A Fake News Knowledge Network Research: Based on Social Network Analysis

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Abstract

This study aims to investigate the literature on fake news, utilizing bibliometric analysis and social network analysis to construct a knowledge network of the literature related to fake news. To understand the recent developments and trends of this topic, we used keywords to search on the Web of Science database to collect relevant literature on fake news published in the past five years. We selected the top 80 ranked papers based on citation counts and screened the collected papers, resulting in a final sample of 70 papers. Social network analysis was conducted on the keywords and the country affiliations of the publishing institutions using UCINET, to construct keyword and country networks for identifying 1) the important issues in fake news literature, 2) the extent and importance of countries' involvement in fake news research and 3) constructing the knowledge network of recent fake news issues, which could serve scholars as a reference for future research.

Keywords: Fake news, misinformation, social network analysis, social network, knowledge network

1. Introduction

Due to the rapid dissemination of information in modern times, unrestricted by any media, everyone can generate and publish messages. The booming social media platforms and their astonishing propagation speed have further accelerated the spread of fake news, making social media the primary way of spreading false information (Nic et al., 2018). Misleading, harmful, and infectious fake news can appear in any field and be spread by people, negatively affecting public opinion and decision-making, and potentially causing social panic and disrupting social stability. Currently, most scholars focus on fake news detection and identification, and people's behavior and intentions in the face of fake news. Although some scholars use Social Network Analysis (SNA) to help identify the propagation path of fake news content (Sivasankari & Vadivu, 2021), few studies focus on constructing knowledge networks for fake news research. The research questions of this study are: 1) What are the most important topics in recent fake news research? and 2) What are the most involved countries in recent fake news research? To answer these research questions, we collected recent fake news research and used social network analysis to find the hidden relationships between keywords and countries. We constructed a knowledge network of fake news research and presented the recent trends of the topic in a visualized manner which helps identify the key knowledge and information flow in fake news research, allowing researchers to better design and execute related studies in the future.

2. Literature Review

2.1 Fake News

Since the 2016 US Presidential election, the term "fake news" has been widely used and gradually become a hot topic. Many scholars have provided different definitions of fake news in their research. Gelfert (2018) proposed the first stipulative definition of fake news which captures most of its distinctive features: "Fake news is the deliberate presentation of (typically) false or misleading claims as news, where the claims are misleading by design." Anderau (2021) proposed a novel account of fake news with the following definition: "Fake news is misleading information intentionally published and presented as news which has the function of deliberately misleading its recipients about its status as news." There is currently no formal definition of fake news in existing research that all scholars agree with and adopt. We mostly define it as intentionally presenting false or misleading statements in a news-like manner to the public. Currently, most research in the field of fake news is primarily about fake news detection, identification of fake news, spread of fake news, fake news sharing, public's intentions towards fake news, and research review of fake news. Shu et al. (2017) provided an extensive overview of various fake news detection methods, categorizing them into distinct groupings based on a comprehensive review of the literature. Talwar et al. (2019) col-

lected 1022 social media users' data to investigate fake news sharing behavior on social media. The results suggest that online trust, self-disclosure, fear of missing out, and social media fatigue are positively associated with the behavior of sharing fake news while social comparison is negatively associated with it. Reuter et al. (2019) conducted an online survey to adults in Germany to investigate their attitudes and perceptions toward fake news. The results show that most participants perceive fake news as a threat and harmful to democracy. Zhao et al. (2020) tracked the databases of news on Weibo in China and Twitter in Japan, and established propagation networks to identify fake news at the early stages which helps prevent the fast propagation of fake news. Apuke and Omar (2021) used the Uses and Gratification framework in their survey research to find the most significant factors that predicted fake news sharing of COVID-19 among social media users. Batailler et al. (2022) demonstrated the value of signal detection theory (SDT) in providing more insights into the factors influencing belief in fake news.

2.2 Bibliometrics

Bibliometrics is the quantitative study of published units or their substitutes, it aims to quantitatively analyze various aspects of literature to reveal the historical development of literature and provide a statistical or quantitative description of the literature (Broadus, 1987). The Bibliometrics method has been utilized by scholars on fake news research in recent years. Wang (2020) applied bibliometrics method to provide insights into the development of research on fake news research published in 2019 and before. He explored the similarities and differences between each of the terms related to fake news, the frequency of usage of these terms in academic articles, the relationship between fake news articles and journals, and countries' contribution to the field of fake news. Zyoud and Al-Jabi (2020) explored the relevant research on fake news published from 2000 to 2018 and employed bibliometric analysis to analyze document types, countries, affiliations, collaboration patterns, journal names, and citation patterns to gain insights into the research landscape during the initial phase of the COVID-19 outbreak. The results highlighted the necessity for increased theoretical and methodological precision in the field of fake news research and suggested the need for more diverse and innovative research methods to gain a deeper comprehension of the complex phenomenon of fake news. Wang et al. (2022) applied bibliometric analysis to analyze disinformation publications published between 2002 and 2021 from Web of Science. The results found that the USA was the most influential country in the field, keywords such as "social media", "COVID-19", and "vaccination" have gained immense popularity recently, and most papers belong to interdisciplinary fields such as public health, computer science, engineering, and policy.

