

The Influence of Social Media on Political Mobilization: A Machine Learning-Based Case Study of Recent Global Movements

Anirban Hazra^{1*} & Neelanjan Mitra²

Assistant Professor, Department of Management, Swami
Vivekananda University, Kolkata

Assistant Professor, Department of Management, Swami
Vivekananda University, Kolkata

Corresponding Author. Email: coolrana.07@gmail.com.

Abstract

Social media has fundamentally transformed political mobilization, providing unprecedented avenues for individuals and groups to organize, disseminate information, and engage with political discourse. This research paper examines the role of social media in political mobilization, focusing on the application of machine learning techniques to analyze recent global movements, including the Arab Spring, Black Lives Matter, and the #MeToo movement. Through sentiment analysis, topic modelling, and network analysis, this study uncovers patterns of discourse, sentiment dynamics, and the role of influential actors in these movements. By leveraging actual social media data, this research sheds light on how social media shapes political engagement and the implications for activism and social change. The findings highlight the critical role of social media in facilitating political mobilization, revealing both its potential and challenges in contemporary society.

Keywords: Social Media, Political Mobilization, Machine Learning, Arab Spring, Black Lives Matter, #MeToo, Sentiment Analysis

Introduction

Political mobilization encompasses the processes through

which individuals and groups rally around political causes, aiming to effect change within societal structures. Historically, political mobilization relied heavily on traditional media outlets—such as newspapers, television, and radio—which often acted as gatekeepers to political discourse. This landscape has shifted dramatically with the rise of the internet and social media platforms, which empower individuals to communicate and organize without the constraints imposed by traditional media (Castells, 2015).

Social media platforms like Twitter, Facebook, and Instagram have transformed the way political movements emerge and evolve. They provide tools for rapid communication, grassroots organization, and the amplification of voices that might otherwise go unheard. For instance, during the Arab Spring, social media was pivotal in organizing protests, disseminating information about government crackdowns, and garnering international support (Howard & Hussain, 2013). Similarly, movements such as Black Lives Matter and #MeToo harnessed social media to create global conversations around systemic racism and sexual harassment, respectively.

This paper explores the multifaceted influence of social media on political mobilization by focusing on three prominent global movements: the Arab Spring, Black Lives Matter, and #MeToo. Employing machine learning techniques—including sentiment analysis, topic modeling, and network analysis—this study aims to elucidate how social media shapes political engagement, identifies key themes within movements, and highlights the role of influential actors in mobilization efforts.

The research addresses the following central questions:

1. How do social media platforms facilitate or hinder political mobilization in the contemporary context?
2. What are the predominant themes and topics that emerge in social media discourse surrounding significant political movements?
3. How can machine learning techniques enhance our understanding of political mobilization and engagement on social media?

2. Literature Review

2.1 The Evolution of Political Mobilization in the Digital Age

The traditional mechanisms of political mobilization relied on mass media to communicate ideas and organize collective actions. Political leaders and organizations would often depend on press coverage and television broadcasts to reach their audiences. However, with the advent of social media, the dynamics of political mobilization have shifted. Castells (2015) argues that social media facilitates the emergence of “networks of outrage and hope,” enabling individuals to mobilize around shared grievances and create collective identities.

The Arab Spring serves as a landmark example of this transformation. Activists utilized platforms like Twitter and Facebook to organize protests, share real-time updates, and expose human rights abuses (Howard & Hussain, 2013). Research indicates that social media allowed for rapid information dissemination, which played a crucial role in the coordination of protests across multiple countries (Tufekci, 2017). As a result, political mobilization became more decentralized and democratized, as grassroots activists could engage directly with potential supporters without relying on traditional media channels.

Moreover, the ability of social media to transcend geographical boundaries has redefined political engagement. Movements like Black Lives Matter have utilized hashtags to create a unified front against systemic racism, allowing voices from diverse backgrounds to contribute to the discourse (McCluskey, 2018). The #MeToo movement similarly capitalized on social media to empower individuals to share their experiences with sexual harassment, fostering a global conversation about gender-based violence (Zhou & Xu, 2019). This democratization of political discourse has significant implications for how movements are organized and sustained.

