Network Analysis of Twitter Users in Iran;
Studying Public Sphere Properties

Hamid Abdollahyan*
Professor in Communication; University of Tehran;
Visiting Professor at UBC; Vancouver BC, Canada;
Email: habdolah@ut.ac.ir

Soha Saleh
PhD Candidate in Communication; University of Tehran;
Tehran, Iran Email: sohasaleh7190@gmail.com

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Abstract: This paper aims to evaluate whether features of the public sphere are present in the activities of Iranian Twitter users. To achieve this objective, the paper provides a synthesis of computational social sciences, network analysis, and Habermas's approach to the public sphere. The data comes from all Iranian users, including those who are actively engaged in political issues on Twitter. This method of data collection focuses on the computational aspects of the users. Added information on how they conducted networking and facilitated public opinion, which resulted in increased user interaction, would complete the data-gathering process to align with the theoretical claims. It also indicates that Twitter was a platform on which Iranian users fulfilled the requirements of the public sphere. Some of the findings indicate that there were 48,076 users connected with 25,534,713 edges, and together, they formed three communities. While one of the communities focused solely on social issues, the other two engaged in a rival political challenge. It seems that this situation exemplified the main characteristic of the public sphere, namely, the freedom to express political views and the formation of diverse communities with competing ideas.

Keywords: Habermas, Public Sphere, Twitter, Public Opinion, Social Network Analysis

* Corresponding Author

1. Introduction

Analyzing the behavior of Twitter users is important because it demonstrates the influence of digital media in shaping a public sphere where users with diverse opinions and information can interact. Conversely, it can also function as an echo chamber that reinforces established views and opinions (Colleoni et al., 2014). The question of whether these properties of the Internet contribute to the public sphere, and whether the potentials of the Internet are realized, is a matter of ongoing and somewhat heated scientific debate (Rauchfleisch & Kovic, 2016). For more than a decade, scholars have argued whether the emergence of the Internet would empower the development of democracy and public debate. The utopian rhetoric connected to new technologies alleges that they will facilitate the democratization of post-industrial society by providing space for personal expression and encouraging citizen activity. online discussion, the fragmentation of such discussion, and, in consequence, polarization. They claim that the Internet is far from revitalizing the public sphere, and quite often, it instead adapts to the current status quo (Batorski & Grzywińska, 2018). Various studies show that the behavior of users of different countries on social networks, especially on Twitter, can be very different. The users of some countries are in a polarized space similar to the definition of an echo chamber, and others are multi-polar, and the interaction between users with different views is seen at a high level, which is more similar to the definition of the public domain (Urman, Context matters: political polarization on Twitter from a comparative perspective, 2020).

According to statistics published by research centers, there are over 2 million active Persian-speaking users on the Twitter social network. This number of users has published more than 500 million tweets in the last year. On the other hand, some studies show that Twitter is the source of certain trends that spread to other platforms like Instagram and Telegram. This paper aims to analyze the behavior of Iranian users on Twitter social media. Therefore, this study aims to evaluate the extent to which Iranian users engage in the features of the public sphere through their activity on Twitter. The main question here is whether Twitter, as a social media platform, plays the role of the public sphere in Iranian society.

The following questions are intended to break down the main question, as they assist in providing a more effective answer to the main question.

- ◇ What are the features of the Iranian users' network on Twitter?
- ◇ What is the extent of dispersion in this network?
- ◇ What features contribute to the formation of Iranian user communities on Twitter?

In order to demonstrate how these questions will be addressed, it is necessary to clarify the position of this paper and its contribution. Whether the Internet and social media enhance public dialogue and contribute to the development of the public sphere, or intensify the tendency of like-minded individuals to form echo chambers, has been a heated debate among academic scholars. Takikawa and Nagayoshi (2017) resort to network analysis to address this issue on Twitter. Using network analysis, these two researchers from Tokyo University investigate social situations and interactions among Japanese users on Twitter. In order to conduct this research, they analyzed 87,000 nodes and 6 million textual connections between followers and followed individuals among Japanese users. At the end of the research, the researchers concluded that Japanese users tend to support parties that focus less on common issues. They also found that Twitter communities supporting different parties often function as echo chambers.

Batorski and Grzywińska (2017), researchers from Warsaw University, also utilize network analysis on Facebook to study the public sphere. They analyzed the data of all active users on the political parties' pages during two four-month periods in 2013 and 2015. They analyzed the data gathered from 154,000 users in the initial stage and 1.5 million users in the second stage. This study demonstrates that Facebook users in Poland rarely engaged with political pages during the selected period of 2013. However, in 2015, their political activities increased. Another part of this study reveals that the majority of Polish users' activities were limited to "liking" posts from their favorite parties, and they rarely created their own content. The number of active users is relatively low, and most of these users under study only published one or a few political posts. In order to measure the existence of the echo chamber in the network of Facebook users in Poland, Batorski and Grzywińska utilize the hierarchical clustering method, which has primarily focused on users who are political activists. The obtained results are ideal and aligned with the political structure of this country. Three distinct clusters have been observed on Facebook, with each representing one of the three political parties in this

country. This finding confirms that users who are active on multiple pages tend to concentrate their activities within one political party or group.

