will be expected in the Twitter research publications in the year 2025 is around are equal to 6921 and the year 2030 is around are equal to 8781. So these research publications are increasing trend. A maximum of 14476(45.22%) research publications are contributed by conference paper in the document type. A maximum of Journal of 1801(35.28%) research publications are contributed by Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics, The maximum of 260(13.42%) contributions is from Carnegie Mellon University, and finally the country of the maximum of 9634(38.34%) research publications are contributed by the United States.

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KEYWORDS: Twitter, Scientometric, Compound annual growth rate, Relative growth rate, Co-author index, Degree of collaboration, Time series analysis, Relative citations index.

INTRODUCTION

The Twitter microblogging system gained widespread use in 2007 and has now become a worldwide phenomenon. It is similar to traditional blogs in its focus on recent posts but differs in that its posts, called "tweets," are restricted to 280 (formerly 140) characters of text. Twitter takes advantage of the idea of blog feeds by allowing you to subscribe to, or "follow," any other Twitter user. Each user's feed is personalized to show the most relevant tweets of all individuals he or she is following, creating a live stream of bite-sized information nuggets. A number of competing services exist, such as China's version called Sina Weibo which boasts nearly 500 million users. Other platforms, such as Facebook and LinkedIn use status messages that serve as microblogs that are broadcast to friends.[1]

Social networking sites (SNSs) have become a crucial part of our daily life. Twitter is one of the popular SNSs that was founded in 2006 (About Twitter, 2015). It is a microblogging site in which a user can tweet 140-character messages and follow other users to read their tweets (Kwak, Lee, Park, & Moon, 2010). Worldwide, the number of monthly active users of Twitter is 284 million, and 500 million tweets are sent per day (About Twitter, 2015). Twitter is a micro-blogging site, which means you use it by typing short statements about what you're doing/what's going on in your world/your opinion on something topical.[2]

Scientometrics Study

Scientometric is one of the truly interdisciplinary research fields to extend almost all scientific fields. In addition, many extensive bibliometric studies of important science fields appeared during the last two decades. At present, the connotation of bibliometrics turns out to be the science of measurement relating to documents. The word measurement means the application of mathematical and statistical techniques to find out the growth of document, scattering, or literature in various types of documents, publication of documents by an author, impact of document, and so on. **Cole and Eales (1917)[3]** in their publication on the history of comparative anatomy, applied statistical methods for analyzing the literature are called Statistical analysis. The most important contribution was made by **Hulme (1923)[4]** when he published the book statistical bibliography, this term continued to be used for statistical measures till the end of the 1960s. **Ranganathan (1948)[5]** coined the term librametry to denote measurement of various library activities services using mathematical and statistical techniques. **Alan Prichard** (1969)[6] coined the term bibliometric to denote the application of mathematical and statistical methods to books and other media, the process of written communication, and of the nature and course of a discipline. **Van Raan (1997)[7]** According to scientometric research is devoted to Quantitative studies of science and technology. So that this paper aims to analyze the contribution of Twitter research publications are published in the Scopus database during the period of 2011 – 2020

REVIEW OF LITERATURE

Jing yuan Yu & and Juan Muñoz-Justicia, (2020)[8] examined a Bibliometric Overview of Twitter-related Studies Indexed in Web of Science, Twitter has been one of the most popular social network sites for academic research; Bibliometric analysis has been applied in this article: we retrieved 19,205 Twitter-related academic articles from the Web of Science after several steps of data cleaning and preparation.

Saleha Noor et al (2020)[9] analyzed Research Synthesis and Thematic Analysis of Twitter Through Bibliometric Analysis, The annual growth rate of Twitter publications increased from 2002 in 2010 to 1381 in 2014 depicting

exponential development of Twitter research. The most dominant country was the USA; owing 3586 TP. the University of Illinois and the University of Arizona State have the highest number of publications. Kaplan and Haenlein (2010) paper got 3170 citations in the Twitter research field and made ESCP EUROPE the most authoritative institute.

Mario Morales-Parragué et al (2022)[10] examined Scientometric Analysis of Research on Corporate Social Responsibility. "Social Responsibility" concept in the "Business and Economics" category, analyzing a total of 8728 papers up to the year 2020. In this work, CSR is associated with views from different fields of study in economics and business, highlighting diverse management fields; it seeks to explain the correlation between CSR and concepts from such fields of study.

Hossein Jelvehgaran Esfahan et al (2019)[11] analyzed big data and social media: A scientometrics analysis, this paper presents a comprehensive review of the studies associated with big data in social media. The study uses the Scopus database as a primary search engine and covers 2000 highly cited articles over the period 2012-2019. Among the most cited articles, papers published by researchers in the United States have received the highest citations (7548), followed by the United Kingdom (588) and China with 543 citations.