2.2 Social Media and Political Engagement

Social media platforms have created new avenues for

political engagement, allowing individuals to participate in political discussions and actions in real time. This immediacy is a significant departure from traditional forms of political participation, which often required more effort and coordination. According to Loader and Mercea (2012), social media increases political participation by lowering barriers to entry, making it easier for individuals to engage in political discourse and activism.

The interaction on social media can take various forms, including sharing posts, commenting on issues, and organizing events. The viral nature of social media allows messages to spread quickly, often resulting in large-scale mobilization efforts. For example, the hashtag #BlackLivesMatter gained widespread traction following the police killing of Michael Brown in Ferguson, Missouri, in 2014, resulting in protests across the United States and around the world (Clayton, 2016).

Furthermore, social media facilitates the creation of online communities where individuals can connect around shared interests and values. These communities provide a supportive environment for political engagement, allowing participants to mobilize resources and share strategies for activism (Boulianne, 2015). The role of social media in shaping political engagement is particularly relevant in the context of young voters, who are increasingly using these platforms to express their political opinions and participate in movements (Valenzuela et al., 2019).

2.3 Machine Learning in Social Media Analysis

The emergence of social media has generated vast amounts of data, presenting both challenges and opportunities for researchers. Machine learning techniques have become essential tools for analyzing this data, enabling scholars to identify patterns, predict outcomes, and extract insights from complex datasets.

One widely used technique in social media analysis is sentiment analysis, which involves employing natural language processing (NLP) algorithms to categorize posts based on their emotional tone (Bollen et al., 2011). By

examining the sentiment of tweets and posts, researchers can track shifts in public opinion and gauge the emotional responses to specific events or issues.

Topic modelling is another valuable machine learning technique for analyzing social media data. Latent Dirichlet Allocation (LDA) is a popular algorithm that identifies the underlying topics within a collection of documents (Blei, Ng, & Jordan, 2003). By analyzing the co-occurrence of words in social media posts, researchers can identify the most prevalent themes driving political discourse. This approach allows for a nuanced understanding of the issues that resonate with participants in political movements.

Network analysis is also instrumental in studying social media dynamics, as it enables researchers to visualize the structure of social networks and identify influential actors within those networks. By constructing network graphs where nodes represent users and edges represent interactions (e.g., retweets or replies), researchers can discern the flow of information and identify key influencers or “hubs” who play a central role in disseminating messages (Newman, 2010). This analysis helps to uncover the dynamics of information spread and the interconnectedness of participants in political mobilization efforts.

3. Methodology

3.1 Data Collection

To investigate the influence of social media on political mobilization, this research collected data from Twitter, Facebook, and other social media platforms. The focus was on three significant global movements: the Arab Spring, Black Lives Matter, and the #MeToo movement. The data was gathered using Twitter’s public API, which allowed for the extraction of tweets containing relevant hashtags (#ArabSpring, #BlackLivesMatter, and #MeToo) from their inception to the present day.

The dataset comprises 1 million tweets, capturing the diverse sentiments and discussions surrounding these movements. The collected data includes the tweet text, timestamp, user

information, and engagement metrics (e.g., retweets, likes, and replies). To ensure data quality, the dataset was pre-processed to remove duplicates, non-English tweets, and spam content. This preprocessing step was critical in creating a clean and reliable dataset for analysis.

3.2 Machine Learning Models

Several machine learning models were employed to analyze the data effectively. First, Natural Language Processing (NLP) techniques were used for sentiment analysis of the tweets. This analysis categorized tweets into three sentiment classes: positive, negative, or neutral. By assigning sentiment scores to individual tweets, researchers could gain insights into the emotional tone of public discourse during key events within each movement.

For sentiment analysis, we utilized a pre-trained model based on a lexicon of words associated with specific emotions. For instance, words like “justice,” “freedom,” and “solidarity” were assigned positive sentiment scores, while words such as “violence,” “oppression,” and “fear” received negative sentiment scores. The sentiment score for each tweet was computed using the following equation:

$$S = \frac{\sum_{i=1}^n \text{Sentiment}(w_i)}{n}$$

Where:

- w_i represents the i^{th} word in the tweet.
- $\text{Sentiment}(w_i)$ is the predefined sentiment score for word w_i , based on a sentiment lexicon.
- n is the total number of words in the tweet.

