



**RESEARCH ARTICLE**

# AUTHORSHIP PATTERN AND COLLABORATIVE RESEARCH IN BIOINFORMATICS

Amsaveni.N<sup>1</sup>, Manikandan.M<sup>2</sup>, Manjula.M<sup>2</sup>

<sup>1</sup>Assistant professor, Department of Library and Information Science, Bharathidasan University, Trichy-24, India

<sup>2</sup> Ph.D research Scholars, Dept. of Library and Information Science, Bharathidasan University, Trichy-24, India  
veni032002@gmail.com; 2013mani.ph.d@gmail.com; mnjmeenakshi@gmail.com

## Abstract

*This article deals with the authorship collaboration research is a well-recognized feature of the modern science and there has been a reliable trend towards enlarged collaboration in all branches of science and technology during the present century. It has also been found that the rate of increased in multiple authorship pattern mottled considerably with subject area. Totally 91655 authors were produced 17318 articles in this subject of bioinformatics. 9.77 percent of articles were single authors' contribution. 90.17 percent of articles produced by collaborative authors. Two authors team has produced more articles and six authors team has highest number of authors.*

*Keywords: Authorship pattern; degree of collaboration; h-index; bioinformatics; Scientometric; Scattering*

## I. Introduction

The number of authors participating to intellectual publications in rappers of authorship pattern is an interesting part of any bibliometric, Scientometric and all metric study. A count of number of authors contributing to articles offers some indication to the degree of collaboration between authors. Collaborative research refers to a research in which any research project is being carried out by at least two people by engaging their efforts in mind and body. It is very common in the field of sciences and Social Science to measure the status of collaborative trend research output in a specific area. Cronin (2001) comments, authorship as “undisputed coin of the real in academia” and “absolutely central to the operation of the academic reward system”. However, the concept of authorship was evolved over the course of the 20<sup>th</sup> century, with a steady increase in collaboration. This trend was anticipated by Price (1963), who stated, “by 1980 the single-author paper will be extinct” and scholarly publications will “move steadily toward infinity of authors per paper”.

## II. Objectives of the Study

The specific objectives of the study are to determine the:

- authorship pattern ;
- proportion of single vs multi authored papers;
- To determine the degree of research collaboration on Bioinformatics literature.

## III. Methodology and Materials

Bibliometrics and Scientometrics tools and techniques are the application of statistical methods to written communication has been measured as appropriate and non-reactive tools for studying collaboration in every research. Hence, the investigators have employed this methodology for studying authorship pattern and collaborative research in Bioinformatics research productivity. Bioinformatics research articles were download the database in Web of Science during the period 1999 to 2013, it includes the databases of SCI (Science Citation Index), SSCI (Social Science Citation Index) and AHCI (Arts and Humanities Citation Index)). The search key term has 'bioinformatics' has been used for the purpose of collection of data, required for the study. Authorship data regarding the number of papers, number of authors for each paper in different types of documents was collected from the database. Further, the data was tabulated using by the software's of Histcite, VOS viewer and MS-Excel and further analyzed for the purpose of interpretation and discussion.

## IV. Results and Discussion

The below table 1 reveals that the maximum number of papers was two authored (15.72 %) when compared to three authored (15.26 %.); four authored (13.35 %); five authored (10.67 %); single authored (9.83 %); six authored (9.15 %) respectively. Followed by seven authored (6.48 %) and eight to thirteen authored contributions are below 5 percent. Above thirteen authored contributions are measured below one percent of articles. Six authors team has been in highest number of contributors. Thus, indicating very clearly the increased trend towards multiple authorship productivity in the field of Bioinformatics.