Vrontis et al (2022)[12] examined the societal effects of social media in organizations: Reflective points deriving from a systematic literature review and a bibliometric meta-analysis. We analyzed academic publications, citations, and Twitter activity for each theory. We found that IIT had the highest growth rates in quantity metrics. But was worse in quality metrics. On social media, IIT and QT were the most-tweeted theories, but their tweets mostly came from the general public. Our findings suggest that a theory's fast growth in quantity and lack of quality could be explained by its over-promotion on social media.

Abbas A.F et al (2022)[13] analyzed the Bibliometric analysis of information sharing in social media Social, The bibliometric analysis identified the following characteristics: the primary articles are based on information sharing through social media; the main authors deal with information sharing in social media; the newest trend topics related to information sharing in social media are demographic characteristics, cognition, sentiment, healthcare, products and services recommendations, tourist recommendations, and COVID-19. The results show significant impact rates, in studies of information sharing in social media.

Subekti D et al (2022)[14] examined the Global Research Trend on Social Media for Election: A Bibliometric Analysis, This study took articles from the Scopus database totaling 1555 documents. This study uses VOS viewers for visualization analysis in the form of co-authorship and co-occurrence analysis. This study uses Nvivo 12 plus assistance to see the contribution of social media in the election The United States has become the most contributing and leading country in global research on social media for election. Community Communication and Information and the Journal of Information Technology and Politics has the most publications related to social media research for election.

Maniatis N et al (2021)[15] analyzed the bibliometric for Measuring Social Media Influence: Evaluating the use of h-Index as a ranking metric of Twitter users' influence. Social media platforms have become a primary source of information and public influence. This dynamic has given rise to the interest of journalists, companies, scientists, and organizations in identifying the most productive and influential agents of a network. Although popular indicators such as Reach, Engagement, and Virality can be a good basis for evaluating the influence of social media users.

OBJECTIVES

- ➢ To study year-wise growth of publications and citations
- ➢ To examine the Twitter output during the study period and the CAGR
- ➢ To study the RGR and author contributions
- ➢ To identify the authorship pattern and Degree of collaboration
- ➢ To study the CC, CI, MCC collaboration of index and co-efficient
- ➢ To study the CAI and Document type
- ➢ To analyze time series analysis
- ➢ To identify the Journals wise research studies
- ➢ To study the Institution-wise Twitter research publications studies.
- ➢ To study the country-wise research output of Twitter research.
- ➢ To study the Funding agency and Keyword of Twitter research.

METHODOLOGY

The in applied in the present study is a scientometric analysis of Twitter research publications during 2011-2020 from the Scopus database. For the present study, the following search strategy has been used in the combined field Title, Abstract very use, and Keywords. The search key was (TITLE-ABS-KEY("Twitter") AND PUBYEAR > 2010 AND PUBYEAR < 2021) Limitations The present study is limited to a period of 10 years from 2011 to 2020 based on the records of Twitter research output reflected from the Scopus database on the publications. . For analyzing data, MS-Excel were used the data was collected for this study is 11.08.2021. The collected data was analyzed using the Micro-soft worksheet.

Data Analysis and Interpretations

Relative Citation Index (RCI)

Relative citation index (RCI) was developed by the Institute of Scientific Information (now Thomson Reuters, USA) and examine the impact of different countries and institutions in the field of Twitter research publications. The scientific impact of leading countries was examined by using two relative indicators, namely citations per paper (CPP) and relative citations index (RCI). Citations per paper (CPP) is a relative indicator computed as the average number of citations per paper. It has been broadly used in bibliometric studies as it normalizes a large difference in the volumes of publications among most productive countries, institutions, and authors.

To measure both influence and visibility of a country research global wise, the following formula has been used by Bharvi Dutt and Khaiser Nikam (2016)[16]

$$RCI = \frac{\text{A Country share of the World Citations}}{\text{A Country share of the World Publications}}$$

RCI = 1 indicates that a country's citation rate is equal to the world citation rate

RCI > 1 indicates that a country's citation rate is greater than the world citation rate

RCI < 1 indicate that a country's citation rate is lower than the world citation rate

Year-wise growth of Twitter research publications

Table 1 Year-wise growth of publications and Citations

S.No	year	Publications	%	Citation	%	Cited	%	Uncited	%	CPP	RCI
1	2011	1080	3.37	56553	12.53	856	3.54	224	2.87	52.36	3.71
2	2012	1657	5.18	54548	12.09	1377	5.69	280	3.58	32.92	2.34
3	2013	2310	7.22	61648	13.66	1927	7.96	383	4.90	26.69	1.89
4	2014	2588	8.08	58745	13.02	2167	8.95	421	5.39	22.70	1.61
5	2015	2968	9.27	53379	11.83	2472	10.21	496	6.35	17.98	1.28
6	2016	3602	11.25	47488	10.52	2983	12.32	619	7.92	13.18	0.94
7	2017	3826	11.95	47679	10.57	3143	12.99	683	8.74	12.46	0.88
8	2018	4271	13.34	35913	7.96	3305	13.66	966	12.37	8.41	0.60
9	2019	4602	14.37	21614	4.79	3255	13.45	1347	17.24	4.70	0.33
10	2020	5110	15.96	13680	3.03	2718	11.23	2392	30.62	2.68	0.19
	Total	32014	100.00	451247	100.00	24203	100.00	7811	100.00		
		CAGR	29.64								

