Politics and disinformation: Analyzing the use of Telegram's information disorder network in Brazil for political mobilization
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Abstract
Over the past few years, with the increasing popularization of network communication in place of traditional mass communication, supported by social platforms and messengers, political campaigns have come to rely on new tools and methods, including the use of these structures to promote an environment of information disorder for the purpose of mobilization. This work followed the use of Telegram as a tool for political mobilization in Brazil, collecting data from a dense network of information disorder used to mobilize voters in support of then-president Jair Bolsonaro on 7 September 2021 and 2022, Independence Day in Brazil. The results showed that engagement was reduced, mainly due to the lack of support from certain groups such as anti-vaccination advocates and the truck drivers’ class. There was also a decrease in extremism on discussion themes and lower user activity levels.

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Introduction
Since the 2016 election campaign in the United States and the Brexit referendum, the use of digital platforms has proved to be a key political technology (Guerrero-Solé, et al., 2020) for populist politicians expanding their base of voters, spreading inaccurate information via computational propaganda (Dutton, et al., 2017), and integrating the data-driven logic of social networks to their strategies of polarization and creation of identities more anchored in beliefs than in facts. As Gerbaudo (2019) conceptualized, politicians became digital leaders, more specifically hyperleaders, obsessed with personality and celebrity, metrics of popularity from social media, formation of a digital fanbase, and distrust of bureaucratic organizations. While the political class has been shifted by social media ecosystems, the campaigns consist in a “NetWar” (Arquilla and Ronfeldt, 2001) by engaging Internet users on social platforms and characterizing them as
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In 2018, in the presidential elections in Brazil, then-candidate Jair Bolsonaro dominated the use of digital platforms, especially WhatsApp, advised by Donald Trump’s campaign chief, Steve Bannon [1]. According to journalist Patrícia Campos Mello [2], contracts worth up to R$12 million (approximately US$2.4 million) ensured mass firing through WhatsApp to databases segmented by demographic data like geographic region and income.

According to a survey by the Brazilian Legislative Power, WhatsApp is the primary source of information for 79 percent of Brazilians. In view of this, actions to combat misinformation and partnerships with the Brazilian Superior Electoral Court were initiated by Meta in order to make WhatsApp and its other social platforms safer. However, Meta actions only happened because the Brazilian Parliament and Supreme Court questioned the company due to negligence regarding the use of mass firing messages from WhatsApp by extremists. Then, in 2019, Meta banished 400,000 WhatsApp accounts [3], associated with the spreading of fake news [4], amidst a criminal investigation, in the Parliament, about illegal mass firing of political messages on WhatsApp during the 2018 general elections. This “Brazilian Lab” motivated Meta, still in 2018, to deploy a limitation on the number of message forwards (up to five chats a time [5]), making it harder the mass firing messages, affecting the Bolsonarist “Propaganda Machine” significantly (dos Reis, 2022).

In 2021, with the Brazilian justice efforts to banish more accounts that contribute to the disturbance of the democratic order and the public exposition of companies aiding the propaganda machine on WhatsApp, the Bolsonarist base shifted its tactic to Telegram. They were attracted mainly by the unlimited number of members in channels and the absence of content moderation (Bär, et al., 2023) at the time. As an example of this new mobilization strategy, Figure 1 shows Bolsonaro’s official account on Twitter, at the beginning of 2021, calling his followers to join his Telegram channel. Several Bolsonaro’s political allies used the same protocol. For instance, the government leader in Congress, Carla Zambelli, promoted, also via Twitter, her Telegram channel with the following message: “Here [telegram link] you will have first-hand information and direct contact with me. Let’s confront the left together!” [6]

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**Figure 1:** Jair Bolsonaro inviting followers to his Telegram channel. Translation: “Subscribe to my official Telegram channel.” Source: https://twitter.com/jairbolsonaro/status/13490220233544454.

