

Characterizing Multimedia Adoption and its Role on Mobilization in Social Movements

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Abstract

This research investigates the vital role of multimedia (images and videos) serve in fostering connective action in contemporary social movements, particularly focusing on the recent political protests in Brazil and Peru between November 2022 and February 2023. Utilizing a dual approach grounded in Diffusion of Innovations (DOI) theory and an analysis of mobilization processes through social networks. This study explores the varying levels of multimedia adoption throughout different social movements phases. The analysis, based on an extensive dataset with 664,865 tweets, 76,867 images, 51,913 videos and 1,256,884 retweets (images and videos) revealed distinct patterns of multimedia usage across DOI stages of the social movements. Notably, the Brazil anti-government social movement showed a preference for images initially, shifting to video usage during significant events, whereas the Brazil pro-government social movement predominantly utilized images. In Peru, the anti-government social movement's media preferences fluctuated between DOI stages.

Keywords: Mobilization, Multimedia, Diffusion of Innovations, Multimedia Network, Twitter.

1. Introduction

In today's digital era, platforms like Twitter and YouTube have become powerful tools for political mobilization, effortlessly uniting people globally in real time. Leveraging smartphones and widespread social media use, these platforms enable seamless documentation and dissemination of political events and human rights violations, providing a global insight into numerous protests and movements Bas and Grabe (2016).

As content creation and dissemination increasingly become democratized, the need for researchers to examine the efficacy of multimedia in the context of connective action become important because it represents a newer form of mobilization facilitated

through technology. Our research enhances existing literature by creating a multi-method framework to explore the role of various multimedia types on Twitter during distinct DOI curve stages and network perspectives in protests. This study, essential in understanding social disruptions, shows that emotionally resonant multimedia can potentially steer behavior and foster connective action, symbolizing unified efforts towards a common goal Polletta and Jasper (2001) and Banjo et al. (2022).

Nevertheless, a significant proportion of research has predominantly focused on the text components of tweets, often overlooking their multimedia aspects Boyd et al. (2010) and Jahng and Lee (2018). There are limited studies exploring through survey-based analysis the role of images in online mobilization Chowdhury et al. (2019) and Doerr et al. (2013). In our study, we classify the protests into three categories: 1) distribution of the multimedia in each social movement, 2) multimedia adoption through the lens of DOI stages and 3) multimedia diffusion and popularity via network analysis.

2. Proposed Theoretical Framework

This section provides the extant literature on this research and the theoretical framework we used for this study. We then outline the research questions.

2.1. Multimedia in social media and social movements

The multimedia shared on social media platforms have also been instrumental in mobilizing resistance in authoritarian regimes, movements such as the Green Movement in Iran in 2009, and the uprisings in Tunisia and Egypt, where they helped spread activist-created images instantly, not just locally but globally Mortensen (2011) and Khatib (2012). Platforms like Twitter, Facebook, and YouTube have been particularly significant in this regard, allowing the sharing of protest's multimedia globally, even within authoritarian states. A study has shown that activists

in Tunisia, Egypt, and other countries were able to reach a wider audience thanks to the content circulated by citizen journalists on platforms like Twitter Aday et al. (2013). Research indicates that multimedia, including images and videos, mobilized more new users to Facebook pages related to the Occupy movement compared to written content, hinting at its vital role in bringing in people who sympathized with the movement Gaby and Caren (2012). Despite these developments, analyzing multimedia content within social movements presents challenges. Social movements can generate massive amounts of multimedia content. Processing and analyzing such large data sets require significant computational resources, sophisticated framework and data analytic techniques Mohamed et al. (2020). The kind of pictures, videos, and messages that are made and shared during social movements can change based on what the movement is about, how it looks, and the beliefs it represents. These activities are a big part of the visual style and identity of social movements Doerr et al. (2013). Hence, categorizing social movements by the role of multimedia can be seen as the first step and there is a need to develop a research method to understand different multimedia practices and how they are used in mobilizing social movements. In particular, it would be interesting to investigate the collective distribution of multimedia in modern contemporary social movements. It will help in understanding which multimedia was crucial to mobilize social movements and ultimately its role in connective action Bennett and Segerberg (2012). We then look into how distributed multimedia has been adopted from the DOI perspective to characterize social movement types.

