

Bibliography and Co-Authorship

Course: Social Network Analysis

Software: VOS-Viewer

Submitted To: DR. Waheed Anwar

Submitted By: M. Arham

Roll no: 1125



The Islamia University of Bahawalpur
Department of Computer Science

VOS viewer Report

Artificial Intelligence in Marketing: Topic Modeling, Scientometric Analysis, and Research Agenda

Abstract:

Today, artificial intelligence (AI) is becoming increasingly important in both industry and academics. To investigate AI in marketing, the authors have used bibliometric study, social network analysis (SNA), main path analysis, and content analysis to examine the top authors, top most cited articles, and top milestone papers from the 965 records. Bibliometric study identified leading authors, documents, universities, countries, and sources of these articles. By using SNA, they spotted an academic social network of crucial publications. Moreover, they recognized 965 articles that constitute the main knowledge flow in AI marketing through main path analysis. Finally, they discussed future directions based on the findings. The study is one among a few studies that have used bibliometric analysis methods to analyze and visualize the citation network of the AI-marketing interface.

1: Introduction

Marketing is a complex decision-making discipline that involves not only the commonly known 4Ps (product, price, promotion, and place) but also strategic issues such as new product development (NPD), customer relationship management (CRM), selling strategies, market segmentation, positioning and targeting, international marketing, marketing research, etc. With the ever-increasing amount and importance of “big data,” now scholars are interested in whether appropriate decision-making technologies can solve marketing problems. Artificial intelligence (AI), which refers to machines and software that exhibit human intelligence, can provide great opportunities to facilitate decision-making in marketing. The existence of AI could be traced back to 1955 when John McCarthy coined the term Artificial Intelligence. In his work, AI was defined as “making a machine behave in ways that would be called intelligent, if a human were so behaving”.

Recently, as an application of digital marketing tools, artificial intelligence (AI) has been actively catching people’s attention. Generally, AI is relevant to any intellectual task. There are many applications in the business world. Banks use artificial intelligence systems to organize operations, maintain investments in stocks, detect fraud, and manage. AI tools make

individualized pricing easy to achieve through estimating individualized demand and supply curves. Using AI tools, marketers can now track customers' digital footprints to predict their general online behaviors and target them with personalized promotions and products. Recently, the applications of personality computing AI tools have been used to reduce the cost of advertising campaigns because it adds psychological targeting to traditional behavioral targeting. AI is still a relatively new research stream, and there is a limited number of publications presenting artificial intelligence applications in marketing.