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In the short term (still in 2021), the bolsonarist strategy on Telegram aimed at building a dense community of supporters, with a large network of groups and channels to freely spread information without any content moderation and to call/mobilize political actions in the streets. The pilot test of this plataformized political base on Telegram were the Bolsonaro’s “motociatas”. The term “motociata” is derived from moto (motorcycle) and passeata (march), which describe a march of motorcycles, with Bolsonaro’s presence, to demonstrate support to his government. All of those were called via Telegram and mobilized approximately 5,000 participants in different Brazilian cities. In 2021, just one of the “motociatas” organizers had an audience of roughly 225,000 people on four channels. However, it was on 7 September 2021, Brazilian Independence Day, that this digital political base on Telegram reached a degree of maturity that enabled a much large mobilization. This mobilization happened synchronously in 83 cities and had as its main agenda to oppose the use of electronic voting machines and the arrest of some important Bolsonaro’s supporters. There were crowds in all Brazilian states. The then-President himself attended the event in Paulista Avenue, São Paulo, where he spoke against the Supreme Court, gathering approximately 125,000 people.

In the medium term, in 2022, the Bolsonarist ecosystem on Telegram became a social network to support Bolsonaro’s re-election candidacy. Then, the Bolsonarist Telegram had the function of mass firing information and disinformation to attract and reinforce the beliefs of ultraconservative followers and to criticize his opponent, Lula, who was leading the polls. With no guarantee of improvement in the polls, Bolsonaro decided to repeat the same formula used in the previous year, calling for new mobilization on 7 September 2022. For electoral purposes, Bolsonaro mobilized all government sectors and other candidates from his political alliance to celebrate the independence bicentennial. In his speech, however, Bolsonaro stated that Brazil was in a battle between good (himself and the Right) against evil (Lula and the Left): “an evil that lasted 14 years in our country, which almost broke our homeland”. In the Bolsonarist Telegram groups, 7 September would be the “atomic bomb” day, “a war day”. This time, there were records of mobilizations in more than 300 Brazilian cities. In Brasilia, the nation’s capital, 50,000 people attended the then-President speech.

These two events are unique in order to understand the modus operandi of the far-right use of social media in Brazil. Analyzing these two political phenomena is an opportunity to detect the patterns of disinformation spreading, online political mobilization, and to examine the consequences of political radicalization faced by modern democracies. Analyzing these two political phenomena in Brazil, from Telegram data, allows us to understand the mechanisms of polarization and weaponized communication fabricated, in opposition to those democracies (Mercieca, 2019), by extremist groups. It was via Telegram, for instance, that Bolsonaro’s supporters coordinated the invasion and destruction of the Brazilian Congress, Supreme Court, and Presidency main buildings, on 8 January 2023, after Bolsonaro lost the election and the new president (Luiz Inácio Lula da Silva) inauguration.

Telegram, which has grown by 400 percent in the last four years and is already present on 60 percent of Brazilian smartphones, has microblogging and instant message features in the same interface, and in the information dissemination context, Telegram allows top-down strategies and bottom-up actions (coordination of mobilizations and campaigns from small groups). Besides, the platform is known for guaranteeing freedom of speech, and it stands as a safe space for communication:

Telegram has a reputation, whether or not well-founded, for highly secure messaging, having notoriously been listed by ISIS as ‘safe’ and having themselves championed privacy upon its founding. [...] Indeed, the founders started Telegram so communications could not be monitored by governments, including the Russian authorities. [...] The Russian state later accused Telegram of enabling terrorists because it would not turn over users’ encrypted messages, leading to a ban of the application in Russia. (Rogers, 2020).
In this way, Telegram historically has received an audience that is limited, banned, or censored on other social platforms when they “push the boundaries of acceptable norms of public culture” (Pohjonen and Udupa, 2017, apud Rogers, 2020).

Júnior, et al. (2021) states that “political discussion increased substantially on Telegram in early 2021”. Figure 2 shows a snapshot of Telegram’s official profile on Twitter “joking” about the topic. Moreover, Júnior, et al. also state that “it was possible to observe the importance of the structure of Telegram’s channels and groups in the dissemination of content within the platform”.