2.2. Diffusion of Innovations theory and multimedia

Individuals have utilized diverse social platforms for various purposes during social movements. One study analyzes the transformative phases of 'social protest cycles' in a 2012 New Delhi case study, showcasing the potent role social media plays in molding and possibly mobilizing societal change movements Tarafdar and Kajal Ray (2021). These platforms serve as means to mobilize users for a wide range of campaigns. Mobilization endeavors prompt users to embrace information campaigns in a manner akin to adopting new technologies McCarthy and Zald (1977). We examine diffusion as it is crucial for social movements to garner extensive support and influence media and political agendas. Consequently, diffusion is conceptually akin to online recruitment into action. To encourage swift adoption, connective action campaigns

leverage affordances through online social networks, minimize costs of joining, and offer anonymity. As the costs to participate in a campaign are low, adopting the idea or joining the movement demands minimal exposure or risk for the user Bennett and Segerberg (2012) and Vaast et al. (2017). In the context of social movements, an analysis of Twitter data related to six COVID-19 hashtags unveils s-shaped diffusion curves, illustrating the rate at which information propagates throughout the life cycles of the six corresponding misinformation campaigns. This s-shaped pattern aligns with discussions from the diffusion of innovations (DOI) theory, which describes the dissemination of new ideas and technologies over time in terms of their adoption rate among users Spann et al. (2022). Expanding upon this research, our present study investigates multimedia as a novel technology and affordance in this diffusion process of mobilizing social movements and its role in connective action Bennett and Segerberg (2012). Utilizing the 'S' curves derived from social movement data and examining multimedia usage, we adopted a DOI perspective in our analysis. We categorized multimedia into various adoption stages, corresponding to the innovations lifecycle stage of each social movement campaign. To scrutinize social movements characterized by multimedia adoption percentages, we assessed the cumulative frequency of messages, which typically followed an s-shaped production function.

This viewpoint aids in discerning whether the adoption of multimedia is in the initialization stage (when innovators first experiment with new ideas and technologies), the amplification stage (involving early adopters, an early majority, and a late majority who each adopt new ideas at different rates within their social systems), or the saturation stage (when it has reached a critical mass, thereby sustaining the movement and seeing a decrease in new adopters) Rogers et al. (2014). We then look into multimedia based networks to characterize social movement types from a network perspective.

2.3. Multimedia in social network and social movements

Social networks have become key places for information sources and diffusion. People can use online social networks to share content in the form of pictures, or videos to mobilize resources for social movements ultimately which leads to connective action Bennett and Segerberg (2012). One of the mechanisms behind this content spreads is through users sharing or retweeting things posted by the people they are connected to. Various studies have looked at how

multimedia has been used in different situations, like riots, protests, or terrorist acts, within these social movement networks Ehnis et al. (2014) and Ruggiero and Vos (2013). One study found that during the Occupy Wall Street social movement in New York, activists shared images that allowed them to establish a network that spanned different locations and helped them mobilize their support outside the mainstream media’s scope Penney and Dadas (2014). Subsequent research posited that a user’s contextual information, such as their social network topology and the content of their tweets (inclusive of images, videos, and URLs), could potentially impact retweet behavior Nagarajan et al. (2010). Twitter’s social network facilitates various forms of user interaction, encompassing follows, mentions, replies, and, notably, retweets. A retweet is a unique information-sharing mechanism, empowering any user to instantaneously mobilize their followers. Retweets serve as a robust indicator of social ties among Twitter users. Typically, users retweet content that resonates with them or sparks their interest Su et al. (2017). Particularly in the context of social movements, retweet network patterns could effectively provide information on which multimedia was diffused effectively for mobilization and its popularity inside the network. In this paper, we leveraged retweets mechanism to scrutinize multimedia behavior, illuminating the role of specific multimedia types as central nodes in a social movement within an information ecosystem. In light of the given context, a pivotal research question arises: How does the diffusion and popularity of multimedia for different social movements differ in a network environment? To investigate this, we zeroed in on the retweet behavior associated with multimedia objects on Twitter.

