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STUDIES ON RELATIVE GROWTH RATE AND DOUBLING TIME OF CONFERENCE ARTICLES PRODUCTIVITY OF NEURAL NETWORK RESEARCH

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ABSTRACT

The present paper deals with the analysis of Relative Growth Rate and Doubling Time of conference articles productivity of neural network research at the world and India level. It is found that the conference articles are first in order securing 49.88 per cent (61633) at the world level, whereas in India it holds the second position with 41.88 per cent. The doubling time of publications on neural network research output increased and is at 4.78 years which is more or less double the time of such publications at India level which is 2.89 years.

INTRODUCTION

One of the objects of the present study is to evaluate the performance of research and development in neural network. The analysis of the growth rate of Neural network research output aims at identifying the growth prospects of the subject of the present study. However, proliferation of neural network literature makes it difficult for scientists to keep in touch with recent advances in that field. Hence the prime duty of the library professionals is to meet the information needs of scientists of various disciplines. Published literature is a yardstick to measure the knowledge in a discipline, and the growth rate study of publications would provide some useful information. The rate of growth of neural network literature is determined by calculating relative growth rates and doubling time of conference articles productivity. Literature in the field of bibliometrics is constantly growing and a number of review articles, books and conference volumes on the development of bibliometrics have been published. The first review of the empirical laws of bibliometrics was by Fairthrone1 in 1969. The second was published by Hjerppe (1980), which contains more than 200 references to bibliometrics. The most comprehensive historical review was published by Hertzel1 in the Encyclopaedia of Library and Information Science of the year 1987.

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Martin (1991) has made a bibliometric assessment of UK scientific performance based on the CHI/NSF Science Literature Indicators data-base and suggested more consistent and realistic set of indicators in assessing the scientific performance. The study of Indian literature on Information Technology and its applications in Library and Information Centres has been conducted by Bagawathi Sudha and Ramesh Babu (2000) based on "Indian Library and Information Science Literature" for the period 1990-1993.

This study revealed solo research and most of the contributions were by practicing library professionals and published in journals. Another study by Kalyane and Sen (1996) studied the contributions published by Nobel laureate Pierre-Gilles de Gennes published during 1956-1995, which revealed that scattering of publications did not follow Bradford's Law but assumptions about author productivity formed to be more or less correct. The honours and awards received by scientists tend to attract more collaborators and increase their productivity. A bibliometric analysis of 'LISA' covering 1994-1998 has been conducted by Parameswarn and Smitha (2001) which shows the vital role performed by 'LISA' in the dissemination of information in Library and Information Science. It was found that not only the proportion of Indian contributions compared to the total output of LIS literature is meager but also the representation of contributions from the third world countries.

In the study of Indian Engineering literature extracted from the database (COMPENDEX), by Ravichandra Rao and Suma (1999) that Engineers in India published mostly in selected journals in English language. Kulkarni (1997) analysed the works of Bhole, a pioneer on Yoga who contributed 147 papers during 1965-1995 reveal that about 60% of his contributions are based on collaborative research and do not confine to one type of research. Anwar (2005) has made bibliometric analysis of literature on Nigella sativa (Habbat al-barakah or Black seed) to study the periodic growth of literature, author patterns, topical focus, and geographic origin of literature on the subject. Twenty related databases and several online catalogues of libraries have been searched to make a final list of 530 citations. This data set has been analyzed employing bibliographic techniques.

Berenika Webster (2005), have applied bibliometric methods to assess the volume of research studies published and the impact and sources of funding of biomedical research in the UK. The analyses also include an examination of national and international collaboration, leading regions and institutions (by volume of output), types of research carried out and their potential impact factor. The publication output of 25 major countries in 10 sub fields of Physics drawn from INSPEC database for the period 1989-1994 were analyzed by Nag paul and Bhattacharya (2000) to study the national patterns of research output and priorities with the help of statistical techniques such as Research Priority Index, Typological Analysis, Multidimensional analysis and Correspondence Analysis, to monitor the changes in the structure of research in Physics. The present paper deals with the analysis of relative growth rate and doubling time of conference articles productivity of Neural Network research at the world and India level.