Since then, the efforts to increase the Telegram base continued. Between January and September 2021, Bolsonaro mentioned Telegram 42 times in his official Twitter account. On 7 September 2021, Brazil’s Independence Day, the mobilization power of the Bolsonarist network on Telegram was put to the test when the then-President Bolsonaro directly motivated his voters — or his subscribers — to participate in acts of support to your government in all Brazilian states. Quickly, hundreds of channels and groups were articulated and exchanged around 2.5 million messages between 1 August and September 30th, totaling 55 million views. Figure 3 shows Carla Zambelli calling for followers. Her message surpassed 40,100 views.
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Figure 3: Mobilizations on Telegram for 7 September 2021 acts. Translation: “On September 7th we will all be in Paulista Avenue for a New Independence! Share!” Source: https://t.me/carlaazambellioficial/837.

In 2022, the national election year, and after facing several political and legal challenges, such as the release of ex-president Luiz Inácio Lula da Silva, Bolsonaro’s direct opponent, and the partnership signed between Telegram and the Brazilian Supreme Federal Court (causing the banishment of important actors of the Bolsonarist network), Bolsonaro used the same strategies to mobilize people and fill the streets on Independence Day. In Figure 4, Carla Zambelli summons her followers again. This time, the message — which also featured political propaganda — received about 21,700 views.
Figure 4: Mobilizations on Telegram for 7 September 2022 acts. Translation: “Our future Governor Tarcisio calls all of you to be on the streets this September 7! Let’s fight for freedom together!!! Fill the streets of our Brazil with green and yellow. In São Paulo, we are waiting for you on Paulista Avenue.”. Source: https://t.me/carla zambelliofficial/2058.
In this context, the objective of this work is to perform a characterization and an analysis of the Bolsonarist network on Telegram in the period that encompassed the demonstrations of 7 September 2021 and 7 September 2022, computing network structure changes, similarities and differences in agendas, their mobilization power and changes of the most relevant actors that compose the network, considering the entry or withdrawal of some, and changes in their influences on the general network. More specifically, the focus will be on answering the following research questions:

\textit{RQ1}: was there an engagement reduction on Telegram between the two analyzed events?
\textit{RQ2}: Is the engagement difference on Telegram proportional to the mobilization numbers observed on the streets?
\textit{RQ3}: Were there changes in the set of most influential actors and the main agenda of the network?
\textit{RQ4} Were there changes in the network’s ability to call for political mobilization on the streets?

\section*{Background}

From the scandals involving fake news in the American elections of 2016 and the potential use of the same strategies in the Brazilian elections of 2018, a number of researchers have turned their attention to this topic and began to closely monitor political movements on social networks. Particularly in messengers, researchers have developed data mining tools (Resende, et al., 2019) and studied the application of different network modeling techniques (Melo, et al., 2019; Tous-Rovirosa and Dergacheva, 2021; Nobre, et al., 2022) and topic modeling (Saha, et al., 2021; Yakunin, et al., 2021).

It is a fact that, on the Web, “the success of content is measured by its dissemination” (Muzell, 2020). In messengers, however, it is necessary to consider that this dissemination is determined by “individual decisions, not corporate decisions”, since it is the “reader who helps to decide whether the report he receives on his cell phone will also be sent to his group of friends”. In this sense, Muzel states that there are “characteristics and factors that allow and favor the propagation of media”, making them more likely to be shared by a user in messengers. On the other hand, Ratier (2020) identified results that “point to a small elite concentrating most of the actions of public groups” in messengers, that is, “most of the posts [...] are in charge of a small number of contacts”. According to Ratier, this “sheds light on a probable centrality in communicative flows and raises doubts about the presumed horizontality” of communication in these media. In the same vein, Nemer [13] stated that, on WhatsApp, influencers “worked behind the scenes, orchestrating disinformation campaigns by sharing the same content at the same time in different groups”.

It is worth mentioning the architecture of disinformation networks on social platforms proposed by Ong and Cabañas (2018), who claimed that disinformation campaigns were designed by “professional and hierarchical groups of political operators”, capable of “mobilizing virtual armies” from innovative digital black ops techniques. The complete hierarchy can be seen in Figure 5.
In recent years, due to efforts to combat this type of action on WhatsApp, a large migration to Telegram has been observed. According to Júnior, et al. (2021), “political discussion increased substantially on Telegram in early 2021, with a high volume of messages suggesting a mass migration from other platforms to Telegram”.