2.3 Social Network Analysis (SNA)

Social network analysis originated in the 1930s and was created by the social psychologist Jacob Levy Moreno. Initially, sociologists used it to explore relationships between groups and individuals (Scott, 1992). A Social network consists of nodes and links in which nodes represent individuals or teams, and links represent various types of relationships between nodes. It is a quantitative analysis method that provides mathematical and visual tools to analyze social networks' structure and property for investigating the relationships between nodes (Liu et al., 2009). Terms describing the network properties in SNA include density, diameter, degree, betweenness, closeness, etc. In past literature, many scholars have used social network analysis for building knowledge maps. For example, Liu et al. (2009) used SNA to identify key figures in an expert knowledge map where the identified figures were in favorable positions to facilitate knowledge sharing between team members and among teams. Dai et al. (2020) applied SNA to papers related to environmental crises published between 2005 and 2018 from the Web of Science database to construct the keyword network which identifies the main research topics in environmental crisis management and outlines the knowledge map of the field. Some scholars specifically applied the co-occurrence network of SNA to build the knowledge network to better understand the research context and development of a certain research field. For example, Lee and Su (2010) applied SNA to construct the country network, institutional network, author network, and keyword co-occurrence network to understand the research context of Regional Innovation Systems (RIS) at different scales. Jaewoo and Woonsun (2014) constructed a keyword co-occurrence network on papers authored by Korean researchers in the Journal of Educational Technology (JET) between 1985 and 2013 to identify themes and trends of Korean educational technology and predict future trends. Cheng et al. (2018) applied keyword co-occurrence and SNA to present the knowledge structure of the librarianship field by identifying the research hotspots, the research trends, the most productive countries, and the most productive authors of articles published in Library Hi Tech between 2006 and 2017. Khan et al. (2019) employed SNA to

investigate the knowledge structure of the PLS-SEM domain by constructing and analyzing author, institution, and country networks.

3. Research Methods and Design

3.1 Research Method

This study applies social network analysis to analyze fake news research. First, we used the Web of Science (WOS) database to export the data of papers related to fake news, including an Excel file. After cleaning the data in Excel, we transformed the processed data into 1-mode matrices from 2-mode matrices and conducted social network analysis using UCINET to construct keyword and country networks. The resulting network value and network graphs were then analyzed. The research schematic of this study is illustrated in Figure 1.

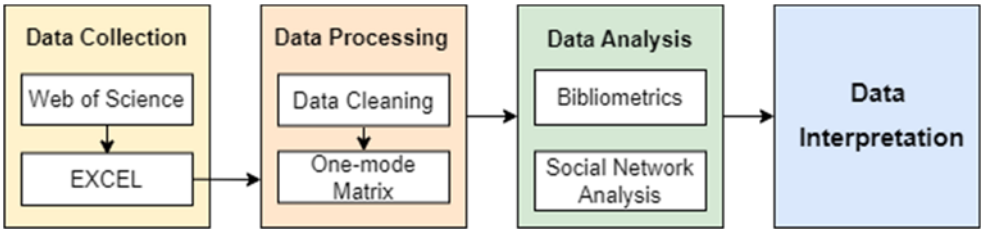

Figure 1: Research Schematic

3.2 Research Design

3.2.1 Data Collection

The data for this study were collected from the Web of Science (WOS) database. We entered the following literature retrieval keywords related to fake news defined by Wang (2020) in the title, keywords, and abstract fields on the WOS search engine to retrieve all papers from 01-01-2018 to 10-31-2022 in the database.

"fake news" OR "news satire" OR "yellow journalism" OR "junk news" OR "pseudo-news" OR "hoax news" OR "propaganda news" OR "advertorial" OR "false information" OR "fake information" OR "misinformation" OR "disinformation" OR "mal-information" OR "alternative fact"

We selected 80 papers in descending order based on the highest citation count and filtered out non-English content and papers without provided keywords, resulting in a final set of 70 papers. Social network analysis was then conducted on these 70 papers. We used UCINET to construct keyword and country networks. Keywords and countries were represented as nodes in keyword and country networks, and when two keywords/countries appeared in the same paper, a link was formed between them, then formed the keyword and country networks.