In this research, we use the above mentioned social and network science theories as a guide to construct a theoretical framework in connection to mobilization aspects to implement a process and analyses that better understands the role of multimedia mobilization in connective action. As a part of this process, our research tries to answer the following research questions **RQ** and hypotheses **H**:

RQ1: How does the distribution of multimedia vary based on significance of a social movement, categorized by its nature (e.g., political protest, grievance-based protests)? **H1:** The distribution of multimedia varies based on the significance of the social movement when categorized by its nature. **RQ2:** How does the significance of a social movement, categorized by its nature (e.g., political protest, grievance-based protests), influence the adoption of multimedia on the

Diffusion of Innovations (DOI) curve? **H2:** The adoption of multimedia varies based on the significance of the social movement on the DOI curve. **RQ3:** How does the diffusion and popularity of multimedia for different social movements differ in a network environment? **H3:** The diffusion and popularity of multimedia varies among different social movements in a network environment.

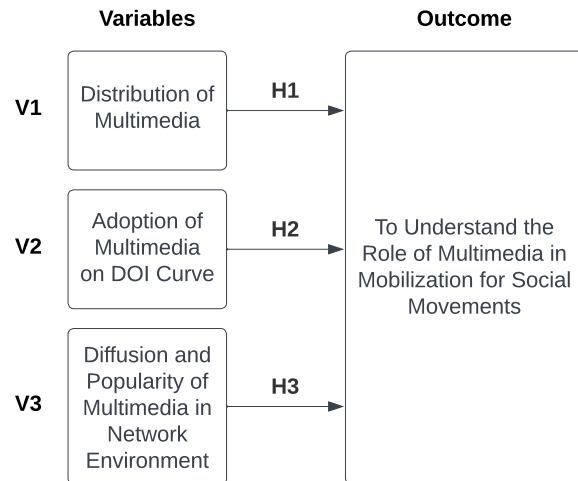


Figure 1. Research Model Diagram

3. Research Methodologies

This section presents our research design, which consists of the data collection and approaches applied for this research based on the social science and network theories defined in the above section.

3.1. Data

To empirically test the proposed research questions, we sourced Twitter data from three distinct social movements transpiring between November 1st, 2022, and February 25th, 2023, in South America. The data harvesting commenced during the onset of social instability in Brazil and Peru, ensuring a comprehensive dataset for the following events: ‘Brazil anti-government protests’, ‘Brazil pro-government protests’, and ‘Peru anti-government protests’. The selection of this dataset, encompassing three distinct social movements, as shown in Table 1. Also aligns well with our research objectives, which illustrates the heterogeneous nature of these protests. A preliminary analysis of contemporary news articles substantiates that these movements have notably escalated in momentum, largely propelled by the continuous and significant

diffusion of multimedia content by participants, thereby presenting a fertile ground for a data-driven investigation into the roles and impacts of multimedia in current social mobilizations.

The ‘Brazil anti-government protests’ event unfolded following the announcement of the Brazilian presidential election runoff results on October 30th, 2022, when supporters of the then-president Jair Messias Bolsonaro cited electoral fraud. This led to a surge of polarizing content on social media, with nationalists calling for a military coup using the hashtag #Brazilwasstolen, among others. The subsequent nationwide demonstrations culminated in riots on January 8th, 2023, involving around 4,000 pro-Bolsonaro supporters who stormed multiple congress buildings The New York Times (2023a).

The ‘Brazil pro-government protests’ event emerged in response, with the chant ‘semanistia’ (‘No amnesty’) echoing across the University of Sao Paulo’s law college and leading thousands of Brazilians to march in the streets of Rio de Janeiro and San Paulo. Concurrently, Twitter accounts began sharing images of alleged riot participants, utilizing the hashtags #semanistia and #infromacia to crowdsource information aiding authorities in identifying and punishing those who evaded arrest MIT Technology Review (2023) and Associated Press News (2023).

