Political Polarization Mechanics on Persian Twitter (X): A Social Network Analysis of the 2024 Iranian Presidential Election

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Article Info	Abstract
	Background: The 2024 Iranian presidential election intensified political polarization on Persian Twitter (X), where ideological factions engaged in networked contestation. This study employs social network analysis to examine polarization mechanics, mapping key actors, echo chambers, and discursive strategies. Findings illuminate digital factionalism, algorithmic amplification, and the role of influencers in political mobilization. **Aims:** This study explores the mechanisms driving political polarization on Persian Twitter (X) during the 2024 Iranian presidential election. **Methodology:** Utilizing computational social science methodologies, the research combines social network analysis (SNA) and thematic analysis to examine over 133,000 active users and numerous election-related hashtags. Data collection spanned June 1–16, 2024, leveraging Twitter's API to identify clusters, user interactions, and thematic trends. Key tools included the Louvain algorithm for community detection and centrality measures for network analysis, visualized through Gephi software. **Findings:** Findings reveal a fragmented political landscape characterized by ideological divides, echo chambers, and limited interaction between opposing factions. Analysis identified six major clusters, each aligned with distinct political affiliations, including reformists, conservatives, and opposition groups. Thematic analysis further highlighted the rhetoric surrounding leading candidates Masoud Pezeshkian and Saeed Jalili, revealing polarized sentiments and distinct narratives among their supporters and detractors. The study also underscores the role of platform algorithms, influencer strategies, and group identities in deepening polarization. **Conclusions:** This research contributes to the understanding of digital polarization within Iran's socio-political context. It emphasizes the dual role of social media as both a space for public discourse and a driver of ideological segregation. Recommendations include strategies for promoting digital literacy, fostering inclusive discussions, and enhancing algorithmic transparency to mitigate polarization in Iran.

1. Introduction

The use of social media has become an integral part of modern communication, enabling individuals to connect, share information, and participate in various online activities (Kaplan & Haenlein, 2010; Shahghasemi, 2023). With the expansion of platforms such as Facebook, Twitter, and Instagram, people worldwide have embraced these digital spaces for personal, social, and political purposes. Social media platforms have emerged as influential arenas for political engagement, providing a forum for citizens to express political opinions, mobilize support, and engage in discussions about political issues (Bode & Dalrymple, 2020). Users share news articles, comment on political events, and follow political figures, all of which contribute to shaping their political beliefs and attitudes.

However, these tools also play an increasingly significant role in amplifying political and social polarization. Society is composed of multiple overlapping identities, and personal characteristics and political preferences vary widely at the individual level. Social media platforms, by design, allow like-minded individuals to find one another, fostering an environment where citizens are often exposed only to information that reinforces their political perspectives (Pariser, 2011).

These filters pave the way for affective polarization, a subset of polarization based on group identity. Affective polarization is characterized by individuals who identify with one group viewing members of opposing groups negatively (Cacciatore et al., 2015). Avoiding exposure to diverse cultural, political, and social differences and ignoring information that challenges personal views can, in the long term, lead to deep societal divisions and erosion of public trust.

Exposure solely to similar viewpoints and the avoidance of contrasting information and perspectives can decrease tolerance for challenging viewpoints (Mutz, 2002). Ultimately, these dynamic fosters division and exacerbates societal polarization (Sunstein, 2017).

New communication technologies have brought new challenges and opportunities (Hosseini et al., 2025) and social media, as one of the primary communication tools of the digital age, plays a pivotal role in politics and the shaping of public discourse. These platforms provide spaces for direct engagement, the rapid dissemination of information, and the expression of diverse viewpoints. However, they can simultaneously become fertile grounds for intensified polarization. This is particularly significant as social media has evolved into a primary venue for election campaigns and related conflicts, though this claim is not without contention (Nordbrandt, 2023).

As Guo and Hu (2023) discuss, since the advent of social networks, their impact on polarization has been a contentious issue. A key challenge in determining whether social media use exacerbates or mitigates political polarization lies in understanding how these platforms influence content consumption. Some scholars argue that

social media fosters exposure to diverse perspectives, and although there might be downsides in that (Nosraty et al., 2021), it facilitates constructive dialogues, enhancing social cohesion, and creating opportunities for engaging with differing opinions. Conversely, other researchers emphasize issues such as selective content consumption, network homogeneity, and the creation of echo chambers, contending that achieving an inclusive online public sphere is difficult and that social media use intensifies public polarization.

The 2024 Iranian presidential election provides a rich context for examining the phenomenon of political polarization on social media, particularly on Twitter (X). As a key arena for political discourse and public engagement, Twitter often amplifies conflicting narratives and transforms into an ideological battleground. In the Iranian context, which is part of the Middle East, this platform functions both as a space for dissenting voices and as a tool for promoting state narratives, creating a unique interplay of polarization (Shahghasemi & Prosser, 2019).

This paper investigates how polarization manifests during the election, analyzing the roles of influencers, hashtags, and content amplification algorithms in shaping public opinion and deepening political divides. By examining trending topics, participation patterns, and sentiments, the study seeks to uncover the mechanisms and implications of polarization in the digital age within the Persian Twitter ecosystem.

2. Discussion
2.1. Types of polarization
Polarization can be categorized into two distinct forms. The first is ideological polarization, which refers to the divergence of political beliefs, attitudes, and positions. The second is affective polarization, which focuses on the role of identity in politics (Mason, 2018) and how the prominence of in-group identities (e.g., political parties) can intensify hostility toward out-groups (Cacciatore et al., 2012). Affective polarization assesses the extent of warmth or affinity toward political allies and aversion or animosity toward political opponents (ibid).

Additionally, affective polarization often encompasses measures such as preferred social distance and trait evaluations (Druckman et al., 2022). Evidence suggests that affective polarization is largely driven by animosity toward political opponents rather than enhanced affinity for political allies.

In another classification, three additional forms of polarization can be identified:
- Elite Polarization: Polarization among political leaders and influential figures;
- Elected Official Polarization: Divergence in the attitudes and behavior of elected representatives; and

- Mass Polarization: Polarization among the general public.