Table 1 shows the year-wise growth of Twitter research publications during the ten-year study period between 2011 and 2020 with 32014 research publications and 451247 citations. From the study, it is identified that the maximum of 5110(15.96%) research publications are contributed in the year 2020, followed by 4602(14.37%) publications in the year 2019, and 4271(13.34%) publications in the year 2018. The average research publication per year is 3201.4

During the ten-year study, it is identified that a total number of32014 publications are received 451247 citations. Out of that maximum of 61648(13.66%), citations are received 2310 publications in the year 2013. Followed by 56553(12.53%) citations are received 1080 publications in the year 2011. From the study, out of 32014 publications, 24203(100%) research publications are cited publications, and 7811(100%) research publications are uncited publications. The maximum of citation per paper is 52.36 in the year 2011, followed by CPP is 32.92 in the year 2012, and by CPP is 26.69 in the year 2013 and the average citation per paper is 19.40. The maximum of RCI is 3.71 in the year 2011, followed by 2.34 in the year 2012, by 1.89 in the year 2013 and the average RCI is 1.37.

Compound Annual Growth Rate [CAGR]

The Compound Annual Growth Rate [CAGR] is one of the useful measures to identify the growth, over multiple time periods. It can be measured from the initial number of publications to the end of the number of publications. The mathematical formula of CAGR is used Ashok Kumar and Gopala Krishnan (2013)[),17]

The CAGR was calculated by the following formula,

$$CAGR = \left[\frac{Ending\ Value}{Begining\ Value}\right]^{\left[\frac{1}{\#\ of\ Years}\right]} - 1$$

During the ten-year study, the period CAGR is calculated by the Twitter research outputs from the beginning year and ending year. It is identified from table-1 the CAGR is 29.64.

Relative Growth Rate of Publications

The RGR of publications was analyzed by using the two parameters namely Relative Growth Rate and Doubling time was originated by Mahapatra (1985)[18.] RGR is a measure to study the increases in the number of articles in a period of time. It is calculated as

$$R(a) = \frac{(W2 - W1)}{(T2 - T1)}$$

Whereas

R (a) = RGR = the mean relative growth rate over the specific period of interval

W_1 = the logarithm of the beginning number of publications/pages

W_2= the logarithm of ending number of publications/pages after a specific period of interval

$T_2 - T_1$ = the unit difference between the beginning time and the ending time.

Doubling Time

The doubling time is the time taken for the doubling of the number of records actually published within a stipulated period. The doubling time is calculated from the RGR and the natural logarithm number is used, the difference has a value of 0.693. Thus the corresponding doubling time can be calculated by the following formula,

$$Dt = \frac{0.693}{R(a)}$$

Relative Growth Rate and Doubling Time of Twitter research publications

Table 3 Relative Growth Rate and Doubling Time of Twitter research publications

S.No	Years	Publications	Cum	W1	W2	RGR=(W2-W1)	Dt=(0.693/RGR
1	2011	1080	1080		6.98		
2	2012	1657	2737	6.98	7.91	0.93	0.75
3	2013	2310	5047	7.91	8.53	0.61	1.13
4	2014	2588	7635	8.53	8.94	0.41	1.67
5	2015	2968	10603	8.94	9.27	0.33	2.11
6	2016	3602	14205	9.27	9.56	0.29	2.37
7	2017	3826	18031	9.56	9.80	0.24	2.91
8	2018	4271	22302	9.80	10.01	0.21	3.26
9	2019	4602	26904	10.01	10.20	0.19	3.69
10	2020	5110	32014	10.20	10.37	0.17	3.99
	Total	32014					

The relative growth rate and the doubling time (Dt) were calculated and the results are presented in Table 3. From the study, it is identified that the relative growth rate is 0.93 in the year 2012 and 0.17 in the year 2020. This study confirmed that the relative growth rate is decreasing trend. At the same time doubling time was found that 0.75 in the year 2012 and 3.99 in the year 2020 and it is confirmed that doubling time is an increasing trend.