**Table 1: Showing the authorship pattern in Bioinformatics research output**

No. of authors	No. of publications	percentage	Authorship pattern	percentage	Cum.authors
1	1702	9.83	1702	1.86	1702
2	<b>2722</b>	15.72	5444	5.94	7146
3	2642	15.26	7926	8.65	15072
4	2312	13.35	9248	10.09	24320
5	1848	10.67	9240	10.08	33560
6	1585	9.15	<b>9510</b>	10.38	43070
7	1122	6.48	7854	8.57	50924
8	869	5.02	6952	7.58	57876
9	668	3.86	6012	6.56	63888

10	464	2.68	4640	5.06	68528
11	322	1.86	3542	3.86	72070
12	243	1.40	2916	3.18	74986
13	179	1.03	2327	2.54	77313
14	150	0.87	2100	2.29	79413
15	88	0.51	1320	1.44	80733
16	66	0.38	1056	1.15	81789
17	62	0.36	1054	1.15	82843
18	43	0.25	774	0.84	83617
19	24	0.14	456	0.50	84073
20	22	0.13	440	0.48	84513
21	23	0.13	483	0.53	84996
22	17	0.10	374	0.41	85370
23	20	0.12	460	0.50	85830
24	13	0.08	312	0.34	86142
25	16	0.09	400	0.44	86542
26 & above	96	0.55	5113	5.58	<b>91655</b>
<b>Total</b>	<b>17318</b>	<b>100</b>	<b>91655</b>	<b>100</b>	

### Degree of collaboration

Table 2 reveals that the single Vs multi-authored paper on bioinformatics research productivity. During the year of 1999 to 2013, at the overall level the single authored papers constitute 9.77 percentage of the total publication reported in the study and the remaining 90.23 percentage of the publications are contributed by multi-authors. The degree of collaboration was not a constant value, it shows differs of 0.59 and 0.96. Based on this study, the result of the degree of collaboration  $C = 0.90$ . i.e, 90 percent of collaborative authors' articles published during the study periods. The study found that single author papers maintained a low profile among bioinformatics research scientists.


**Table 2: Showing Degree of collaboration in Bioinformatics research output**

Year	Single authors		Multi authored		Total	Degrees of Collaboration
	No of output	%	No. of output	%		
1999	53	3.11	75	0.48	128 (0.73)	0.59
2000	95	5.58	164	1.04	259 (1.49)	0.63
2001	119	6.99	252	1.60	371 (2.13)	0.68
2002	134	7.87	413	2.63	547 (3.14)	0.76
2003	124	7.29	615	3.91	739 (4.24)	0.83
2004	128	7.52	847	5.39	975 (5.60)	0.87
2005	155	9.11	1007	6.41	1162 (6.67)	0.87
2006	142	8.34	1116	7.10	1258 (7.22)	0.89
2007	118	6.93	1192	7.58	1310 (7.52)	0.91
2008	123	7.23	1253	7.97	1376 (7.90)	0.91
2009	117	6.87	1420	9.04	1537(8.82)	0.92
2010	114	6.70	1664	10.59	1778 (10.21)	0.94
2011	109	6.40	1849	11.77	1958 (11.24)	0.94
2012	104	6.11	2125	13.52	2229 (12.8)	0.95
2013	67	3.94	1727	10.99	1791 (10.28)	0.96
<b>Total</b>	<b>1702</b>	<b>9.77</b>	<b>15716</b>	<b>90.23</b>	<b>17418</b>	<b>0.90</b>