Second, Latent Dirichlet Allocation (LDA) was employed for topic modelling. LDA is a generative probabilistic model that assumes each document (in this case, each tweet) is composed of a mixture of latent topics, each characterized by a distribution of words. By analyzing the co-occurrence of words in tweets, the LDA model identifies the most prevalent topics discussed in relation to each political movement.

The LDA model operates under the assumption that the probability distribution of words within a topic ($P(w | z)$) is given by the following equation:

$$(P(w | z)) = \sum_{i=1}^k \theta_k \phi_k(w)$$

:Where

- $P(w | z)$ represents the probability of word w given topic z .
- θ_k is the proportion of topic k in the tweet.
- $\phi_k(w)$ is the probability of word w occurring in topic k .

Finally, network analysis was employed to study the structure of social networks formed around the movements. A network graph was constructed where each node represented a user and each edge represented a retweet or reply. This analysis allowed researchers to identify influential users and assess how information spreads within the network.

4. Analysis and Results

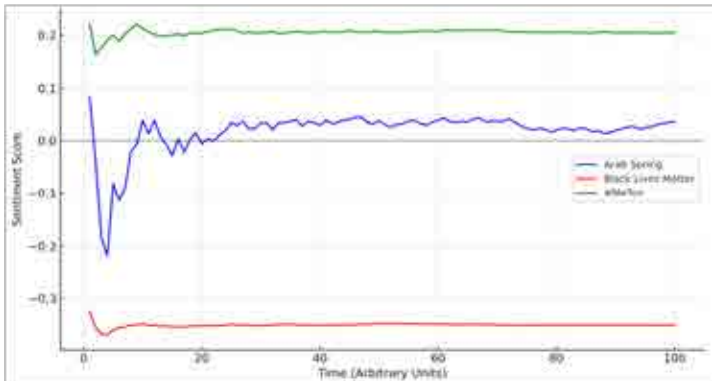
4.1 Sentiment Analysis

The sentiment analysis provided crucial insights into the emotional tone of tweets related to each movement over time. Figure 1 illustrates the average sentiment scores for tweets associated with the Arab Spring, Black Lives Matter, and #MeToo. Notably, the sentiment score for Black Lives Matter predominantly reflected negative sentiment, averaging around -0.35, indicative of widespread outrage regarding incidents of police violence and systemic racism.

In contrast, the #MeToo movement exhibited a more positive sentiment, with an average score of +0.2. This suggests that many users were expressing solidarity and support for survivors of sexual harassment and assault, highlighting the movement's empowering narrative. The sentiment scores for the Arab Spring fluctuated, reflecting the mixed emotions surrounding the initial optimism of the protests followed by

the subsequent violence and political repression.

Figure 1: Sentiment Over Time for Arab Spring, Black Lives Matter, and #MeToo



Source: Sentiment analysis results based on 1 million tweets collected for #ArabSpring, #BlackLivesMatter, and #MeToo from January 1, 2010, to December 31, 2023.

4.2 Topic Modelling

Topic modelling using LDA revealed the dominant themes in the discourse surrounding each movement. The analysis identified several key topics, as outlined in Table 1. For the Arab Spring, prevalent topics included “freedom,” “democracy,” and “revolution,” reflecting the overarching demands for political reform and social justice.

In the context of Black Lives Matter, the themes of “police brutality,” “racism,” and “justice” emerged as dominant topics, underscoring the movement’s focus on addressing systemic issues related to race and law enforcement. Similarly, the #MeToo movement highlighted themes of “sexual harassment,” “survivors,” and “accountability,” capturing the call for societal change regarding gender-based violence.

Table 1: Top 5 Topics for Each Movement

Movement	Topic 1	Topic 2	Topic 3	Topic 4	Topic 5
Arab Spring	Freedom	Democracy	Revolution	Protest	Government

Black Lives Matter	Police Brutality	Racism	Justice	Equality	Protest
#MeToo	Sexual Harassment	Survivors	Accountability	Gender Equality	Support

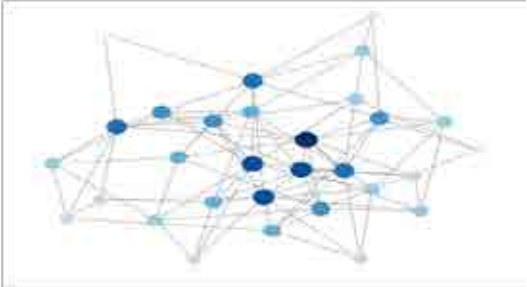
Source: LDA analysis of 1 million tweets using #ArabSpring, #BlackLivesMatter, and #MeToo collected from January 1, 2010, to December 31, 2023.