Johannessen (2014) has studied the role of social media in improving the public sphere in Norway. He called this media "Virtual Public Meetings." Johannessen believes that we live in a network society. In the past, the public sphere was considered a space for collective dialogue and discussion, which is gradually turning to public sphere networking consisting of some interrelated spaces for dialogue and discussion. This Norwegian researcher exclusively follows the Norwegian Worker Party as the subject and seeks to understand to what extent this party adheres to the precepts of the public sphere. Overall, he identifies a gap between the results of users' discussions and dialogues regarding the pages of this party and achieving a comprehensive public sphere. However, he hopes that virtual spaces will lead to an increase in the participation of citizens in political affairs and dialogue about managing society.

Colleoni, Rozza, & Arvidsson (2014), at Milan University, use macro data of Twitter to evaluate the extent of political homophily in the network of American users. This paper makes use of advanced tools of machine learning in the process of collecting data and is a project based on macro data. Four hundred sixty-eight million posts from 20 million users were used in this study to evaluate the extent of homophily in the supporters of both Democrat and Republican parties in the US. Various features of the users in this study including sex, political tendencies, etc. are tagged by the smart machine learning algorithm.

Here we add a social network analysis to the body of literature by indicating how Twitter can function as a platform for the formation of the Iranian public sphere. There is no literature on this issue, whether in the Iranian case or another social context. This is while the development of social media and its effects on political activities and the formation of an online public sphere is a reality that social sciences must address.

2. Theoretical Issues and the Concept of the Public Sphere

Dialogue is a critical element in Habermas's conceptualization of the public sphere (Habermas, 1989). In other words, public opinion takes its shape through dialogue, and thereby the public sphere could focus on its principal concern, i.e.,

to be critical of the state's policies, and to rationalize them. However, dialogue in the public sphere could only serve its liberating role when the following conditions are present:

1. The content of the dialogue should be rational-critical;
2. Dialogue should deal with common civil issues of the Iranians, not private issues;
3. Dialogue should overlook the individuals' distinctions, and differences and people should cooperate in dialogues as equal individuals;
4. The process of dialogue is limited to the formation of public opinion;
5. With the consideration of the diversity of public spheres, one can argue that there is a preference for a substantial public sphere in which it is possible to foster harmony.

According to Habermas (1989), in an ideal condition, the community is a sheer product of the actors' proper reasoning in a situation where there are no force and domination tendencies among community individuals. The ideal speech situation is the source of equality and collaboration. Creating such a situation would pave the way for criticizing inequalities, injustice, and discrimination caused by the unequal distribution of power in a community.

Almost since the advent of the Internet, there has been great interest in analyzing and understanding online communication from the perspective of public sphere theory (Rauchfleisch & Kovic, 2016).

Researchers have different and even contradictory approaches to the impact of the Internet in general and social media in particular on the formation of the public sphere. By providing a clear and measurable definition of public domain features, Christian Fuchs (Fuchs, 2014) seeks to elucidate the relationship between what is going on between Twitter and public domain features.

Public sphere analysis on social media is tied to two other concepts. "Homophilia" and "echo room" are two important theoretical concepts in research on the realization of the public sphere in social media.

We live in a networked society (Prell, 2012, pp. 1-4). The public sphere, which was considered a shared space of dialogue in the past, is gradually turning into a network public sphere consisting of some interconnected spaces for dialogue and discussion (Johannessen & Følstad, 2014) One way to witness the occurrence

of such a public sphere is to see how individuals are acting using new means of communication, mainly social networks and social media, and here Twitter. In this regard, the paper needs to deal with some key concepts in social networks, including homophily and echo chambers.

Homophily is one of the main concepts in Social Network Analysis. The literature on social networks considers the existing similarities among the members of social groups as homophily (Kadushin, 2012). The phenomenon of homophily could occur through selection mechanisms or social influence, i.e., two effects that are often combined and make it difficult to recognize them individually (Aiello et al., 2012). Homophily sketches out the similar tendencies of social actors in comparison with different others in terms of social factors attached swiftly. Homophily is one of our social realities (Smith et al., 2014). Some theoretical claims force us to believe that people are attracted to one another not based on shared interests as traditional sociological frameworks used to believe but based on homophily, i.e., similarities in their characters or other personal characters.