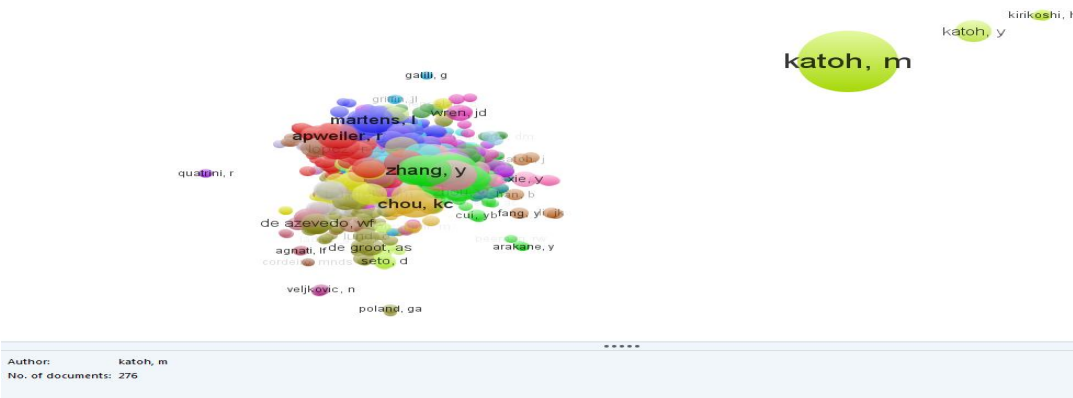
### Prolific authors

Out 91655 authors, 2310 authors were meet thoreshold contributing minimum number of documents 5 authors. For each of the 2310 authors, the number bibliographical coupling links will be calculated. The authors with the largest number of links will be selected. 2310 authors were selected. Using by the VOSviewer clustering map indicated the above information.the below table derived from VOSviewer for knowing the prolific authors and their contributions. Identifying from the below map and table, **Katoh, M** (276 articles, 91 h index, 4227 LCS, 6708 GCS and 340 colloaborative authors) is the most productive author in the field of Bioinformatics and dominated in first rank position, followed by **Zhang, Y** (76 articles, 101 LCS, 2277 GCS, 23 h index and 657 collaborative authors) and **Wang, Y** (74 articles, 38 LCS, 830 GCS, 19 h-index and 614 collaborative authors) were contributed in bioinformatics. Remaing authors were contributed below 70 articles. Figure 1 deals with the prolific authors productivity in bioinformatics research. Its shows the variotion in different colours along with authors name.

**Table 3: Showing the prolific authors in Bioinformatics research output**

 **Verify selected authors**

Sel...	Author	Documents	Bib. coupling
<input checked="" type="checkbox"/>	katoch, m	276	13603
<input checked="" type="checkbox"/>	zhang, y	76	2873
<input checked="" type="checkbox"/>	wang, y	74	2435
<input checked="" type="checkbox"/>	wang, j	69	2348
<input checked="" type="checkbox"/>	wang, l	66	2317
<input checked="" type="checkbox"/>	li, y	65	1925
<input checked="" type="checkbox"/>	zhang, j	61	2026
<input checked="" type="checkbox"/>	li, j	59	2004
<input checked="" type="checkbox"/>	chou, kc	58	2670
<input checked="" type="checkbox"/>	[anonymous]	54	63
<input checked="" type="checkbox"/>	martens, l	54	1582
<input checked="" type="checkbox"/>	li, l	52	2206
<input checked="" type="checkbox"/>	liu, y	51	1530
<input checked="" type="checkbox"/>	apweiler, r	50	1153



**Figure 1: Scattering of Label view of prolific authors in bioinformatics research output**

**Table 4: Showing the document wise analysis of Bioinformatics research output**

S.No	Document type	Pub. Records	Percent	TLCS	TGCS
1	Article	12934	74.3	20673	256690
2	Review	2034	11.7	3914	60430
3	Article; Proceedings Paper	1080	6.2	1059	12967
4	Editorial Material	613	3.5	721	6345
5	Meeting Abstract	445	2.6	4	36
6	Review; Book Chapter	87	0.5	164	2454
7	News Item	62	0.4	7	121

8	Software Review	41	0.2	10	653
9	Letter	38	0.2	41	215
10	Article; Book Chapter	29	0.2	4	64
11	Correction	28	0.2	1	8
12	Book Review	14	0.1	1	1
13	Database Review	6	0.0	0	92
14	Biographical-Item	3	0.0	1	2
15	Reprint	3	0.0	0	3
16	Editorial Material; Book Chapter	1	0.0	0	0