2: Data and Methods

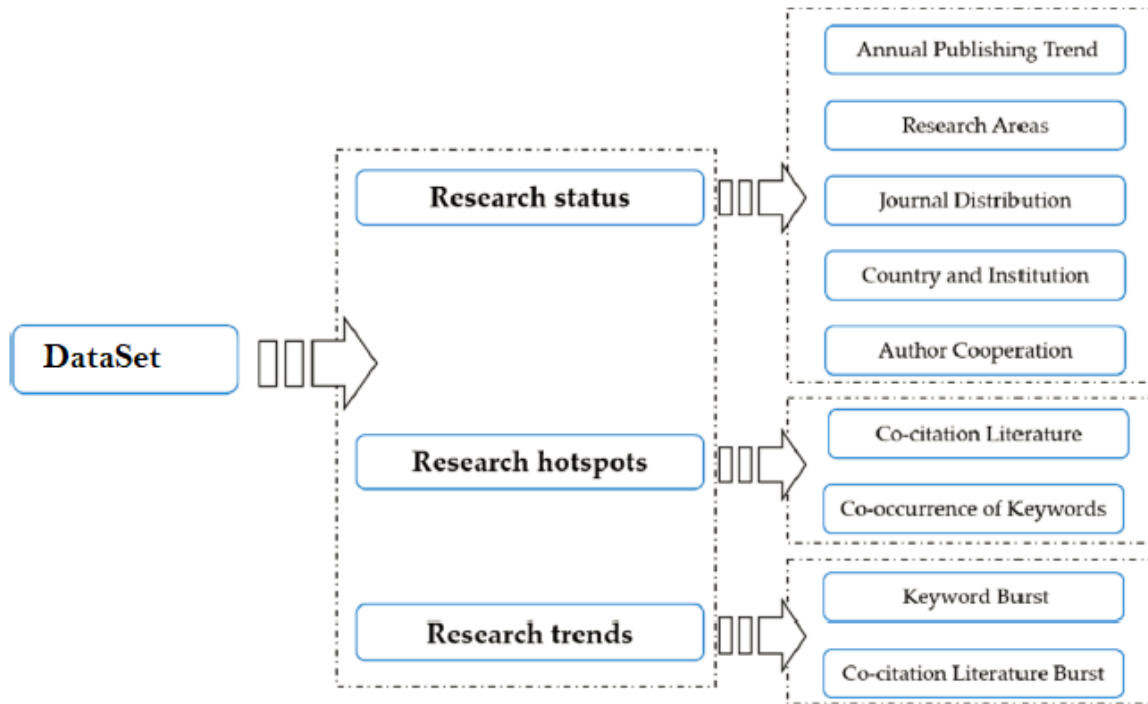
2.1: Data Sources

The Web of Science (WOS) is published by Thomson Reuters and is an interdisciplinary database with records from several bibliographic databases, among them Science Citation Index Expanded (SCI-EXPANDED) and Social Sciences Citation Index (SSCI). SCI-EXPANDED includes records from most of the medical disciplines. SSCI coverage includes public health, psychology, and psychiatry. The Web of Science contains records of publications from 1900 to the present. The web of sciences is an information retrieval platform. WoS keeps a details record of all aspects of the publications of the paper. Many scholars and researchers used the WoS database as the data source bibliometric and analysis of the literature. Therefore, to ensure the accuracy and reliability of the data, this report used publications in the Web of sciences core collection database as the sample data source to analyze the field of Artificial Intelligence (AI) in Marketing. The retrieval the information strategy was follows: “AI” OR “artificial intelligence” OR “machine learning” OR “robot” OR “automation” OR “big data” OR “neural network” OR “text mining” OR “natural language processing” OR “data mining” OR “soft computing” OR “fuzzy logic” OR “biometrics” OR “geotagging” OR “wearable*” OR “IoT” OR “internet of things” OR “algorithm” OR “deep learning” OR “intelligent automation” OR “ML” OR “intelligent agents” OR “LDA” OR “unsupervised learning” OR “topic model”AND”marketing” OR “service” OR “retailing” OR “consumer” OR “end user” OR “client” OR “customer”). A **total of 1200** effective publications were retrieved and the retrieval results were saved and output in text format, each document contained author, institution, keywords, abstract, date and other information.

Artificial Intelligence in Marketing	WOS categories
“AI” OR “artificial intelligence” OR “machine learning” OR “robot” OR “automation” OR “big data” OR “neural network” OR “text mining” OR “natural language processing” OR “data mining” OR “soft computing” OR “fuzzy logic” OR “biometrics” OR “geotagging” OR “wearable*” OR “IoT” OR “internet of things” OR “algorithm” OR “deep learning” OR “intelligent automation” OR “ML” OR “intelligent agents” OR “LDA” OR “unsupervised learning” OR “topic model”AND”marketing” OR “service” OR “retailing” OR “consumer” OR “end user” OR “client” OR “customer”)	<ul style="list-style-type: none"> • Computer Science, Information Systems • Computer Science, Artificial Intelligence
Abstract, Title, Keywords	1200 Articles Found

2.2: Analysis Tools

To achieve our objectives, we combined the traditional statistical method and scientific knowledge mapping tool VOS Viewer to describe the research status. VOS Viewer is a data visualization software developed by **Nees Jan van Eck and Ludo Waltman** at Leiden University's Centre for Science and Technology Studies (CWTS)., which is widely used in many fields such as science, information and bibliometric. It could visualize the location and size of nodes in the knowledge network. In this report, the software was used to analyze the knowledge base, research hotspots and development context by using the modules of bibliography country. The software was used to analyze the AI in Marketing research field visually and draw the corresponding knowledge map. The parameters were as follows: Node Type: Selection based on analysis; Time Period: 2000-2022; Time Slice Length = 1; Threshold Selection Criteria: Top 25 per slice; others were default settings. In the cluster graph, the silhouette value was used to measure the homogeneity of the network. The closer to 1, the higher homogeneity of the network was, and the value above 0.5 indicates that the cluster result was reasonable. Meanwhile, the color and size of each node represented different years and the number of citations, which were used to represent the citation history of the literature since its publication.