The ‘Peru anti-government protests’ event began on December 7th, 2022, following the removal of Peru’s then-president Pedro Castillo by its congress due to his proposition to dissolve the congress for a new constitution. Castillo’s removal was met with significant resistance, particularly from indigenous peoples, due to Castillo being the first rural president in Peru’s history. The ousting sparked public outcry, caused thousands to descend on the capital and various cities, and resulted in violent clashes with the police. Following this, the popular hashtags used in this social movement were #peruprotests, and #PedroCastillo The New York Times (2023b).

We utilized Twitter as the platform of choice due to its high user base and capacity for producing rich multimedia content during social upheavals. We used Twitter’s developer platform to access the academic API and extract the required data. News coverage from October 1st, 2022, to February 28th, 2023, was continuously reviewed to provide further keywords to enhance data inclusivity. It should be noted that no information was found regarding any Peru pro-government protests. The finalized data details are depicted in Table 1.

Table 1. Collected data details

Social movements	Nature of the social movement	Time frame	No.of tweets	No.of retweets
Brazil anti-gov	Riot	11/01/22-01/31/23	405,160	736,081
Brazil prov-gov	Confrontation	11/01/22-02/25/23	44,415	42,367
Peru anti-gov	Grievance	12/07/22-02/14/23	195,290	683,023

We programmatically divided each post into four objects for each social movement: 1) Text = A post that only consists of plain text. 2) Videos = A post that consists of Twitter’s native embedded video or YouTube video or TikTok video or Instagram video. 3) Images = A post that consists of Twitter’s native embedded image or GIF or Instagram image or PNG or JPEG. 4) Others = A post that has news articles or hyperlink shared from third party websites such as Medium.com, Foxnews, NYTimes, and Breitbart.com etc. To study multimedia’s role in recent social movements, we conducted a two-step content analysis covering both the distribution and volume of multimedia across DOI stages and a network analysis focusing on multimedia diffusion and identifying prominent nodes in the networks.

3.2. Exploratory Analysis and Results

In this section, we focus on answering the research questions listed in the proposed framework in section 2.

3.2.1. Multimedia distribution and adoption in accordance with mobilization. In this analysis, we discuss the results for **RQ1**, and **H1**. Figure 2. offers the following insightful illustrations. All pie charts in Figures 2(a), (c) and (e) elucidate the distribution of different multimedia forms used in three social movements. Other charts in Figures 2(b), (d) and (f) plot the temporal frequency of multimedia posts, using an s-curve function. This approach enables us to track the cumulative count of Twitter posts, identifying the adoption rate of new multimedia-infused posts up until the growth curve begins to plateau. In this function, we incorporated the concept of Diffusion of Innovations (DOI), as demonstrated in our previous study Spann et al. (2022), to discern whether a social movement is at the initialization, amplification, or sustainment stage of multimedia adoption. The function represents the cumulative sum of multimedia posts, with the slope indicating the adoption rate for new multimedia-containing posts up until it reaches an inflection point in the growth trajectory where new

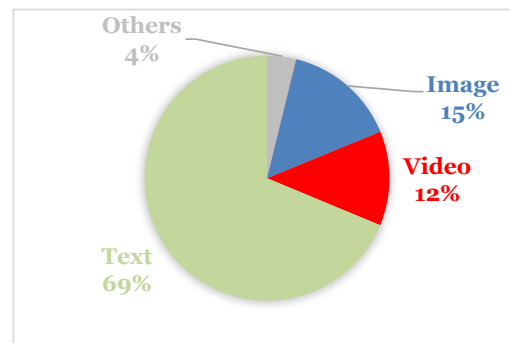
posts continue to decline. The boundaries for the three stages were determined by the slope's acceleration and decelerating rates which consist of inflection points over the trajectory. The pie charts revealed a high concentration of text-based tweets, accompanied by a comparatively smaller percentage of image- and video-based tweets. As the significance of 'Others' was relatively minor in all charts compared to images, videos, and text, we subsequently present a comparative analysis of these three multimedia types in the ensuing set of analyses. Also noteworthy is that an uptick in multimedia use aligned with an increase in new multimedia-integrated posts, as demonstrated in the trends in Figures 2(b), (d) and (f). Figures 2(b) and (f) provide a typical representation of a social movement's life-cycle via the s-curve function, which gradually initiates (initialization), rapidly grows (amplification), and eventually stabilizes (sustainment). Conversely, (d) depicts a unique diffusion pattern where all three stages happen quickly, offering a different perspective on mobilization characteristics and multimedia adoption. This leads to our analysis on **RQ2**, and **H2**.

