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Bibliometric Analysis of Paper Publication for Artificial Intelligence on Librarianship System With Full and Fractional Method

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ABSTRACT

Knowing the bibliometric analysis of AI publications in the librarian system will be a great research opportunity because its development is very high. On the other hand, we can solve the convenience of current bibliometric analysis with bibliometric network applications, such as VOSViewer. However, the calculation is presented with two options, complete and fractional, for analysis. The bibliometric method is used to analyze the trend from time to time regarding AI in this library. The study uses Scopus to get data and VOSViewer to analyze, accompanied by trials with full and fractional methods. Through a restricted search of the past five years. AI has relevance to Librarianship Systems and trends in Digital Libraries. Then, it is found that there are differences in the calculation of the total and fractional methods that stand out in the bibliographic coupling approach. The development of AI in the librarian system is very high and is influenced by surrounding phenomena, while the choice of whole and fractional methods is not found to have absolute differences.

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1. INTRODUCTION

AI has been in the limelight since the buzzword was announced on research forums in the 1950s. This development began because the software also developed, such as the new digital age, which changed the sociocultural community to be more informative. AI is considered to have created an innovative and effective environment. Today, generations cannot be separated from their influence. We can even believe that maybe in the next few years, the mastery of AI and its power will become a strong influence in this world more than any other resource. Today many answers to problems from any aspect of life using AI technology tools are sold at affordable prices. Then what about life in the world of information that involves libraries because it is their primary resource? It turns out that AI is very popular in libraries. As an institution related to universities' research and development environment, AI developments are known to accept the latest concepts, conveying information and technology (Koc-Mischalska et al., 2016; Massis, 2018).
The long history of rapid AI is seen in application breakthroughs. Information sectors such as law and education have been significantly impacted (Cox et al., 2018; Neary & Chen, 2017). So there is no doubt that libraries are influenced in several ways, for example, in discovery and search, information services using chatbots, cataloging, and classification, decision-making, indexing, supporting text, and data mining. If seen, AI plays more of a role in librarian systems that involve complex information management with a combination of human intelligence, computer science, and engineering, science of human reasoning with computer science (Doshi & Kim, 2017; Kamar, 2016; Nager & Atkinson, 2016). Inevitably, AI is an opportunity as well as a challenge for libraries in the future because some have a point of view. For libraries, the question is not what technology will be affected, but what technology, if any, will remain unaffected by AI (Fernandez in Cox, 2018; Sonntag, 2019). Recently, AI surveys which have played a significant role in the development of libraries, have started to climb up. This is coupled with all aspects to help humans need Big Data and make decisions quickly. The library also does not want to lose as an institution that houses the information warehouse (Efendi & Krisanty, 2020; George et al., 2014; Zheng, et al., 2013).

The various directions of AI thinking in libraries are interesting for future research trends. The assumption is that AI will continue to be a topic that continues to grow and raises many issues as its use develops. In the future, the impact of AI in libraries can be seen as something exciting and full of debate (Massis, 2018; Ntoutsi et al., 2020; Stavros et al., 2015). This debate is interpreted because AI raises arguments that cause library problems. AI in libraries will continue to add to its research and impact. Related to previous studies, the last three years show the productivity of this keyword itself which involves the librarianship system.

Bibliometrics is a statistical method that quantitatively analyzes research studies on specific topics through mathematical means (Yu et al., 2020). The survey of bibliometric network analysis is widely reviewed. How do they study the relationship between authors and cluster groups? The network between citations of articles and how many publications are on a specific topic within a certain period. In addition, through calculations, it can analyze the main areas of research, access the quality of studies, and predict the direction of further research studies. For example, the topic that is very hot in this pandemic is Covid-19. We may be able to relate Covid-19 to many other research topics. However, to predict empirically, this calculation can be known through bibliometrics (Hamidah et el., 2020; Yu et al., 2020).

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VOSViewer, as an application, can create bibliometric visualization and analyze quickly. Throughout the VOSViewer, various research angles are emphasized to examine the trending of specific topics and the relationships between authors to be analyzed (Van Eck & Waltman, 2021). VOSViewer also provides co-authorship, bibliographic counting, and co-citation networks, and from the panels, you can set how they will determine this visualization later. However, there is a difference between the whole (complete) and fractional (fractional) calculations presented at the beginning of the calculation. Previous studies are still very minimal and even exclusive only to the procedure. The VOSViewer wizard says these two calculations are different visualizations of the map wizard. Generally, the study and use of calculations using the whole counting method during fractional counting as an alternative NS.

The comparison of these calculations, concluding that this difference is seen in relative terms with needs (Perianes-Rodriguez et al., 2016). For example, with the different results from the university co-authorship network, having the full calculated results gives a large number and dominant effect on this network. While in the case of fractional calculations, the development begins to diminish. The second example is the calculation of the journal's bibliographic coupling network (Biscaro & Giupponi, 2014; Kobayashi et al., 2012; Yan & Ding, 2012). The fractional analysis has a more negligible effect.

This article aims at the two problems above to find the distribution of AI research in the librarian system, find trends in the last five years, and test it with two calculations to find differences between them. Scopus supports bibliometric analysis from 2017 to 2021. The specifics will be explained through research methods.

2. METHODS

The specification of the librarianship system lies with AI because of this linkage. AI is utilized in library management through its role. Then, take keywords in documents that want to discuss the study of librarianship systems abstractly with the word AI. The study of librarianship is considered more challenging to find relationships than studies in general fields such as information science or library science. However, through a bibliometric approach, we can see the librarianship system's distribution (Fei, 2011). The search was also carried out using Boolean techniques (AND) and ABS-KEY, emphasizing keywords (Keywords). The bibliographic data were taken from the Scopus database. Scopus is one of the most trusted and complete databases for calculating both the origin of the article and the authenticity of the article (without worrying about predatory themes), so it can provide sound and quality scientific references in academics (Hamidah et al., 2020; Klapka & Slaby, 2018).