Echo Chamber: "Echo Chamber" is another primary concept in Social Network Analysis. It is an expression that has recently been used in the literature on the methodology of political and social sciences. This expression describes a condition in which ideas, beliefs, or particular data are enhanced through repetition in a closed system/circle that prevents the free movement of ideas, and alternative or competitive concepts (Colleoni et al., 2014). The underlying idea here is that human beings are not free agents acting as they wish; instead, they act under echo chamber requirements. In an echo chamber, since there is an inherent inconsistency in the way data and information are produced, accumulated, and distributed, the process through which ideas gain legitimacy and acceptance takes place based on limited information. In other words, there are not some concrete criteria that ideas could be evaluated; instead, it is the echo situation and repetitiveness of the ideas that result in ideas being successfully accepted.

The echo chamber is created once there are tendencies among individuals to form homogenous groups that are like-minded (Boutyline & Willer, 2017). This phenomenon is a crucial issue in many societies, including Iran. As there is more heterogeneity of the network, people have more tendencies to receive information about various issues. Furthermore, various political private networks increase

awareness of opposite viewpoints and political tolerance and lead to political dynamism. However, if they do not follow this pattern, the Internet would serve as an echo chamber in which political tendencies would enhance in a closed ring.

The concept of an echo chamber has an extensive connection with concepts such as “public sphere” and “homophily.” Questioning homophily is crucial since it challenges the capacity of digital media to support the formation of a public sphere. The diversity of viewpoints and information in social networks could interact or, on the contrary, serve as an echo chamber in a way that enhances the same viewpoints or ideas (Barberá, Jost, & Nagler, 2015).

Both scenarios are essential in the studies of Political Communication on the Internet. This paper offers three theoretical frameworks and tries to make a connection between them to use the synthesis to explain the central question of the paper.

Figure 1 briefly depicts how various levels of political homophily bring about some differences in the relations between the members of the network. One side of the figure depicts a low level of homophily, which is reminiscent of the situation in the public sphere. On the other side, we have a high level of homophily, which is reminiscent of the situation in the echo chamber.

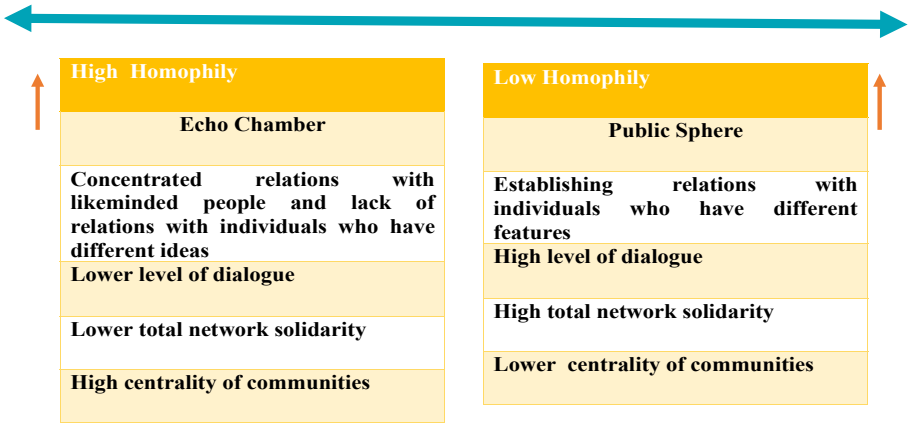

Figure 1. Levels of Homophily in Political Communities

3. Methodology

This is interdisciplinary research about the social world in different scales of individual actors and large social groups, which could be defined through mathematical calculations. Methodologically, it means that the objective of this research falls within the realm of the Computational Social Sciences (CSS). Furthermore, the adjective “computational” refers to various computer tools and also main concepts and theories that use the algorithms of information extraction and computer simulation models (Cioffi-Revilla, 2018).

In summary, CSS is considered a wide field of study, consisting of exciting scientific research, that covers numerous fields such as Social Sciences, Computer Sciences, and some other disciplines. Besides, this research works within the field of Social Network Analysis (SNA). SNA refers to the process of studying and evaluating the structures of a social network as a graph of agents or humans attached through connected lines. These connected lines could include friendship, the transmission of a disease or virus, the relation between sending and receiving a message, exchanging ideas regarding casting a vote in an election, the relation between sending and receiving information packages, or every other relation (see Kadushin, 2012).

One of the essential aspects of Twitter a social network is that it consists of nodes that are connected through different edges. Twitter has various communities, and a community refers to a group of people who are following a similar subject. Social networks, therefore, depict a strong social structure. In comparison to the various nodes that may be present in a typical social group, the nodes within a community tend to interact more closely. For instance, researchers studying similar subjects tend to show more collaboration than those studying unrelated subjects. Figure 2 demonstrates three communities in a social network, such as Twitter.