3.2.2 Data Processing

This study used Microsoft Excel as a tool for organizing fake news literature data. The data includes the publication date, title, keywords, countries, and authors of the literature. We retained the fields of article title, keywords, countries, and publication date from the literature to perform subsequent data analysis and processing. We will convert the keywords and countries into 1-mode matrices and import them into UCINET for data analysis. The processing methods are described below.

1. Keywords: Singular and plural keywords will be treated as the same keyword.
2. Country: The nationality of all authors will be used as the countries in the country network in this study.
3. mode matrix: The paper titles and keywords/countries will be entered into an Excel spreadsheet to form a 2-mode matrix, and a function in Excel will be used to convert the 2-mode matrix to a 1-mode matrix.
4. Import the 1-mode matrix data into UCINET for data analysis and social network construction.

3.2.3 Data Analysis

This study utilized bibliometrics and UCINET for analysis. Firstly, bibliometric measurement was used to determine the frequency of keywords in fake news literature, identifying the most influential keywords in fake news research. Additionally, the frequency of publication from countries and the total citation count of the literature for countries were measured to identify the most influential countries.

UCINET was used to construct keyword and country networks, visually displaying the relationships between data. The density (matrix average) of keyword and country networks was calculated to analyze the level of actual information exchange and the number of message exchanges between nodes. Network centralization was then analyzed to measure the degree of network structure centralization. Furthermore, degree centrality and betweenness cen-

trality were analyzed to measure the number of node connections in the network and the node's intermediary effect in the network. Finally, find the focal points to determine the most important keywords and countries in fake news research. In the next chapter, we will label important nodes in the network with different colors to aid in identification.

4. Data Interpretation

4.1 Keyword Bibliometrics

Table 1 presents the top 10 keywords with their corresponding frequency in the 70 papers.

Table 1: Top 10 High Occurrence Keywords

Rank	Keyword (Total 199)	Occurrence
1	fake news	34
2	misinformation	30
3	social media	25
4	COVID-19	14
5	public-health	8
6	coronavirus	6
7	infodemic	5
8	news media	5
9	pandemic	5
10	Twitter	5

4.2 Keyword Network Analysis Results

4.2.1 Density (Matrix Average)

The overall density of the keyword network in this study is 0.047, indicating that 4.7% of the possible links exist. The density of the core component is 0.0463, indicating that 4.63% of the possible links exist. From these two points, it can be inferred that both the overall network and the core component of the network have relatively low activity in exchanging information, and less frequency in communication between nodes.

4.2.2 Degree Centrality

In the keyword network, the top 10 nodes with the highest degree centrality are fake news (86), misinformation (77), social media (76), COVID-19 (44), public-health (37), infodemic (24), coronavirus /preregistered (17), disinformation (16), continued influence /dual-process theory / emotion/ infodemiology(15), and media/news media(14) respectively. These nodes have the highest number of connections to other nodes, showing that they play an important role in the network.

4.2.3 Betweenness Centrality

The top 10 nodes with the highest betweenness centrality in the keyword network are ranked as follows: fake news (5400.089), social media (4137.067), misinformation (3872.075), public health (2687.988), COVID-19 (1352.987), opinion (772.733), vaccine (692), media (602.699), information (522), and inoculation (483.297). These nodes serve as important mediators for information dissemination in the keyword network, facilitating communication and exchange of information among other nodes, and helping the network has stability and reliability. In this study, the top 5 nodes with the highest betweenness centrality were selected as the primary keywords, while the 6th to 10th ranked nodes were designated as secondary keywords. The primary keywords are connected to the edge nodes through the secondary keywords. These edge nodes have fewer connections to other nodes in the network and are less susceptible to the influence of other nodes, thus reflecting unique topics in the network.

Based on Figure 4, the top three main keywords, "fake news" (5400.089), "misinformation" (3872.075), and "COVID-19" (1352.987), are connected to the secondary keyword "inoculation" (483.297), which then connects to the secondary keyword "media" (602.699), and further expands outward to the keywords contained within the red box on the left side. Similarly, the primary keyword "public health" (2687.988) is connected to the red box through the secondary keyword "opinion" (772.733), which links to the same group of keywords within the box as the "media" keyword. Through Figure 4, it can be observed that the topics of the edge nodes (keywords within the red box) that are connected through the secondary keywords from the primary keywords include the topic of the social media phenomenon of echo chambers and collective action, as well as the causal relationship in the spread of the infodemic.

Figure 5 displays the primary keywords "fake news" (5400.089) and "public health" (2687.988) connected to the secondary keyword "vaccine" (692.000), which then spreads outward to other keywords related to the vaccine issue. Figure 6, on the other hand, shows the primary keywords "social media" (4137.067) and "COVID-19" (1352.987) branching outwards through the secondary keyword "information" (522.000), connecting to "confirmation," "age," and "collective influence." In this context, "confirmation" refers to confirmation bias, and these keywords are related to the topic of spreading fake news on Twitter during the 2016 US presidential election.