This study was conducted by online search on November 7, 2020, with keywords that have been spread on "librarianship systems" consisting of library automation, library integration systems, information technology, information retrieval, management information sources, electronic information sources, online information services, libraries and the internet, online library catalogs, and computer systems. With the assumption of this study, it was tested that the survey by Fei Xu, also visualized by VOSViewer, related to the distribution of study keywords and the relationship between these keywords to the study of "librarianship systems." (Fei, 2011). Furthermore, it has been explained that big data, analysis, machine learning, visualization, automation, and logical decisions are combined to test the relationship between things related to the librarian system and things in AI. To explain the keywords need to be analyzed in depth with time restrictions and article sources so that the calculation results will be detailed and precise (Brookes, 1969; Fei, 2011). So the search was limited to the last five years for reasons of the relevance of the study and the development of this study.

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VOSViewer will calculate bibliographic data in the form of RIS. Once in the VOSViewer, keywords can be adjusted as desired, and less relevant keywords can be deleted and used for data addition, mapping, and grouping articles taken from database sources (Hamidah et al., 2020; Xie et al., 2020). Calculations are carried out in two ways by presenting examples of co-authorship calculations, bibliographic coupling, and author keyword strength (occurrence of author keyword trend).

The flow of the analysis stages to clarify the methodology flow, starting from searching for documents in the Scopus database. By exploring the AND librarianship AND "Artificial Intelligence" AND system and the 2021-2017 limit searched on December 25, 2021, the results found 1.3985 documents. The data is obtained from RIS and CSV files which are then entered in VOSViewer. With the calculation option, the same thing is done but with two visualization steps: fractional and full. All documentation will be analyzed for differences. Then the journal coupling will find a ranking to find out the difference in the sorting method taken from the total network strength results from calculating the number of documents and citations.

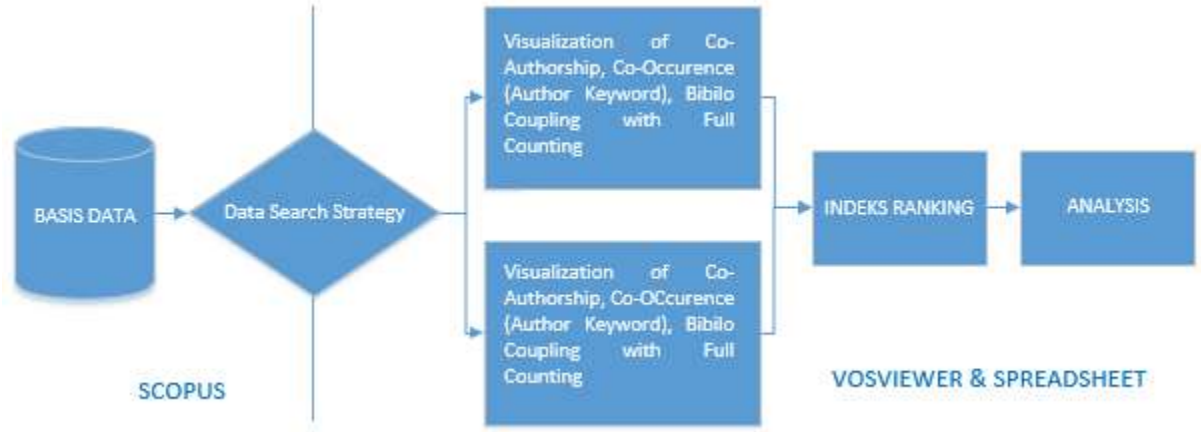

Figure 1. Flow of bibliometric analysis stages

3. RESULTS AND DISCUSSION

3.1 Data on the spread of AI research on the Librarianship System with a distance of five years

The distribution of publications on AI in the Librarian System over a distance of five years has increased. This increase quadrupled from 2018 (422 document results) to 2021 (342 document results) but experienced a decrease in 2017 (200 document results) to 2018 (can be seen in Figure 4). However, this publication is still running, so from day to day, it will increase. This means, not to deny, that after the search tomorrow, the distribution and number of documents will also change.

Then, regarding the top five types of publication documents, articles were dominated by reports (911), followed by scientific conference results (326), reviews (89), book chapters (52), and books (22). This means that many discussions of AI in this librarian system are in scientific articles and exciting talks at conferences.

The source of this distribution title is the most by Lecture Notes in Computer Science, including the subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics (a total of 90 publications), then Library Philosophy And Practice (as many as 31 publications), Journal Of Documentation (as many as 31 publications), Hi-Tech Library (a

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total of 28 publications), Journal of Librarianship and Information Science (a total of 27 publications), Journal of Academic Librarianship (a total of 26 publications), Journal Of The Association for Information Science and Technology (a total of 23 publications), Electronic Library (a total of 21 publications), Scientometrics (21 publications, and Sustainability Switzerland (17 publications).

Figure 3 shows the top five countries that publish the most are the United States (as many as 292 documents), China (as many as 140 documents, the UK (as many as 110 documents), Germany (as many as 101 documents), and Australia (as many as 73 documents). This publication is made because of the significant similarity between the Co-Authorship Country and the Bibliography Coupling Country. The five publications affiliation are the University of Tehran (as many as 13 documents), University of Melbourne (as many as 12 documents), Universiti Sains Malaysia (as many as 11 documents), Universidad de Granada (a total of 11 documents), and Wuhan University (a total of 11 documents).

For authors based on Scopus analysis, there are ten names of active authors who produce AI publications in the librarian system. The top names were McKay, D. (9th), Buchanan, G. (7th), Sotudeh, H. (6th), Beyene, W.M. (a total of 5), Herrera-Viedma, E. (a total of 5), Mirzabe igi, M. (a total of 5), Ribeiro, C. (a total of 5), Chua, A.Y.K. (a total of 4), Du, J.T. (as many as 4), and Foo, S. (as many as 4). If indeed these authors have a relationship, then these ten authors are the ones who produce the most, or their assumptions have the most citations.