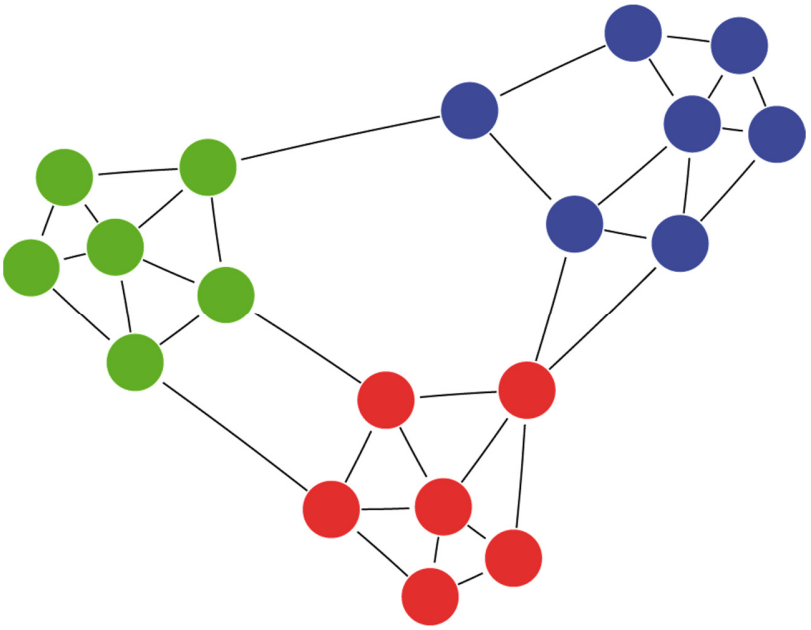

Figure 2. A graph with three Communities

Nonetheless, why is it important to identify communities in a social network such as Twitter? Citing a few examples can clarify this issue. Sometimes, the proportion of nodes that exist in a community has more similarities within itself than with different communities. Thanks to these similarities, we can offer some suggestions to the members of the community. Alternatively, the web pages in the community (graph web) could refer to similar subjects (Aggarwal, 2011).

Another important subject is the high volume of the graph of social networks. The structural study of social networks with numerous graphs poses difficulty and is a time-consuming task. Therefore, describing the graph of social networks with the existing communities in it, such as in Twitter, is a lot less convoluted and demonstrates connections more directly. In some cases, it helps to analyze the Twitter network of users more simply. In other words, there is no necessity to study every single node of the graph; instead, when studying communities, the significant features of networks could be discovered easily. This paper uses the same approach to identify the significant features of the public sphere among the Iranian community of Twitter users.

Having outlined the broad methodological approach of this research, we offer

the following argument on data collection.

Since there was no valid database for the target users, we did not foresee any process for the identification of the users. In the first step, 4500 Persian Twitter users were identified during the summer of 2019, who published more than five times the most retweeted tweets. In the second step, a computer program was written in Python to collect information about the followers and the followed of 4500 initial users. The program had more than 1500 line-writing codes. Although, for writing code, we used some of the codes that were available in the libraries of Python.

After collecting data, organizing, and normalization of the communication of the users, we have the first layer of the graph with 43116 users as the nodes with 5642036 edges are connected. As mentioned before, we used Gephi software which is one of the most practical and powerful software for the data analysis and visualization of the graph. This software, however, has a limitation of 10 thousand graphs and one million edges and could not analyze graphs with the targeted dimensions mentioned in the current study. To depict and analyze this network, other tools of computer programming and visualization, such as Python, were used to meet the requirements. A network library in Python was the best choice for this research. Using all the coding of Gephi's library, all analyses of Gephi could be applied to this graph. To do visualization, the codes of output data were inserted into the plot tool. Since the number of edges was high, only the nodes were depicted during the visualization.

It should be taken into consideration that the graph at this stage had no direction and weight. This means if there was a connection between two nodes of a graph, one of them followed the others in the Twitter network. Alternatively, both of them were considered members of the community of followers who followed each other.

This graph, however, was not a complete graph that could display the whole network of the users. Communication between 4,500 initial users of the Twitter network was a complete one. Suppose that users A and B were two present users in the group of 4,500 initial nodes. After collecting the data on the group of followers and the followers of these two users, it became possible to determine whether there was a connecting node between them or not. Concerning 4,500 initial edges, all the

communication between them was drawn. However, we witnessed approximately 37,000 new nodes in the graph of the first layer, which were created by sharing the initial followers or the followed ones. Communication between these nodes and 4,500 initial nodes in this layer was drawn, but the communication between the emerging nodes was not as clear to draw. For instance, suppose node F and node G were two new nodes that were created through their connection with node A, i.e., the initial node in this group. If node F and node G had a connection with other members of initial nodes such as node B, then it meant the related edges existed in the network but were not clear. The question then is whether there would be a connection between themselves, i.e., between node F and node G. The answer is no. Therefore, to draw a precise network, we collected data on an extra layer of groups of followers and the followings. This time the data gathering included 43,116 users in the graph of layer one.

Accordingly, we extracted the graph of the second layer. Roughly speaking, there is no new node in this network. Only a few worthless nodes are identified and replaced with high-scaled nodes. Therefore, 48,076 users with 25,534,713 edges were connected, which depicts all the communication between these users.