Top 10 Authors Contributions Twitter research publications

Table 4 Top 10 Authors Contributions in Twitter research publications

Publications and Citations Analysis of Twitter Research output from SCOPUS Database: A Scientometric Analysis

S.No	Author	Country	No, of Publications	%	Citation	%	CPP	h-index	RCI
1	Liu, H.	United States	64	13.01	2528	16.92	39.50	23	1.30
2	Lim, E.P.	India	55	11.18	2086	13.96	37.93	18	1.25
3	Ganguly, N.	United Kingdom	54	10.98	1142	7.64	21.15	17	0.70
4	Rosso, P.	China	51	10.37	1279	8.56	25.08	17	0.83
5	Weber, I.	Spain	51	10.37	1155	7.73	22.65	19	0.75
6	Carley, K.M.	Australia	49	9.96	969	6.49	19.78	13	0.65
7	Ghosh, S.	Germany	49	9.96	1214	8.13	24.78	18	0.82
8	Faloutsos, C.	Canada	41	8.33	1263	8.45	30.80	18	1.01
9	Dredze, M.	Japan	39	7.93	2176	14.56	55.79	21	1.84
10	Kumaraguru, P.	Italy	39	7.93	1129	7.56	28.95	12	0.95
	Total		492	100.00	14941	100.00			

Table 4 identified the top ten author contributions for the research publications of Twitter research publications from the Scopus database. From the study, it is identified that a maximum of 64 (13.01%) research publications are contributed by Liu, H. The United States, followed by Lim, E.P, India with 55(11.18%) research publications, Ganguly, N., United kingdom with 54(10.98%) research publications. The highest citations of 2528(16.92%) with the CPP is 39.50, h-index is 23 and RCI is 1.30. the lowest citations are 1129(7.56%) kumara guru, P, Italy with the CPP is 28.95, h-index is 12 and RCI is 0.95. From this study, it is identified that 492(100%) research publications are contributed by the top 10 authors from the ten different countries.

Authorship Pattern in Twitter research publications

Table 5 Authorship Pattern in Twitter research publications

Authorship Pattern							
year	1	2	3	4	5	>5	Total
2011	288	247	262	158	56	69	1080
2012	364	389	427	258	120	99	1657
2013	443	557	571	387	178	174	2310
2014	463	652	648	410	213	202	2588
2015	534	777	720	452	259	226	2968
2016	608	894	910	590	291	309	3602
2017	577	931	957	655	368	338	3826
2018	635	1093	1060	708	375	400	4271
2019	642	1181	1200	750	391	438	4602
2020	731	1309	1205	792	492	581	5110
Total	5285	8030	7960	5160	2743	2836	32014
%	16.51	25.08	24.86	16.12	8.57	8.86	100.00

Table 5 identified the year-wise authorship pattern in the field of Twitter research during the 10-year study period. From the study, it is identified that, out of 32014 research publications, 5285 research publications are contributed by single authors and the remaining 26729 research publications are multi-author's contributions. From the multi-author publications, a maximum of 8030 research publications are contributed by two authors, followed by 7960 publications are contributed by three authors, 5160 publications are four authors, 2743 publications are five authors, During the ten-year study period, more than five authors have contributed to 2836 publications.

Degree of Collaboration Twitter research publications

Table 6 Degree of Collaboration in Twitter research publications

Year	Single author publications	Multi-author publications	Total author publications	Degree of collaboration DC= NM/(NM+NS)
2011	288	792	1080	0.73
2012	364	1293	1657	0.78
2013	443	1867	2310	0.81
2014	463	2125	2588	0.82
2015	534	2434	2968	0.82
2016	608	2994	3602	0.83
2017	577	3249	3826	0.85
2018	635	3636	4271	0.85
2019	642	3960	4602	0.86
2020	731	4379	5110	0.86
Total	5285	26729	32014	

The degree of collaboration is the relationship between single author and multi-author contributions. The degree of collaboration is calculated by the Subramaniyam (1983)[19] formula and used by Vivekanandhan. S (2016),[20] Sivasamy. K (2020)[21]. Ravichandran. S (2021)[22]

$$DC = \frac{Nm}{(Nm + Ns)}$$

Where DC = Degree of Collaboration

N_m = Number of Multi-authored publications

N_s = Number of single-authored publications

In the present study, Nm = 32014, Ns= 5285

So that the degree of collaboration is =32014/ (32014+5285) = 0.83

Table 5 shows the degree of collaboration in Twitter research publications for the 10-year studies period. From this study, it is identified that the degree of collaboration is between 0.73 in the year 2011 and 0.86 in the year 2020. The average degree of collaboration is 0.83. From this study, it is identified that the majority of Twitter research publications are contributed by collaborative authors.

Collaborative of Co-efficient (CC)

The pattern of co-authorship collaboration among the authors can be measured with the following formula suggested by Ajiferuke, et al. (1988)[23]

$$CC = 1 - \left[\sum_{j=0}^{k} \left(\frac{1}{j} \right) \times F_j / N \right]$$

Whereas,

F_j = Number of publications with j author papers

N = Total number of the research publications and

k = the greatest number of authors/papers in the given field

Collaboration Index (CI)

The simple indicator is presently employed in the publications to the collaboration index among the co-authors, which is to be understood nearly as the mean number of authors per paper are suggested by Ajiferuke, et al.(1988)[23]

$$CI = \frac{\sum_{j=1}^{k} j f_j}{N}$$

Here

J - The number of co-authored papers appearing in a discipline

N - The total number of publications in the field over the same time period of interval and

k - The highest number of authors per paper in the same time field.