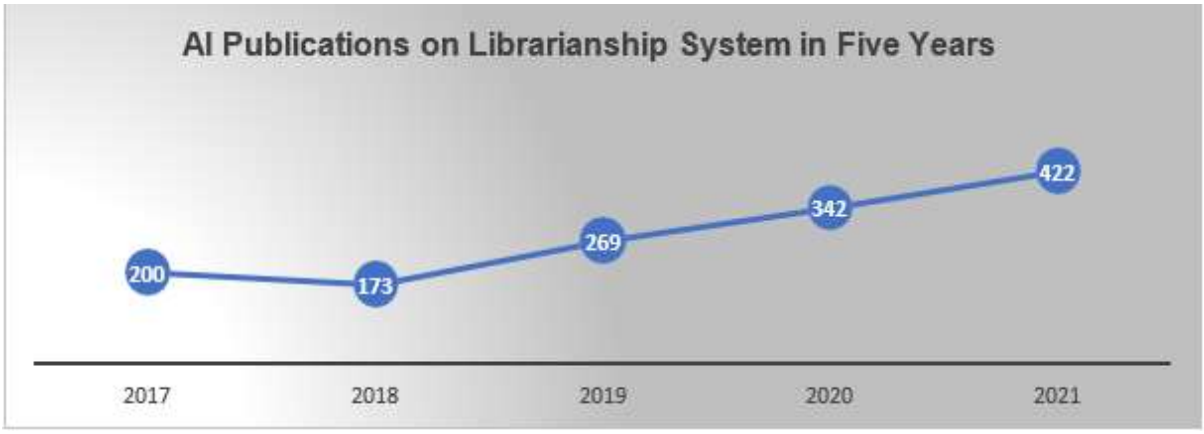

Figure 2. Total publication in five years

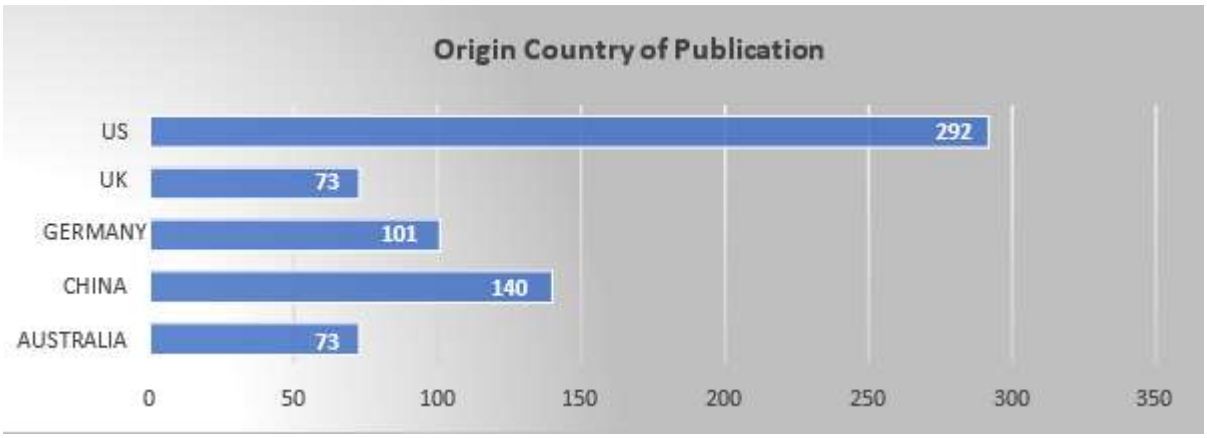

Figure 3. Country of origin of publication

Some of these articles discuss a lot of computer science (as much as 31.3%) and social science (as much as 29%), which shows a multidisciplinary development reflected in the two

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fields of science. Computer science is considered a more detailed analytical tool for social problems, such as in the scope of the library. Then, the research object is digital libraries, social media, and their relation to activities.

Humans have become a natural thing, especially concerning the Librarianship System. Artificial Intelligence, Human, and Digital Libraries were found as the primary keywords related to Artificial Librarianship in Systems Librarianship. Through the help of Biblioshiny on trending topics per year. The bibliophile here is only for plotting topic trends which we will analyze later with VOSViewer. If seen from the picture (see Figure 4 to 7), Artificial Intelligence is indeed consistent until 2021 to be the key that is often used. The trend in 2020, social media ranks first. The movement in 2019, digital libraries became popular, then the trend in 2019—2018, "metadata" in the first place, and the internet in 2017.

3.2 Analysis with VOSViewer as well as comparison with two calculations

3.2.1 Co-Occurrence (author keyword)

VOSViewer provides a keyword network visualization, meaning that every keyword with a network is related to the network owned through co-occurrence author keywords. There is no significant difference in the visualization of whole counting and fractional calculations, both through tables and visualizations. Table 1 describes the order based on the strength of the relationship between keywords, and Figure 8 is a visualization of the keyword network. The image is given because it has a significant difference in the pattern of Co-Occurrence (Author Keyword).