Research framework.

1. Analysis:

1.1 Co-author analysis (Countries)

AI growth has become an important factor in the development of countries around the world. By utilizing artificial intelligence, countries have been able to improve their economic progress in unprecedented ways. From a financial perspective, AI technology has enabled companies to automate processes, optimize resources, and scale their operations in a more efficient manner. Consequently, it becomes essential to objectively evaluate the AI advancement. Currently, 78 countries and regions have made a major contribution to knowledge transfer research in the decade from 2000 to 2022. In this section, I considered analyzing the most productive and influential countries of AI in computer graphics.

Figure 1 presents the results of the top 34 countries and regions publishing in knowledge transfer research. The ranking is based on the number of publications.

Create Map



Choose thresholds

Minimum number of documents of a country:

Minimum number of citations of a country: ?

Of the 78 countries, 34 meet the thresholds.


Create Map



Verify selected countries

Selected	Country	Documents	Citations	Total link strength
<input checked="" type="checkbox"/>	peoples r china	357	3143	158
<input checked="" type="checkbox"/>	usa	134	3235	106
<input checked="" type="checkbox"/>	england	45	596	52
<input checked="" type="checkbox"/>	australia	35	473	43
<input checked="" type="checkbox"/>	south korea	104	787	37
<input checked="" type="checkbox"/>	canada	34	552	36
<input checked="" type="checkbox"/>	italy	31	504	34
<input checked="" type="checkbox"/>	taiwan	77	1337	34
<input checked="" type="checkbox"/>	india	66	440	31
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<input checked="" type="checkbox"/>	japan	30	313	25
<input checked="" type="checkbox"/>	germany	32	302	24
<input checked="" type="checkbox"/>	saudi arabia	37	241	24
<input checked="" type="checkbox"/>	singapore	18	398	20
<input checked="" type="checkbox"/>	belgium	11	207	16
<input checked="" type="checkbox"/>	malaysia	16	230	15
<input checked="" type="checkbox"/>	netherlands	8	59	15
<input checked="" type="checkbox"/>	u arab emirates	12	80	14

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Selected	Country	Documents	Citations	Total link strength ▼
<input checked="" type="checkbox"/>	germany	11	11	11
<input checked="" type="checkbox"/>	saudi arabia	37	241	24
<input checked="" type="checkbox"/>	singapore	18	398	20
<input checked="" type="checkbox"/>	belgium	11	207	16
<input checked="" type="checkbox"/>	malaysia	16	230	15
<input checked="" type="checkbox"/>	netherlands	8	59	15
<input checked="" type="checkbox"/>	u arab emirates	12	80	14
<input checked="" type="checkbox"/>	greece	12	91	13
<input checked="" type="checkbox"/>	poland	11	62	13
<input checked="" type="checkbox"/>	iran	37	382	12
<input checked="" type="checkbox"/>	ireland	5	43	11
<input checked="" type="checkbox"/>	portugal	9	523	11
<input checked="" type="checkbox"/>	brazil	10	86	10
<input checked="" type="checkbox"/>	sweden	11	296	10
<input checked="" type="checkbox"/>	egypt	7	93	8
<input checked="" type="checkbox"/>	vietnam	5	14	7
<input checked="" type="checkbox"/>	finland	7	60	6
<input checked="" type="checkbox"/>	turkey	10	134	5
<input checked="" type="checkbox"/>	mexico	5	46	2
<input checked="" type="checkbox"/>	serbia	5	32	2
<input checked="" type="checkbox"/>	switzerland	6	123	0

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Figure 3: 34 countries Table

As seen in this Figure, China leads the paper with 357 publications while other countries such as England have 45 and USA have 134 respectively. Additionally, the table provides an overview of each country's publication citations along with its corresponding link strength.