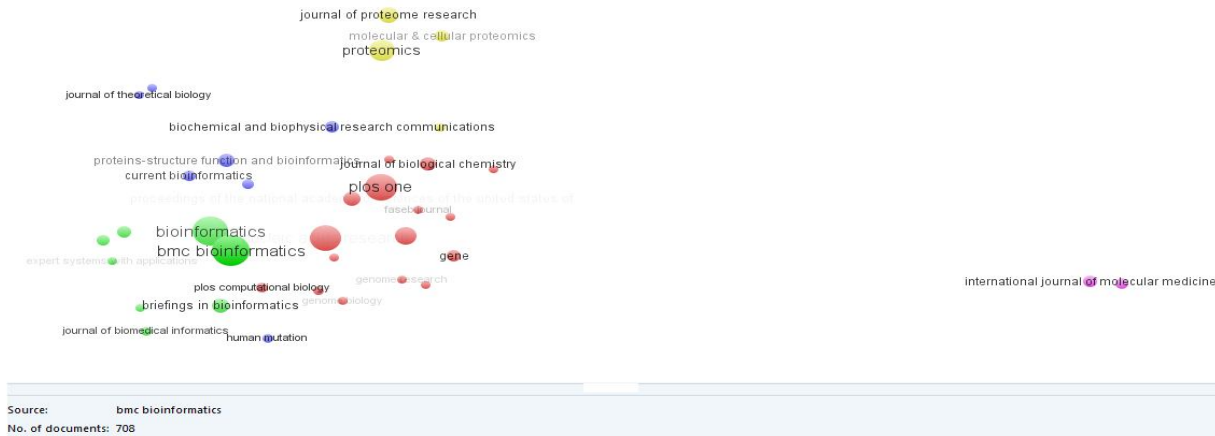
Table 4 reveals that the 16 types of published documents in the subject of bioinformatics, Such as; journal article, review, articles in conference proceedings, editorial material, meeting abstract, review in book chapters, news item, software review, Letter, articles in book chapter, correction, book review, database review, biographical item, reprint and editorial material in book chapter). Among those, 74.3 percent of publications were in the form of journal articles (12934 articles, 20673 TLCS and 256690 TGCS) dominated the highest contribution.

The table 5 reveals that the prolific journals in the subject of bioinformatics. 2820 sources, in which 39 journals were appearance of more than 50 articles. The journal of '**bmc Bioinformatics**' has published 708 articles during the sample period and its dominated the first rank position in publication productivity in bioinformatics, and it earned the values of 10308 TGCS; 45 h-index where the contributed authors were 3291 and followed by the journal of '**Bioinformatics**' has published 678 articles and ranked second position in the total productivity. The remaining selected journals were contributed their publications is below 600 article in the field of bioinformatics.

**Table 5: Showing the prolific journals in Bioinformatics research output**

Verify selected sources			
Selected	Source	Documents	Bib. coupling
<input checked="" type="checkbox"/>	bmc bioinformatics	708	13210
<input checked="" type="checkbox"/>	bioinformatics	678	9951
<input checked="" type="checkbox"/>	plos one	583	10124
<input checked="" type="checkbox"/>	nucleic acids research	543	10267
<input checked="" type="checkbox"/>	proteomics	367	9433
<input checked="" type="checkbox"/>	bmc genomics	249	5352
<input checked="" type="checkbox"/>	journal of proteome research	220	5068
<input checked="" type="checkbox"/>	proceedings of the national academ...	168	2246
<input checked="" type="checkbox"/>	briefings in bioinformatics	160	5250
<input checked="" type="checkbox"/>	journal of biological chemistry	153	2067
<input checked="" type="checkbox"/>	proteins-structure function and bioi...	142	3859
<input checked="" type="checkbox"/>	gene	114	1668
<input checked="" type="checkbox"/>	biochemical and biophysical researc...	113	1506
<input checked="" type="checkbox"/>	international journal of molecular m...	110	4328

The below figure 2 indicates that the selected 39 journals scattering in label view. its clearly showed that variation in their colours and sizes of circles. The result related to the above table analysis.