From the early initialization phase of the Brazil anti-government movement from Table 2. the use of images (4.5%) was only slightly ahead of videos (4.2%). However, during the amplification stage, this gap widened, showing images at 9% and videos at 7.1%. Interestingly, the data reveals peculiar patterns on specific dates. For instance, on 2-Nov-22, which fell under the initialization stage, videos (1.14%) were more adopted than images (0.83%). This spike in video use may hint at a significant event during that day that was best captured in motion rather than stills. Contrarily, on 8-Jan-23, during the amplification phase, videos slightly edged out images by a narrow margin. Notably, such key events illustrated a distinct preference for videos over images, emphasizing that some occurrences are better conveyed through moving visuals. Broadly, this social movement sheds light on how various multimedia forms play distinct roles at different junctures of social or political movements for mobilization. Twitter posts featuring multimedia content were predominantly marked with hashtags such as #Brazilwasstolen, #intervençãofederal, #crimeeleitoral, and #festadaselma.

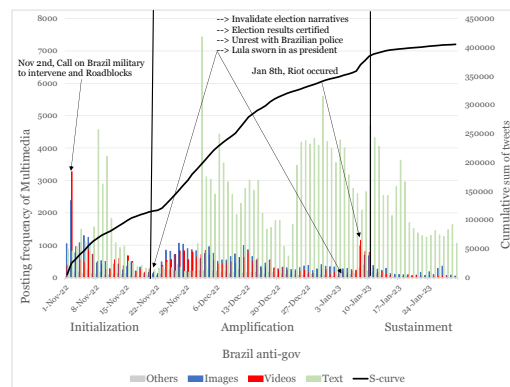
Throughout the different phases of the Brazil pro-government movement Table 2. images consistently held a more dominant position than videos. This reflects a steady inclination towards still visuals in this social movement. Images played a crucial role in conveying information about anti-government protesters and crowdsourcing data to identify them, using hashtags

like #semanistia and #infromacia. Alongside, textual content emerged as a stalwart medium, indicating the importance of narratives, clarifications, and official communications in shaping the movement. A closer look at the amplification stage's key events underscores that while videos had a momentary surge on 9-Jan-23, they still played second fiddle to images. In essence, this movement primarily hinged on images and written content for its message dissemination, with videos being a supplementary channel.

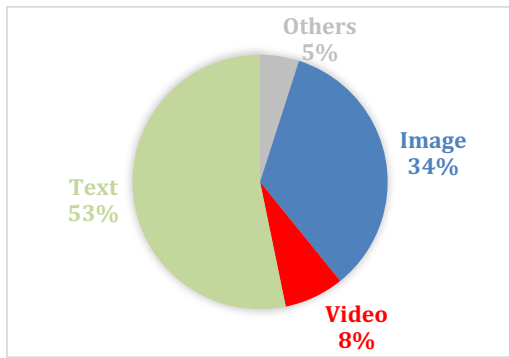
Similarly, Peru's anti-government mobilization from Table 2. exhibited intriguing media adoption dynamics. On 7-Dec-23, during the initialization stage, images (1.54%) were the preferred medium, surpassing both videos and text. This trend persisted on 8-Dec-23, with images leading the charge. However, on 9-Jan-23, during the amplification stage, while images were still more popular than videos, text dominated the scene. A broader perspective reveals that while text was the primary medium across most stages, the early days of the movement (initialization stage) witnessed a pronounced preference for images. Such patterns suggest that during the social movement's infancy, images were crucial in portraying the crux of key events for mobilization.