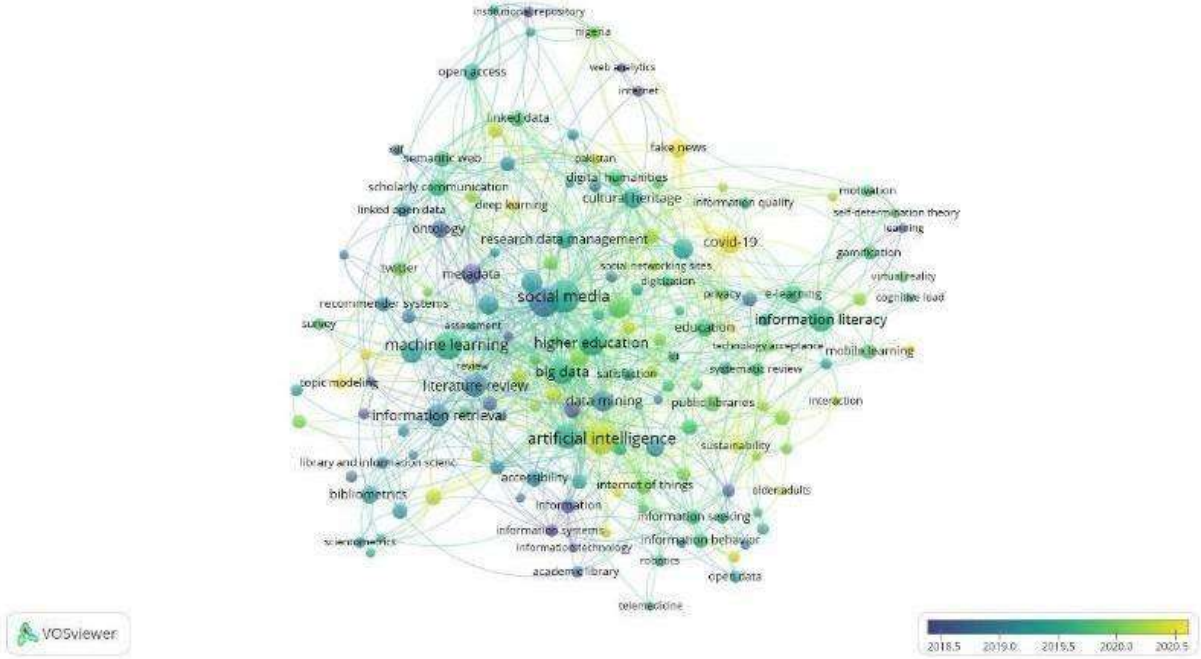

Figure 4. Trending keyword topics by author keyword based on overlay year of publication based on keywords in full counting calculation

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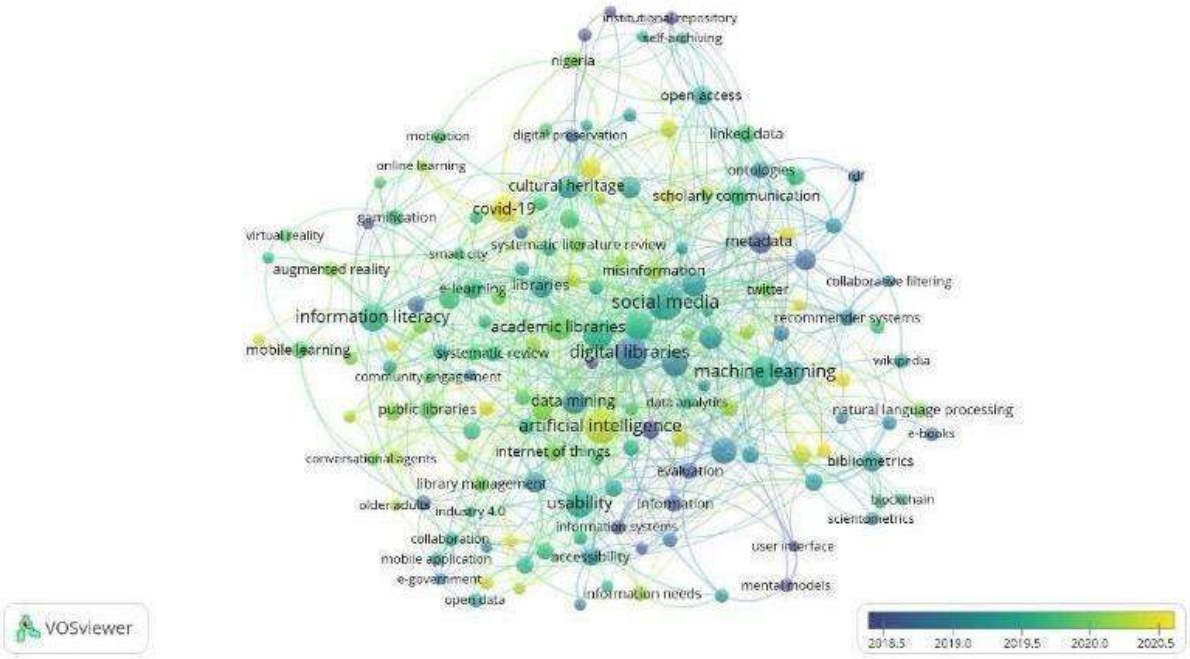

Figure 5. Trending keyword topics by author keyword based on overlay year of publication based on keyword in calculation of fractional counting