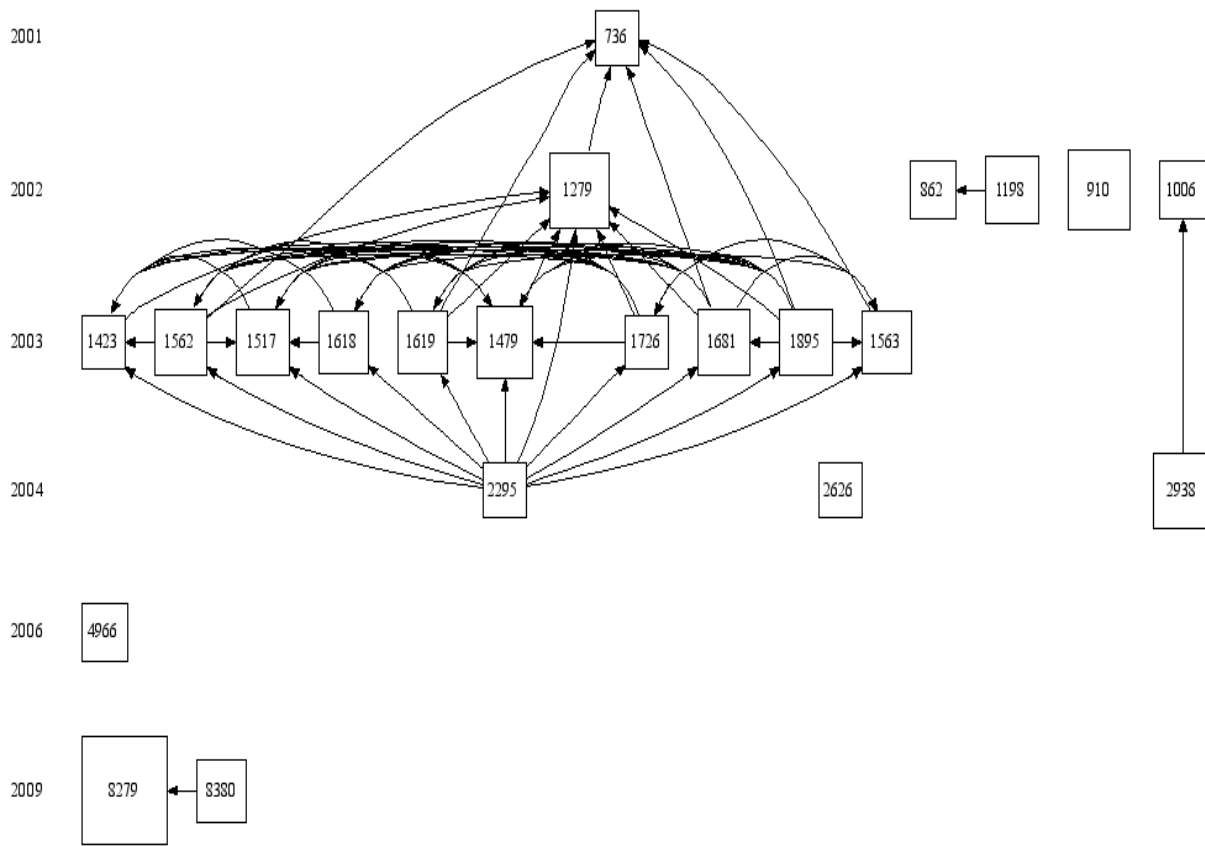


**Figure 2: scattering of Label view of prolific journals in bioinformatics research output**

### Histriographic Analysis

The sample records were exported to HistCite software for data extracting to acquire a large list of 17418 articles written by 91,655 authors along with 761,464 times cited references during 1999 to 2013, and their local and global citation scores (LCS and GCS). It is found from this histriograph map analysis 70 authors were contributed the selected 30 nodes out of 70 authors, only one author (**Katoh, M**) has contributed 24 times, four authors were participated only two times and remaining 65 authors were contributed each once in the research of bioinformatics. Totally 14 journals were been in the selected 30 nodes, among these the journal of ‘International Journal of Molecular Medicine’ has mapped in nine times, followed by the journals of ‘International journal of oncology’ and ‘Nucleic acids research’ were produced each 4 articles; the journals of ‘Bioinformatics’ and ‘Proceedings of the National Academy of Sciences of the united States of America’ were produced each two articles; and the remaining nine journals were produced each one articles. The highest values of the selected 30 nodes, the Local cited reference is 40; the cited reference is 89; The Total Local Citation Scores is 281 and the Total Global Citation Scores is 5938 has measured from this analysis.

The article number of 1895<sup>th</sup> has written by the authors of “Katoh M, Katoh M” has published in the journal of “International Journal of Molecular Medicine” at the year of 2003 with 85 times cited references; 69 LCS and 110 GCS scaled and it having six links of quoted and cited. This article dominated in the value of LCR.



**Figure 3: Historiographic mapping of top 30 nodes and LCS scales**

The article number of 1279<sup>th</sup> has written by the authors of “Kato M” has published in the journal of “International Journal of Molecular Medicine” at the year of 2002 with 89 times cited references; 135 LCS and 146 GCS scaled and it having nine links of quoted and cited. This article dominated the highest CR value. The article number of 121<sup>st</sup> has written by the authors of “Perkins DN, Pappin DJC, Creasy DM, Cottrell JS” has published in the journal of “Electrophoresis” at the year of 99 