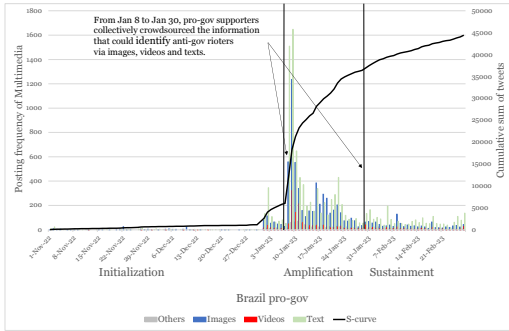
Brazil anti-gov (a)



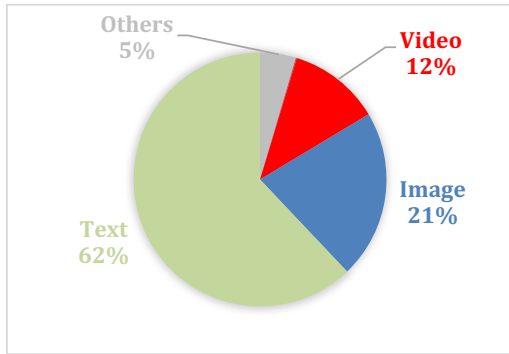
Brazil anti-gov (b)



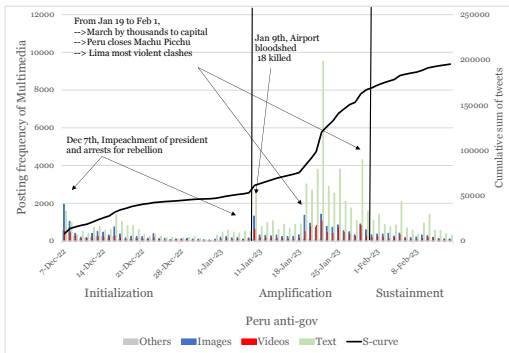
Brazil pro-gov (c)



Brazil pro-gov (d)



Peru anti-gov (e)



Peru anti-gov (f)

Figure 2. Multimedia usage and posting frequency of the multimedia with s-curve

Table 2. Percentages of multimedia adoption on DOI curve

Brazil anti-gov		Others	Images	Videos	Text
11/01/22-11/20/22	Initial-ization	0.83	4.5	4.2	9.1
11/21/22-01/08/23	Amplifi-cation	2.67	9	7.1	42.9
01/08/23-01/30/23	Satura-tion	0.5	1.5	0.7	17
Key event's dates		Others	Images	Videos	Text
11/02/22	Initial-ization	0.1	0.83	1.14	0.28
01/08/23	Amplifi-cation	0.1	0.34	0.4	0.73
Brazil pro-gov		Others	Images	Videos	Text
11/01/22-01/07/23	Initial-ization	0.51	2.71	0.32	5.1
01/08/23-01/30/23	Amplifi-cation	3.3	25.99	6.28	37
01/31/23-02/27/23	Satura-tion	1.19	5.3	1.4	10.9
Key event's dates		Others	Images	Videos	Text
01/08/23	Amplifi-cation	0.06	2.7	0.23	7.3
01/09/23	Amplifi-cation	0.29	5.9	1.55	7.9
Peru anti-gov		Others	Images	Videos	Text
12/07/22-01/08/23	Initial-ization	3.55	7.38	3.65	12.94
01/09/23-02/01/23	Amplifi-cation	1.13	11.12	7	40.8
02/02/23-02/14/23	Satura-tion	0.32	2.5	1.35	8.26
Key event's dates		Others	Images	Videos	Text
12/07/22	Initial-ization	0.44	1.54	0.4	1.25
12/08/22	Initial-ization	0.47	0.82	0.34	0.78
01/09/23	Amplifi-cation	0.01	0.12	0.08	0.4

3.2.2. Multimedia diffusion and popularity in networks in accordance with mobilization.

In this analysis, we discuss the results for RQ3, and H3. To examine the function of multimedia according to the type of social movement from a network perspective, we constructed a multimedia-based retweeted URL network for each social movement. We investigated the distribution of multimedia content amongst nodes and communities. A network is directed graph G, in which nodes represent multimedia and the links between the nodes represent the retweeted URL assigned, with retweet count of a URL as a weight. To enhance

visibility, we visualized the retweet network utilizing Gephi software, employing the Force Atlas graph layout algorithm. Multimedia nodes possessing a high degree of betweenness centrality were emphasized. The flow of multimedia within the communication network can be measured by assessing the degree of centrality of the network structures. In network analysis, the degree of a node serves as a measure of its popularity. One significant measure of degree is centrality, represented by the betweenness. Betweenness measures the degree to which a node lies on the paths between other nodes. In essence, a node with a higher betweenness centrality is typically more influential within the network, due to the larger volume of information that traverses through it. Our work leverages the betweenness centrality concept to identify popular multimedia nodes in the multimedia embedded networks White and Borgatti (1994).