2.1.1. Political polarization

The most common scientific definition of political polarization emerged in the 1990s. Esteban and Ray (1994) define polarization as the clustering of individuals into similar groups, such that the groups differ significantly from one another. This phenomenon arises from in-group identity and out-group alienation. The authors outline three key characteristics of polarized distributions:

1. **High homogeneity within each group**: Members of each group share similar traits;
2. **High heterogeneity between groups**: Significant differences exist between the groups;
3. **Few groups of considerable size**: Smaller or isolated groups (e.g., marginalized individuals) carry little weight.

2.2. Algorithms and echo chambers

Social media platform algorithms are designed to present content that aligns with users' prior interests and beliefs. This process can lead to the creation of "echo chambers", where users are exposed exclusively to viewpoints that reinforce their existing beliefs, while opposing perspectives are filtered out. This phenomenon can deepen ideological divides and reduce individuals' willingness to consider alternative views.

One prominent aspect of social media usage is the emergence of echo chambers (Pariser, 2011). These digital environments occur when individuals predominantly encounter information and opinions that align with their preexisting beliefs. As users engage with like-minded individuals and sources, their perspectives may become more rigid, further entrenching their political ideologies and intensifying divisions (Sunstein, 2017).

In general, social media platforms employ algorithms that curate content based on users' past interactions (Bovet & Makse, 2019). These algorithms can inadvertently contribute to political polarization by amplifying content that aligns with users' existing beliefs. Consequently, users are consistently exposed to materials that reinforce their views, further solidifying their political stance.

2.3. Theories of polarization

Several global theories have been employed to explain the phenomenon of societal polarization. Among the most prominent are the Filter Bubble Theory, the Spiral of Silence Theory, and the Selective Exposure Theory, each offering unique insights into the mechanisms of polarization.

2.3.1. Filter bubble theory

The filter bubble theory, originally proposed by Eli Pariser, highlights the complex relationship between personalized algorithms and the information environments created for users on social media platforms (Pariser, 2011).

According to this theory, algorithms prioritize content that aligns with users' existing beliefs and preferences, effectively creating individual "filter bubbles". These bubbles isolate users within tailored information ecosystems that cater exclusively to their interests and perspectives.

This personalization significantly influences the information users are exposed to, subsequently shaping their political beliefs and attitudes. By customizing content to individual preferences, social media platforms inadvertently limit users' exposure to diverse political viewpoints, reinforcing their pre-existing ideologies. Over time, this constant exposure to affirming content can lead to increasing polarization, as users' beliefs are continuously validated and intensified within their filter bubbles.

Understanding this theory is crucial for analyzing how social media use exacerbates political polarization by shaping the informational environments in which users operate (Otieno, 2024). Social media platforms, by reinforcing existing biases, create filter bubbles that intensify inter-party differences and hinder efforts to find common ground (Saaida, 2023).

This theory underscores a critical mechanism through which social media platforms contribute to political polarization, emphasizing the unintended consequences of algorithmic personalization in fostering ideological divides.

2.3.2. Spiral of silence theory

The spiral of silence theory, originally developed by Elisabeth Noelle-Neumann, explores the dynamics of public opinion and individual behavior within a social context (Noelle-Neumann, 1974). This theory describes situations in which individuals, fearing social isolation or potential backlash, often choose to remain silent or adjust their expressed opinions to align with the dominant perspective. In the context of social media, this phenomenon is particularly relevant, as users may hesitate to express minority political views due to concerns about criticism or rejection.

The Spiral of Silence Theory provides valuable insights into how individuals engage with political discourse on social platforms. It explains why some users might refrain from voicing their true political beliefs when they perceive themselves to be in an ideological minority within their online communities.

As individuals suppress their genuine opinions or conform to majority viewpoints, this can create a distorted perception of public

opinion, contributing to a false sense of consensus or polarization. These dynamic highlights the importance of considering social dynamics and perceived consensus when analyzing the impact of social media on political polarization (Otieno, 2024).

By silencing minority views, social media platforms may inadvertently reinforce dominant narratives, creating an environment where dissent is discouraged and ideological divides are amplified. The Spiral of Silence Theory thus underscores the need to account for these social pressures when assessing the role of social media in shaping political discourse.

2.3.3. Selective exposure theory

The selective exposure theory, developed by Joseph T. Klapper, examines individuals' natural tendency to seek information and media content aligned with their pre-existing attitudes and beliefs (Klapper, 1960). The theory posits that people gravitate toward media sources and engage with content that reinforces their political views while avoiding or dismissing information that contradicts these beliefs. This selective exposure to information results in individuals surrounding themselves with content that confirms their ideologies, effectively filtering out opposing perspectives.

In the context of political polarization and social media, the selective exposure theory offers valuable insights into user behavior and content consumption patterns. It suggests that individuals are naturally drawn to social media content that validates their political beliefs, fostering echo chambers and intensifying polarization. As users actively curate their online experiences to align with their preferences, the theory underscores how this self-selection of content can reinforce existing political views while limiting exposure to alternative perspectives.

Understanding the implications of selective exposure is crucial for examining how social media usage contributes to political polarization by facilitating the isolation of like-minded individuals and ideas (Otieno, 2024). Unlike passive recipients of media, individuals actively choose their exposure to news and social media content, tending to favor information that confirms their pre-existing beliefs. This phenomenon, termed selective exposure, significantly drives affective polarization (Kim et al., 2020).

While it remains unclear whether exposure to social media inherently fosters affective polarization (e.g., Beam et al., 2018), research consistently demonstrates that selective exposure to attitude-consistent media content exacerbates polarization. The theory shows that audiences who choose to expose themselves to selective information related to their beliefs prioritize preferred content and may neglect essential information or broader perspectives that conflict with their viewpoints.

Moreover, scholars argue that the dynamics of information

consumption have evolved with the advent of social media and internet-based reporting, reshaping traditional patterns of selective exposure. Unlike traditional media, where citizens have limited control over content selection, social media platforms enable users to deliberately choose the content they consume, actively immersing themselves in selective exposure experiences (Cacciatore et al., 2016).