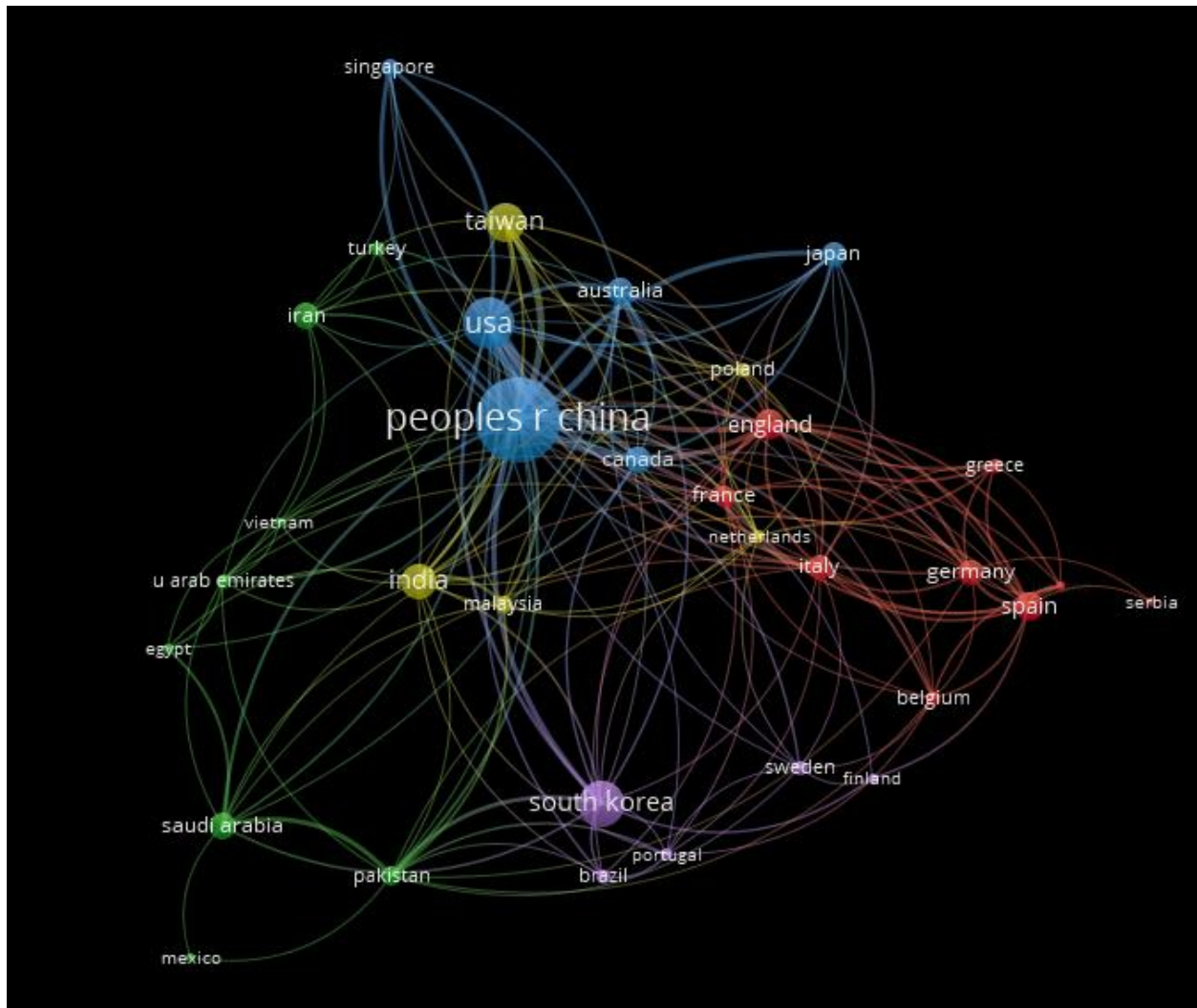



Figure 2: Network Graph of Most Country Publications

1.2 Co-author analysis (authors)

Co-author analysis is the study of collaborations between authors such as publications, papers, citations and research journals. Through this method, we can gain greater understanding into the relationships between collaborators and how they impact their respective fields. VOS has enabled me to assess the co-author collaboration across different authors, countries and research communities by analyzing two properties: author and country. With this tool, I was able to uncover a wealth of valuable insights about my data that would have been difficult or impossible without it.