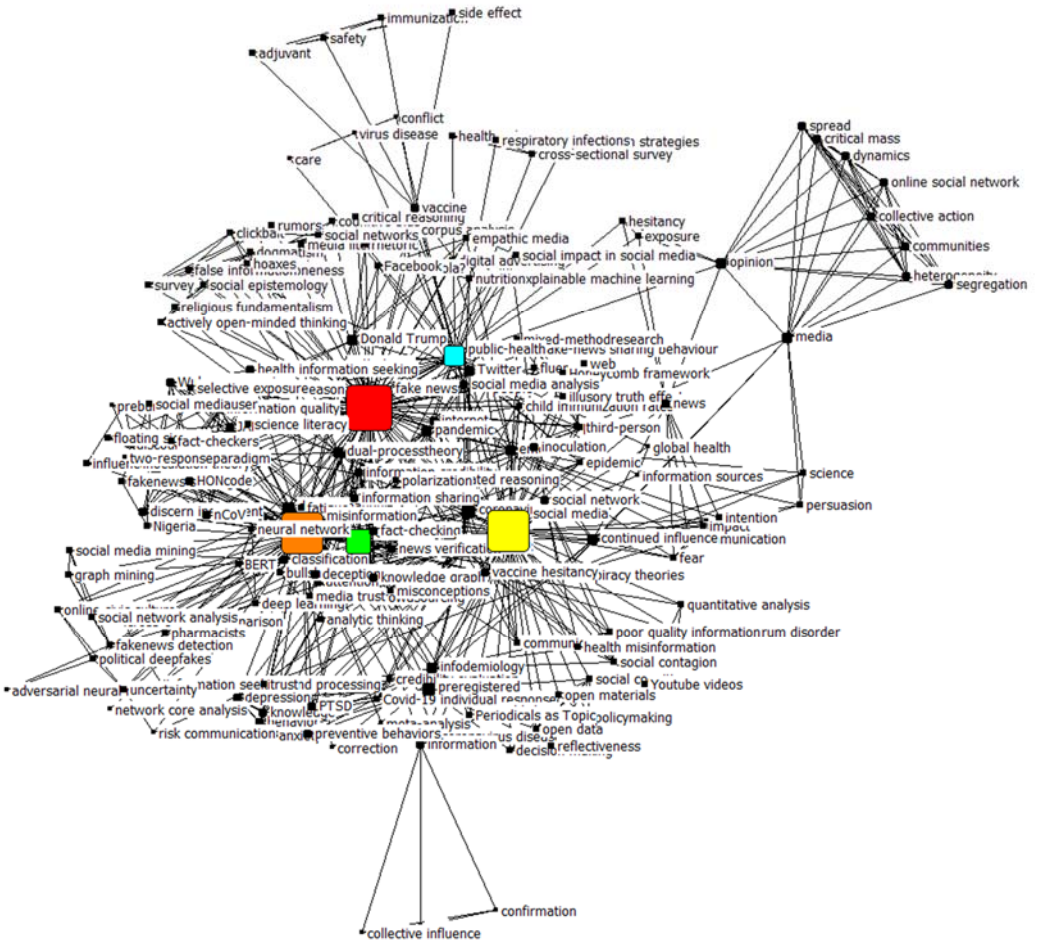

Figure 2: Keyword Network Core Component in Degree Centrality

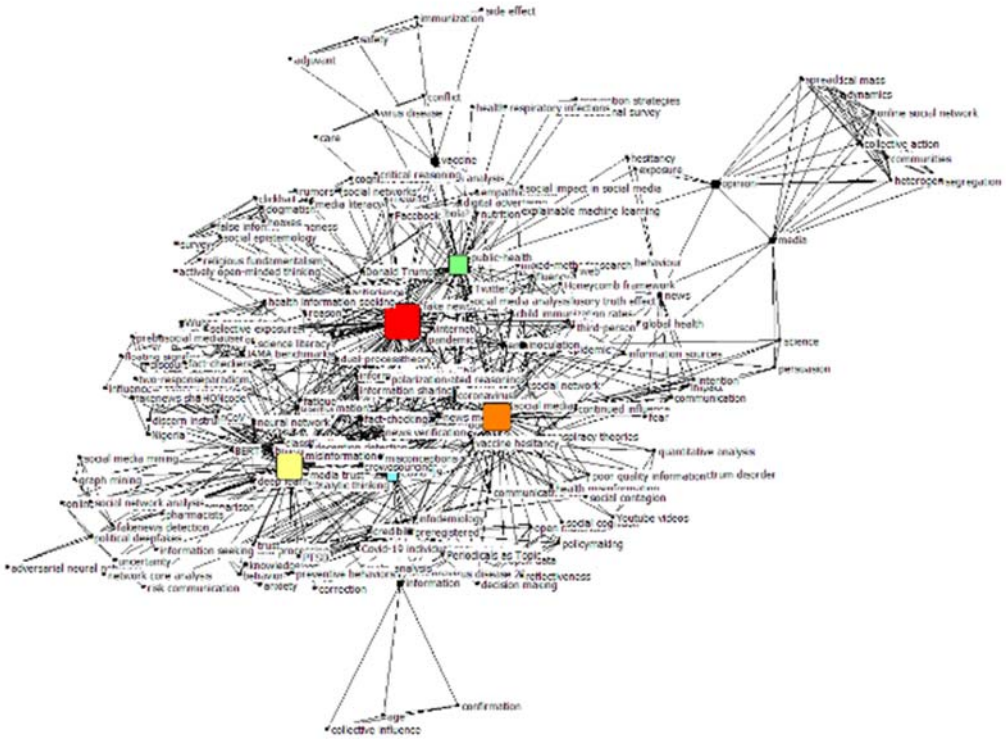

Figure 3: Keyword Network Core Component in Betweenness Centrality

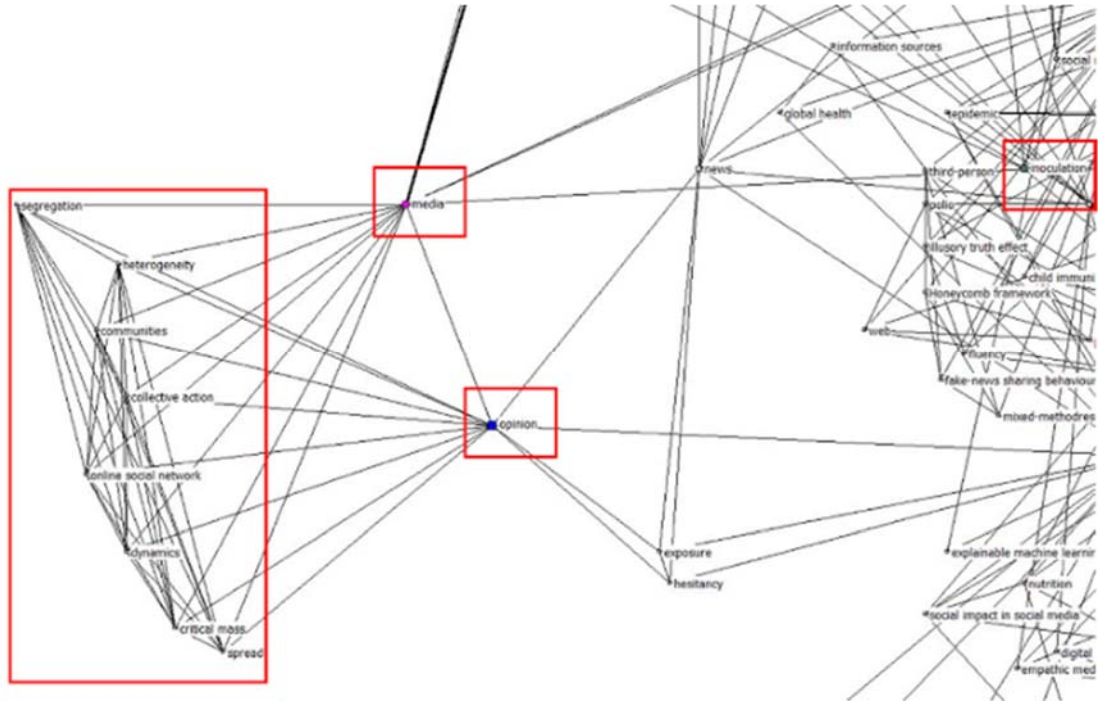

Figure 4.

Figure 5.

Figure 6.

4.2.4 Focal Point

In social network analysis, a focal point refers to a node that has high values of both degree centrality and betweenness centrality, indicating its importance in the network. Based on Table 2, the most important focal points in the keyword network of this study are fake news, social media, misinformation, public health, and COVID-19.

Table 2: Top 10 Keywords with Highest Network Properties

Rank	Degree Centrality	Betweenness Centrality
1	fake news	fake news
2	misinformation	social media
3	social media	misinformation
4	COVID-19	public-health
5	public-health	COVID-19
6	infodemic	opinion
7	Coronavirus/preregistered	vaccine
8	disinformation	media
9	continued influence/ emotion /dual-process theory/infodemiology	information
10	media/news media	inoculation

4.3 Country Bibliometrics

Table 3 presents the frequency and percentage of occurrences of the countries affiliated with the authors in 70 publications, as well as the ranking of their total citations and percentage (listing the top 5 in the table). A total of 32 countries were involved in this study. The table reveals that the top three countries in terms of both occurrence and total citation are the USA, the UK, and Canada, indicating that these three countries have the highest publication rate and citation impact.