This key difference between selective exposure in traditional and social media lies in the user's agency. In traditional media, citizens have minimal control over the content presented to them, whereas social media users exercise significant autonomy in curating their content. Despite these differences in the mechanisms of influence, the outcomes of selective exposure— reinforcement of political beliefs and reduced exposure to opposing views— remain consistent across media forms.

Social media's unique structure and accessibility further amplify the effects of selective exposure. Being freely accessible and open to diverse content creators, these platforms enable political actors to exploit selective exposure for their strategic purposes (Khan & Rahman, 2023). Consequently, selective exposure on social media has become a pivotal factor in shaping political beliefs and contributing to political polarization.

3. Literature review: Empirical studies

Empirical evidence on the persistent ideological clustering within online communication networks suggests that internet use can exacerbate collective polarization (Conover et al., 2012; Colleoni et al., 2014). The internet appears to foster a community of like-minded individuals where cross-ideological interactions and exposure to political diversity are rare. This argument builds on a long-standing tradition of research indicating that political discussion within homogeneous networks reinforces individuals' existing attitudes (Berelson et al., 1954; Huckfeldt, 1995; Mutz, 2006).

Given that people are generally reluctant to engage with political opponents in their day-to-day interactions, many individuals increasingly shape their perceptions of opponents through media representation—particularly social media (DellaVigna & Kaplan, 2007; Lau et al., 2017).

However, media may not always have a polarizing effect on viewers. Some researchers argue that social and traditional media exert no influence on political polarization. Others suggest that under certain conditions, political information may even have a depolarizing effect on audiences (Beam et al., 2018; Wojcieszak et al., 2020).

Some scholars contend that personalized social media networks not only fail to amplify echo chambers but also help moderate political tendencies. One notable example is Pablo Barberá, who examined Germany, Spain, and the United States. His findings demonstrate that platforms like Facebook and Twitter increase random exposure to

politically charged messages shared by peers. Moreover, these platforms facilitate exposure to messages from individuals with whom users have weak social ties, making it more likely to encounter new information (Granovetter, 1973). Consequently, despite the homogeneous nature of personalized networks, social media exposes users to a broader range of political opinions compared to conventional settings (McPherson et al., 2001). This exposure leads to political moderation at the individual level and directly contributes to reducing collective political polarization. Findings from this study indicate that most social media users inhabit ideologically diverse networks, and exposure to political diversity has a positive impact on political moderation.

The studies by Campante and Hojman (2013) further illustrate the relationship between political polarization and media exposure. Their findings suggest that many individuals prefer examining both sides of an issue before forming their conclusions, thereby fostering a healthier environment for public awareness and democracy.

Thus, while scholars have extensively examined the role of media in political polarization, several key gaps in this area remain unexplored. In Iran, however, there has been limited research on political polarization. In 2018, Mehdi Goldani conducted an in-depth study of this concept, exploring its mechanisms, growth, and the potential positive and negative impacts it may have on the political system. Accordingly, given the significance of the issue and the fact that the process of polarization on social networks can play a crucial role in creating social and political challenges in Iran, leading to widespread societal divisions, it is essential to examine this polarized environment across various dimensions. In Iran's diverse and multicultural society, attention to this matter is of paramount importance. Considering the role of political elites in fostering polarization, the present article aims to study this phenomenon within the context of the presidential election process.

4. Method
The data collection and analysis method employed in this study is based on the methodology of computational social science. The integration of social sciences with computer science and engineering disciplines has established a new field of study known as computational social science. This field applies computational methods to novel digital data sources, such as social media, to advance the development of theories on human behavior.

Computational social science has significantly influenced the study of collective behavior and politics. Social media data and other communication platforms have particularly advanced the analysis of collective behavior. Many studies have utilized online data, automated text analysis, experiments, and agent-based modeling to examine

polarization and political persuasion. These studies explore how political streams shape and amplify the role of "echo chambers", which facilitate selective exposure to information.

Research also highlights the polarization of social networks. Studies using other methodologies indicate that patterns of financial contributions to political candidates have become increasingly polarized in recent decades, with elite contributions contributing to the polarization of beliefs.

In this article, employing a computational method for data collection during the period from June 1 to June 16, 2024, over 133,000 active users were analyzed using the Twitter API. It should be noted that in the data collection process of this research, three domestic data collection platforms–Datak, Life Weband Hashtag–were utilized, and all available data within the specified timeframe were used. Additionally, two methods were employed to extract the list of relevant hashtags.

In the first method, a list of trending hashtags was compiled by referring to the aforementioned platforms. In the second step, relying on domain experts consisting of six specialists, the list of hashtags was finalized by examining the accounts of active users within each political faction and reviewing the hashtags they used. Ultimately, the following hashtags were used in the data collection process based on the text of the tweets.

> #Qalibaf, #PresidentialElection, #Pezeshkian, #ElectionCircus, #SaeedJalili, #Jalili, #GainAltitude, #LowAltitude, #Larijani, #FromLarijani, #RightChoice, #IVote, #LikeRaisi, #GovernmentOfProgressAndService, #ActionsMatter, #WhyQalibaf, #PourMohammadi, #GovernmentOfCommitment, #ForIran, #Zakani, #RevolutionTank, #BePureAndServe, #Qazizadeh, #GovernmentOfPeopleAndFamily, #SaeedPresident, and #StrategicDepth

In the next step, utilizing the Social Network Analysis (SNA) method and tools for graphing the relationships of followers, followees, and retweet shares, a study was conducted on over 133,000 active users who had employed the aforementioned hashtags. The foundation of social network analysis, also referred to as network science or network sociology, lies in the concept that individual nodes— depending on the type of network, these nodes could represent individuals, events, or similar entities— are interconnected through complex but comprehensible relationships, resulting in the formation of networks. Human relations have undergone significant changes due to introduction of ICTs (Shahghasemi et al., 2023) and as a result, new communication networks have been formed. These networks, governed

by principled structures and simple rules, are ubiquitous and provide a structural framework for many natural events, organizational phenomena, and social processes (Ressler, 2006).