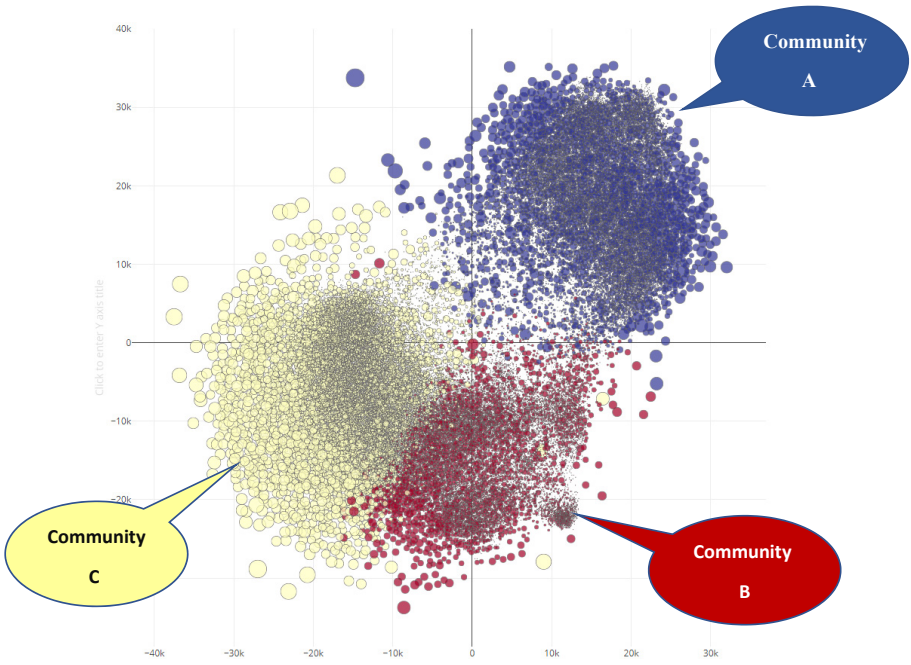

Figure 3. Complete graph nodes of the communities of over 48,000 Iranian Twitter users

Finally, there were three major groups of Persian users of Twitter, which were identified based on “the followed” on Twitter. It means that the members of these three clusters followed the contents of the users on Twitter, i.e., the ones that had more similarities with their own, but sent comments to them and got in touch with them. Then, we should focus on other features of the members in every cluster to discover based on what standard features the Persian users of Twitter were connected to.

The numerical analysis of the network parameters, such as central indices, helps to offer better accounts. According to Cochran (1977), and the statistical rules, it is possible to select some samples from the users. Here, this rule can be applied through selection within the community of Iranian Twitter users by observing posts, and biographies. Besides, we tag every community. Four features in this stage were evaluated: 1- Real identity or virtual user, 2- the type of activity, 3- political tendency, and, 4- job.

Real or virtual identity: Some users of Twitter reveal their identity. Getting a

blue tick from Twitter is the best index for understanding the identity of the user. However, we based our paper on the people who had particular names (i.e., alias), and only their information made their identity recognizable.

Type of activity: Publishing a tweet on Twitter has different styles. These styles among the users have famous names. Writing routines and satirical writing are prime examples of such styles. Here we select writing routines, sharing personal feelings, expressing political ideas, social activity, and satirical writing as the tag.

Political tendency: Identifying the political tendencies of Iranians has always been a challenging issue. Here we discovered that tags are used to discover political tendencies; then, there is a tool that can be used to identify political tendencies, at least among Twitter users. We have discovered that they can be divided into five categories, as follows:

1. Supporters of the Islamic Republic of Iran and the Principlists;
2. The Reformists and supporters of the Moderation and Development Party;
3. Moderate opposition groups;
4. Supporters of the destabilization of the Islamic Republic of Iran and finally;
5. Those who showed no or little political tendency.

In the end, categories 1, 2, and 5 will be further analyzed. The other two categories were not methodologically significant, especially in the network analysis of Twitter.

Job: Most of the users that determine their identity, state their jobs too. Journalists, computer programmers, and students are some examples of these tags.

In addition to the tagging of every community's users, we resort to the formula of identifying communities to identify the existing sub-communities in every cluster. In the following, we review the results of community and sub-community tagging.

Overall evaluation of the network of communities: A network analysis of Iranian Twitter users indicates that there could be three categories of users, each of which depicts a community (table 1).

Table 1. The complete statistical information relating to each of the three communities

	Community A	Community B	Community C
Number of nodes	15572	16382	16127
Number of edges	7962533	7694928	4418701
Average of total grade	1167	1215	806
Average of internal grade	1023	939	547
Proportion of internal-social communication	%87	%77	%68
Density	0.075	0.028	0.017
Average of closeness centrality	0.57	0.56	0.52
Average of betweenness centrality	0.000133	0.000125	0.00001
Total tagging of the users	Political supporters of Islamic Republic of Iran and the Principlists	Non-political Writing routines Social activity	Political Reformist and supporters of the subversion of Islamic Republic of Iran

Some of the results depict that community A has the highest correlation and centrality among the members (Table 1). Community C has the lowest correlation and centrality among the members. External-social communication of the users of community C is more than the other two communities. The members of community A have less connection with the individuals who are out of the inside community of A. The final evaluation of the users reveals that most of these users have “political” activity on Twitter, and they tend to support the Islamic Republic of Iran. Some well-known figures of the Principalist Party, journalists, and reporters of the related media are in this community.