Table 3: Top 5 Countries with Highest Occurrence and Total Citation

Rank	Occurrence(Times/Percentage)	Total Citation(Times/Percentage)
1	USA(36/30.51%)	USA(6118/34.83%)
2	UK(16/13.56%)	UK(2812/16.01%)
3	Canada(11/9.32%)	Canada(1907/10.86%)
4	Netherlands(5/4.24%)	Belgium(744/4.24%)
5	Australia(4/3.39%), Italy(4/3.39%), Spain(4/3.39%)	Netherlands(699/3.98%)

4.4 Country Network Analysis Results

4.4.1 Density (Matrix Average)

The density of the overall country network is 0.1391, indicating that 13.91% of the possible links exist in the network. The density of the core component in the country network is 0.1425, indicating that 14.25% of the possible links exist in the core network. Although the densities of both the overall network and the core component for the country are higher compared to the keyword network, the actual level of information exchange activity among nodes is not high, and the frequency of information exchange between nodes is relatively low.

4.4.2 Degree Centrality

Based on Figure 7, the three nodes with the highest degree centrality in the country network are the UK (14), the USA (13), and Netherlands (5), Belgium (5), Germany (5), Australia (5) and Bangladesh (5) tied for the third rank. These nodes have the highest number of connections with other nodes, indicating their important roles in the network.

4.4.3 Betweenness Centrality

According to Figure 8, the top three countries according to betweenness centrality are the UK (179.333), the USA (127.833), and Australia (81.667). These countries serve as important mediators for the dissemination of information, playing a crucial role in the propagation of fake news. They assist other nodes in the country network in communicating and exchanging information, thereby ensuring the stability and reliability of the network.