Modified Collaboration Coefficient

The modified collaboration coefficient (MCC) counted by the formula which is suggested by (Savanur and Srikanth, 2010)[24]

Which is given below:

Where,

$$MCC = \frac{N}{N-1} \left[1 - \frac{\sum_{j=1}^{k} j f_j}{N} \right]$$

j = the number authors in an article i.e. 1, 2, 3......

F_j = the number of j authored articles

N = the total number of articles published in a year, and

A = the total number of authors per article

Collaboration Index and Collaborative of Co-efficient of Twitter research publications

Table 7 Collaboration Index and Collaborative of Co-efficient of Twitter research publications

Authorship Pattern									
Year	1	2	3	4	5	>5	CC	CI	MCC
2011	288	247	262	158	56	69	0.48	2.68	2.68
2012	364	389	427	258	120	99	0.51	2.81	2.81
2013	443	557	571	387	178	174	0.54	2.92	2.92

2014	463	652	648	410	213	202	0.54	2.95	2.95
2015	534	777	720	452	259	226	0.54	2.93	2.93
2016	608	894	910	590	291	309	0.55	3.00	3.00
2017	577	931	957	655	368	338	0.57	3.08	3.08
2018	635	1093	1060	708	375	400	0.57	3.07	3.07
2019	642	1181	1200	750	391	438	0.57	3.08	3.08
2020	731	1309	1205	792	492	581	0.57	3.15	3.15
Total	5285	8030	7960	5160	2743	2836			

It is observed from Table 7 the collaborative co-efficient is calculated and presented during the ten-year study period for Twitter research publications**.** It is observed from the table highest collaboration coefficient is 0.57 in the year 2020, 2019, 2018, 2017, and lowest CC is 0.48 in the year 2011, and the average CC is 0.54. The collaboration index observed from Table-7 the maximum of the collaboration Index is 3.15 in the year 2020 a minimum of 2.68 in the year 2011, and the average CI is 2.96. The Modified collaboration co-efficient observed the Table-7 the maximum is 3.15 in the year 2020, a minimum of 2.68 in the year 2011, and the average modified collaboration co-efficient is 2.96.

Co-Authorship Index

Co- Authorship Index (CAI) is obtained by calculating proportionately the publications by single, two, and multi-authored papers (Garg & Padhi, 1999).[25]

$$CAI = \frac{N_{ij}/N_{io}}{N_{oj}/N_{oo}} X 100$$

Where,

Nij = Number of papers having authors in block i

Nio = Total output of block i

Noj = Number of papers having j authors for all blocks.

Noo = Total number of papers for all authors and all blocks

CAI=100 indicates that a country's co-authorships effort for a particular type of Authorship correspondents to the world average.

CAI>100 reflects higher than average co-authorship effort, and

 CAI<100 shows lower than average Co-authorship effort for a given type of authorship pattern.

For calculating the co-authorship index for authors, years have been replaced into block years. For this study, the authors have been classified into two blocks (ie.2011-2015 and 2016-2020) Vs**.** Single, Two, Three authors, and More than three authors.

Co- Authorship Index (CAI) in Twitter research publications

Table 8 Co-Authorship Index (CAI) in Twitter research publications

5 year Block	Single Author	CAI	Two Author	CAI	Three Author	CAI	More than three Author	CAI	Total Author

2011-2015	2092	119.52	2622	98.59	2628	99.68	3261	91.68	10603
2016-2020	3193	90.34	5408	100.70	5332	100.16	7478	104.12	21411
Total	5285		8030		7960		10739		32014

Table 8 shows that Co-Authorship Index values are calculated by block year period for Twitter research publications for the selected ten-year study period. From the study, it is identified that CAI for single authorship contributions is decreasing trend from 1st block year to 2nd block year. At the same time CAI is increasing trend for two, three, and more than three authors from 1st block year (91.68) to 2nd year block year (104.21).