Most members of community B are “non-politically motivated” Twitter users. Many of them engage in routine writing, sharing posts with personal feelings, poems, and personal notes. Social routine issues such as football, music, new movies, and criticizing the social behavior of others are some issues that attract the attention of the members of this community. Most of these members have a

virtual identity and do not reveal their real identities on Twitter.

Community C is the most scattered community in the network of Persian/ Iranian users of Twitter. Most of the members of this community are politically motivated users. Two sub-communities of C2 and C3 have a lot of real members, most of whom are well-known political and media figures. Community C1, however, mostly consists of political users with virtual identities. The common point in this community is criticizing or opposing the Islamic Republic of Iran. However, the political approaches in sub-communities of C2 and C3 are high, as evidenced by the dispersion and lower indicators of centrality. Community C4 has more similarities with community C3 in terms of identity.

Figure 3 provides a general view of the network and ten communities. The borderlines between communities have thoughtful points. For instance, in total community C consisted of a broad spectrum from the Reformists and the moderate opposing groups of the Islamic Republic of Iran to those who support the subversion of the Islamic Republic of Iran and the monarchists. On the one hand, community C2 includes the Reformists and moderate opposing groups, which are on the border with the Principalists and supporters of the Islamic Republic of Iran. On the other hand, community C1 consisted of satirical Twitter writer who is opposed to the regime and is on the border with non-political and routine writer users. Two communities of C2 and C3, which have similar identities are situated along with each other.

As it is evident, internal-to-external communication has a high ratio. In this vein, community A has the lowest external communication. Indicators of centrality in two communities of A and B have high grades in comparison with community C.

The high density of community A depicts that the coherence among the users of this community is very high. On the contrary, community C has more dispersion.

In terms of network indicators, community C has significant differences from the other two communities. Less centrality, more external communication of community, more sub-communities, and very low density depict that this community has less coherence in comparison with the other two communities.

Community A has the most centrality. The graph shows that the border of this node with the other two communities is very pale. However, the border between B and C is very bold and interwoven.

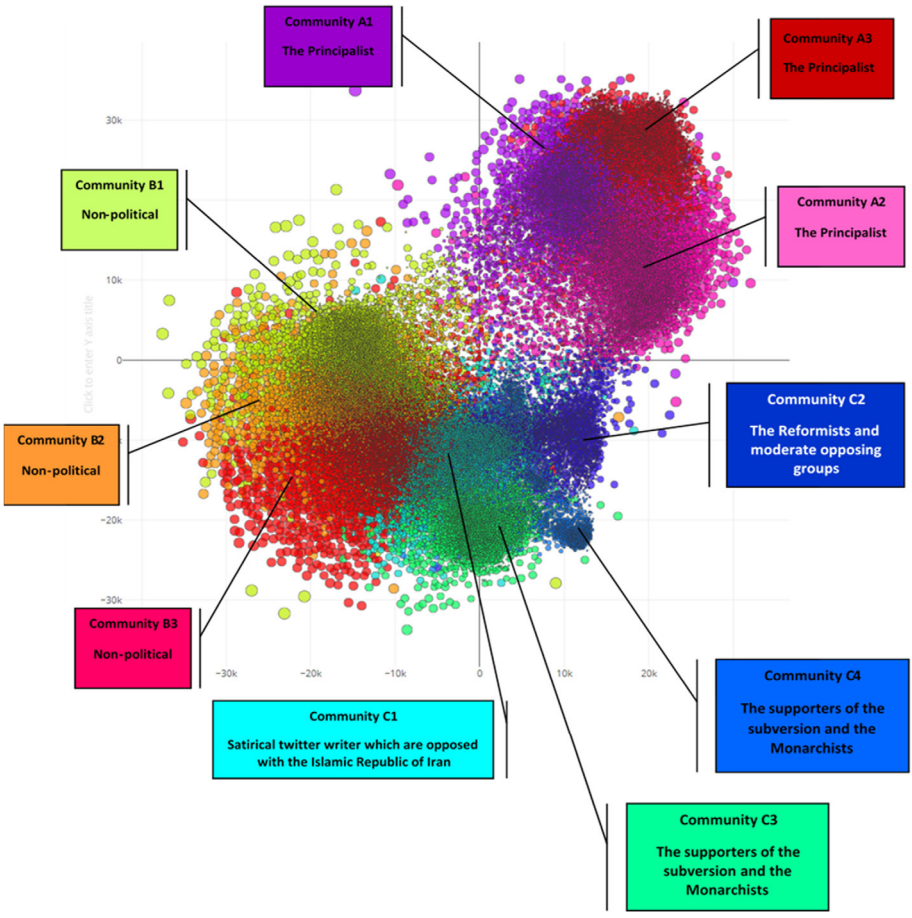

Figure 4. Outline graph of the communication network of Twitter users in Persian after tagging all communities

4. Concluding Remarks

Following the data analysis, we can now provide answers to the central questions of the study, i.e., can Twitter play the role of the public sphere in Iranian society?