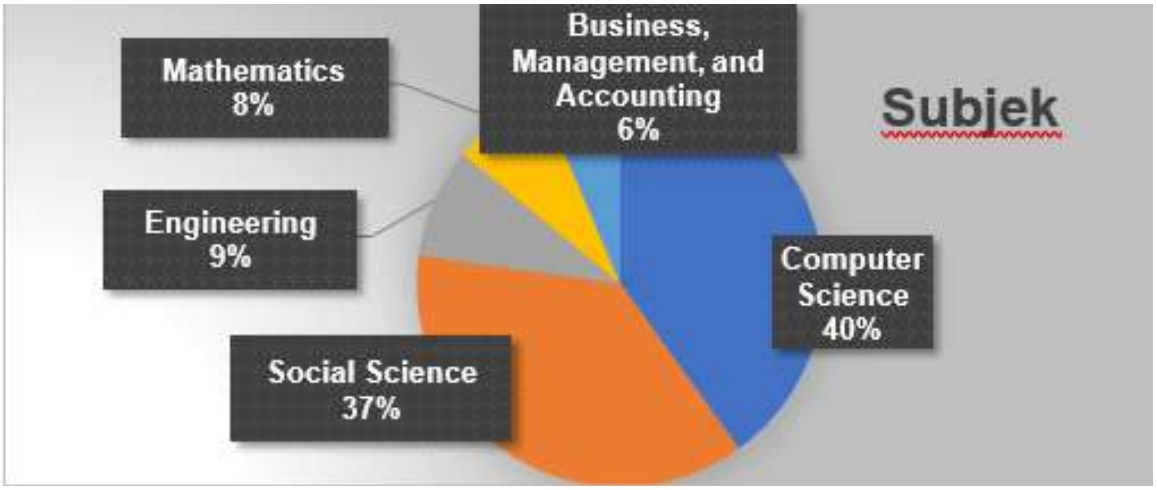

Figure 6. Trending keyword topics by author keyword based on scopus

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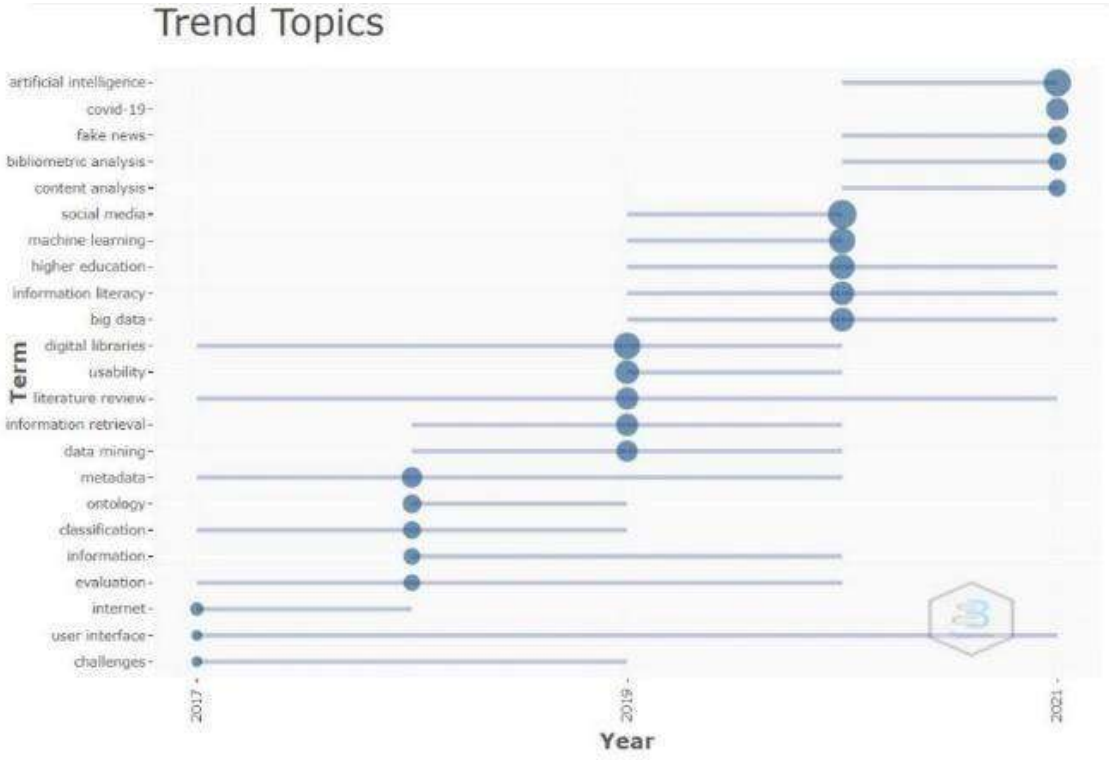

Figure 7. Trending keyword topics by author keyword based on Biblioshiny

Figure 8. (Left) co-occurrence author keyword full counting (right) co-occurrence author keyword fractional counting

Table 1. Ranking co-occurrence author keyword

Rank		Keyword	No. of Co-Occurrence Author Keyword link	
Full	Frac		Full	Frac
1	1	Artificial Intelligence	73	33.00
2	2	Social media	63	32.00
3	3	Digital libraries	49	28.00
4	4	Higher education	45	26.00
5	8	Big data	41	20.00
6	7	covid-19	41	20.00
7	6	usability	39	21.00
8	5	Machine learning	37	23.00
9	9	Literature review	34	18.00
10	10	Academic Libraries	32	16.00

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3.2.2 Co-Authorship

This approach explains that the full and fractional differences significantly influence the calculation of the Co-Authorship network from university/organizational sources (Haddow, 2015; Perianes-Rodriguez et al.,2016). The Co-Authorship approach is a reference from research that the most collaborative authors are the number of subnets with the properties of each Author listed (Batagelj & Cerinsˇek, 2013; Munoz et al., 2016; Uddin et al., 2012). So, in this subchapter, all Co-Authorship options are calculated to find the most significant comparison. Co-Authorship Author does not have a substantial difference in a pattern, so almost the exact visualization is not shown, but it can be seen together in Table 2 regarding the order of whole and fractional Co-Authorship Authors. Then, for the Co-Authorship Organization, there was no network, and we found no difference.

Figure 9 shows the differences in the Co-Authorship Country network, along with table 3 of the order.

Table 2. Ranking co-authorship author keyword

Rank		Author	No. of Co-Authorship Author strength link	
Full	Frac		Full	Frac
1	1	Buchanan, G.	7	7.00
2	2	Mckay, D.	7	7.00
3	3	Chen Y.	2	2.00
4	4	Li, J.	2	2.00
5	5	Mirzabeigi, M.	2	2.00
6	7	Wang, M.	2	2.00
7	8	Liu, X.	1	1.00
8	9	Zhang, X	1	1.00
9	10	Beyene W. M	0	0.00
10	11	Herrera-Viedma, E.	0	0.00