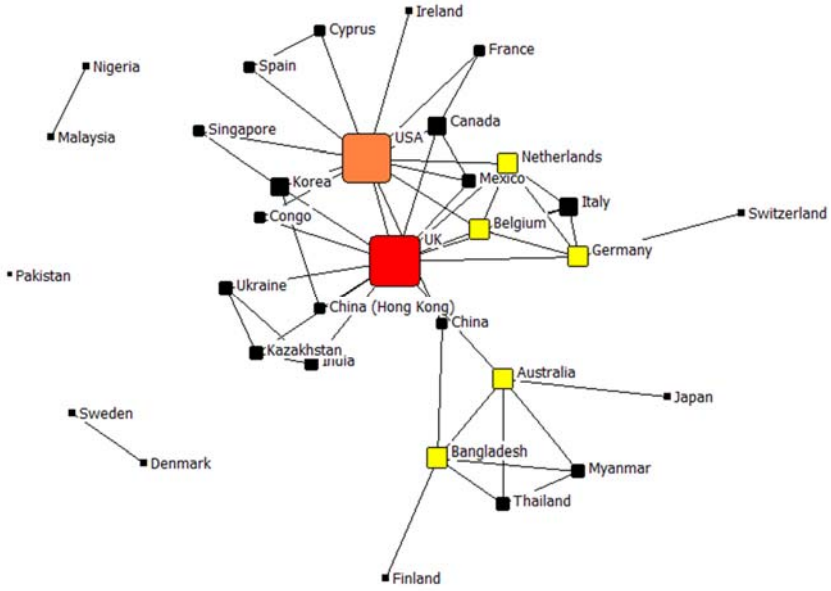

Figure 7: Country Network Core Component in Degree Centrality

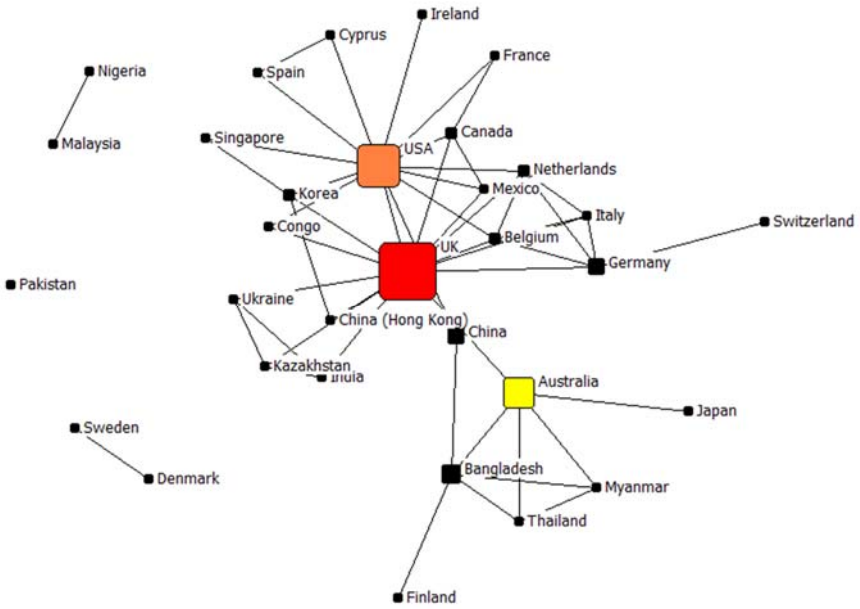

Figure 8: Country Network Core Component in Betweenness Centrality

4.4.4 Focal Point

Based on Table 4, the three most important focal points in the country network are the UK, the USA, and Australia. These three countries are both ranked in the top three for degree centrality and betweenness centrality, indicating that they are the most important nodes in the country network.

Table 4: Top 3 Countries with Highest Network Properties

Rank	Degree Centrality	Betweenness Centrality
1	UK	UK
2	USA	USA
3	Netherlands, Belgium, Germany, Australia, Bangladesh	Australia

5. Discussion and Conclusion

5.1 Conclusion

This study utilizes bibliometrics and social network analysis methods to investigate research on fake news, constructing a knowledge network of fake news research to identify important topics, information flows between keywords, and the extent of each country's involvement and importance in fake news research. Results show that social network analysis methods can quickly identify research hotspots for a given topic and trends over time and provide unique insights differing from other methods.

To answer the first research question: What are the most important topics in recent fake news research? This study conducts a keyword bibliometrics measurement and constructs a keyword network to identify the most important topics of recent fake news research. Based on Table 1 in bibliometrics measurement, the keywords were mostly related to social media or medical conditions after excluding the search terms "fake news" and "misinformation" used in the data collection stage. Directly associated with social media were keywords such as "social media" and "Twitter", whereas "infodemic" and "news media" also showed a certain degree of relevance to social media. Keywords related to medical conditions include "COVID-19", "public-health", "coronavirus", and "pandemic". The results indicate that the fake news research in the past five years has primarily focused on social media, news media, COVID-19, and medical conditions. This trend is likely due to the high level of scholarly discussion related to the 2016 U.S. presidential election and COVID-19 during this period. Based on Table 2 in keyword network analysis, we confirm that social media, public health, and COVID-19 are the three most important nodes in the keyword network after excluding the search terms "fake news" and "misinformation". Moreover, these three nodes also rank top 3 in keyword bibliometrics measurement after excluding "fake news" and "misinformation." These results suggest that the three most important topics in recent fake news research are: “social media”, “public health”, and “COVID-19”. Furthermore, this study identifies the flow of fake news information based on the betweenness centrality analysis of the keyword network, tracing the unique research topics in the fake news domain from the main nodes through secondary nodes to edge nodes. Through betweenness centrality analysis, we found the unique research topics include “the

social media phenomenon of echo chambers and collective action", "the causal relationship in the spread of the infodemic", and "the phenomenon of spreading fake news on Twitter during the 2016 US presidential election." Based on the result of this study, fake news research in the past five years can be mainly categorized into two main themes: 1) "fake news dissemination related to public health issues", and 2) "the causal relationship between the clustering effect on social media and the spread of the infodemic". The former emerged due to the outbreak of COVID-19 at the end of 2019, leading to the widespread dissemination of false information, while the latter was triggered by the clustering effect on social media during the 2016 U.S. presidential election.

To answer the second research question: What are the most involved countries in recent fake news research? This study conducts a country bibliometrics measurement and constructs a country network to identify the most involved countries in recent fake news research. Based on Table 3 in bibliometrics measurement, the top three countries in terms of both occurrence and total citation are the USA, the UK, and Canada, indicating that these three countries have the highest publication rate and citation impact. Based on Table 4 in country network analysis, the three most important focal points in the country network are the UK, the USA, and Australia. Additionally, the UK and the USA rank second and first respectively in Table 3 in country bibliometrics measurement. Although Australia ranks fifth and tenth in occurrence and total citation, and Canada ranks third in both occurrence and total citation, Canada has co-authored one publication with the UK and ten publications with the USA out of all 11 publications. Moreover, the betweenness centrality value of Australia (81.667), which ranks third, is significantly higher than Canada (5.25), which ranks tenth. This suggests that compared to Canada, Australia plays a more important bridging role in the country network, assisting other countries in communication and information exchange. In other words, Australia is in a more important position than Canada in terms of controlling the flow of information. Therefore, this study regards the UK, the USA, and Australia as the three most important and involved countries in recent fake news research, while Canada also has a certain degree of importance in this field. The three most involved countries have the most co-authorship relationships with other countries, while also occupying an important position in the information flow of fake news research.