However, it is still a challenge to implement observations that fully consider the complex structure of Telegram, which has private chats, groups, and channels (which may or may not be associated with each other) and bots. Nobari, et al. (2021) presented a complete characterization of Telegram’s structure,
comparing it with traditional ones already known in the literature, such as Twitter and WhatsApp, and identifying attributes that made messages viral and their flow on the network.

Given that “a key feature of Telegram is the extreme simplicity of sharing content” (Nobari, et al., 2021), where “users, who contribute to forwarding rate of viral messages, act like a media”, the key to analyzing Telegram dynamics is based on the message forwarding event.

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**Research methods**

In this section research methods are described, including details of data collection, messages pre-processing, and identification of the influence of actors in the network.

**Data collection**

To perform data collection and systematize storage and pre-processing, the authors developed the Telegram Observatory, a tool based on the official Telegram API [14] through the Python Telethon [15] library. This tool allowed us to retroactively collect all public information referring to a list of channels and groups, considering the given time interval, and storing data in SQLite [16] databases.

In order to collect messages, Telegram Observatory needs a list of target channels and groups. Unfortunately, there was no prior information about which Telegram’s channels and groups were related to information disorder. To circumvent that problem, a controlled snowball (Goodman, 1961) was performed. Snowball sampling is a “commonly used method for the identification of social networks in sociometric research” (Johnson, 2014), especially “to locate rare or difficult-to-find populations”, allowing the identification of similar individuals or items to the current sample. To start the sampling process, a carefully selected seed was used. More specifically, the starting point was composed of Telegram channels and groups associated with people, sites, and pages cited in inquiries conducted by the Brazilian Federal Supreme Court [17] and Senate [18] related to fake news and hate speech. Next, an iterative process was carried out. In each iteration, the dataset was expanded with chats that were mentioned in messages posted in chats already collected. However, since there were mentions to too many chats, with most not relevant, not all mentioned chats were included in the sample. In this context, relevance was measured according to the influence of a chat over others as defined later in this paper. The iterative process was interrupted when the set of most influential chats in the sample reached stability (i.e., the set of chats and their computed influence stopped changing significantly).

From each channel and group identified by Telegram Observatory, all messages, participants, and metadata were collected [19]. Besides the basic data from each entity, information regarding the interactions among channels and groups was obtained as well. To that end, an interaction between two channels/groups happened when there was a message forwarded from one to the other. Forwarded messages could be identified in Telegram once they had a parameter called “fwd_from_chat_id”, indicating from what channel or group that message was originally posted.

**Messages pre-processing**

The obtained messages were submitted to pre-processing before analysis. For this purpose, the following libraries were used: Enelvo (Bertaglia and Nunes, 2016), which allowed the normalization of texts with Web features, such as acronyms, spelling errors, and typical Internet language; and Gensim (Řehůřek and Sojka, 2010), a well-known topic modeling tool, for tokenization.

Considering the goal of topic modeling in this work, where expected results are an overview of discussions
on the network and identification of topics that triggered mobilizations, a simple pre-processing stage was conducted. To that end, stopwords, usernames, URLs, and emojis were filtered out. Despite the simple filters that were applied, some non-verbal elements, such as emojis, are important for an analysis of computer-mediated communication (Elder, 2018). An in-depth analysis of non-verbal elements was out of the scope of this work, left for future research.

After the pre-processing stage, topics were modeled using the LDA (Latent Dirichlet Allocation) algorithm (Blei, et al., 2003). LDA is capable of extracting a predefined number of discussion topics from a set of documents (in this case, each channel or group), returning the level of importance of each word in the document for each topic.

Identification of influential actors

In order to identify influential actors in the disinformation network, groups and channels were modeled as a weighted directed graph. Then, a variation of the well-known Google’s PageRank algorithm (Brin and Page, 1999) was used.

To model groups and channels as a weighted directed graph, denoted as $G(V, E, W)$, it is necessary to define: the set of nodes, $V$; the set of edges, $E$; and the mapping from edges to their respective weight, $W$. In this work, $V$ represents channels and groups. The set $E$ represents the relationship between pairs of nodes from $V$, i.e., in the context of this work, an edge $(a, b)$ indicates that at least one message posted in channel/group $a$ was forwarded to $b$.