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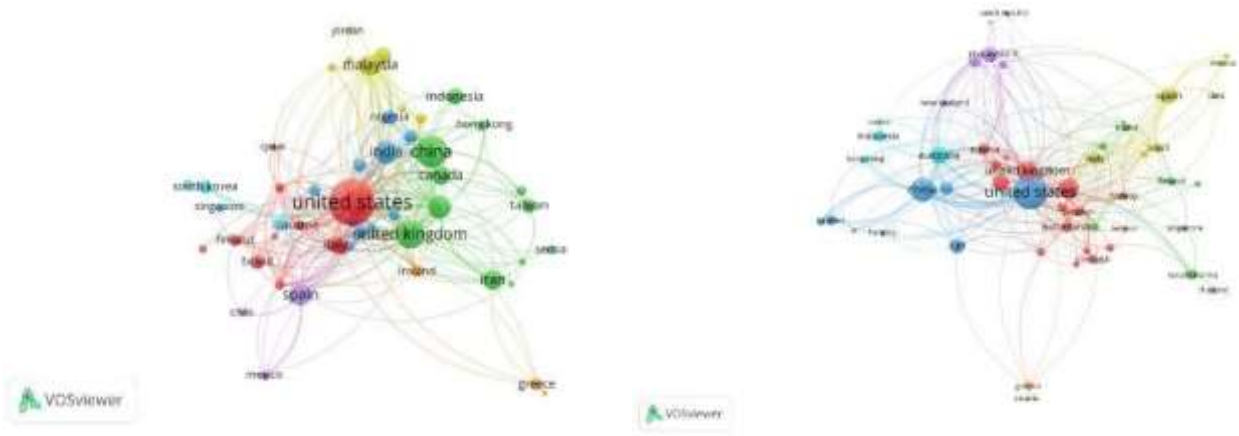

Figure 9. (Left) co-authorship country full counting (right) co-authorship country fractional counting

Table 3. Ranking co-occurrence author keyword

Rank		Author	No. of Co-Authorship Author strength link	
Full	Frac		Full	Frac
1	1	United States	164	105.00
2	3	United Kingdom	92	54.00
3	4	Australia	76	39.00
4	2	China	67	56.00
5	5	Germany	59	34.00
6	7	Spain	49	29.00
7	9	Netherland	42	19.00
8	13	Italy	35	14.00
9	26	Switzerland	33	8.00
10	10	Canada	32	18.00

3.2.3 Bibliographic Coupling

Bibliographic coupling is a comparison between full and fractional (Perianes-Rodriguez et al., 2016), and there are five coupling approaches. The coupling results are ranked to find the most significant difference between the Coupling Bibliography approaches, which have a network—first, the document coupling. Document coupling has a considerable difference between authors (visualization is in Figure 10, and ranking is in Table 4). Second, the author's coupling does not show any difference or is almost identical, so the visualization is not given. This is evidenced by Table 6. Third, source coupling is also the case. There is no markedly different network visualization, but the rankings can be seen in Table 6. Fourth, in the organizational coupling, the network visualization is similar, as seen in the ranking table in Table 7. Fifth, the country coupling shows significant differences. Although it is considered consistent with the top three countries, it turns out that there are differences in the visualization network (in Figure 11) and a slightly different ranking in Table 8.

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Figure 10. (Left) Full counting document coupling (Right) Fractional counting document coupling

Table 4. Ranking bibliographic coupling document

Rank		Author	No. of Co-Authorship Author strength link	
Full	**Frac**		**Full**	**Frac**
1	1	Haider, j (2019)	175	65.31
2	2	Agarwal n.k (2018)	146	63.00
3	3	Zitt, m (2019)	125	62.00
4	6	Cleverley, p.h (2017)	116	43.00
5	17	Salam, m (2020)	91	30.00
6	28	Al-adwan a.s (2021)	89	25.00
7	4	Wang, x (2018)	89	45.00
8	61	Coskun-setirek a.(2017)	80	18.00
9	26	Potnis (2018)	78	26.00
10	7	Hepp, a (2019)	75	43.00

Table 5. Ranking bibliographic coupling author

Rank		Author	No. of Co-Authorship Author strength link	
Full	**Frac**		**Full**	**Frac**
1	1	Mckay, D.	635	409.59
2	2	Buchanan, G.	634	408.59
3	3	Chen, Y.	214	172.00
4	5	Li, J.	167	127.00
5	4	Wang, M.	159	145.00
6	6	Zhang, X	136	118.00
7	7	Mirzabeigi, M	134	113.00
8	8	Sotudeh, H.	131	112.00
9	9	Liu, X	88	81.00
10	10	Zhang, Y	12	8.33

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Table 6. Ranking bibliographic coupling source

Rank		Author	No. of Co-Authorship Author strength link	
Full	Frac		Full	Frac
1	1	Lecture notes in computer...	942	451.00
2	2	Journal of documentation	778	361.54
3	3	Journal of the association ...	773	329.54
4	5	Scientometrics	589	246.44
5	4	Journal of librarianship an...	567	267.52
6	6	Library hi tech	483	203.14
7	7	Journal of academic librar...	467	195.03
8	8	Electronic library	398	181.73
9	9	Aslib journal of information...	368	174.50
10	10	Library and information sc...	322	141.27

Table 7. Ranking bibliographic coupling organization

Rank		Author	No. of Co-Authorship Author strength link	
Full	Frac		Full	Frac
1	1	Faculty of computing and...	34	25.00
2	2	School information manag...	31	22.00
3	5	Information school, univer...	6	4.00
4	7	School of information man...	6	4.00
5	3	School information studies...	6	5.00
6	6	Pratt instituteny, united sta...	5	4.00
7	9	University of washington, ...	5	3.00
8	4	Departemen of electrical...	4	4.00
9	10	Departement of informati...	3	1.00
10	8	Texas a&m international...	3	3.00