Time Series Analysis

Time series analysis reveals the estimated growth values are identified based on previous data. A straight–line equation is adapted to measure the future values based on previous data. Time series analysis used by Jeyshankar. R (2013) [26] Ravichandran. S (2021)[27]

Time Series Analysis of Twitter research publications

Table 9 Time Series Analysis of Twitter research publications

S. No	Years	Count(Y)	X	X^2	XY
1	2011	1080	-5	25	-5400
2	2012	1657	-4	16	-6628
3	2013	2310	-3	9	-6930
4	2014	2588	-2	4	-5176
5	2015	2968	-1	1	-2968
6	2016	3602	1	1	3602
7	2017	3826	2	4	7652
8	2018	4271	3	9	12813
9	2019	4602	4	16	18408
10	2020	5110	5	25	25550
	Total	32014		110	40923

Table 9 shows that the time series analysis formula has been predicted for Twitter research publications for the years 2025 and 2030

Straight Line Equation is

$Y = a + bx$

Here,

$\sum Y = 32014, \sum X^2 = 110, \sum XY = 40923$

$a = \sum Y/N = 32014/10 = 3201.4 = 3201$

$b = \sum XY / \sum X^2 = 40923/110 = 372.02 = 372$

Estimated publications in the year 2025 are when X=2025-2015=10

$Y = a + bx$

$= 3201 + (372*10) = 3201+3720 = 6921$

Estimated literature in 2030 is when X=2030-2015=15

$$Y = a + bx$$
$$= 3201 + (372*15) = 3201+5580 = 8781$$

The estimated growth based on a time series analysis statistical application will be expected in the Twitter research publications in the year 2025 is around are equal to 6921 and the year 2030 is around are equal to 8781. So that time serious analysis conformed that the publications on Twitter research are increasing trend.

Document Types of Twitter research publications

Table 10 Document Type of Twitter research publications

S. No	Document Type	Publications	%	Cumulative	%
1	Conference Paper	14476	45.22	14476	3.44
2	Article	13879	43.35	28355	6.74
3	Book Chapter	1312	4.10	29667	7.05
4	Conference Review	837	2.61	30504	7.25
5	Review	725	2.26	31229	7.42
6	Note	237	0.74	31466	7.48
7	Book	168	0.52	31634	7.52
8	Editorial	125	0.39	31759	7.55
9	Letter	115	0.36	31874	7.57
10	Erratum	54	0.17	31928	7.59
11	Short Survey	52	0.16	31980	7.60
12	Data Paper	12	0.04	31992	7.60
13	Retracted	7	0.02	31999	7.60
14	Undefined	15	0.05	32014	7.61
	Total	32014	100.00	420877	100.00

Document types are identified during the ten-year study period on Twitter research publications are shown in table 10. From the study, it is identified that a maximum of 14476(45.22%) research publications are contributed by conference paper, followed by 13879(43.35%) research publications are Article and third-placed in book chapter with 1312(4.10%) research publications. This study confirmed that more than 92.67% of research publications are contributed by conference papers, articles, and book chapters. The remaining nearby 7.33% of research publications are identified in the other form documents.

Journals Contributions Twitter research publications

Table 11 top 10 Journals Contributions Twitter research publications

S. No	Journals	Publications	%	Citation	%	CPP	h-index	RCI
1	Lecture Notes In Computer Science Including Subseries Lecture Notes In	1801	35.28	12870	27.13	7.15	46	0.77

S.No		Publications	%	Citation	%	CPP	h-index	RCI
	Artificial Intelligence And Lecture Notes In Bioinformatics							
2	ACM International Conference Proceeding Series	778	15.24	4152	8.75	5.34	29	0.57
3	Ceur Workshop Proceedings	711	13.93	2831	5.97	3.98	24	0.43
4	Advances In Intelligent Systems And Computing	432	8.46	894	1.88	2.07	13	0.22
5	Communications In Computer And Information Science	360	7.05	746	1.57	2.07	10	0.22
6	Plos One	274	5.37	11074	23.34	40.42	55	4.35
7	Journal Of Medical Internet Research	213	4.17	7533	15.88	35.37	47	3.81
8	Procedia Computer Science	187	3.66	1614	3.40	8.63	22	0.93
9	IEEE Access	175	3.43	1902	4.01	10.87	20	1.17
10	International Conference On Information And Knowledge Management Proceedings	174	3.41	3831	8.07	22.02	32	2.37
	Total	5105	100.00	47447	100.00			

Table 11 shows the top10 journal contributions in the field of Twitter research publications. From the study it is identified that a maximum of 1801(35.28%) research publications are contributed by Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics, followed by ACM International Conference Proceeding Series with 778(15.24%) research publications, third-placed is Ceur Workshop Proceedings with 711(13.93%) research publications. During ten year study period the highest citations were 12870(27.13%) with the CPP being 7.15, h-index is 46, RCI is 0.77, and the lowest citations of 746(1.57%) Communications in Computer and Information Science with the CPP is 2.07, h-index 10, RCI is 0.22