By running co-author query using VOSviewer, I found total 3349 authors, I discovered that 19 met the criteria for collaborative co-authorship. These findings are both represented in a table and graphically displayed via a network graph.

Create Map ×

 **Verify selected authors**

Selected	Author	Documents	Citations	Total link strength ▼
<input checked="" type="checkbox"/>	cheng, bo	5	96	5
<input checked="" type="checkbox"/>	zhao, shuai	4	95	5
<input checked="" type="checkbox"/>	zhang, yang	4	17	4
<input checked="" type="checkbox"/>	li, xi	4	72	3
<input checked="" type="checkbox"/>	dou, wanchun	4	73	2
<input checked="" type="checkbox"/>	guo, shaoyong	4	34	2
<input checked="" type="checkbox"/>	qi, lianyong	4	93	2
<input checked="" type="checkbox"/>	qiu, xuesong	4	25	2
<input checked="" type="checkbox"/>	xu, xiaolong	4	78	2
<input checked="" type="checkbox"/>	yu, qi	4	120	1
<input checked="" type="checkbox"/>	dahan, fadl	5	33	0
<input checked="" type="checkbox"/>	hu, jingjing	4	22	0
<input checked="" type="checkbox"/>	jia, bing	4	23	0
<input checked="" type="checkbox"/>	wang, tian	4	288	0
<input checked="" type="checkbox"/>	wang, wei	4	53	0
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<input checked="" type="checkbox"/>	yang, kun	4	31	0
<input checked="" type="checkbox"/>	zhang, lei	4	3	0
<input checked="" type="checkbox"/>	zhang, yiwen	4	45	0

Figure 3: Author Collaborations Table

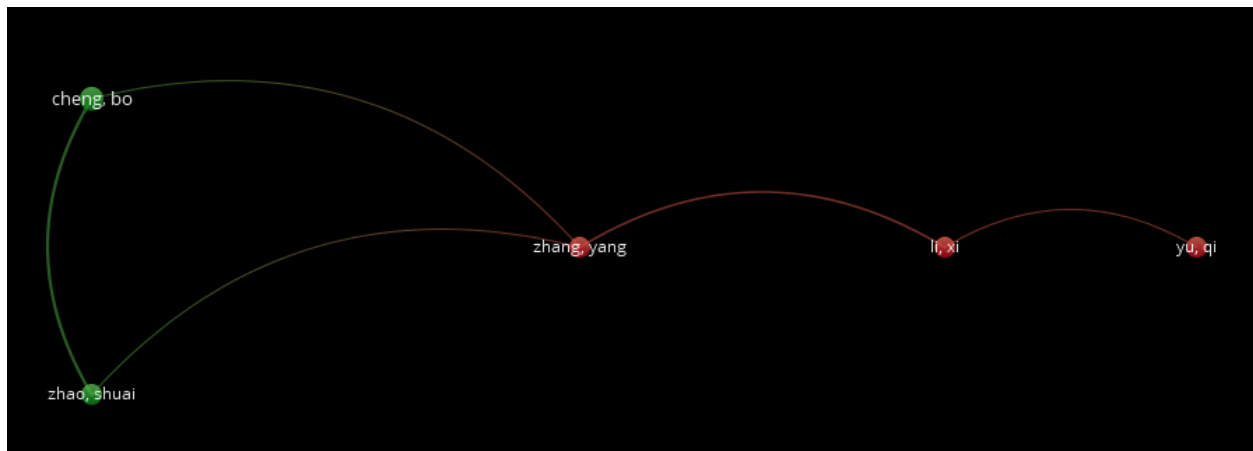


Figure 4: Author Collaborations Graph


I ran a co-author analysis between authors and discovered 78 collaborative countries. Afterward, I conducted an in-depth query of country collaborations to determine the total number of countries that collaborated on research papers on Artificial Intelligence in Marketing: 78 countries found in total and 34 meet the criteria for collaboration with other countries.