Finally, $W$ measures the amount of influence flowing in each edge. The idea is that, for a given edge $(a, b)$, the influence from $a$ to $b$ should increase as the number of forwarded messages increases, and it should decrease as the time intervals between the publication of the original messages, by $a$, and the forwarded messages, to $b$, increase. To quantify this intuition, similarly to Saez-Trumper, et al. (2012), in this work, the weight of edge $(a, b)$ is defined as:

$$W((a,b)) = \sum_{m \in M_{a,b}} \exp(-\alpha(t_{m,a} - t_{m,b}))$$

where:

- $M_{a,b}$ is the set of all messages sent from $a$ to $b$;
- $t_{m,a}$ is the time when message $m$ was posted in channel/group $a$;
- $t_{m,b}$ is the time when message $m$ was posted in channel/group $b$; and
- $\alpha \in [0, \infty)$ is a tuning parameter.

The tuning parameter $\alpha$ regulates the timescale between events. A large value of $\alpha$ implies that only quick message forwarding will significantly contribute to edge weight. Similarly, a small $\alpha$ implies that most of the forwarding, even those occurring after several weeks or months, will have a strong effect on the edge weight. In this work, the value of $\alpha$ was set to 0.3, meaning that forwarding happening after a week would have almost no effect. In the context of this work, i.e., analyzing the use of Telegram for political mobilization, this choice of $\alpha$ was justified because messages being forwarded after a long period of time were unlikely related to a specific mobilization campaign.
With this network, a variation of the classical PageRank (Brin and Page, 1999) algorithm could be applied in order to identify influential nodes, i.e., channels or groups. To that end, the personalized PageRank proposed by Saez-Trumper, et al. (2012) was used. It is out of the scope of this work to examine the details of how this personalized PageRank works, but intuitively, it was designed to identify trendsetters in information networks. In the context of Telegram, trendsetters can be seen as channels/groups that were strategically well-connected and succeeded at disseminating many messages throughout the network in a short amount of time. In other words, to do that, the personalized PageRank took into account the structure of the network and the weight of the edges.

Results and discussion

In this section, the results of the conducted analysis are presented. First, basic statistics related to the collected dataset are described. Second, it is shown the main actors in the network and how they changed over one year. Finally, the main topics of discussion are explored.

Dataset characteristics

In order to understand and compare the mobilization strategies for acts regarding Brazilian independence days in 2021 and 2022, the Telegram Observatory tool was used to collect a large set of channels/groups and messages. More specifically, the collection was performed for both years during the interval of 30 days centered on the respective Brazilian Independence Day (7 September).

From the initial set of mapped groups and channels, the Telegram Observatory tool identified more than 6,000 channels and groups. However, not all of those were necessarily related to the phenomena of information disorder and political mobilization. Hence, an initial PageRank analysis was conducted, and it allowed the collection procedure to focus on a more significant and smaller portion of the network. In summary, the final dataset is composed of 121 channels and 96 groups (totaling 217 actors). Table 1 illustrates basic statistics and a comparison between the two data collections.

<table>
<thead>
<tr>
<th>Period</th>
<th>7 September 2021</th>
<th>7 September 2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Channels</td>
<td>121</td>
<td>122 (+0.82%)</td>
</tr>
<tr>
<td>No. of Groups</td>
<td>96</td>
<td>92 (-4.16%)</td>
</tr>
<tr>
<td>Sum of Channels Participants</td>
<td>3,802,194</td>
<td>4,111,376 (+8.13%)</td>
</tr>
<tr>
<td>Sum of Groups Participants</td>
<td>203,940</td>
<td>215,838 (+5.83%)</td>
</tr>
<tr>
<td>No. of Unique Groups Participants</td>
<td>104,388</td>
<td>59,859 (-42.65%)</td>
</tr>
<tr>
<td>Percentage of Unique Groups Participants</td>
<td>51.18%</td>
<td>27.73%</td>
</tr>
<tr>
<td>Total No. of Messages</td>
<td>1,386,593</td>
<td>976,738 (-29.55%)</td>
</tr>
<tr>
<td>Average Views per Message</td>
<td>10,721</td>
<td>9,733 (-9.16%)</td>
</tr>
</tbody>
</table>
Table 1: General comparison between data collections.