In the present article, the focus is on the creation of human clusters through the machine learning process. It is worth noting that clustering involves dividing data into different groups (clusters) that are not predefined, based on within-cluster similarity and between-cluster differences. Clustering is an unsupervised learning method. Here, algorithms seek patterns, structures, and relationships within the data without prior knowledge of the outputs. Additionally, in this study, graphs have been employed to visualize and represent these clusters, utilizing the Gephi software for this purpose.

In this article, the Louvain algorithm has been utilized to identify clusters. This algorithm, introduced for detecting groups within a graph, designates each extracted group as a "community." The Louvain algorithm employs a bottom-up clustering approach (Girvan & Newman, 2002).

In this algorithm, a parameter called modularity is used to evaluate the quality of the identified communities. One of the key advantages of the Louvain method is its ability to address the challenges posed by large graphs while maintaining high execution speed. After clustering the network, it is necessary to determine the most suitable initial nodes for activation. In this study, four types of node centrality measures were employed to identify these initial nodes.

Node centrality defines the structural position of a node to assess its relative importance within the graph. Various centrality measures are used to determine the significance of nodes in the structure of a social network. This article focuses on four centrality measures applied in the research. Centrality metrics assess the importance or prominence of nodes in a network, identifying those with central positions that play a crucial role in information flow, influence, or communication. Commonly used centrality measures include degree centrality, betweenness centrality, and closeness centrality.

It is worth noting that in this study, the modularity metric of the Louvain algorithm has been employed to evaluate the quality of communities. Modularity is recognized as one of the most prominent metrics for assessing the effectiveness of community detection methods. The maximum modularity value is achieved when all nodes within each community are fully connected, while no edges connect nodes between different communities. A fundamental feature of modularity is its ability to compare communities with varying numbers of clusters. Since different algorithms do not necessarily produce the same number of communities, many existing metrics fail to facilitate a valid comparison of methods, rendering them unsuitable for evaluating such approaches. However, when utilizing the hierarchical bottom-up Louvain algorithm, the progression of modularity changes can be

analyzed during the division or merging of communities. The configuration that maximizes modularity is considered the optimal final state (Blondel et al., 2008).

It is worth noting that in the next phase, after identifying the user clusters, thematic analysis was employed to identify the themes attributed to each of the candidates. Thematic analysis is a widely used qualitative method often applied to identify qualitative and verbal patterns and generate codes associated with them. This method allows for the identification of patterns within qualitative data. Thematic frameworks are commonly used tools within thematic analysis.

Accordingly, in this study, the thematic analysis method has been employed to examine the topics and actions related to the two main candidates in this election, Masoud Pezeshkian and Saeed Jalili, based on the content published on Twitter. For this purpose, 500 tweets related to each candidate were selected as a probabilistic sample using relevant keywords and analyzed. Probabilistic sampling here means that the selection of tweets was done without bias, solely based on assigning numbers to the texts. Specifically, regardless of the number of likes, views, or the status of the users, the extracted texts were numbered, and then 500 texts were selected as samples for analysis. It is worth noting that to enhance the reliability of the coding; the triangulation[1] technique was used, with three researchers with completely different political and theoretical approaches participating in the coding process. Additionally, it is important to emphasize that since this article adopts a qualitative and exploratory approach to studying the themes of the tweets, it does not claim generalizability. The sole purpose of coding the tweet texts was to qualitatively extract the key themes related to the two final candidates in this election. The thematic analysis method was used complementarily alongside network analysis, and the researchers also considered the triangulation process in their methodological approach.

5. Findings
An analysis of Persian Twitter data from June 1 to June 16, 2024, identified over 133,000 active users. The findings indicate a politically multi-polar environment on Twitter, characterized by significant ideological and social distance between political groups.

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1. Researcher triangulation refers to the use of more than one observer, interviewer, coder, or data analyst. The findings obtained from each evaluator are compared with one another. If the findings of the evaluators converge to the same result, the validity of the research is confirmed. If the results significantly differ, further studies are conducted to uncover the true and definitive findings. The goal of employing multiple researchers is to reduce the likelihood of bias in data collection, coding, and analysis, and to help establish internal validity.
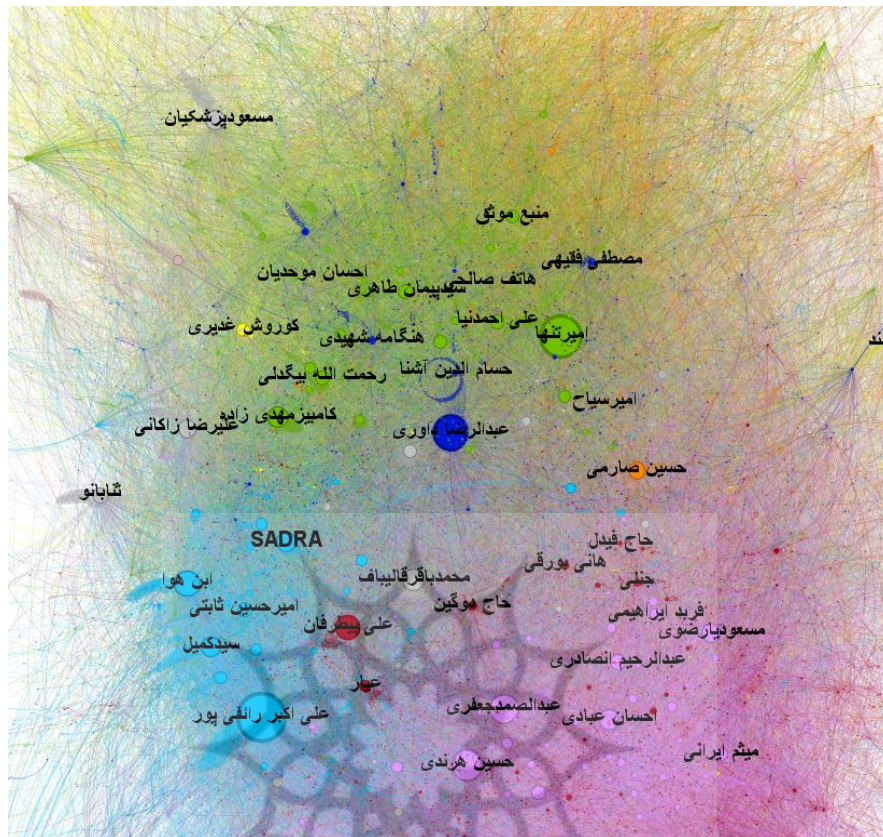
Figure 1. Graph related to supporters of electoral candidates in Iran