1.3 Bibliography analysis (authors)

Bibliography analysis is the study of collaborations between authors such as publications, papers, citations and research journals. Through this method, we can gain greater understanding into the relationships between collaborators and how they impact their respective fields. VOS has enabled me to assess the co-author collaboration across different authors, countries and research communities by analyzing two properties: author and country. With this tool, I was able to uncover a wealth of valuable insights about my data that would have been difficult or impossible without it.

By running Bibliography query using VOSviewer, I found total 3349 authors, I discovered that 19 met the criteria for collaborative co-authorship. These findings are both represented in a table and graphically displayed via a network graph.

Create Map ×

 **Verify selected authors**

Selected	Author	Documents	Citations	Total link strength ▼
<input checked="" type="checkbox"/>	zhang, yang	4	17	213
<input checked="" type="checkbox"/>	cheng, bo	5	96	198
<input checked="" type="checkbox"/>	li, xi	4	72	194
<input checked="" type="checkbox"/>	zhao, shuai	4	95	183
<input checked="" type="checkbox"/>	qiu, xuesong	4	25	96
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<input checked="" type="checkbox"/>	zhang, yiwen	4	45	47
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<input checked="" type="checkbox"/>	wang, tian	4	288	14
<input checked="" type="checkbox"/>	yang, kun	4	31	11
<input checked="" type="checkbox"/>	zhang, lei	4	3	10
<input checked="" type="checkbox"/>	jia, bing	4	23	5
<input checked="" type="checkbox"/>	wu, dapeng	4	84	4
<input checked="" type="checkbox"/>	wang, wei	4	53	3

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Figure 5: Author Collaborations Table

