Visual Analysis of Social Network Influence Based on Knowledge Mapping

To cite this article: Xueying Sun and Fu Xie 2019 IOP Conf. Ser.: Mater. Sci. Eng. 490 042039

View the article online for updates and enhancements.
Visual Analysis of Social Network Influence Based on Knowledge Mapping

Xueying Sun¹, Fu Xie¹,*

¹School of Information Science and Engineering, Shandong Normal University, Jinan, China

*Corresponding author e-mail: 1451850328@qq.com

Abstract. In this paper, we obtained 691 Chinese literatures and 1764 foreign literatures on social network related research from China Knowledge Network and Web of Science, and analyzed using CiteSpace software. From the literature countries, research institutions, keywords, word frequency, cited literature and authors, the mainstream research direction, research frontiers and research hotspots of current social network research are analyzed. The analysis shows that the research on the direction of social network influence is on the rise. From an international perspective, the United States, China, South Korea and England are the core strengths, and the research institutions are mainly China and the United States. From the perspective of research strength, the main domestic forces are Tsinghua University, Chinese Academy of Sciences, Beijing University of Posts and Telecommunications, and City University of Hong Kong. From the research hotspots and frontiers, Weibo and Facebook are the main research platforms, and the vast majority of research data sets come from these two social platforms; Key words such as monitoring social, media influence, user influence, models, behaviors, online social advertising, and heterogeneous social networks represent the main research hotspots and frontiers of social networks.

1. Introduction

With the development of the network, society has entered the era of information, and online social networks have rapidly spread. As of September 2017, Weibo’s monthly active population reached 376 million, of which China’s mobile terminal accounted for 92% and the daily active population reached 165 million. Online social networking has become an important platform for people to obtain information, disseminate information and interact with friends. Due to the complexity of social networks, the large-scale behavior of the group and the massive amount of information generated have important influences on the economic, political, and management aspects of the country and society. Therefore, the research and analysis of social networks are endless, and the research on its influence is especially important. This paper analyzes the research results of influence in social networks at home and abroad, and presents relevant information in this field to readers.
2. Related work

2.1 Data source
The Chinese data in this paper is from China Knowledge Network, were retrieved 691 related literatures. The foreign data was obtained from the core database of Web of Science database, and a total of 1764 related literatures were retrieved.

2.2 Research content
The research content of this paper mainly includes the following contents based on the research direction of social network influence: (1) Time distribution of publications; (2) Research strength and distribution; (3) Research mainstream analysis; (4) Research hotspots and frontier analysis.

2.3 Research tools
The research tool used in this paper is CiteSpace. CiteSpace is a citation visualization analysis software that is developed in the context of scientometrics and data visualization. CiteSpace software is applicable to all operating systems, and can handle international WOS citation format and domestic CSSCI citation format. The software's own data conversion tool has rich analysis functions, including author and journal coupling analysis, author, Cooperative analysis of countries and institutions, co-cited analysis of references, and analysis of confession of keywords. Due to the above advantages, it has been widely used at home and abroad in recent years. Foreign applications include astrobiology [1], bioenergy [2], transportation [3] and the field of natural sciences. Domestically, it is widely used in the fields of humanities and social sciences such as graphic science [4], education [5], physical education [6], economics [7], and linguistics [8].

3. Results analysis

3.1 Domestic research

3.1.1 Issues analysis. The earliest literature on the related research of influence in China is the 1993 research on the influence of social journals, which mainly discusses several factors that should be considered in evaluating the influence of journals [9]. It can be seen from Figure 1 that the research on impact calculation since 1993 has been in an ascending stage. The related research has risen sharply when Weibo is just popular, and it is developing steadily after 2014. However, the annual research literatures are still endless, indicating that the research on impact computing is still of great research significance. Of the 691 articles on influence research obtained by China Knowledge Network, 497 are researches on the influence of online social platform Weibo, accounting for 71.92%, of which 295 are researches on the influence calculation of Weibo. More than 59.36%. It can be seen from the scale that the relevant research on the influence calculation of Weibo still occupies an important position.