As observed in the generated graph (Figure 1), the complex network is divided into six clusters: Cluster 1 (Purple): This cluster constitutes 17.12% of the graph network. Based on the active nodes within this cluster, it is associated with supporters of Mohammad Bagher Ghalibaf; Cluster 2 (Green): Representing 15.54% of the network, this cluster is aligned with reformist movements and supporters of Masoud Pezeshkian; Cluster 3 (Light Blue): This cluster, comprising 13.54% of the network, includes supporters of Saeed Jalili; Cluster 4 (Red): Key nodes in this cluster include users such as "Ayar" and "Jenli." This cluster accounts for 7.06% of the network's density; Cluster 5 (Yellow): This cluster features opposition accounts critical of the regime.

These accounts have notably engaged in criticizing Masoud Pezeshkian. The distribution and composition of these clusters reflect the political and ideological divisions within the Persian Twitter space during the observed period.

Based on what is observed in the graph, it is important to note that in the 1403/2024 election process, unlike previous elections, external and opposing factions had the least interaction with domestic factions. However, in general, their approach was most antagonistic toward the

group supporting Masoud Pezeshkian's opponents. They focused on the notion of "non-participation" and the role of Masoud Pezeshkian in attracting groups that were boycotting the election, and from this perspective, they widely criticized him. As the Twitter environment became more polarized and approached the election period, the volume of content opposing Masoud Pezeshkian increased significantly.

Table 1. Six complex networks

Colour	Flow	Density	Some members of the cluster
	Supporter of Mohammad Baqer Qalibaf	17.12%	Masoud Yarazavi, Abdolsamad Jafari, Hossein Herandi, Ehsan Ebadi, Farbod Ebrahimi
	Masoud Pezeshkian	15.54%	Amir Tanha, Kambiz Mahdizadeh, Ali Ahmadnia, Seyed Peyman Taheri, Rahmatollah Bigdeli, Trusted Source
	Saeed Jalili	13.54%	Ali Akbar Raefipour, Ibn Hawa, Seyed Kamiel, Sadra, Amirhossein Sabeti
	Saeed Jalili	7.06%	Ali Bi Tarafan, Ayar, Hajj Doghin, HaniBouraghi, Jenali, Haji Fidel
	Opponent of Masoud Pezeshkian	4.36%	Kourosh Ghadiari, Armand, Milad
	Mixed	4.33%	Abdolhossein Davari, Hesamoddin Ashna in the Blue Cluster

Furthermore, an analysis of the most frequent hashtags on Twitter shows that, as of Thursday, July 4th, according to the data mining system of Life Web Company, the hashtags #سیرک_انتخابات (Election Circus) and #رای_بی_رای (Vote Without Vote) were among the most frequently used hashtags in Persian Twitter. This reflects the fragmented nature of Iranian society in the digital space, where some users have expressed support for Masoud Pezeshkian, others have introduced Saeed Jalili as their elected president and, alongside this, opposing political factions have created content using election boycott hashtags.

Therefore, it must be noted that in this election cycle, the use of "fear" as one of the influencing variables in voting behavior has receded. A newly formed social core, which could perhaps be called the "401 Core", rejects the intellectual and influential references of the reformists. For this group, abstaining from voting is no longer simply a protest ritual influenced by external factors, but a conscious action among the domestic population. Hence, it can be said that in the process of studying Twitter content, we are not merely facing two active poles, but rather witnessing a cultural fragmentation in this domain.

The analysis of Twitter data also shows that the election boycott campaign intensified one week before the election and peaked in the days leading up to the election.

Figure 2. Most used hashtags

Notably, some prominent opposition figures took a firm stance against the election in the final days. It should be noted that there has not been a direct study examining the impact of the election boycott campaign on voter participation, especially in the first round. The chart below illustrates the volume of content produced on this subject. It appears that at the beginning of the electoral activities, the boycott-oriented factions, employing psychological operations tactics by avoiding election coverage, initially disregarded the issue. However, over time, the process of content production intensified and expanded significantly.

Figure 3. Number of tweets and retweets published with hashtags related to the election boycott until election day
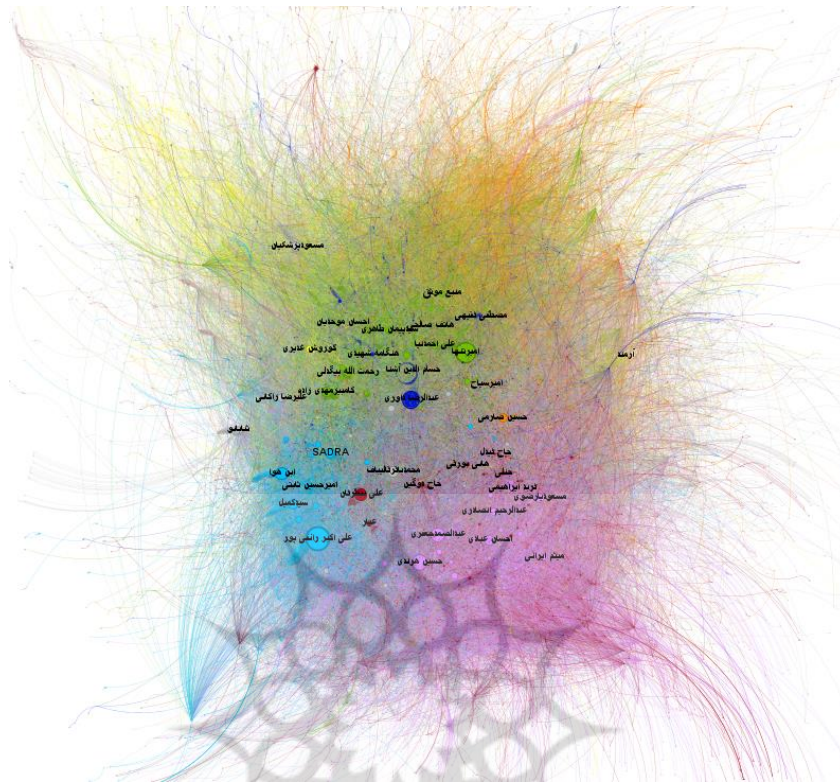
Figure 4. Cloud worlds

In addition to what has been mentioned, among the supporting factions, it seems that the behavior of users and accounts associated with certain conservative figures indicates widespread organization. This suggests that they have the ability to influence virtual polls and manipulate results. This indicates that among some candidates, organized and bot-like activity was observed among users, which led to a significant discrepancy between the results of polls and surveys conducted by domestic polling institutes and the content generated in the virtual space.

