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# Spreading Like Wildfire: The Securitization of the Amazon Rainforest Fires on Twitter

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As a tool of political communication and information diffusion, social media has transformed the process of securitization, allowing (in)security messages to spread and scale up rapidly. Focusing on the case of the Amazon rainforest fires in 2019, this article seeks to answer two questions: How does securitization spread in online networks? And who are the actors that contribute to the diffusion of security messages? To explore this puzzle, the study develops a dictionary of query terms and performs a full-archive search to collect tweets posted between June and October 2019 and reconstruct the communication network of more than 3 million users. Drawing from theories of online activism and research on information diffusion in networks, the study uses both the structure of the Twitter network and the dynamics of activity in message exchange to identify four types of users and explore their roles in the spread of the message. The findings shed new light on the ways in which social media facilitates the definition of security problems and provide empirical evidence of the prominent position of influence taken by lay actors in the process of securitization.

*Keywords: securitization, political communication, social media, network analysis*

#PrayForAmazonia became a global trend in 2019, as Twitter users around the world called for immediate action to stop the fires raging in the Amazon rainforest. Yet, although 126,000 wildfires were recorded that year in the Brazilian Amazon (Burgueño Salas, 2023), up to 263,000 fires had been recorded yearly in that same decade (Burgueño Salas, 2023), showing that 2019 was less of an anomaly than it was the norm. So, why did the issue gain sudden international attention? This can be explained by the concept of securitization. Famously coined by the Copenhagen School of Barry Buzan, Ole Wæver, and Jaap de Wilde (1998), securitization claims that the way we speak about certain issues can have an effect on whether they are treated as security threats. In other words, rather than treating security as a given object, securitization seeks to understand "what people do" to bring security into existence (Aradau, Huysmans, Neal, & Voelkner, 2014) and

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proposes that by "speaking security" a given issue becomes a security problem (Austin, 1975; Stritzel, 2014; Wæver, 1995). Undeniably, the development of the concept of securitization has significantly transformed the field of security studies. The success of the Copenhagen School in establishing a dominant approach to security is evidenced by the number and scope of publications working with its central concept of securitization or some variation of it (Balzacq, 2015; McDonald, 2008). However, despite the impressive body of highly cited literature that followed the publication of *Security: A New Framework for Analysis* (Buzan et al., 1998) in 1998, securitization has been slow to adapt to the new context of online political communication, leaving many open questions about how online networks facilitate the emergence and diffusion of security discourse.

As with other cases of political communication, the advent of social media has raised new questions about the process of securitization. Compared with mainstream media and other forms of traditional political communication (e.g., presidential speeches), social media diminishes the gatekeeping power of the elites by accommodating a wider range of actors and providing more accessible means to make effective claims about threats (Gilardi, Gessler, Kubli, & Müller, 2021; Makhortykh, 2018). Platforms like Twitter, for example, offer new opportunities to understand the process of securitization. Behaving as organizational structures, these platforms facilitate the transmission of individual/personal expressions of (in)security and allow them to scale up rapidly and reach global proportions (Bennett & Segerberg, 2012). However, although it is true that the concept of securitization has significantly evolved over the last two decades, the scholarship has been slow to engage with the modern dynamics that arise as a result of the widespread adoption of communication technologies. In particular, the claim that "security is only articulated in an institutional voice by the elites" (Wæver, 1995, p. 57) has hindered the securitization scholarship from studying social media's potential for lay actors to become influential within security debates (Downing & Dron, 2020). Thus, addressing these limitations and seeking to update the theory to the modern dynamics of political communication, this study takes a sociological stance (Balzacq, 2008, 2010, 2015) to analyze securitization through the lens of diffusion.

Previous research on online activism and information flows on social media networks have highlighted the importance of the "vital middle" in the spread of information, which suggests that, in most cases, information flow events develop as a result of mixed top-down and bottom-up forces working together (Hemsley, 2019; Nahon & Hemsley, 2013; Vaccari & Valeriani, 2015). Yet, the empirical claim that security is "very much a structured field in which some actors are placed in positions of power by virtue of being generally accepted voices of security, by having the power to define security" (Buzan et al., 1998, p. 31) suggests that securitization might behave differently, as a special case that does not align with previous findings. Therefore, the analysis that follows aims to answer two core questions: How does securitization spread in online networks? And who are the actors who contribute to the dissemination of security messages?