Top 10 Institution contributions in Twitter research publications

Table 12 Top 10 Institution contribution in Twitter research publications

S.No	Institution	Publications	%	Citation	%	CPP	h-index	RCI
1	Carnegie Mellon University	260	13.42	8869	17.02	34.11	48	1.27
2	University of Maryland, College Park	206	10.63	5432	10.42	26.37	37	0.98
3	University of Illinois Urbana-Champaign	203	10.47	4772	9.16	23.51	31	0.87
4	Arizona State University	197	10.17	5713	10.96	29.00	38	1.08
5	University of Pennsylvania	189	9.75	4161	7.98	22.02	30	0.82
6	University of Southern California	185	9.55	4187	8.03	22.63	35	0.84
7	Qatar Computing Research Institute	178	9.18	4976	9.55	27.96	34	1.04
8	Tsinghua University	176	9.08	4517	8.67	25.66	36	0.95
9	Nanyang Technological University	173	8.93	4315	8.28	24.94	32	0.93

| 10 | University of Michigan, Ann Arbor | 171 | 8.82 | 5181 | 9.94 | 30.30 | 33 | 1.13 |
| | Total | 1938 | 100.00 | 52123 | 100.00 | | | |

During the 10- year study period, the top 10 institutions' contributions are identified from Table -12, from the study maximum of 260(13.42%) contributions are Carnegie Mellon University, followed by University of Maryland, College Park contributed with 260(10.63%) research publications, the University of Illinois Urbana-Champaign contributed with 203(10.47%) research publications. During ten year study period the highest citations were 8869(17.02%) with the CPP being 34.11, h-index is 48, RCI is 1.27, and the lowest citations of 4161(7.98%) the University of Pennsylvania with the CPP is 22.02, h-index 30, RCI is 0.82.

Top ten countries - wise in Twitter research publications

Table 13 Country - wise in Twitter research publications

S.No	Country	No. of Publications	%	Citation	%	CPP	h-index	RCI
1	United States	9634	38.34	222337	50.68	23.08	178	1.32
2	India	3028	12.05	17725	4.04	5.85	51	0.34
3	United Kingdom	2659	10.58	51931	11.84	19.53	95	1.12
4	China	1988	7.91	31364	7.15	15.78	79	0.90
5	Spain	1641	6.53	20467	4.67	12.47	63	0.71
6	Australia	1353	5.39	22644	5.16	16.74	67	0.96
7	Germany	1285	5.11	20981	4.78	16.33	67	0.94
8	Canada	1248	4.97	25943	5.91	20.79	66	1.19
9	Japan	1165	4.64	9502	2.17	8.16	42	0.47
10	Italy	1124	4.47	15798	3.60	14.06	53	0.80
	Total	25125	100.00	438692	100.00			

Table-13 shows the top 10 countries' research publications for Twitter research publications during the study period of 2011-2020. From this study, it is identified that a maximum of 9634(38.34%) research publications are contributed by the United States, followed by India with 3028(12.05%) research publications, third place in the united kingdom with 2659(10.58%) research publications. During ten year study period the highest citations were 222337(50.68%) of the United States with the CPP being 23.08, h-index is 178, RCI is 1.32, and the lowest citations of 9502(2.17%) of Japan with the CPP is 8.16, h-index 42, RCI is 0.47.

Funding Agency in Twitter research publications

Table 14 Funding Agency in Twitter research publications

S.No	Name of the Funding Agency	Publications	%
1	National Science Foundation	1040	21.99
2	National Natural Science Foundation of China	737	15.58
3	European Commission	658	13.91
4	National Institutes of Health	427	9.03
5	U.S. Department of Health and Human Services	370	7.82

6	Ministry of Education, Culture, Sports, Science, and Technology	328	6.93
7	U.S. Department of Defense	317	6.70
8	Japan Society for the Promotion of Science	313	6.62
9	Horizon 2020 Framework Programme	310	6.55
10	UK Research and Innovation	230	4.86
	Total	4730	100.00

Table 13 shows funding agencies in the field of Twitter research publications during the 10-year study period. From the study it is identified from table 14, the maximum of 1040(21.99%) research publications are in the National Science Foundation, followed by 737(15.58%) research publications are National Natural Science Foundation of China, 658(13.91%) research publications are European Commission and the lowest research publications are 230(4.86%) with the UK Research and Innovation.

Keyword in Twitter research publications

Table 15 Keyword in Twitter research publications

S.No	Keyword	Frequency	%
1	Social Networking (online)	15432	29.37
2	Social Media	10291	19.58
3	Twitter	9542	18.16
4	Data Mining	3464	6.59
5	Sentiment Analysis	3259	6.20
6	Human	3038	5.78
7	Humans	2253	4.29
8	Facebook	1852	3.52
9	Learning Systems	1715	3.26
10	Classification (of Information)	1704	3.24
	Total	52550	100.00

Table- 15 shows keyword research publications in the field of Twitter research publications during the 10-year study period. From the study it is identified from Table-15, the maximum of 15432(29.37%) research publications are Social Networking (online), followed by 10291(19.58%) research publications are Social Media, 9542(18.16%) research publications are Twitter, and the lowest research publications are 1704(3.24%) with the Classification (of Information).