It is important to note the change in the number of channels and groups between periods. Telegram allows you to associate channels with groups (in a feature called Discussion Group). In this way, the collection tool always identifies new associations and inserts them into the base. In addition, exclusions, suspensions, and bans from channels and groups can also change the size of the collection, as is the case of the channel “AllanDosSantos”, banned from the platform after a request from the Brazilian Federal Supreme Court.

In addition, the increase in the total number of participants in the groups in contrast to the decrease in the percentage of unique participants is also noteworthy. This indicates a smaller number of people on the network, but an increase in their engagement, as they were in more groups. However, despite being in more groups, the number of messages decreased by almost 30 percent in 2022, compared to 2021.

In 2021, 94 percent of messages were sent in groups by their participants, while the remaining six percent were in charge of channels. The same pattern repeated itself in 2022, with 94.13 percent of messages sent in groups by participants. However, while in 2021 32.89 percent of the users collected from the groups had sent at least one message in the period, in the following year this number was equal to 17.65 percent, that is, 82.35 percent of the network participants did not actively participate in discussions.

Figure 6 shows the time series related to the number of messages posted in the network per day. It can be seen that the acts that occurred in 2021 caused a surge of messages. This surge started approximately two days before the act and lasted around four days. In 2022, the mobilization strategy on Telegram did not have the same outcome as in 2021. This can be observed in Figure 5, once the same surge of messages, around the act, did not occur.

Figure 6: Messages per day comparison between collections. Zero represents 7 September (Brazilian Independence Day).

Influence analysis
Figure 7 presents a visual representation of Telegram’s mobilization networks related to the acts of 2021 (a) and 2022 (b), showing the structural evolution of the network and the main differences relative to influential actors. In the figure, the node size represents its personalized PageRank (i.e., its influence in the network). Channels and groups that were present in both data collection appeared in the same position in both figures. Moreover, in each figure, the top-15 nodes (with respect to influence) were labeled.

Figure 7: Mobilization network for 2021 (a) and 2022 (b). Some of the channels can be “translated” from Portuguese to English. For instance: reacoesadversas (Adverse Reactions); ucranizabrasilcanal (‘Ukrainize’ Brazil Channel); terrabrasilnoticias1 (Terra Brazil News); AdvogadosPelaLiberdade (Lawyers for Freedom); medicospelavida (Doctors for Life); VaccineVacinaCovid19 (Covid-19); NAOSOMOSCOBAIAS (We are not ‘Guinea Pigs’); OsPatriotas (The Patriots); amidianaesuaamiga (The Media is not Your Friend); newsatual (Actual News); semprequestione (Always Question); oinformatiofficial (The Informant Official); FechadosComBolsonaro2022 (‘Supporting’ Bolsonaro 2022); verdadesconectadas (Connected Truths); O_Despertar (The Awakening).

There are four main aspects revealed by Figure 7 (details and an interactive version of the figures are available at dsl.ufes.br/files/september7). First, it can be seen that the mobilization network lost significant density. There was a reduction of 30.67 percent in the number of edges and the average edge weight dropped around 29.39 percent, meaning that the interactions between channels/groups became less frequent over time. In addition, while in 2021 the network nodes had an average distance of 2.6 hops, in 2022, this average increased to 4.5.

Second, the density reduction was more significant in the lower-right quadrant of Figure 7, where the concentration of channels related to anti-vaccine movement, such as medicospelavida (Doctors for Life), antivaxxx, AdvogadosPelaLiberdade (Lawyers for Freedom), reacoesadversas (Adverse Reactions), and verdadesconectadas (Connected Truths).

Third, Figure 7 also shows that influence (as measured by the PageRank definition) was concentrated in fewer nodes in 2021 when compared to 2022. This observation is supported by Figure 8, which presents the distribution of PageRank across all channels and groups of the network. From this figure, one can observe
that in 2021, a few chats (approximately five) have influences that stand out. Meanwhile, in 2022, the influence values were more evenly distributed, even for the set of chats that had the largest values.