It is important to note that various definitions and features have been proposed for the concept of the public sphere (e.g., Hauser, 1987). Overall, as mentioned before, the features of Habermas's public sphere could be summarized below (Habermas, 1989):

1. The content of the dialogue should be rational-critical;

2. Dialogue dealing with common civil issues of citizens, not private issues;
3. Overlooking individuals' distinctions and differences and cooperation of the people in dialogues like equal individuals;
4. The process of dialogue is limited to the formation of public opinion;
5. Considering the diversity of public spheres, prefer a solid public sphere in which it is possible to foster harmony.

The concept of the Echo Chamber is on the opposite side of the concept of the public sphere as it operates based on power and influence. The Echo chamber is a description of a situation in which individuals with high political homophily are categorized into one group and, in a circular process, circulate and enhance the beliefs of one another and disregard codes of variety and heterogeneity. Accordingly, unlike the public sphere in which individuals seek to achieve a common objective, meaning public goodness, in an equal space through rational discussion, members of the echo chamber fall in a situation where money and power determine the objective of the individuals with a lack of power. Basically, in an echo chamber, there is no discussion about two or some opposing ideas; instead, similar ideas enhance each other. Following, each of the features of the public sphere is evaluated based on the results of the Social Network Analysis of the Iranian Twitter users. Azad Aramaki and Emami (2005) mention seven measurable features of the public sphere, which could be studied in the platform of Twitter. These features could be divided into two categories.

On the one hand, some features could be evaluated based on the very nature and structure of Twitter as a social media regardless of what is practically happening in this system. And, some other features are related to the fact that they may not have been materialized and are under question. This paper focuses on the features of the second group.

Before addressing the features of the second group, we provide an overview of the features of the first group.

The features of the public sphere related to the nature and structure of Twitter consist of:

1. Equality of the individual in a dialogue;
2. Lack of the interference of political power in the dialogues;
3. Freedom in the discussion (every subject could be proposed).

4-1. Evaluation of the Features of First Group

Equality: All the services of Twitter as social media are equally accessible to all users of any type. However, some politically driven policies have recently placed Twitter in a situation to limit some users' access to Twitter. Every person in this social media can have an account and a private page. However, there are some rules for blocking the pages, which are generally based on the reports of other users. Overall, it can be said that on Twitter, all the users have equal access to services that they can use to express their ideas. This result is, of course, regardless of the discussions that can be made about Internet access and other basic issues.

Power interference: The element of power interference in the discussion on Twitter's users could be evaluated on three levels. The first level is related to the obligation of Twitter Company to follow the regulations of the United States of America. For instance, blocking the accounts of various Iranian users whose publishing contents are recognized as a threat to the US national interests, provokes some criticism. Therefore, the US government presents itself in this social media, one way or another. The second level of interference is the ability to control the local/national Internet service. For instance, the Iranian government began blocking Twitter in 2010, and the users have had to resort to some bypassing or anti-filtering techniques to be able to have access to Twitter. This is considered a kind of power interference in public space. The third form of power interference in this space is observing and punishing. The governments observe public discussions in the Twitter space, and the statements of the users in this space could have a legal consequence for them. Therefore, Twitter could not wholly realize this feature of the public sphere. However, the power also has some problems to interfere in this space.

Freedom: Twitter, like social media, does not have any limit for the users to make statements about various issues. However, publishing some unethical pictures and advertisements for terroristic activities is against the law. Although, as mentioned before, confirming this issue poses some challenges and discussion, in general, it can be said that Twitter has created a free space for discussion.

Features of the public sphere related to the users:

- ◇ Individuals discuss with each other rationally;
- ◇ This discussion leads to an agreement.

4-2. Evaluation of the Features of Secend Group

Rational discussion and the attempt to reach a collective agreement are the second category of characteristics that relate to user behavior. An evaluation of this category shows whether in practice what is flowing on Twitter is like a public domain or an echo chamber.