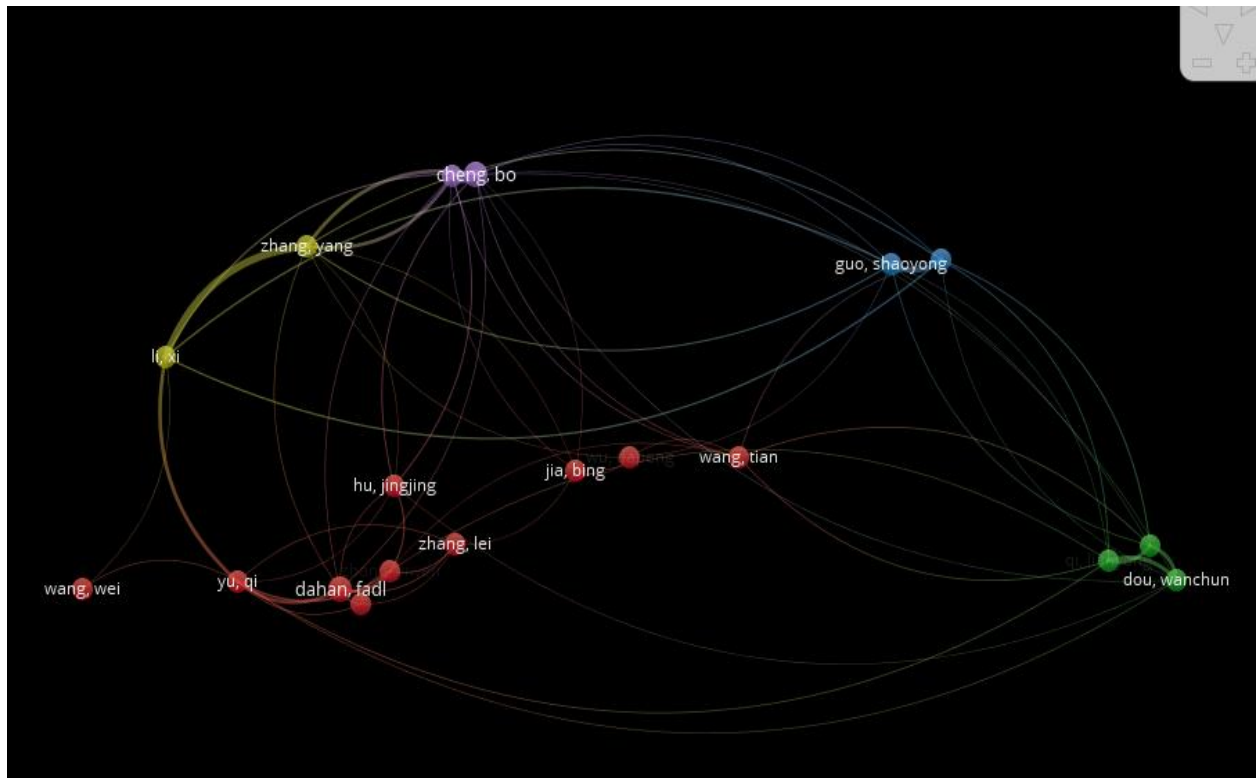


Figure 6: Author Collaborations Graph

1.1 Bibliography analysis (Countries)

By running Bibliography query using VOSviewer, I found total 78 countries, I discovered that 35 met the criteria for collaborative. These findings are both represented in a table and graphically displayed via a network graph and table.



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Selected	Country	Documents	Citations	Total link strength ▼
<input checked="" type="checkbox"/>	peoples r china	357	3143	13555
<input checked="" type="checkbox"/>	usa	134	3235	8017
<input checked="" type="checkbox"/>	south korea	104	787	3956
<input checked="" type="checkbox"/>	england	45	596	3586
<input checked="" type="checkbox"/>	taiwan	77	1337	3293
<input checked="" type="checkbox"/>	saudi arabia	37	241	2919
<input checked="" type="checkbox"/>	australia	35	473	2683
<input checked="" type="checkbox"/>	italy	31	504	2458
<input checked="" type="checkbox"/>	india	66	440	2432
<input checked="" type="checkbox"/>	pakistan	21	144	2280
<input checked="" type="checkbox"/>	spain	42	480	2047
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<input checked="" type="checkbox"/>	france	23	931	1843
<input checked="" type="checkbox"/>	germany	32	302	1636
<input checked="" type="checkbox"/>	japan	30	313	1241
<input checked="" type="checkbox"/>	singapore	18	398	1109
<input checked="" type="checkbox"/>	greece	12	91	960
<input checked="" type="checkbox"/>	malaysia	16	230	921
<input checked="" type="checkbox"/>	portugal	9	523	900
<input checked="" type="checkbox"/>	uk	48	86	884

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Verify selected countries

Selected	Country	Documents	Citations	Total link strength ▼
<input checked="" type="checkbox"/>	japan	30	313	1241
<input checked="" type="checkbox"/>	singapore	18	398	1109
<input checked="" type="checkbox"/>	greece	12	91	960
<input checked="" type="checkbox"/>	malaysia	16	230	921
<input checked="" type="checkbox"/>	portugal	9	523	900
<input checked="" type="checkbox"/>	brazil	10	86	821
<input checked="" type="checkbox"/>	yemen	5	4	751
<input checked="" type="checkbox"/>	belgium	11	207	745
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<input checked="" type="checkbox"/>	ireland	5	43	676
<input checked="" type="checkbox"/>	turkey	10	134	605
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<input checked="" type="checkbox"/>	mexico	5	46	349
<input checked="" type="checkbox"/>	finland	7	60	271
<input checked="" type="checkbox"/>	serbia	5	32	236
<input checked="" type="checkbox"/>	switzerland	6	123	66

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Figure 7: Countries Collaborations Table