5.1. Analysis of the themes discussed regarding Masoud Pezeshkian on Twitter
It is worth mentioning that in order to analyze the content generated regarding Masoud Pezeshkian, the keywords #ReturnOfLife, #Pezeshkian, and #ForIran have been used. Table 2 presenting some of the actions and concepts attributed to him by his supporters.

The image below illustrates the hashtag cloud representing the hashtags used for this candidate across all published tweets.

Table 2. Actions and Concepts attributed to Masoud Pezeshkian on Persian Twitter by supporters

Themes	Examples
Hope-inducing	#Return_of_Life is such a meaningful hashtag. I hope we all return. To diminish all this death-seeking rhetoric, to hear the footsteps of hope for the future, and to vote for Dr. Pezeshkian for the #Return_of_Life, perhaps this is the last opportunity and resort. #Return_of_Life means we are all hopeful. It means the end of #Delusion_of_Expertise #Pezeshkian
Honest and people-oriented	After watching tonight's *Without doubt*, I felt even prouder of my support for Dr. #Pezeshkian. A sincere, unpretentious, and people-oriented individual. Thank you, Dr. #Pezeshkian, for stepping into the electoral arena #For_Iran and bringing hope to society. ✌️ #Pezeshkian ✌️✌️ #Return_of_Life I admire his honesty, especially during the peak of the #election campaign, when colorful but unrealistic promises are often among the main priorities of candidates. #Masoud_Pezeshkian #Return_of_Life #Pezeshkian is the sole voice of the #nation—he can lead. #Pezeshkian #For_Iran #Honest_President A #man of the people—someone who stands tall with resilience yet sheds tears when reminded of a past love. Someone who stood by the people in their grief and supported them when they were powerless. #Pezeshkian is one of us, one of our own. #For_Iran
Strong and Anti-Corruption	#Pezeshkian: "Within five months, we can put an end to corruption. I am not beholden to anyone. I have always stood by the people, not the powerful. The people are right, and it is our duty to solve their problems. If you remain active and hold us accountable, I can move forward with strength." #For_Iran #Pezeshkian: "If the people trust me and I gain power, I will eliminate the parallel systems of the government, parliament, and judiciary that operate separately from the people's interests." #For_Iran
Having a language understandable by the public	Dr. #Pezeshkian speaks with clarity and simplicity, avoiding complex language to ensure that all people and the broader community understand his message. He communicates about his government's plans in a way that resonates with everyone. #Pezeshkian_For_Iran speaks the language of the people. ✌️✌️ #Physician_President #Return_of_Life #Return_of_Life, Pezeshkian's simple yet impactful slogan, is universally understandable and resonates with the general public. It was a wise and strategic choice.
Critical and Reformist	The fundamental difference between Masoud #Pezeshkian and the other five candidates is this: they are accomplices, beneficiaries, and advocates of the current state of affairs and cannot bring about change. In contrast, Pezeshkian has entered the race to bring change and is a staunch critic of the status quo. #Pezeshkian #For_Iran
Having a healthy family (commitment/ loyalty/ living without privilege)	Pezeshkian: "My children have not only never caused me disgrace, but they are my pride. There are many who are not like this. I am proud of my family. I lost my wife 30 years ago, and my children have never exploited my position for their own benefit." #For_Iran
Trustworthy and Committed	He says: "I am a reformist who puts his neck on the line for the words I speak." Although our people have heard nothing but deceptive promises from those in power for years, with no fulfillment, the words of this man carry a sense of honesty. We will not regret voting for #Pezeshkian. #For_Iran

Figure 5. The hashtag cloud representing the hashtags used for the elected candidate

Table 3. Topics attributed against Masoud Pezeshkian on Persian Twitter by opponents

Topics	Simple	Dissemination flow
Conservatives	#Pezeshkian: "In order for justice and fairness to take shape in society, reforms are necessary. Society must be active so that we do not take a single step in the wrong direction. For justice and fairness to take shape, reforms are essential." #For_Iran	Ethno-nationalism (Separatism)
Conservatives	Experience has proven that the reformist agenda in each period has been a return to power, not a #Return_of_Life.	Power-seeking of reformists
Opposition	This couldn't be more ridiculous! You, Khatami, and your master Khamenei are like cancerous tumors, and with your presence, there is no possibility for a #Return_of_Life, which requires utilizing Iran's assets #For_Iran. You don't even pay attention to the words of this lady, and you're just wandering in space like a scarecrow in the #Election_Circus! #Return_of_Life? Interesting! Dude, you already said the final word in the beginning: the only reason people like you show up is to increase participation, and thanks for having the decency to admit the main point—that in the end, all of you are nothing more than toys. You should see what the higher-ups are saying. ☺	Alignment and endorsement of the regime

5.2. Analysis of topics related to Masoud Pezeshkian on Twitter

By analyzing over 2,000 tweets published during the election period regarding Saeed Jalili, the most frequent hashtags and key terms have been identified.