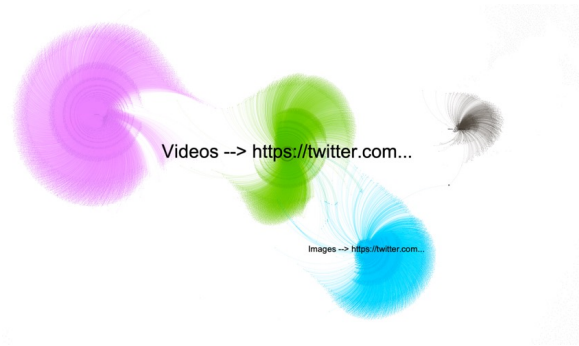
Betweenness centrality can be represented by

$$BC(v) = \sum \left(\frac{\sigma_{st}(v)}{\sigma_{st}} \right) \quad (1)$$

Where v is the node we're interested in, and σ_{st} is the total number of shortest paths from node s to node t . $\sigma_{st}(v)$ is the number of those paths that pass through v . The sum (\sum) is computed over all pairs of nodes s and t in the network, where $s \neq v \neq t$. This formula computes the raw betweenness centrality score.

However, the normalized betweenness centrality for node v is calculated by dividing the raw score by the maximum possible score, which in a directed graph is $(n-1)(n-2)/2$ and in an undirected graph is $(n-1)(n-2)$, where n is the number of nodes in the network.

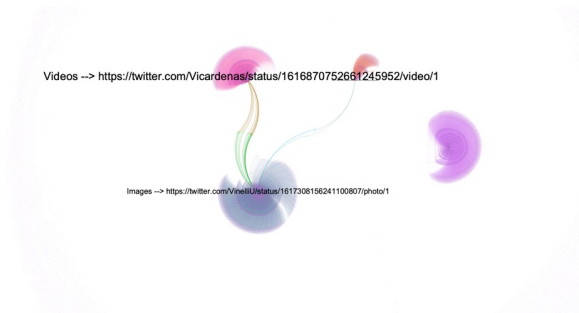
Figure 3. illustrates the significant variation in the betweenness centrality measures of multimedia objects within networks, especially when compared to the adoption multimedia in the diffusion process, as shown in Figure 2. For example, images, which were widely adopted during Brazil's pro-government diffusion process, also had a significant degree of betweenness centrality in the network analysis. On the other hand, we see a different pattern in the network analyses for the anti-government movements in Brazil and Peru. Despite the diffusion process favoring images in Figure 2, videos emerged as the more popular multimedia form within their respective networks. Nevertheless, a fascinating observation emerges from our study: despite the heavy diffusion of textual objects throughout the process, they consistently lag behind images and videos when viewed from the perspective of the multimedia networks.



Brazil anti-gov (a)



Brazil pro-gov (b)



Peru anti-gov (c)

Figure 3. Multimedia and retweeted URL networks

ALERT BRAZIL: The majority of population is in Brasilia protesting AGAINST Lula, a 12 years convicted corrupt taking power through fraud on elections. But the media are using the images to manipulate the public opinion, as if people are there SUPPORTING Lula #BrazilianSpring



Fox News and 2 others

Brazil anti-gov (a)



Brazil pro-gov (b)

"Tengo 82 años y me tiraron al suelo como un animal. A la media hora me pidieron que me arrodille. Nos trataron como ganado", denuncia campesino recién liberado por la Policía. #PerúEnDictadura #DDHH
 Translated from Spanish by Google
 "I am 82 years old and they threw me to the ground like an animal. After half an hour they asked me to kneel. They treated us like cattle," denounces a farmer recently released by the Police. #PerúEnDictadura #DDHH



Peru anti-gov (c)

Figure 4. Popular retweeted images

In the Brazil anti-government network, the multimedia content from a user with the Twitter handle '@WillLisil' was notably prevalent across categories, such as images, and videos which can be observed in Figures 4(a) and 5(a). Video by this user in Figure 5(a) garnered approximately 12,000 retweets, indicating its high popularity compared to other videos.