Leveraging the opportunities offered by the newest Twitter API for Academic Research, the study develops a novel empirical approach to better account for both the human and algorithmic agents that coact in the spread of online information. First, the study develops a dictionary of 28 query terms related to the Amazon fires to perform a full-archive search of all publicly available tweets shared between June and October 2019 and reconstruct the complete discourse network of more than 3 million users. Then, building on the methodology developed by González-Bailón, Borge-Holthoefer, and Moreno (2013), tweets are taken as the main unit of analysis to study at a granular level the time at which a given user joined the securitization process (by contributing to the flow of messages) and how far the cascades of security information went (in terms of the number of users involved at any given time). Tracking the activity at the individual and group levels, the study identifies the position of users in the overall communication network; then, using the time stamps of messages, it follows changes in those measures over time to reconstruct the longitudinal development of securitization. This study, thus, contributes to the existing literature both theoretically and methodologically. On the one hand, it sheds light on the spreading mechanisms that bolster securitization online and provides an empirical analysis of the how lay and elite actors contribute to the emergence of security problems. On the other hand, this study develops a new methodological approach that is more contemplative of the nature of the Twitter sphere and accounts for the black box algorithmic agents that coact alongside human actors by altering the diffusion paths of a message.

The study proceeds in five sections. First, it begins by scrutinizing the Copenhagen School's framework to highlight the opportunities presented by the advent of social media to reengage with modern readings of securitization. Then, it discusses the nature of the Twitter sphere, seeking to explain the implications that this medium has the definition of security problems. The third section delves into the case of the Amazon rainforest fires, providing evidence of their relevance as a process of securitization and outlining the research design developed to analyze this case. The fourth section presents the findings, which suggest that securitization benefited from the synergies between the fast-growing information cascades prompted by central actors and the numerous focuses of action generated by grassroots users. Finally, I conclude by considering the implications of these results for securitization theory and proposing a pathway for further research.

## Related Work

### *The Copenhagen School and the Sociological Take*

Securitization focuses on political communication to explain how security threats come into existence. Rather than treating security as a given object, securitization theory understands security as a linguistic practice (Aradau et al., 2014). Indeed, in their most famous articulation of securitization, the Copenhagen School of Buzan, Wæver, and de Wilde proposes that "security is a speech act" (Wæver, 1995, p. 46), pointing at the constructivist idea that by "speaking security" a given issue becomes a security problem (Austin, 1975; Stritzel, 2014; Wæver, 1995). Being, thus, conceived as a self-referential practice, securitization develops as a two-stage process: First, a securitizing agent pronounces a "speech act" that presents something as an existential threat (Buzan et al., 1998), and second, the audience accepts the security discourse, allowing the application of extraordinary measures to protect the referent object (Buzan et al., 1998; Wæver, 1989, p. 42).

There is one core element to the Copenhagen School's framework that significantly limits its applicability to the online sphere: the authority position of the speaker. Seeking to strengthen their speech act approach, the Copenhagen School argues that "security is articulated only from a specific place, in an institutional voice, by elites" (Wæver, 1995, p. 57). This claim is based on the (empirical) assumption that security is "very much a structured field in which some actors are placed in positions of power by virtue of being generally accepted voices of security, by having the power to define security" (Buzan et al., 1998, p. 31). However, the top-down approach proposed by Wæver and his colleagues and the focus on a single actor and a one-time utterance (Butler, 2010; Wullweber, 2013), undermines the intersubjective element of security and stands in opposition with the Copenhagen School's own description of securitization as "the process of constructing a shared understanding of what is to be considered and collectively responded to as a threat" (Buzan et al., 1998, p. 26; Léonard & Kaunert, 2010). As a result, this approach hinders the applicability of the Copenhagen School's framework, in so far as it could not possibly account for the wide range of actors who collectively bring security into existence.

The important and innovative contribution offered by the concept of securitization should, however, not be up for question. Modern readings, such as Balzacq's (2008, 2010, 2015) sociological approach, have been successful in addressing the limitations imposed by the initial framework and are better suited to analyze securitization on social media. Indeed, proponents of the sociological take have argued that the excessive focus on the politics of the state and the elites, without sufficiently accounting for society at large, has led to an under-theorization of securitization (Wullweber, 2013, p. 20). Thus, moving beyond the one-time utterance by a single elite actor, the sociological approach considers securitization as "*a set of interrelated practices, and the processes of their production, diffusion, and reception/translation that bring threats into being*" (Balzacq, 2010, p. 1; emphasis in original). This conceptualization highlights the need to explore the spreading mechanisms by which actors collectively and intersubjectively produce meanings of security. These theoretical insights, therefore, provide grounding study securitization on social media from a lens of diffusion and foster the analysis of the relative positions of the users who, by contributing to the spread of the security message, may themselves become influential (Downing & Dron, 2020).