MAJOR FINDING

- During the ten-year study period of Twitter research publications between 2011 and 2020 with 32014 research publications and 451247 citations. A maximum of 5110(15.96%) research publications are contributed in the year 2020, followed by 4602(14.37%) publications in the year 2019, and 4271(13.34%) publications in the year 2018. The average research publication per year is 3201.4

- A maximum of 61648(13.66%), citations are received in 2310 publications in the year 2013. Followed by 56553(12.53%) citations are received 1080 publications in the year 2011. From the study, out of 32014 publications, 24203(100%) research publications are cited publications, and 7811(100%) research publications are uncited publications. The maximum of citation per paper is 52.36 in the year 2011, followed by CPP is 32.92 in the year 20121, and by CPP is 26.69 in the year 2013 and the average citation per paper is 19.40. The maximum of RCI is 3.71 in the year 2011, followed by RCI is 2.34 in the year 2012, by RCI is 1.89 in the year 2013 and the average RCI is 1.38. The compound annual growth rate is 29.64.

- During the study, the relative growth rate is 0.93 in the year 2012 and 0.17 in the year 2020. This study confirmed that the relative growth rate is decreasing trend. At the same time doubling time was found that 0.75 in the year 2012 and 3.99 in the year 2020 and it is confirmed that doubling time is an increasing trend.

- During the maximum of 64 (13.01%) research publications are contributed by Liu, H. The United States, followed by Lim, E.P, India with 55(11.18%) research publications, Ganguly, N., United kingdom with 54(10.98%) research publications. The highest citations of 2528(16.92%) with the CPP is 39.50, h-index is 23 and RCI is 1.30. the lowest citations are 1129(7.56%) kumara guru, P, Italy with the CPP is 28.95, h-index is 12 and RCI is 0.95.

- A maximum of 8030 research publications are contributed by two authors, followed by 7960 publications are contributed by three authors, 5285 research publications are contributed by single authors 5160 publications are four authors, 2743 publications are five authors, During the ten-year study period, more than five authors have contributed to 2836 publications. The average degree of collaboration is 0.83.

- The Co-Authorship Index values are calculated by block year period for Twitter research publications for the selected ten-year study period. From the study, it is identified that CAI for single authorship contributions is decreasing trend from 1st block year to 2nd block year. At the same time CAI is increasing trend for two, three, and more than three authors from 1st block year (91.68) to 2nd year block year (104.21).

- The study of analysis estimated growth based on a time series analysis statistical application will be expected in the Twitter research publications in the year 2025 is around are equal to 6921 and the year 2030 is around are equal to 8781. So that time serious analysis conformed that the publications on Twitter research are increasing trend.

- During the document types have identified a maximum of 14476(45.22%) research publications are contributed by conference paper, followed by 13879(43.35%) research publications are Article and third-placed in book chapter with 1312(4.10%) research publications.

- During the maximum of 1801(35.28%) research publications are contributed by Lecture Notes In Computer Science Including Subseries Lecture Notes In Artificial Intelligence And Lecture Notes In Bioinformatics, followed by ACM International Conference Proceeding Series with 778(15.24%) research publications, third-placed is Ceur Workshop Proceedings with 711(13.93%) research publications. the highest citations were 12870(27.13%) with the CPP being 7.15, h-index is 46, RCI is 0.77, and the lowest citations of 746(1.57%) Communications in Computer and Information Science with the CPP is 2.07, h-index 10, RCI is 0.22

- During the maximum of 260(13.42%) contributions are Carnegie Mellon University, followed by the University of Maryland, College Park contributed with 260(10.63%) research publications, the University of Illinois Urbana-Champaign contributed with 203(10.47%) research publications. the highest citations were 8869(17.02%) with the CPP being 34.11, h-index is 48, RCI is 1.27, and the lowest citations of 4161(7.98%) the University of Pennsylvania with the CPP is 22.02, h-index 30, RCI is 0.82.

- The country of the maximum of 9634(38.34%) research publications are contributed by the United States, followed by India with 3028(12.05%) research publications, third place in the united kingdom with 2659(10.58%) research publications. the highest citations were 222337(50.68%) of the United States with the CPP being 23.08, h-index is 178, RCI is 1.32, and the lowest citations of 9502(2.17%) of Japan with the CPP is 8.16, h-index 42, RCI is 0.47.

- During the funding agencies, the maximum of 1040(21.99%) research publications are in the National Science Foundation, followed by 737(15.58%) research publications are National Natural Science Foundation of China, 658(13.91%) research publications are European Commission and the lowest research publications are 230(4.86%) with the UK Research and Innovation.

- keyword research publications, the maximum of 15432(29.37%) research publications are Social Networking (online), followed by 10291(19.58%) research publications are Social Media, 9542(18.16%) research publications are Twitter, and the lowest research publications are 1704(3.24%) with the Classification (of Information).

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