The results of this study provide new insights for the research and practice of fake news as follows. One of the significant findings of this study is that in the past five years, the core focus of fake news research has notably centered around several key themes, including social media, news media, COVID-19, and topics related to medical conditions. These themes reflect critical fake news issues in society and media. Scholars and governments can address these issues in a targeted manner based on these themes. The fake news knowledge network established in this study identifies information flows and associations between keywords. This not only helps reveal how fake news information spreads across different topics but also provides additional insights that scholars and governments can refer to for countermeasures and prevention against the fake news phenomenon. Based on the result of this study, the UK, the USA, and Australia are the most important and most involved countries in fake news research, and they have significant influence in the global research and practice of fake news issues. This finding can help promote cross-border cooperation to address the challenges posed by fake news. Scholars and governments can refer to this study to collaborate with scholars and academic institutions from these countries to exchange research information, make their research more visible, and develop in-depth research on fake news.

5.2 Contribution

With the rise of the issue of fake news, scholars have published numerous studies on the topic. This study fills specific gaps in existing research. Despite the increasing severity of the issue of fake news, most research has focused on the detection and identification of fake news, as well as public behavior and intentions regarding fake news. While Wang (2020) and Wang et al. (2022) used the bibliometrics method to identify research hotspots related to fake news, there is currently no study utilizing the Social Network Analysis (SNA) method to construct a knowledge network in the field of fake news research, providing detailed insights from the unique perspective of SNA. This study fills the following gaps in existing research: Prior to this study, there has been no research employing the SNA method to construct a visual network, analyze topics and countries of fake news research, and create a knowledge network in this domain. Differing from Wang's (2020) and Wang et al.'s (2022) bibliometric analysis, this research not only considers the occurrence frequency of keywords and countries but primarily uses degree centrality and betweenness centrality values in SNA as standards to identify the focal points in the constructed social networks for the importance of nodes. It explores the relationships

between nodes and identifies key nodes controlling the flow of information. In terms of keywords, this study not only presents core topics in recent fake news research, trends in these topics, and their interrelationships but also identifies the less popular topics (edge nodes) extending through primary and secondary nodes, and finally, classifies fake news research into two main thematic categories by constructing and analyzing the keyword network. In terms of countries, this study provides insights into the levels of participation and importance of different countries in fake news research. It offers a perspective on the global landscape of fake news research, including cooperation partnerships, providing researchers with a unique understanding of cross-border collaboration. Through this study's results, researchers can comprehend the cooperative relationships among various countries and identify those holding significant positions in the field of fake news research. Hence, this study offers a relatively rare analytical perspective within the current fake news research landscape, filling the research gaps in the field.

The innovative contributions of this study are as follows. This study enhances scholars' understanding of the core content of fake news research and the current state of cross-border collaboration in this field, guiding scholars toward future research directions. Applying the social network analysis method to build the knowledge network is relatively rare in the field of fake news research, making it a pioneering contribution offering scholars a new method and new perspectives for a deeper understanding of recent fake news research. We suggest that future scholars consider using the social network analysis method to continuously analyze research topics across different domains.

The substantial contributions provided by this study are as follows. Scholars can refer to the results of this study to choose the important topics in fake news research, making their research more likely to attract attention. Scholars and governments can also develop corresponding strategies against fake news specifically on these key topics. Alternatively, scholars can choose to research the edge nodes in the keyword network of this study to make innovative contributions in the field. Furthermore, scholars can focus on keywords occupying important positions in the keyword network, conduct in-depth analyses of the relationships between these keywords and other topics, and apply the results to investigate how fake news topics interact and spread. In terms of international collaboration research, scholars can refer to the results of this study to select partners for cross-border cooperation. Collaborating with academic institutions in countries that are highly involved and significant in fake news research can increase the visibility of their research. Scholars from countries in important positions in the country network can also collaborate with those from countries as the edge nodes in the country network, facilitating academic exchange across borders and reducing the unequal distribution of research resources among nations.

5.3 Limitations and Suggestions for Future Research

This study has several limitations that should be addressed. Future studies can also refer to the limitations of this study to improve their research design.

1. This study exclusively utilized 70 documents sorted by citation count in descending order over the past five years for research purposes. Given the relatively short time interval and limited sample size, the overall representativeness of the sample may be compromised, and the resulting findings may lack precision. We recommend that scholars collect additional literature data and expand the publication time frame to compare differences in fake news research topics across various periods, analyze trends in fake news research topics, and construct a more comprehensive knowledge network for fake news research.
2. This study only analyzed the level of country involvement and control over the flow of information on fake news research. We suggest that future researchers conduct more extensive investigations on the countries. This will allow them to analyze the issues that different countries prioritize in the context of fake news.
3. This study only constructed keyword and country networks to analyze the social network of fake news issues. Future researchers can construct more networks, such as networks of affiliated institutions and co-authors, to provide a more detailed and complete information flow and knowledge network of fake news research topics.

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