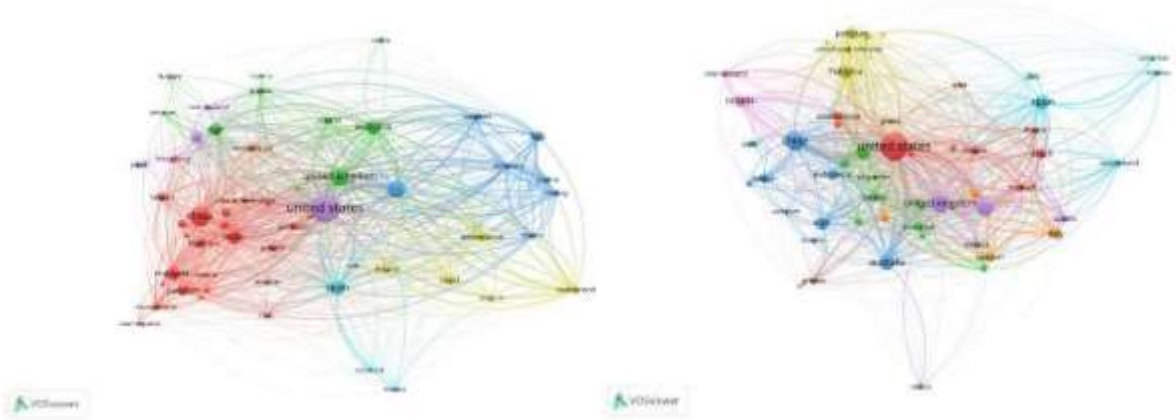

Figure 11. (Left) Full counting country coupling (Right) Fractional counting country coupling

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Table 8. Ranking bibliographic coupling country

Rank		Author	No. of Co-Authorship Author strength link	
Full	Frac		Full	Frac
1	1	Faculty of computing and...	34	25.00
2	2	School information manag...	31	22.00
3	5	Information school, univer...	6	4.00
4	7	School of information man...	6	4.00
5	3	School information studies...	6	5.00
6	6	Pratt instituteny, united sta...	5	4.00
7	9	University of washington, ...	5	3.00
8	4	Departemen of electrical...	4	4.00
9	10	Departement of informati...	3	1.00
10	8	Texas a&m international...	3	3.00

3.3 Development of AI in Librarianship System in five years

After knowing the trend and distribution, AI is stated to remain the most exciting topic, especially with digital libraries in the discussion of the librarian system. The librarianship system consists of library automation, library integration systems, information technology, information retrieval, information resource management, electronic information sources, and online information services can be discussed simultaneously with AI as a tool (Bhukuvhani et al., 2012; Bibo, 2014; Fei, 2011). For example, information retrieval (Bailey C. W. 1991). Then, recently the discussion of AI in 2020-2021 has been very intense with Covid-19 as a pandemic that has hit for the last two years (Hamidah et al., 2020; Yu et al., 2020). However, AI in librarianship systems emphasizes the use and practice of library management, such as educational materials in data mining and machine learning so that it allows these keywords to increase the topic of research, especially in the last few years (Baek & Doleck, 2020; Jordan & Mitchell, 2015).

As countries with a higher frequency of digital media use, the United States, Britain, Germany, and China provide more AI publications to the librarian system, both organizationally and with related authors. We can see that even though from full and fractional differences, their Coupling Country visualization looks very different (see figure 11), these countries are consistent in the ranking of network strength. Neither Scopus nor the VOSViewer Biblio coupling gives different results by source and author. For example, in the first position, Coupling Source by Lecture Notes in Computer Science, including the subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics, and coupling author.

3.4 Comparison of the results of full counting and fractional counting

The approach taken, Co-Authorship, Co-Occurrence, and Bibliographic Coupling, were tested to find the most significant differences. As a result, this difference affects the bibliographic coupling. The difference between these two calculations (Perianes-Rodriguez et al., 2016). However, this article is more about ranking. For example, document coupling indicates it is in eighth place in the counting but 61st in fractional (Coskun-Setirek & Mardikyan, 2017; Vaz & Arsanjani, 2015). Then, the difference is more visible in the clutch of countries such as China which ranks 6th in total and 3rd in fractions. Overall, the rankings of these comparisons remained consistent in their first to second order.

According to the experiment of this article, the comparison cannot be absolute in every approach. Some still look the same as Co-Occurrence keyword author and Co-Authorship. This

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comparison is too challenging to solve. The fractional and full have advantages and disadvantages. For example, fractional is weak against bibliographic coupling and inconsistent with changes, while complete is prone to not understanding and errors in analyzing (Perianes-Rodriguez et al., 2016). However, they also suggest that either of these two calculations can be used, depending on the analysis's point of view and needs.

4. CONCLUSION

AI analysis in the librarian system is no longer foreign. Its development is enormous and increasing. However, AI is used as a management and learning tool. Recently, Covid-19 has become a trend and has something to do with AI because of the growing need for analysis—the pandemic. Likewise, in the next few years, AI in librarian systems such as machine learning and Digital Libraries can continue to trend in the future.

Then, both calculation analysis uses VOSViewer, Full and Fractional. This depends on the preferences of each examination. On the other hand, this comparative study is likely to be done and become new research with new perspectives that can be combined.

5. REFERENCES

Baek, C., & Doleck, T. (2020). A bibliometric analysis of the papers published in the Journal of artificial intelligence in education from 2015-2019. *iJAI: International Journal of Learning Analytics and Artificial Intelligence for Education, 2*(1), 67-84.

Bailey, C. W. (1991). Intelligent library systems: Artificial intelligence technology and library automation systems. *Advance in Library Automation and Networking, 4*, 1-19.

Batagelj, V. & Cerinsˇek, M. (2013). On bibliographic networks. *Scientometrics*, *96*, 845-864.

Bhukuvhani, C., Chiparausha, B., & Zuvalinyenga, D. (2012). Effects of electronic information resources skills training for lecturers on pedagogical practices and research productivity. *International Journal of Education and Development Using ICT*, *8*(1), 16-28.

Bibo, L. (2014). Overtures to reducing romanian ministry of national defense tenuity in information resource management. *Journal of Defense Resources Management*, *5*(2), 89-98.

Biscaro, C., & Giupponi, C. (2014). Co-authorship and bibliographic coupling network effects on citations. *PloS one*, *9*(6), 1-12.

Brookes, B. C. (1969). Bradford's law and the bibliography of science. *Nature*, 224, 953- 956.