**Figure 8:** PageRank distribution by chats (groups and channels). In this context, a PageRank value indicates the influence of a chat to disseminate content in the network.

In terms of political mobilization, these results indicate that few actors were responsible for producing most of the content circulating on the network. In fact, the political context surrounding the Brazilian Independence Day of 2021 and the structure of the mobilization network allowed that few actors (groups/channels) needed to be activated to spread (or push) a message to a large portion of the network. As for 2022, this observation was still valid, but a considerably larger set of trendsetters (or influential actors) were necessary to achieve a similar (but smaller) effect.

Finally, it is worth noting that the set of most influential actors changed considerably over a period of one year. **Table 2** presents the Top-15 most influential channels/groups and their respective rank changes.
Table 2: Top-15 most influential channels and groups, according to PageRank, in each period compared to the other. The first and second columns indicate the position of the chats in the ranking for 2021 and 2022, respectively. The same applies for the fourth and fifth columns.

Of the channels present in the 2021 top-15, only four remained (shown in bold), two of which were related to the anti-vaccine movement. The 7 September acts were also fomented by anti-vaccine groups and channels, as shown in Figure 9, which guided the end of the vaccine passport and preached against vaccines and in favor of a “covid kit”, a cocktail of medicines that includes the immunomodulator hydroxychloroquine and the anti-parasitic ivermectin.
Figure 9: Protest for the end of the vaccine passport on 7 September 2021 with posters in English. Source: https://noticias.uol.com.br/politica/ultimas-noticias/2021/09/07/manifestacao-7-de-setembroaposta-frases-ingles.htm.

Former President Jair Bolsonaro had flirted with anti-vaccine speeches earlier, as in a statement published by the government’s Special Secretariat for Social Communication in September 2020; see Figure 10.

Figure 10: The government’s Special Secretariat for Social Communication quotes a speech
In 2022, however, the anti-vaccine base did not mobilize for the act, this time purely political, aligned with density reduction as observed in Figure 7. Conspiracy-themed channels, however, remained highly influential in the general network, such as: semprequestione (Always Question), O_Despertar (The Awake), NAOSOMOSCOBAIAS (We Are Not Guinea Pigs), and amidianaoesuaamiga (The Media Is Not Your Friend).

The ZeTrovaoOficial channel, which dropped from the fifth to the 3,500th position, belongs to the leadership of the truck drivers class, Marcos Antônio Pereira Gomes. At the time, Zé Trovão (as he is known) mobilized truck drivers for the acts and was decreed for arrest by the Brazilian Federal Supreme Court on 3 September 2021. He was a fugitive during the period of the acts, communicating via Telegram and mobilizing protesters, captured eventually on 26 October and later elected, in October 2022, as a Federal Deputy.

In 2022, it was also possible to observe that the truck drivers class did not actively participate in the acts. Thus, the final result was the absence, in 2022, of two classes of great prominence in the previous year.

Another important observation is the relevant position of the “terrabrasilnoticias1” channel, which rose from the third to first. The channel is owned by the alternative news portal “Terra Brasil Notícias”, which already had content with disinformation removed from the portal by court order [20].

**Topic analysis**

Figures 11 and 12 show the results of the topic analysis in the set of messages by applying the LDA algorithm. For the sets of words contained in the figures, the LDA scores represent the importance of a given word in the discussions that happened in each period. These important words and their respective scores represent an overview of the agenda of the mobilization network in each year.
Figure 11: Top-20 words from 2021 compared to 2022. The terms were translated from Portuguese.

Figure 12: Top-20 words from 2022 compared to 2022. The terms were translated from Portuguese, with the exception of the abbreviations “pl” and “dep”, which mean “Liberal Party”, the party of former President Jair Bolsonaro, and “deputy”, respectively.