### *The Twitter Sphere and the Diffusion of the Security Message*

Empowering users to "share and distribute information, create viral events, [and] collaborate to produce knowledge" (Nahon, 2015, p. 41), platforms like Twitter have turned into an essential instrument in times of disaster, revolution, and uprising (Barberá, 2015; Rogers, 2018). In fact, technological social networks have affected how we produce and consume information, shifting the paradigm from a broadcasting model (one-to-many) to a peer-to-peer (many-to-many) distribution system (Varol, Ferrara, Ogan, Menczer, & Flammini, 2014). These dynamics have important implications for the process of securitization. Compared with mainstream media and other forms of traditional political communication (e.g., presidential speeches or parliamentary debates), social media diminishes the gatekeeping power of more traditional agents by accommodating a wider range of actors and being more accessible in terms of making effective claims about threats (Gilardi et al., 2021; Makhortykh, 2018).

Technological networks do not only create online meeting spaces, but they also select, order, and amplify content, calibrate relationships, and behave as organizing entities that facilitate the action of sharing and transmitting information (Bennett & Segerberg, 2012; Huszár et al., 2022). Compared with the early days of social networking, in which users spoke directly to their network of followers, messages are now subjected to an algorithm that amplifies or suppresses their circulation (Riemer & Peter, 2021). Some empirical examples of network-mediated diffusion processes include insurgencies, such as the Arab Spring (Comunello & Anzera, 2012; Tudoroiu, 2014), political demonstrations, like *indignados* (Bennett & Segerberg, 2015; González-Bailón et al., 2013), and securitization, as in the case of the Amazon rainforest fires. The one common denominator connecting these very distinct cases is that, rather than emerging from structures of formal organization and central authority, individual messages spontaneously snowballed until they reached global proportions (González-Bailón et al., 2013). But what were the conditions that facilitated the growth of such information cascades?

The existent literature offers two competing approaches to explain these dynamics (González-Bailón et al., 2013, p. 949): The first, suggests that large-scale diffusion processes are incited by a small subset of influential individuals with large networks of followers, who can reach a disproportionate number of users with a single post. This first approach aligns with the Copenhagen School's framework, by which security discourse spreads following a broadcasting model: one speaker and a large audience. The second model, on the other hand, proposes that influence derives from a critical mass of lay actors who, in the aggregate, bolster small chain reactions to converge in global cascades (Bastos, Raimundo, & Travitzki, 2013; Nahon & Hemsley, 2013; Vaccari & Valeriani, 2015; Watts & Dodds, 2007). This latter approach resembles the dynamics described by the sociological model: Rather than developing as a critical decision or a moment of disruption, securitization emerges from recurring "banal security nothings" (Huysmans, 2011, p. 371). In other words, peer-to-peer influence drives the diffusion of security messages, leading to a collective definition of security threats. From the perspective thus defined, this implies that the process of securitization involves a large set of speakers who repeatedly receive and pass on security messages to their peers, producing system-wide implications and behaving both as securitizing agents and audience(s).

Both models are likely to exert an influence on behavior (Onnela & Reed-Tsochas, 2010) and, particularly in the case of securitization, the competing theories provide no clear answer in this regard. Although social media's network structure, formed by a patchwork of "personal publics" (i.e., what Facebook calls "friends" and Twitter calls "followers"), offers the opportunity for grassroots users to generate reverse flows of information from the bottom-up (Sayre, Bode, Shah, Wilcox, & Shah, 2010), it also allows prominent individuals or hubs to easily influence a disproportionate number of others (González-Bailón et al., 2013). Thus, it remains unclear whether the diffusion of securitization on Twitter is stirred by the elites, as proposed by the Copenhagen School, or whether a wide range of securitizing actors are responsible for collectively defining security threats. This brings the discussion back to the original question: Who are the actors who lead the diffusion of security messages on Twitter and the growth of the information cascades?