Figure 1 Chinese publication time distribution

3.1.2 Analysis of institutions and authors. From the research knowledge map of Figure 2, we can see that in the study of social network influence, the School of Economics and Management of Beijing University of Posts and Telecommunications is in the first place, publishing 16 articles, followed by the publication of 8 articles by the School of Information Management of Wuhan University, Secondly, it published 8 articles for the School of Information Management of Wuhan University, followed by the School of Journalism and Management of Renmin University of China, the School of Journalism
and Communication of Nanjing Normal University, and the School of Business of Sichuan University. The number of publications was 5 or more.

From the author's knowledge map of Figure 3, it can be concluded that the author with the largest number of publications is He Yue, professor of Business School of Sichuan University, and a doctor of management, and 5 articles; Professor Qi Jiayin, dean of School of Business Administration, Shanghai University of International Business and Economics, also served as Beijing An adjunct professor and doctoral supervisor of the School of Cyberspace and Security of the University of Posts and Telecommunications, issued 5 articles; Cheng Xueqi, deputy director of the Institute of Computing Technology of the Chinese Academy of Sciences and a doctoral tutor, issued 5 papers. Secondly, Xie Gengwei, director of the Media Economics and Management Research Center of Shanghai Jiaotong University, Professor Jia Yan of the National University of Defense Technology, and Zhou Bin, a professor at Sichuan Normal University, have published 4 articles, and Professor Yu Guoming, Executive Dean of the School of Journalism and Communication, Beijing Normal University. Anzhen, an associate professor at the School of Information Management at Wuhan University, has in-depth research in the direction of Weibo influence research.

3.1.3 Analysis of mainstream direction. Citespace was used to analyze the co-occurrence network of 691 documents, and select Keyword to perform (co-words) mining analysis on text topics. In the theme of the paper, keywords, and the network map of the scientific category, the size of the nodes represents the frequency at which they appear, and the line between them represents the co-occurrence intensity. As shown in the above figure, the deeper the color, the more frequently the number of occurrences, the most frequent words are “microblogging”. We can conclude that the domestic research data for social networks mostly depends on Weibo, and it can be seen from the figure that The main research direction of Weibo is influence research, opinion leader research, user influence research, communication influence, etc. Therefore, the current mainstream research direction of social networks is the research of influence direction. For the influence research to discover the key nodes in the network, the political aspect helps the government to manage, lead the public opinion, and realize the public opinion control; the commercial aspect uses the celebrity effect to stimulate economic development and drive consumption.
3.2 Foreign research situation

3.2.1 Number of documents issued. This article obtained a total of 1764 articles from 2010 to 2018 through Web of Science. From the timeline, as shown in Figure 5, from 2010 to 2017, the number of documents has been on an upward trend. In 2018, due to limited retrieval time, the amount of documents is still not much. The increase in the amount of publications shows that the study of the influence of social networks has always been a hot research direction and has important research significance.

![Figure 5 Foreign publication time distribution](image)

3.2.2 Analysis of state and institutions. In order to analyze the research power and distribution of the influence direction of social networks, national and institution analysis are carried out in Citespace respectively. Figure 6 shows the knowledge map of national and regional issues and the knowledge map of research institutions. From the point of view of publications, the United States issued 629 articles, far higher than other countries and regions, followed by China's 422 articles, South Korea's 143 articles, England's 128 articles, and Taiwan, Japan, and Canada's publications are also around 100 articles. However, the volume of US publications accounts for 35.6% of the total number of publications, with a centrality of 0.47. In addition, the total number of publications in China, South Korea and the United Kingdom accounts for about 75% of the total number of publications, indicating that the United States, China, South Korea and England are leading the way in the study of social network impact computing, with the United States being the largest.

![Figure 6 National and regional knowledge map (left) research institution knowledge map (right)](image)
influence research under the support of powerful social network platforms such as Weibo is at a strong core position, and the developed countries such as the United States can still lead the research direction. Therefore, in addition to strengthening the research depth of domestic research institutions, China should cooperate more with foreign institutions in the future to enhance the core competitiveness of China's core institutions.