Coskun-Setirek, A., & Mardikyan, S. (2017). Understanding the adoption of voice activated personal assistants. *International Journal of E-Services and Mobile Applications (IJESMA)*, *9*(3), 1-21.

Doshi-Velez, F., & Kim, B. (2017). Towards a rigorous science of interpretable machine learning. *arXiv preprint arXiv:1702.08608.*

Efendi, T. F., & Krisanty, M. (2020). Warehouse data system analysis PT. Kanaan Global Indonesia. *International Journal of Computer and Information System (IJCIS)*, *1*(3), 70-73.

Fei, X. (2011). A standard procedure for bradford analysis and its application to the periodical literature in systems librarianship. *Library Hi Tech*, *29*(4), 751-763.

DOI: https://doi.org/10.17509/edulib.v12i1.42622
p- ISSN 2089-6549 e- ISSN 2528-2182

George, G., Haas, M. R., & Pentland, A. (2014). Big data and management. *Academy of management Journal*, *57*(2), 321-326.

Haddow, G. (2015). Research classification and the social sciences and humanities in Australia:(Mis) Matching organizational unit contribution and the impact of collaboration. *Research Evaluation*, *24*(3), 325-339.

Hamidah, I., Sriyono., Hudha, M, N. (2020). A Bibliometric Analysis of Covid-19 Research using VOSViewer*. Indonesia Journal of Science & Technology, 5*(2), 209-216.

Jordan, M. I., & Mitchell, T. M. (2015). Machine learning: Trends, perspectives, and prospects. *Science, 349*(6245), 255-260.

Kamar, E. (2016). Directions in hybrid intelligence: Complementing AI systems with human intelligence. *Proceedings of the Twenty-Fifth International Joint Conference on Artificial Intelligence* (*IJCAI),* 4070-4073.

Klapka, O., & Slaby, A. (2018, September). Visual analysis of search results in scopus database. *International Conference on Theory and Practice of Digital Libraries,* 340-343.

Kobayashi, Y., Kato, A., Watanabe, H., Hoshi, T., Kawamura, K., & Fujie, M. G. (2012). Modeling of viscoelastic and nonlinear material properties of liver tissue using fractional calculations. *Journal of Biomechanical Science and Engineering*, *7*(2), 177-187.

Koc-Michalska, K., Lilleker, D. G., & Vedel, T. (2016). Civic political engagement and social change in the new digital age. *New Media & Society*, *18*(9), 1807-1816.

Cox, A. M., Pinfield, S., & Rutter, S. (2018). The intelligent library thought leaders' views in the likely impact of artificial intelligence on academic libraries. *Library Hi Tech*, *37*(3), 418-435.

Massis, B. (2018). Artificial intelligence arrives in the library. *Information and Learning Science*, *119*(7/8), 456-459.

Munoz, D. A., Queupil, J. P., & Fraser, P. (2016). Assessing collaboration networks in educational research: A co-authorship-based social network analysis approach. *International Journal of Educational Management, 30*(3), 76-99.

Nager, A., & Atkinson, R. D. (2016). The case for improving US computer science education. *ITIF: International Technology & Innovation Foundation,* 1-38.

Neary, M. A., & Chen, S. X. (2017). Artificial intelligence: legal research and law librarians. *AALL Spectrum*, *21*(5), 15-20.

Ntoutsi, E., Fafalios, P., Gadiraju, U., Iosifidis, V., Nejdl, W., Vidal, M. E., & Staab, S. (2020). Bias in data-driven artificial intelligence systems—An introductory survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, *10*(3), 1-14.

Perianes-Rodriguez, A; Waltman, L; van Eck, NJ. (2016). Construction bibliometric network: A Comparison between full and fractional counting. *Journal of Informetrics 10*(4), 1178-1195.

Sonntag, D. (2019). Artificial intelligence in medicine-the wrong track or promise of cure? *HNO*, *67*(5), 343-349.

DOI: https://doi.org/10.17509/edulib.v12i1.42622
p- ISSN 2089-6549 e- ISSN 2528-2182

Stavros, J. M., Godwin, L. N., & Cooperrider, D. L. (2015). Appreciative inquiry: Organization development and the strengths revolution. *Practicing organization development: Leading transformation and change*, (pp. 96-116). John Wiley and Sons.

Uddin, S., Hossain, L., Abbasi, A., & Rasmussen, K. (2012). Trend and efficiency analysis of co-authorship network. *Scientometrics*, *90*(2), 687-699.

Xie, L., Chen, Z., Wang, H., Zheng, C., & Jiang, J. (2020). Bibliometric and visualized analysis of scientific publications on atlantoaxial spine surgery based on Web of Science and VOSviewer. *World neurosurgery, 137*, 435-442.

van Eck, N. J., & Waltman, L. (2019). *Vosviewer manual*. Universiteit Leiden. https://www.vosviewer.com/documentation/Manual_VOSviewer_1.6.10.pdf

Vaz, E., & Arsanjani, J. J. (2015). Predicting urban growth of the greater Toronto area-coupling a markov cellular automata with document meta-analysis. *Journal of Environmental Informatics*, *25*(2), 71-80.

Yu, Y., Li, Y., Zhang, Z., Gu, Z., Zhong, H., Zha, Q., Yang, L., Zhu, C., & Chen, E. (2020). A bibliometric analysis using VOSviewer of publications on COVID-19. *Annals of translational medicine*, *8*(13), 1-11.

Yan, E., & Ding, Y. (2012). Scholarly network similarities: How bibliographic coupling networks, citation networks, cocitation networks, topical networks, coauthorship networks, and coword networks relate to each other. *Journal of the American Society for Information Science and Technology*, *63*(7), 1313-1326.

Zheng, Z., Zhu, J., & Lyu, M. R. (2013, June). Service-generated big data and big data-as-a-service: an overview. *2013 IEEE international congress on Big Data,* 403-410.

DOI: https://doi.org/10.17509/edulib.v12i1.42622
p- ISSN 2089-6549 e- ISSN 2528-2182