## Case Study: #PrayForAmazonia

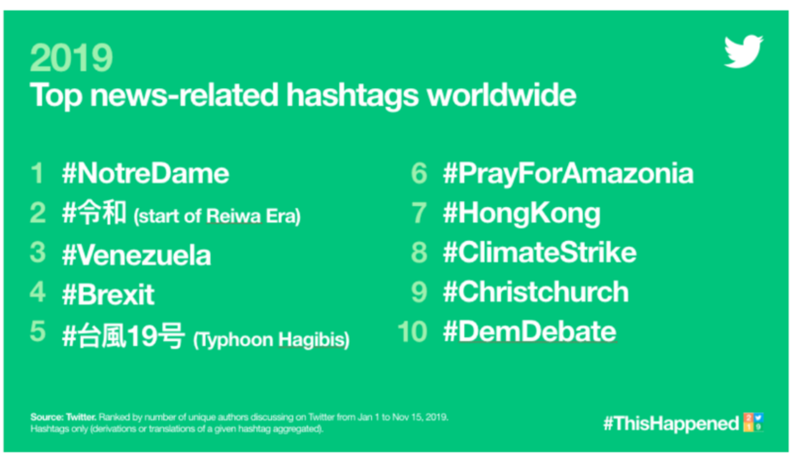



***Figure 1. Top trending news-related hashtags worldwide (Filadelfo, 2019).***

The #PrayForAmazonia hashtag became a global trend in 2019, just a few days before the city of São Paulo was completely covered in smoke (Figure 1). This also coincided with Jair Bolsonaro's first presidential year. Known for his right-wing policies, Bolsonaro took a hard stance to promote farming, even at the expense of the Amazon rainforest. Although this contrasted significantly with the protectionist discourse promoted by his predecessor, the fires raging in the Amazon were not a novel event. Indeed, as shown in Figure 2, even though the number of wildfires increased by more than 40% in 2019 compared with the previous year, going from 90,000 to 126,000 fires, up to 150,000 fires were registered in 2017 and 2020, and 263,000 in the previous decade, showing that the events of 2019 were not so much an exception, as they were the norm (Burgueño Salas, 2023).

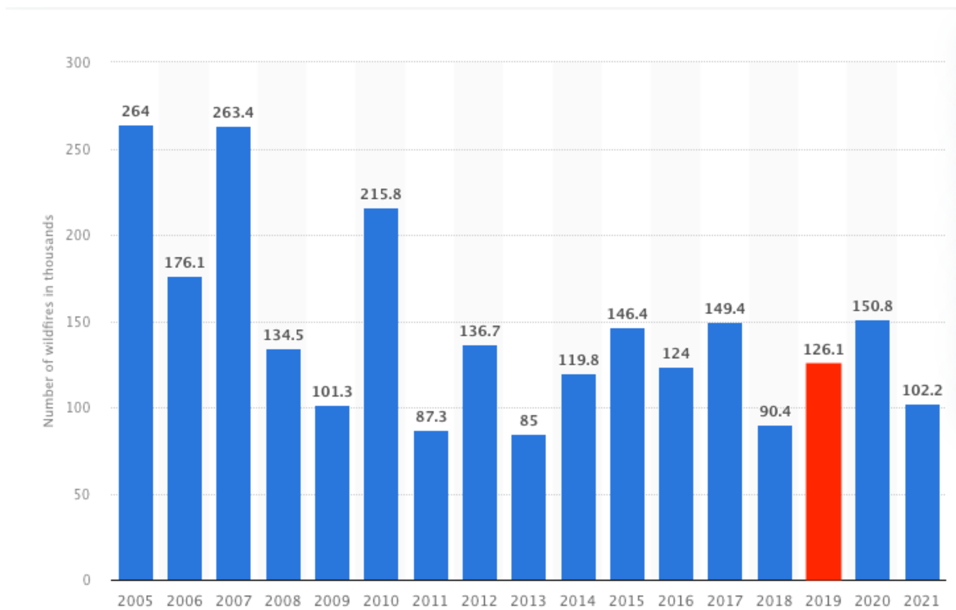



***Figure 2. Number of wildfires in the Legal Amazon area in Brazil from 2005 to 2021 (Burgueño Salas, 2023).***

The #PrayForAmazonia movement was, however, unprecedented. What started as a recast demand to protect the rainforest by Brazilian citizens and local advocacy organizations, quickly scaled up to become an international trend engaging users from around the globe. Many different mottos and slogans were produced as a result of the vast diversity in participation, although "the lungs of the planet are burning" (Macron, 2019) quickly became the main trend, suggesting that the fires posed a global threat. This was also mirrored by the broad number of multilingual hashtags developed and employed by engaged users. Although #PrayForAmazonia became the sixth most employed news-related hashtag worldwide in 2019, as shown in Figure 1—right after #Brexit and #NotreDame, and before #HongKong and #Christchurch—many hashtags and linguistic terms were developed to refer to the issue, such as #ActForTheAmazon, #AmazonasEnLlamas, #lAmazonie, and #SOSAmazonia, to name a few.