3.2.3 Analysis of mainstream authors and journals. Co-citation analysis of authors via Citespace, as shown in Figure 7. The Professor Fornell of the University of Michigan Business School was cited most frequently. He received his Ph.D. in Economics from Lund University in Sweden in 1976. Professor Fornell also taught at Duke University, Northwestern University, Stockholm School of Economics and INSEAD. He also holds honorary professorships at Renmin University (2005) and Tianjin University (2007). The article was cited as many as 268 times, with a median of 0.16. After, Professor Venkatesh V (222 times) of the University of Engineering and Education in Malaysia.

![Figure 7 Cited author knowledge map](image1)

![Figure 8 Knowledge map of cited journals](image2)

Figure 8 show that the SSCI journal COMPUT HUM BEHAV has been cited the most, up to 652 times. Subjects are psychology and interdisciplinary, the impact factor is 2.694. Secondly, the J COMPUT-MEDIAT COMM journal in the direction of information science and communication system was cited 483 times, the MIS QUART journal of the top journal of computer science and information system was cited 458 times, and the J MARKETING RES journal of business and applied subjects was cited 442 times. The system research INFORM SYST RES was cited 375 times, the DECIS SUPPORT SYST journal of computer science and artificial intelligence was cited 337 times, the MANAGE SCI journal of operations research and management science was cited 331 times, and the top journal of social psychology J PERS SOC PSYCHOL was cited Lead 315 times and so on.

It can be obtained from the category knowledge map. The largest number of documents is COMPUTER SCIENCE. The number of documents is up to 634. According to the number of documents, COMPUTER SCIENCE, INFORMATION SYSTEMS 401, INFORMATION SCIENCE & LIBRARY SCIENCE 263 articles, BUSINESS & ECONOMICS 259 articles, PSYCHOLOGY 253 articles, ENGINEERING 240 articles, etc.

From the perspective of cited journals and subject categories, the study of social networks in computer science, information science and business economics and psychology has a large proportion. The popularity and application of social networks have a great impact on people's lives. Often, important nodes in the network will affect people's thoughts or certain behaviors, such as the "star effect" in the network. the idol's certain behavior will cause fans to follow the trend. Therefore, due to the complexity of social networks, it has a very important influence on politics, economy, management and so on.

3.2.4 Mainstream branch analysis. In order to study the mainstream branching field, we have classified the cited documents according to the three clustering algorithms of LSI, LLR and MI, and obtained 14 main branch fields, as Figure 9. According to Professor Chen Chaomei's opinion, we
select the LLR results with better results for analysis. Due to the large number of clusters, this article focuses on the top three categories.

Figure 9 Literatures co-cited cluster results

The first category consists of 90 articles with an internal cohesion of 0.691 and an average publication year of 2009. The representative literature is Fuchs C's studiVZ: social networking in the surveillance society. The article mainly introduces the results of some use of the social network platform studiVZ by Salzburg students in Austria. The theme is based on the background of electronic surveillance, and an online survey based on questionnaires is conducted to calculate the knowledge index and comment index. And analyze the information behavior on the platform, and the critical awareness of the test to assess the students' general knowledge. In the case of studiVZ, under the change of terms of use in 2008, social platforms may have targeted personalized advertisements as the subject of public discussion, and also affect students' knowledge and information behavior [10].

The second category contains 52 articles with an internal cohesion of 0.782 and an average published year of 2009. The representative literature is Pei S's Spreading Dynamics In Complex Networks. The article focuses on how to find influential communicators in complex networks. The article discusses the problem of locating individual and multiple influence diffusers, and based on the empirical diffusion data LiveJournal of large-scale online social communities, it is found that only a small number of users participate in the dissemination. In the process of information dissemination, although the nodes participating in information diffusion can be located with a high probability, it is found that K-shell is more effective in finding nodes with larger influences, and provides effective information for actually designing effective communication strategies in the future [11].

The third category consists of 46 articles with an internal cohesion of 0.681 and an average publication year of 2008. The representative literature is Li DC's Online Social Network Acceptance: A Social Perspective. The paper proposes and empirically tests a research model that includes interpersonal motivation (sociality and status) and hedonic motivation (perceived enjoyment), as well as three processes of social influence: compliance, identification and internalization, and getting to know a person using social Intention of the network [12].