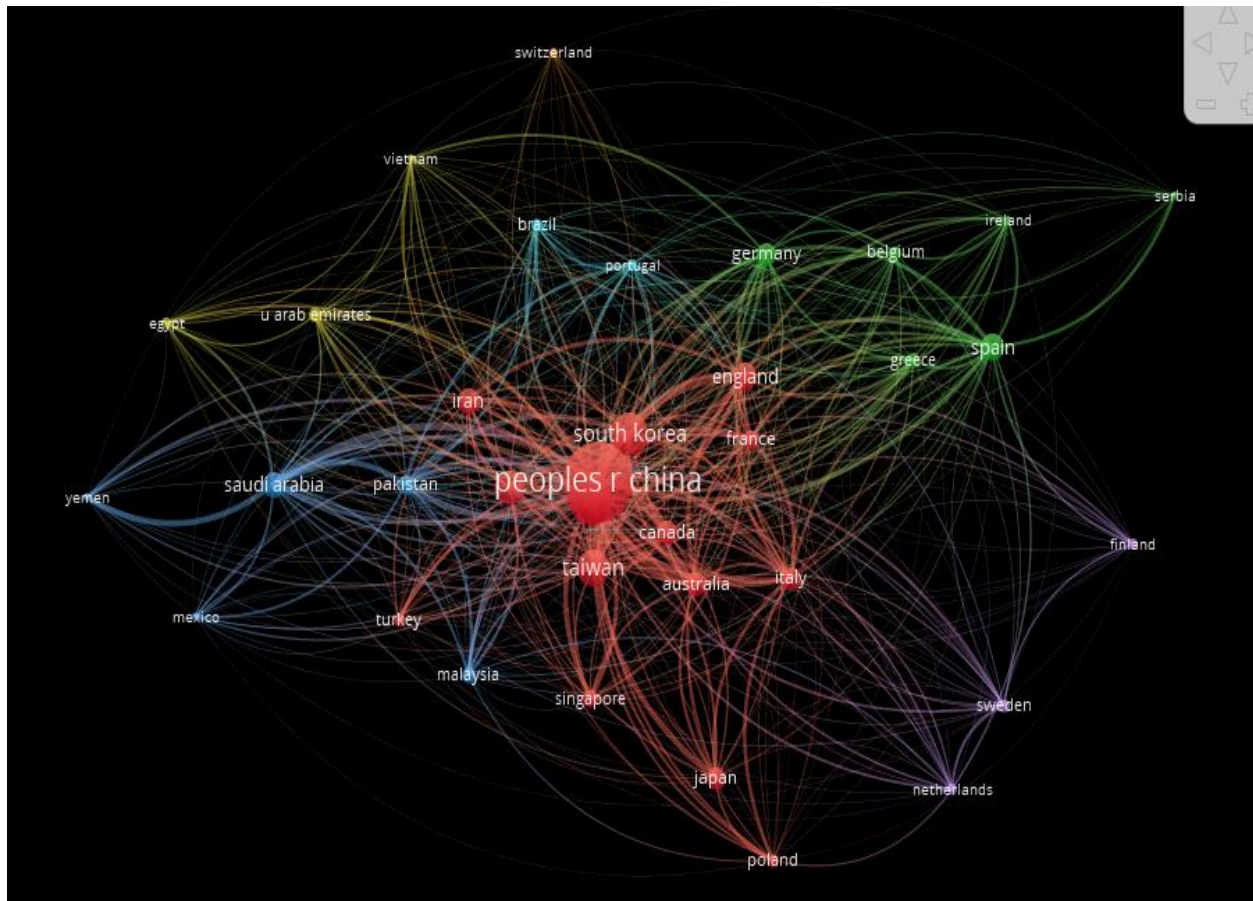


Figure 8: Countries Collaborations Graph

2. Conclusion

To complete my report writing on VOSviewer, I utilized a variety of analysis techniques such as Keyword, Author and Country Collaborations. Furthermore, there are numerous other analyses that can be conducted with this tool in the future.

As a researcher and academic, I am always looking to utilize the latest tools and techniques that can help me analyze and better understand my data. VOSviewer is one such tool that has helped me gain valuable insights into several of my research projects.

With VOSviewer, I was able to conduct a variety of analyses including Keyword, Author, and Country Collaborations. This tool allowed me to identify important trends and patterns in my data, which helped me better understand the relationships between different concepts.