with 33 times cited references; 281 LCS and 3978 GCS scaled and it does not have any kind of links. This article dominated the highest LCS and GCS values. The article number of 2295<sup>th</sup> has written by the authors of “Kato M, Kato M” has published in the journal of “International Journal of Molecular Medicine” at the year of 2004 with 48 times cited references; 71 LCS and 77 GCS scaled and it having eleven links of quoted. This article dominated in the highest number of links in whole 63.

## V. Conclusion

The article mainly dealt with the authorship pattern and collaborations in the area of Bioinformatics research output. In the field of science and technology, the studies have conventional the increased growth of multiple authorship and collaborative research. The following facts are derived from this analysis; **Kato, M** has identified most productive author; The journal of ‘**bmc Bioinformatics**’ has highest



publications; 2012 having highest publications; the form of journal type document produced more number of articles and 90 percent of authors were contributed at collaborative produced. It is essential that in the sphere of Science and Technology large scale studies are carried out to identify the trends in the collaborative research.

## References

- [1] Amsaveni. N & Vasanthi. R. (2013). Authorship Pattern and Collaborative Research in the Field of Network Security. *Indian Journal of Applied Research*..3 (1): 52-54.
- [2] Amsaveni, N & Vasanthi, R (2012). Mapping of Green Biotechnology Research: A Scientometric Analysis, *Journal of Advances in Library and Information Science*, Vol. 1. No.4. 2012. pp. 181-185.
- [3] A.Manimekalai & N.Amsaveni (2012). Collaborative Research Publications of Genetics. in India. *Journal of Advances in Library and Information Science*, Vol.1.(2), pp-88-93.
- [4] Cronin, Blaise. Shaw, Debra and Barre, Kathryn La. (2003). A cast of thousands: Coauthorship and subauthorship collaboration in the 20th century as manifested in the scholarly journal *Literature of psychology and philosophy*, *JASIST*, 54 (9):855–871.
- [5] Price, Derek J. deSolla. (1963). *Little science, Big science*. (pp.78). New York: Columbia press.
- [6] Karisiddappa, CR, Maheshwarappa, B S., & Shirol M.V (1990). Authorship pattern and Collaborative research in Psychology. *IASLIC Bulletin*, 35 (2), 1990, pp. 73-78.