4. Conclusion

(1) From the perspective of the amount of documents on the timeline, the research on the direction of social network influence is on the rise.

(2) From the perspective of research strength, the main domestic powers include Tsinghua University, Chinese Academy of Sciences, Beijing University of Posts and Telecommunications, and City University of Hong Kong. From an international perspective, the United States, China, South Korea, and England are the core strengths, and research institutions are based in China. The United States is predominant. Although China is relatively high-yield in terms of total volume, there are still very few high-yield researchers in specific directions. China should strengthen cooperation with international countries and enhance its core competitiveness.

(3) From the mainstream of research, the vast majority of domestic research relies on the data of Weibo platform. The main direction of research on Weibo is influence research, opinion leader research, user influence research, communication influence, etc.; In the literature, Professor Fornell of the University of Michigan Business School is the most influential researcher; mainstream journals
include COMPUT HUM BEHAV, J COMPUT-MEDIAT COMM, MIS QUART, etc.; from the perspective of cited journals and subject categories, the main research The fields are computer science, information science and business economics and psychology.

(4) From the research hotspots and frontiers, supervising society, media influence, user influence, model, behavior, Keywords such as online social advertising and heterogeneous social networks represent the main research hotspots and frontiers of social networks. Nowadays, the research on the influence of social networks is not limited to the field of computer science research or information research, but also begins to penetrate and integrate in the fields of business, psychology and behavior. More and more people use the social network platform, people's psychology, behavior and other aspects will appear on the platform, the complex multi-faceted social network is more and more obvious. Therefore, the research on social networks is increasing, and the coverage area is more extensive.

Although this paper analyzes the research from multiple angles, the angle is not comprehensive enough to cover all relevant research. So the next step is to use a variety of analysis tools to conduct a more comprehensive and detailed analysis from more perspectives.

References

[1] Tas Z. Collaborative interdisciplinary astrobiology research: A bibliometric study of the NASA Astrobiology Institute[J]. Scientometrics, 2015, 103(3): 1003-1022.

[2] Qian G, Fong M. Scientometrics analysis on the intellectual structure of the research field of bioenergy[J]. Journal of Biobased Materials & Bioenergy, 2013, 7(2): 305-308.

[3] Liu C, Gui Q. Mapping intellectual structures and dynamics of transport geography research: A scientometric overview from 1982 to 2014[J]. Scientometrics, 2016, 109(1): 159-184.

[4] Wei Junchao, Wei Haiyan. Analysis of Hot Spots in Digital Library Based on CiteSpace II[J]. Library Journal, 2011(4): 70-77.

[5] Wang Juan, Chen Shichao, Wang Linli, et al. Hotspots and Trends of Education Big Data Research Based on CiteSpace[J]. The modern education technology, 2016, 26(2): 5-13.

[6] Gao Ming, Duan Hui, Han Shangjie. Research on the Measurement of Foreign Physical Education Based on CiteSpace III[J]. Sports Science, 2015(1): 4-12.

[7] Yi Chunbo, Xu Xin. Research Hotspots and Frontiers in the Field of Free Trade Zone——Based on Citespace II's Econometric Analysis[J]. Shanghai Economic Research, 2014(3): 67-78.

[8] Xu Jinfen, Nie Rui. Dynamic Visual Analysis of International Second Language Writing Research Based on CiteSpace (2004-2014)[J]. Foreign Language Electrotechnical Teaching, 2015(4): 3-9.

[9] Qin Wei. Thoughts on the Social Influence of Journals[J]. Publishing and Publishing Research, 1993(04): 48-50.

[10] Fuchs C. studiVZ: social networking in the surveillance society[M]. Kluwer Academic Publishers, 2010, 12(2): 171-185.

[11] Pei S, Makse H A. Spreading dynamics in complex networks[J]. 2013, 2013(12): 131-136.

[12] Li DC. Online social network acceptance: a social perspective[J]. Internet Research, 2011, 21(21): 562-580.