Figure 6. The most frequent hashtags for Saied Jalili

Table 4. Actions and Concepts attributed to Saeed Jalili on Persian Twitter by supporters

Themes	Sample
Diligent and hard-working	The Iranian nation, in order to preserve its interests in complex international equations and to solidify its strategic depth, requires an active, hard-working, knowledgeable president who believes in the principles of the revolution. Imam Khamenei, May God Protect Him, 14th of Khordad, 1403. #Servant_of_the_Nation #Like_Raisi
Honesty and truthfulness	The pious have signs by which they are recognized: truthfulness, trustworthiness, and keeping promises. Imam Ali (PBUH) #Like_Raisi #Cancer_of_Reforms #Strategic_Depth
Being revolutionary	The Supreme Leader of the Revolution stated: For the Iranian nation to solidify its strategic depth, sweeten the lives of the people, and fill the economic and cultural gaps, it needs an active, hard-working, knowledgeable president who believes in the principles of the revolution ⫿ 📌 #Like_Raisi, who established such a #Revolutionary_Government…
Utilization of domestic capacities and talents	The result of electing an active and hard-working president is the preservation of national interests in international equations, filling economic and cultural gaps and vulnerabilities, sweetening the lives of the people, solidifying the strategic depth of the Iranian nation, and the emergence of Iran's natural and human capacities and talents. #Servant_of_the_Nation
Attention to the axis of resistance	The outstanding record of the foreign policy of the 13th government: • Active participation in international forums and dynamic legal follow-ups • Strengthening the neighborhood policy • Activating economic diplomacy • Reinforcing the axis of resistance and developing the strategic depth of the country #Someone_Like_Him

Table 5. Topics attributed against Saeed Jalili on Persian Twitter by opponents

Topics	Simple	Dissemination flow
Inability in planning	The output of 7,000 pages of program over 11 years in the shadow government is what you see: strategic depth! Proficient in generalizations; helpless in presenting program details! This is even a cultural/religious issue that the so-called experts in imagery have struggled with for a lifetime, let alone economics, which they have no proper understanding of!	Reformists
Selectivity in adherence to the law	Jalili: "As long as the hijab law exists, it must be implemented. Speaking of the law, Article 27 of the Constitution explicitly considers the freedom of assembly and marches as the undeniable right of the people. Who said the law should be implemented selectively and arbitrarily? I wish you would lie less and deceive the public less." #Strategic_Depth #Compulsory_Hijab	Reformists
Costly policies for Iran	• Supporters of #Jalili envy his "simple lifestyle" and every day, they take more pleasure in this worn-out approach! • However, it's a shame they don't realize that this #simple_lifestyle has imposed a huge cost on the country and the people's livelihoods! Lowering office expenses and public funds by using a few similar #Tiba cars, bringing food from home, or using a personal pen (instead of a government-issued one), etc., does not simply result in a "half-thousandth percent" savings for public funds! • On the other hand, repeating theories like "sanctions are a blessing," "opposing negotiations," and prescribing "resistance to sanctions," leads to a devastating blow to the shrinking livelihoods of the people, imposing a loss and opportunity cost worth billions of dollars on the country. Such a slogan-driven and naïve approach is not only unworthy of praise, but actually shows a lack of understanding of the people's concerns and is a sign of naivety in recognizing the #Strategic_Depth of Iran's enemies!	Reformists

5.3. Identifying the mechanics of polarization
5.3.1. The role of politicians and political elites
In addition to the points mentioned, the role of elites and political activists in the process of election polarization should not be overlooked. Based on this, numerous pieces of content from political

activists in various identified categories have been observed, aiming to incite users and create a polarized atmosphere.

In this regard, it can be said that while many factors contribute to this polarization, the role of politicians in utilizing media to fuel and amplify these divisions cannot be underestimated. Politicians misuse various media platforms to initiate and sustain political polarization. They have found new ways to communicate directly with their voters. While this provides an opportunity for greater transparency and interaction, it has also become a breeding ground for misinformation, echo chambers, and confirmation bias. Politicians exploit the algorithmic nature of these platforms to target specific demographics, reinforcing pre-existing beliefs and ideologies, thereby deepening the divide between opposing political factions.

چه کسی فکر می‌کرد #منصورارضی مداح، مبلغ #پزشکیان بشود؟

در حاشیه دعای عرفه بی ادبانه به پزشکیان گفته این دیوانه می‌خواهد رییس جمهور ما شود.

هرچه مخالفت آنها با پزشکیان بیشتر شود سبد رأی او افزایش می‌یابد.

Translate post

10:51 PM · Jun 16, 2024 · **6,361** Views

@MrTajernia

انتخاب بین #پزشکیان و اون ۴ نفر انتخاب بین کار علمی شایستگان داخلی با کمک کارشناسان قوی بین‌المللی است با مدیریت یک عده‌ی کوچیک دانشگاه امام صادقی #برای_ایران

Translate post

6:44 PM · Jun 14, 2024 · **823** Views

Figure 7. Sample Tweets

The findings of the present study align with the research conducted by Tandoc, Lim, and Ling (2020). These researchers conducted a comparative analysis of online media in Europe to examine its impact on political polarization. Using a content analysis approach, they examined data from Facebook and Twitter during the European Parliamentary elections. Their findings revealed that social media platforms play a significant role in amplifying the polarization of political discourse, particularly in countries with highly fragmented political landscapes. Echo chambers formed around political candidates, reinforcing existing political beliefs among users. Based on these findings, the authors recommended developing algorithms that

prioritize fact-based reporting and the promotion of diverse political perspectives on social media to mitigate the intensification of political polarization.

In summary, it can be said that in today's interconnected world, media plays a decisive role in shaping public opinion and influencing political discourse. However, the modern media landscape has undergone significant changes over the years, and politicians increasingly leverage its power to advance their agendas. One of the most concerning outcomes of this manipulation is the rise of political polarization, a phenomenon that has deeply affected societies worldwide. Political polarization refers to the growing ideological divide between different groups or political parties, leading to an increasingly divided and antagonistic political environment (Ahmed et al., 2016).

In addition, sensationalism and fear-mongering also play a significant role. Politicians seeking to rally their base often resort to sensationalism and fear-mongering to advance their political agendas. By using emotionally charged rhetoric and framing issues in extreme terms, they polarize public opinion and leave little room for debate or compromise (Ahmed & Skoric, 2014).

For example, a content analysis of tweets by American politicians found that Republican politicians used more bipolar language and rhetoric compared to their Democratic counterparts. Another content analysis revealed that when politicians tweet more ideologically polarized content, they gain more followers on Twitter (Hong & Kim, 2016).