Rational Discussion: The first notable feature of the public sphere is the prevalence of rational discussion. If there were not any chance to promote discussion among and between the ideas and members, then it would be an indication that the public sphere did not exist. Such a situation was similar to having an echo chamber prevailed. We noted before that the network of Persian users on Twitter is divided into three inclusive communities and ten sub-communities. Then, we sought to determine the characteristic features of communities under study by studying the features of the existing users of every community, as is evident in Figure 3. Based on the evaluation of all related parameters, the study shows that only political features could be considered as the tag of communities. Iranian users on Twitter, select their friends from the individuals who share similar political tendencies with them. Although one of the communities consists of individuals who are not interested in political affairs, their apolitical tendencies, in a way, are reminiscent of being engaged in political affairs, and this is one of the underlying facts about the Iranian social network users. If these users shared other standard features, then we could attribute the reason for being in a collective community to issues other than politics. However, their common feature is to avoid political users. In general, it is concluded that Iranian Twitter users use Twitter as a political platform. This, however, raises the question of whether politically motivated users of Twitter promote a rational discussion among themselves.

Table 1 depicts the situation of internal and external communication of the community of Persian Twitter. Users of communities A and C, who are mainly political activists, indicate that 87 and 68 percent, respectively, of their total communication, is limited to those individuals within the groups that share more

similarities with them. Considering the presence of users in community C, these figures depict that although Persian Twitter users publish many political posts, they do not like to listen to ideas that are in sharp contrast with of their own. Every community creates an echo chamber for itself. It is stronger for the users of community A consisting of the Principalists/fundamentalists and the supporters of the Islamic Republic of Iran. The density of the network and central indicators also corroborate this issue. Community A has more coherence than others, but its external communication is minimal. This issue in community C, which is the opposite pole of community A is less visible than the former one. However, the existence of a broad spectrum of groups in a community could influence this situation. The borders in Figure 3 depict that communities B and C have a relatively longer common border, but the border of community A is different from the other two communities.

Overall, it could be said that the general condition of the network shows that political users support different views, and even those who are not political activists show a high percentage of having a connection with their like-minded people. The political homophily in this network is very high. Therefore, the situation is like an echo chamber.

Political Agreement: According to the issues discussed regarding the high political homophily of Persian Twitter users, in a situation in which individuals are not interested in listening to opposing ideas, reaching a collective agreement, which is the aim of the public sphere, is not possible.

5. Results

The results of this study show that although Twitter provides some basic features for community members to form a public sphere; Achieving this requires the will and desire of society. Other research shows that positive or negative approaches to the nature of social media are somewhat accelerated. Alexander Orman's research on the impact of Twitter on the political polarity of different societies (Urman, Context matters: political polarization on Twitter from a comparative perspective, 2019) shows that political culture in a real society is a major factor in determining Twitter users' behavior.

This study challenges deterministic theories about the nature of media and shows that the characteristics of political culture in each society can be crystallized differently in the context of social media. However, to get a more complete look at user behavior analysis, we need to delve deeper into Twitter user behavior analysis. Mapping relationship networks more accurately, taking into account the time factor and published content is one of the things that can be done to develop Twitter users network analysis.

6. Discussion

This article is one of the first Iranian research that studies the social world of Iranians by using the network analysis method in the general paradigm of computational social sciences. From the point of view of the amount of analyzed data, until the writing of this article, no research in Iran has used such a volume of virtual space data. Regardless of the results of this paper as a social research, from the perspective of the development of the use of big data, it plays a role in social research. It is hoped that more Iranian researchers will use big data in their social research in the future. Although using the network analysis method has a relatively long history in Iranian social studies. Due to performing this method on big data, we had to use different tools. For example, Gephi software isnot able to process this amount of data.

On the other hand, the data collected in this research and the network obtained from them can be reused in social research. There is valuable information from Persian Twitter in these data that can be used in the future.

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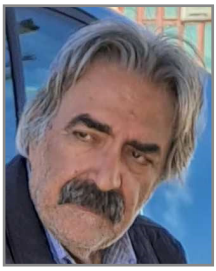

Hamid Abdollahyan

Hamid Abdollahyan is a Professor of Communication at the University of Tehran. His research interests include new media and cultural differences, Media and Public Sphere, Cultural Studies and Generations' Gap, Research Methods in Communications Studies, Comparative Dimensions of Sociology, Communication and History, Historical Sociology, Social Networking, Human-computer Interaction, Internet World and its Problematic for Science. His writings have appeared as a book titled Historical Sociology of Iran (2021), Comparative Perspectives in Sociology, Anthropology and Communication (2008). He also has published several articles in Journals such as *Alternate Routes, Critique; Critical Middle Eastern Studies, WeltTrends, Asian Journal of Social Sciences, Journal of Media and Religion, Iranian Social Science Letter, Communication and Culture, Global Media Journal, and Women's Studies*. He has done extensive research on the generation gap in Iran. He is currently working on theoretical dimensions of the internet and pathology. Currently, he is working on Historical sociology.

Saha Saleh

Saha Saleh graduated from the University of Tehran and holds a Master's degree in social communication sciences and is currently a PhD student in Communication at the University of Tehran. His research focus is on social network analysis and computational social sciences. Using new tools of artificial intelligence and big data he tries to offer a more recent understanding of social issues.