From these figures, it can be seen that the scores were more evenly distributed in the second period, except for the term “bolsonaro”, which presented a small growth and remained a prominent agenda. According to Figure 13, in fact, one can see that the agenda (topics of discussion) in 2022 was more concentrated in a few topics. This fact could indicate an attempt to unify the political discourse to improve mobilization. Other important factors for this agenda change might be the impact of a reduction in the COVID-19 pandemic and the proximity to the Brazilian presidential and congressional elections.
As observed in Figure 13, in 2022, while the first topic had a similar score compared to the first topic of 2021, others lost strength, perhaps representing a reduction in extremism of discussions, or a greater diversity of topics. From Figures 10 and 11, can be seen there was a reduction of discussion related to COVID-19 and an entry to the agenda related to the elections, with the terms “lula” (Luiz Inácio Lula da Silva, Bolsonaro’s direct opponent) and “left” gaining greater prominence, as well as “PL” (Liberal Party) and “dep” (Deputy).

Conclusion

This work presents a characterization and analysis of the Telegram information disorder network in Brazil, and its use as a political mobilization tool for the 7 September demonstrations in 2021 and 2022, highlighting similarities and differences. It is important to consider that 2021 and 2022 were characterized by efforts of the Brazilian Supreme Court to act against disinformation and hate speech on social platforms, especially focused on the context of elections. Part of this effort was a partnership between the Brazilian Superior Electoral Court and Telegram, in May 2022 [21], causing some users to be banned from the platform and the fear of possible exposure of the personal identities of important actors. Moreover, the acts of 2022 were marked by a more electoral agenda, related to the general elections.

In this way, and in response to the RQ1, the analysis showed a considerable reduction in the network’s engagement, especially over a non-adoption of mobilization by the anti-vaccine community, very active in 2021. Furthermore, the reduction in the average number of participants in the groups in contrast to the increase in the number of groups that each user participated in demonstrated that the network lost a portion of the audience that was possibly less engaged while increasing the engagement of others. Overall, the network lost engagement, as demonstrated by a reduction in the number of shared messages and views.

Regarding RQ2, one can observe that changes in network engagement corresponded to the numbers of acts on the streets. In 2021, estimates pointed to around 400,000 [22] people in Brasilia, the capital of Brazil, and 125,000 [22] in São Paulo. In 2022, estimates pointed to around 100,000 [24] people in Brasilia and 32,700 [25] in São Paulo. As these numbers were highly variable, and given that the acts took place over
many hours, it can be difficult to accurately estimate the numbers of participants, leaving it up to the media, researchers, and Military Police to use appropriate methods. However, considering the political context of the movement, it is important to emphasize that the numbers could be inflated or reduced according to the interests of third parties. An example of this is the estimate made by the Planalto Palace (Brazilian Government), represented at the time by former President Bolsonaro, who stated that around 1,000,000 people were at the acts in Brasilia in 2022.

The differences also include the main influential actors in the network, aligned to the main discussion agenda. In respect to RQ3, only four of the Top 15 channels in 2021 remained in the rank in 2022. Observing the Top 15 ranking, it was also detected that the anti-vaccine channels lost significant influence in the network, as well as some political figures, while the support channels for Bolsonaro stood out. The probability distribution among the most important terms in the main discussion agenda of the network also provided important information: besides the discussion becoming less extreme over time, with LDA scores less concentrated in the first 10 terms (except for the term “bolsonaro” which presented slight growth), this study noted a reduction of LDA scores related to the pandemic, such as “vaccine” and “covid”, in comparison to 2021, while topics associated with the opposition of former president Bolsonaro in the elections, such as “lula” and “left”, appeared.

Taking these results into account and other differences observed in network structure, regarding the RQ4, in terms of mobilization, Bolsonarist supporters faced more difficulties to push messages via Telegram. In 2021 a small core of channels disseminated information quickly across an extensive part of the network. In 2022 more channels needed to be activated while fewer connections among them provoked a decrease in effectiveness, resulting in a lower ability of the network to carry out mobilizations.

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Notes
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6. https://twitter.com/Zambelli2210/status/1347960530267484163
15. https://docs.telethon.dev/
19. The authors intend to make the dataset and code publicly available upon publication of this manuscript at https://github.com/athuscavalini/telegram-observatory.
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