Peru anti-government network revealed that the multimedia content was largely centered around police brutality and the deaths resulting from the protests as presented in Figures 4(c) and 5(c). In contrast, the Brazil's pro-government multimedia content in Figures 4(b) and 5(b) was predominantly focused on the demand for 'No Amnesty' for the participants in the

BRAZIL: Supreme Court minister Alexandre de Moraes, involved with organised crime, ordered persecution to indigenous people who criticised him. The dictator minister allowed Lula a 12 year convicted to take power through fraud on elections #BrazilWasStolen #BrazilianSpring



Brazil anti-gov (a)

That's right, guys: #SemAnistia for today's and yesterday's predators. Are their inspirational leaders to blame? Lula and Dino will also rot. Chain all over the world!



7:49 PM · Jan 8, 2023 · 491.6K Views

Brazil pro-gov (b)

Un infiltrado de la policía estaba por apedrear una ambulancia y es detectado por los estudiantes de San Marcos quienes lo increpan. La policía fue a protegerlo. Estos son los violentistas! Difundir!

#SOSPeru
 #DinaRenunciaYa
 Translated from Spanish by Google

A police infiltrator was about to stone an ambulance and is detected by the students of San Marcos who rebuke him. The police went to protect him. These are the violent! Spread!

#SOSPeru
 #DinaRenunciaYa



Peru anti-gov (c)

Figure 5. Popular retweeted videos

pro-government protests in mockery style. The widely shared multimedia across all these social movements were consistently reflective of these narratives.

4. Conclusion and Future Directions

In conclusion, our in-depth examination of the role of multimedia in social movements sheds light on how different types of multimedia contribute to various stages of mobilization. Our study clearly shows that multimedia adoption rate does vary according to the nature of the social movement related to the protests in Brazil and Peru as discussed in 3.2.1 section. The data suggests that while text-based tweets continue to be widely used, images and videos play a significant role in boosting and sustaining the impact of social movements from a network perspective. We noticed that despite the widespread use of images in the diffusion process, videos seem to garner more attention through retweets in certain mobilizations as observed in 3.2.2 section. This understanding is crucial for creating tailored communication strategies for different social movements, for policy makers to collaborate with data scientists, communication experts, and sociologists to gain deeper insights from multimedia centric DOI and networks to get holistic view of contemporary social movements.

In future research, we aim to conduct a comprehensive analysis on multimedia content and engagement behavior. This will offer a deeper understanding of the dynamics underlying the process of connective action, in line with theories of cognitive mobilization, and network organization within the social process. We are also simultaneously working on studying multimedia via computational method. videos, images, and audio require complex analysis techniques, including machine learning for tasks such as content recognition. So, we are utilizing video barcode characterization technique Erol et al. (2020) with color theory, for emotion classification. This will help us analyze and understand how emotions are evoked by multimedia content, which in turn facilitates mobilization and ultimately leads to connective action. Furthermore, potential research question we intent to address in the direction of multimedia mobilization is to see how usage of conative words patterns across multimedia and to identify the network structures where these words correlate strongly with quick diffusion.

Finally, our work contributes to the field of multimedia mobilization in connective action with novel multi-method framework that analyzes the role of multimedia across social movements. It broadens

the traditional theoretical framework that heavily relies on that survey work as stated in the introduction section. Understanding multimedia adoption provides a more comprehensive understanding on modern social movements. Therefore, our work paves the way for a more detailed exploration in mobilization aspects. However, our work does have limitations due to the focus on a short timeframe and primarily in the contexts of Brazil and Peru, utilizes the Diffusion of Innovations (DOI) theory to analyze multimedia adoption in social movements, potentially overlooking broader trends and deeper insights into network structures that influence multimedia diffusion.

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