5.4. Intensification of group identities

Another mechanism used in the process of political polarization is the intensification of group and ethnic identities, which, in this election, led to heightened conflict among internal forces, especially by emphasizing the ethnic backgrounds of the candidates.

Therefore, it can be said that social media can also help reinforce group identities, such as political, religious, or ethnic identities. This can result in the creation of "us" versus "them" dynamics and increase hostility between different groups. Individuals on these platforms tend to connect with those who share similar views and avoid engaging with individuals who hold opposing perspectives.

Many of the negative impacts on political discourse have also emerged with the proliferation of political propaganda on social media. This has intensified division and extremism, challenging people's participation in meaningful political discourse (Saaida, 2023).

Figure 8. A sample Tweet

5.5. Strategies
Overall, five strategic dimensions can be identified:

1. **Educational strategies**. One of the most important strategies currently being implemented and planned by various societies is the need to increase digital media literacy programs (Arsalani et al., 2022). These programs aim to equip individuals with critical thinking skills to identify credible information on social media platforms. Therefore, developing and implementing comprehensive digital media literacy programs aimed at equipping individuals with the skills to critically assess information and distinguish reliable sources from misinformation and false content on social media platforms is essential. These programs should be tailored to different age groups and educational levels, focusing on improving media literacy and critical thinking skills. Furthermore, they should address specific challenges arising from the rapid spread of political content on social media, including methods of fact-checking and verification. As digital media literacy increases, individuals will be better equipped to navigate the digital landscape and make informed decisions about the content they engage with. This will reduce the risk of being influenced by polarizing and misleading information.

2. **Policy Strategies**. These strategies should be framed in the context of engagement with social media platforms and aimed at promoting algorithmic transparency and accountability. This will ensure that the prioritization of content does not unintentionally exacerbate polarization within societies. Accordingly, users must have access to information about how these algorithms work and how they affect the content appearing in their feeds. Additionally, platforms should establish clear guidelines and standards for content moderation, focusing on promoting a variety of political viewpoints and a balanced discourse. Furthermore, regular audits and evaluations of these algorithms should be conducted to ensure that they do not unintentionally contribute to political polarization. Platforms must also be held accountable for addressing instances of bias or algorithmic manipulation that may exacerbate polarization. By promoting algorithmic transparency and accountability, social media platforms can work towards creating a more balanced and less polarized online environment.

3. **Promotional Strategies.** Promoting constructive and civil online discourse and implementing moderation policies can foster a more inclusive online environment. Social media platforms should actively promote civil and constructive online discourse. This can be achieved through the enforcement of ethical guidelines that prevent hate speech, harassment, and inflammatory rhetoric. Platforms should also encourage respectful and informed discussions by identifying and rewarding users who participate in constructive conversations. Furthermore, moderation policies should be continuously implemented to address toxic behavior and the spread of misinformation or disinformation. Encouraging users to engage with different viewpoints in a respectful manner can cultivate a more inclusive online environment and reduce the amplification of extreme political positions.

4. **Supportive Strategies**. Supporting independent fact-checking and news verification efforts can help combat the spread of misinformation and promote trust in credible sources, thus reducing the impact of misinformation on political conflict. To combat the spread of misinformation and false content on social media, there should be increased support for independent fact-checkers and news verification initiatives. These organizations play a crucial role in identifying and discussing false or misleading information and providing users with accurate and reliable sources. Social media platforms should collaborate with credible fact-checking organizations and prominently display verified factual information to users when claims are disputed. Moreover, users should be encouraged to verify information before sharing it and to rely on reputable news sources. By supporting fact-checking efforts and promoting responsible

information-sharing practices, platforms can help mitigate the impact of misinformation on political conflict in the digital age.

5. **Regulatory Strategies.** Part of the strategies also involves political figures, elites, and officials, who should establish regulatory frameworks at the appropriate legal moment to prevent the creation of polarized spaces, the spread of false news, and the emotional manipulation of the public. This means that politicians, intellectuals, and ideological leaders must explicitly oppose polarizing and hateful language and actions. They should also avoid repeating misinformation, even if the intent is to refute it.

6. Conclusion

The findings of this study illustrate the significant role Persian Twitter (X) plays in shaping political polarization during the 2024 Iranian presidential election. The research highlights the emergence of a fragmented digital landscape, characterized by ideological echo chambers, limited cross-group interactions, and polarized discourse. Social network analysis revealed six distinct clusters representing various political alignments, while thematic analysis uncovered the contrasting narratives surrounding leading candidates Masoud Pezeshkian and Saeed Jalili. These dynamics reflect broader trends of polarization driven by platform algorithms, influencer activities, and the amplification of group identities.

A key takeaway from this study is the dual nature of social media: it serves as both a space for public engagement and a mechanism for deepening ideological divides. The interplay of algorithmic filters, selective exposure, and identity-based clustering exacerbates political fragmentation, undermining the potential for constructive dialogue. Notably, opposition groups used hashtags and campaigns to advocate election boycotts, signaling a shift in public engagement patterns compared to previous elections.

The study's findings emphasize the need for actionable strategies to address the challenges posed by digital polarization. Recommendations include enhancing digital media literacy to promote critical evaluation of online content, fostering inclusive algorithmic designs that encourage exposure to diverse perspectives, and implementing regulatory frameworks to combat misinformation and polarizing narratives. These measures can help mitigate the negative impacts of social media on political discourse, fostering a healthier and more balanced digital public sphere.

In conclusion, while social media has undeniably transformed political engagement in Iran, its role in amplifying polarization necessitates a multi-pronged approach to harness its potential for constructive discourse. Future research should explore longitudinal effects of polarization on voter behavior and investigate strategies to create inclusive digital environments in politically charged contexts.

Conflict of interest
The author declared no conflicts of interest.

Authors' contributions
All authors contributed to the original idea, study design.

Ethical considerations
The author has completely considered ethical issues, including informed consent, plagiarism, data fabrication, misconduct, and/or falsification, double publication and/or redundancy, submission, etc. This article was not authored by artificial intelligence.

Data availability
The dataset generated and analyzed during the current study is available from the corresponding author on reasonable request.

Funding
This research did not receive any grant from funding agencies in the public, commercial, or non-profit sectors.

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