Database and Statistical Tools Employed

Relative Growth Rate

The relative growth rate is the increase in the number of publications /pages per unit of time. The growth rate of total publications has been calculated on the relative growth rate and doubling time model developed by Mahapatra (1985). The mean relative growth rate R (1-2) over a specified period of interval can be calculated by applying Mahapatra model. There exists a direct relation between the relative growth rate and doubling time. If the number of publications /pages of subject double during a given period, then the difference between the logarithms of the numbers at the beginning and at the end of the period must be the logarithms of the number 2.

Analysis

Relative Growth Rate and Doubling time of Conference Articles Productivity on Neural Network Research – World wide

Table 1. shows data on the relative growth rate and doubling time of conference articles on neural network worldwide. In 1969, published neural network research output of conference articles was just two and it rose to 61633 in the year 2007, more than a thirty thousand fold increase from 1969 to 2007. The relative growth rate has shown a declining trend. It could be seen from the data presented in the table that its relative growth rate has decreased gradually from 1.10 in 1969 to 0.11 in 2007. The study period records the mean relative growth rate of 0.27.

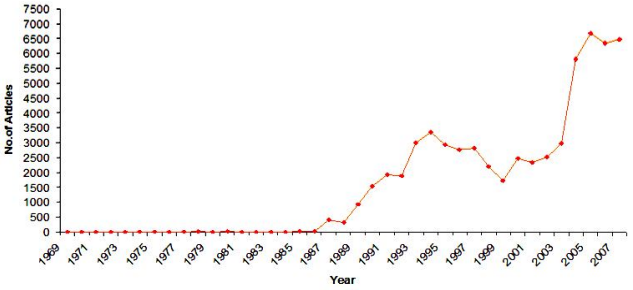

Fig.1 Relative Growth Rate and Doubling time of Conference Articles Productivity of Neural Network Research –World wide

On the contrary, the doubling time for publication of neural network research output has increased from 0.73 in 1973 to 5.33 in 2007. The five year mean doubling time for neural network publications for the period and years is as follows:

Period	Doubling Time
1969 – 1973	0.73 year
1974 – 1978	4.3 year
1979 – 1983	7.05 year
1989 – 1993	4.17 year
1994 – 1998	1.56 year
1999 – 2003	4.56 year
2004 – 2007	5.33 year

The doubling time for publications at the aggregate level has been computed as 4.78 years. It could be deduced that in general there is a progressive increase in the number of publications of as conference articles on neural network. However, relative growth rate shows a down trend which means the rate of increase is low in terms of proportion, and this is highlighted by the doubling time for publications, which is higher than the relative growth rate.

Relative Growth Rate and Doubling time of Conference Articles Productivity on Neural Network Research – India

Table 2. shows data on the relative growth rate and doubling time of conference articles on neural network from India. In 1988, published conference articles on neural network research was just three and it rose to 146 in the year 2007, nearly a 50 times increase from 1998 to 2007. The relative growth rate rises and falls. It could be observed that its relative growth rate rose from 0.31 in 1992 to 0.48 in 1997 only to fall to 0.18 in 2007. The study period records the mean relative growth rate of 0.31. The doubling time for publication of conference articles on neural network research increased from 1.78 in 1992 to 3.40 in 2007. The mean doubling time for neural network conference articles for the period and years is as follows:

Period	Doubling Time
1988-1992	1.78 years
1993-1997	1.67 years
1998-2002	3.70 years
2003-2007	3.40 years

The doubling time for publications at the aggregate level has been computed as 2.93 years. There is a steady increase in the number of conference articles on neural network. However,

Table 1. Relative Growth Rate and Doubling time of Conference Articles Productivity of Neural Network Research –World wide