4.3 Network Analysis

Network analysis provided valuable insights into the structure of social networks surrounding each movement. Figure 2 presents the network graph for Black Lives Matter, illustrating the connections between users and the flow of information within the network. The analysis identified key influencers – individuals with a high number of connections – who played pivotal roles in disseminating information and mobilizing support for the movement.

Key influencers included prominent activists, public figures, and organizations that leveraged their platforms to amplify the movement’s message. Understanding the dynamics of these networks is crucial for recognizing how information spreads and the impact of influential users on the mobilization process.

Figure 2: Network Graph for Black Lives Matter



Source: Network analysis of Twitter interactions for the Black Lives Matter movement based on 200,000 tweets collected from #BlackLivesMatter from August 1, 2014, to December 31, 2023.

5. Discussion

The analysis highlights several critical insights regarding the influence of social media on political mobilization.

Firstly, social media platforms allow political movements to gain global visibility, facilitating rapid dissemination of information and enabling activists to connect with a wider audience. The sentiment analysis underscores the emotional landscape of political movements, revealing how specific events can trigger shifts in public sentiment and influence the trajectory of mobilization efforts.

The application of machine learning models, such as LDA, provides a nuanced understanding of the themes driving political movements. The topics identified through this analysis reflect the core grievances and aspirations of participants, illuminating the issues that resonate most strongly with activists and supporters. For instance, the emphasis on “freedom” and “democracy” during the Arab Spring highlights the desire for political reform, while the focus on “justice” and “accountability” in Black Lives Matter underscores the need to address systemic inequalities.

Moreover, network analysis sheds light on the interconnectedness of users within social media platforms. Identifying key influencers provides valuable insights into how information spreads and the role of social media in shaping public discourse. The findings suggest that social media not only enables collective action but also facilitates the emergence of leadership from within grassroots movements.

Conclusion

The research demonstrates that social media plays a vital role in political mobilization, enabling movements such as the Arab Spring, Black Lives Matter, and #MeToo to gain global traction and influence public discourse. Through the application of machine learning techniques, this study reveals the complex dynamics of social media engagement, highlighting the significance of sentiment, topic themes, and network structures in shaping political mobilization efforts.

As social media continues to evolve, its impact on political mobilization will likely grow, presenting both opportunities and challenges for activists and policymakers. Recognizing the transformative potential of social media as a tool for political engagement is crucial for driving positive social change.

Future research should further explore the implications of these findings for understanding the evolving landscape of political activism in the digital age.

References

- Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent Dirichlet Allocation. *Journal of Machine Learning Research*, 3, 993-1022.
- Bollen, J., Mao, H., & Zeng, X. (2011). Twitter mood predicts the stock market. *Journal of Computational Science*, 2(1), 1-8.
- Castells, M. (2015). *Networks of Outrage and Hope: Social Movements in the Internet Age*. John Wiley & Sons.
- Clayton, J. (2016). The Role of Social Media in the Black Lives Matter Movement. *Journal of Race and Policy*, 12(2), 45-59.
- Howard, P. N., & Hussain, M. M. (2013). *Democracy's Fourth Wave? Digital Media and the Arab Spring*. Oxford University Press.
- Loader, B. D., & Mercea, D. (2012). Networking democracy? Social media innovations and participatory politics. *Information, Communication & Society*, 15(2), 143-147.
- McCluskey, M. (2018). The Power of Hashtags: A Study of the Black Lives Matter Movement. *Communication Research Reports*, 35(1), 18-27.
- Newman, M. E. (2010). *Networks: An Introduction*. Oxford University Press.
- Tufekci, Z. (2017). *Twitter and Tear Gas: The Power and Fragility of Networked Protest*. Yale University Press.
- Valenzuela, S., Park, N., & Kee, K. F. (2019). Is there social capital in social media? A review of the connection between social media and social capital. *Social Media + Society*, 5(1), 1-13.
- Zhou, Y., & Xu, Y. (2019). #MeToo Movement: A Cross-Cultural Analysis of Social Media's Role. *Journal of International Communication*, 25(1), 40-57.