Year	No of Conference Articles	Cumulative number of Articles	W1	W2	R(a)	Mean R(a)	Doubling time Dt(a)	Mean Doubling time
1969	2	2	0.00	0.69	0.00		0.00	
1970	0	2	0.69	0.69	0.00		0.00	
1971	4	6	0.69	1.79	1.10		0.63	
1972	7	13	1.79	2.56	0.77		0.90	
1973	5	18	2.56	2.89	0.33	0.44	2.10	0.73
1974	10	28	2.89	3.33	0.44		1.58	
1975	7	35	3.33	3.56	0.23		3.01	
1976	3	38	3.56	3.64	0.08		8.66	
1977	5	43	3.64	3.76	0.12		5.78	
1978	14	57	3.76	4.04	0.28	0.23	2.48	4.3
1979	10	67	4.04	4.2	0.16		4.33	
1980	13	80	4.2	4.38	0.18		3.85	
1981	9	89	4.38	4.49	0.11		6.30	
1982	5	94	4.49	4.54	0.05		13.86	
1983	10	104	4.54	4.64	0.10	0.12	6.93	7.05
1984	10	114	4.64	4.74	0.10		6.93	
1985	13	127	4.74	4.84	0.10		6.93	
1986	18	145	4.84	4.98	0.14		4.95	
1987	405	550	4.98	6.31	1.33		0.52	
1988	324	874	6.31	6.77	0.46	0.43	1.51	4.17
1989	929	1803	6.77	7.5	0.73		0.95	
1990	1551	3354	7.5	8.12	0.62		1.12	
1991	1941	5295	8.12	8.57	0.45		1.54	
1992	1895	7190	8.57	8.88	0.31		2.24	
1993	3001	10191	8.88	9.23	0.35	0.49	1.98	1.56
1994	3363	13554	9.23	9.51	0.28		2.48	
1995	2925	16479	9.51	9.71	0.20		3.46	
1996	2782	19261	9.71	9.87	0.16		4.33	
1997	2809	22070	9.87	10	0.13		5.33	
1998	2204	24274	10	10.1	0.10	0.17	6.93	4.51
1999	1737	26011	10.1	10.17	0.07		9.90	
2000	2467	28478	10.17	10.26	0.09		7.70	
2001	2334	30812	10.26	10.34	0.08		8.66	
2002	2526	33338	10.34	10.41	0.07		9.90	
2003	2976	36314	10.41	10.5	0.09	0.08	7.70	8.77
2004	5822	42136	10.5	10.65	0.15		4.62	
2005	6679	48815	10.65	10.8	0.15		4.62	
2006	6341	55156	10.8	10.92	0.12		5.78	
2007	6477	61633	10.92	11.03	0.11	0.13	6.30	5.33
	61633		11.03			0.27		4.78

Table 2. Relative Growth Rate and Doubling Time of Conference Articles Productivity of Neural Network Research –India

Year	No of Conference Articles	Cumulative number of Articles	W1	W2	R(a)	Mean R(a)	Doubling time Dt(a)	Mean Doubling time
1988	3	3		1.1				
1989	2	5	1.1	1.61	0.51		1.36	
1990	3	8	1.61	2.08	0.47		1.47	
1991	4	12	2.08	2.48	0.40		1.73	
1992	2	14	2.48	2.64	0.16	0.31	4.33	1.78
1993	14	28	2.64	3.33	0.69		1.00	
1994	21	49	3.33	3.89	0.56		1.24	
1995	41	90	3.89	4.5	0.61		1.14	
1996	35	125	4.5	4.83	0.33		2.10	
1997	32	157	4.83	5.06	0.23	0.48	3.01	1.67
1998	35	192	5.06	5.26	0.20		3.47	
1999	52	244	5.26	5.5	0.24		2.89	
2000	59	303	5.5	5.71	0.21		3.30	
2001	42	345	5.71	5.84	0.13		5.33	
2002	73	418	5.84	6.04	0.20	0.20	3.47	3.70
2003	80	498	6.04	6.21	0.17		4.08	
2004	114	612	6.21	6.42	0.21		3.30	
2005	117	729	6.42	6.59	0.17		4.08	
2006	136	865	6.59	6.76	0.17		4.08	
2007	146	1011	6.76	6.92	0.16	0.18	4.33	3.40
			6.92			0.31		2.93

relative growth rate shows a down trend; it means the rate of increase is low in terms of volume: this is highlighted by the doubling time of conference articles which is higher than the relative growth rate.

Conclusion

The pattern of growth of neural network research literature of the various sources both at the world and India level has been presented. Data on source wise publication of conference articles on neural network research at the world level and at India level reveal that conference articles are first in order securing 49.88 per cent (61633) at the world level, whereas in India it holds the second position with 41.88 per cent (1011). Conference articles on neural network research at both the world level and at India level and their relative growth rate show a declining trend. On the contrary, the doubling time of publications on neural network research output increased and is at 4.78 years which is more or less double the time of such publications at India level which is 2.89 years.

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