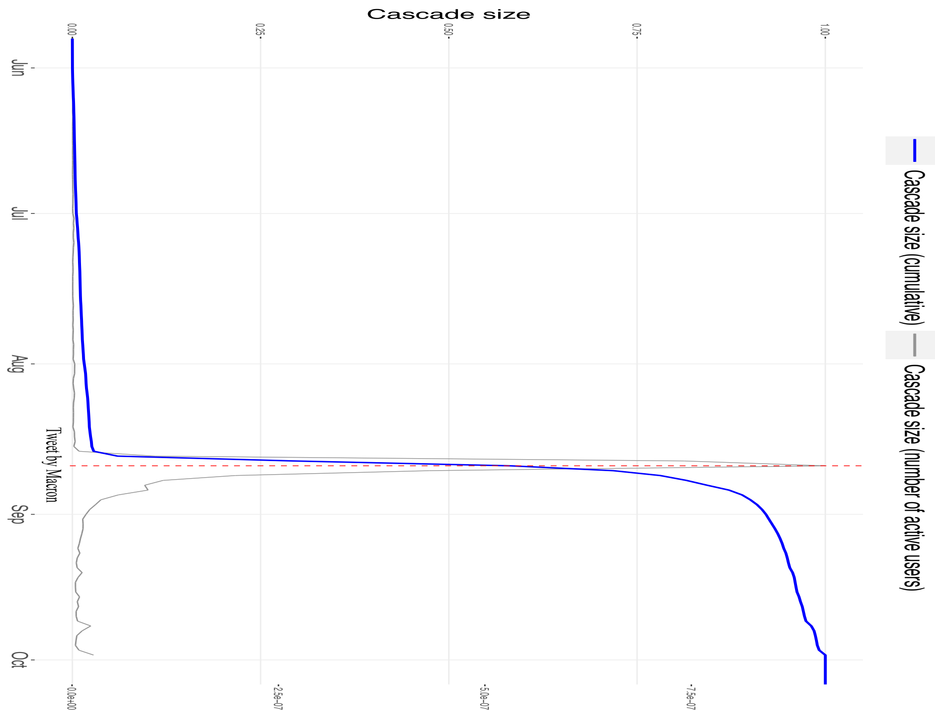



***Figure 3. Chronological activity growth measured by number of daily active users engaged with the securitization process.***

Figure 3 displays the chronological growth of the diffusion process measured by the number of daily active users. The number of users is expressed both as proportions and in the cumulative form to show that the securitization of the Amazon fires follows the traditional S-shaped curve that characterizes processes of diffusion (González-Bailón et al., 2013). One important contribution to this information flow was made by Emmanuel Macron, who, on August 22, 2019—less than a week before the 45th G7 Summit, which was hosted in France—shared a tweet calling for international action to stop the fires (as shown in Figure 4). Indeed, Macron's commitment to the cause led other world leaders, such as Justin Trudeau, to take to Twitter to discuss the "global emergency" that was unraveling in the Amazon and resulted in a historic G7 agreement to provide resources to protect the rainforest. At first glance, this could be thought to align with the Copenhagen School's framework, where securitization is enacted by elite agents. However, as shown in Figure 3, the growth in online activity was not triggered by Macron's tweet. On the contrary, Macron only engaged with the securitization process after the security discourse had become widespread, which puts into question the top-down dynamics proposed by the Copenhagen School. Thus, focusing on the case of the Amazon fires, which offers but one example of online securitization, this study seeks to explore how security messages spread on Twitter and analyze who are the actors who contributed to this process.


***Figure 4. Tweet by Emmanuel Macron (2019).***

The analysis that follows centers on two main questions: How did security messages diffuse in the population of engaged online users? And who were the most prominent actors in that diffusion process? Seeking to answer these questions and in light of the discussion held in previous sections, the study explores the position of actors within the structure of the communication network and their level of influence. Three possible explanations could describe the spread of securitization in the case of the Amazon fires (Ferrara, 2017; González-Bailón et al., 2013; Varol et al., 2014): (1) Prominent personalities with large networks of followers spurred the spread of the security discourse, generating fast-growing information cascades of global proportions; (2) securitization developed spontaneously and without formal organization or central authority out of numerous foci of action that ultimately converged in a global cascade; and (3) securitization benefited from a mixture of the first two dynamics, creating synergies between the minority of hubs and the majority of grassroots users. The following section introduces the data collected to examine these alternative explanations and gives details of how the communication network is reconstructed to measure the cascades of information and the dynamics of diffusion.

***Data and Methods***

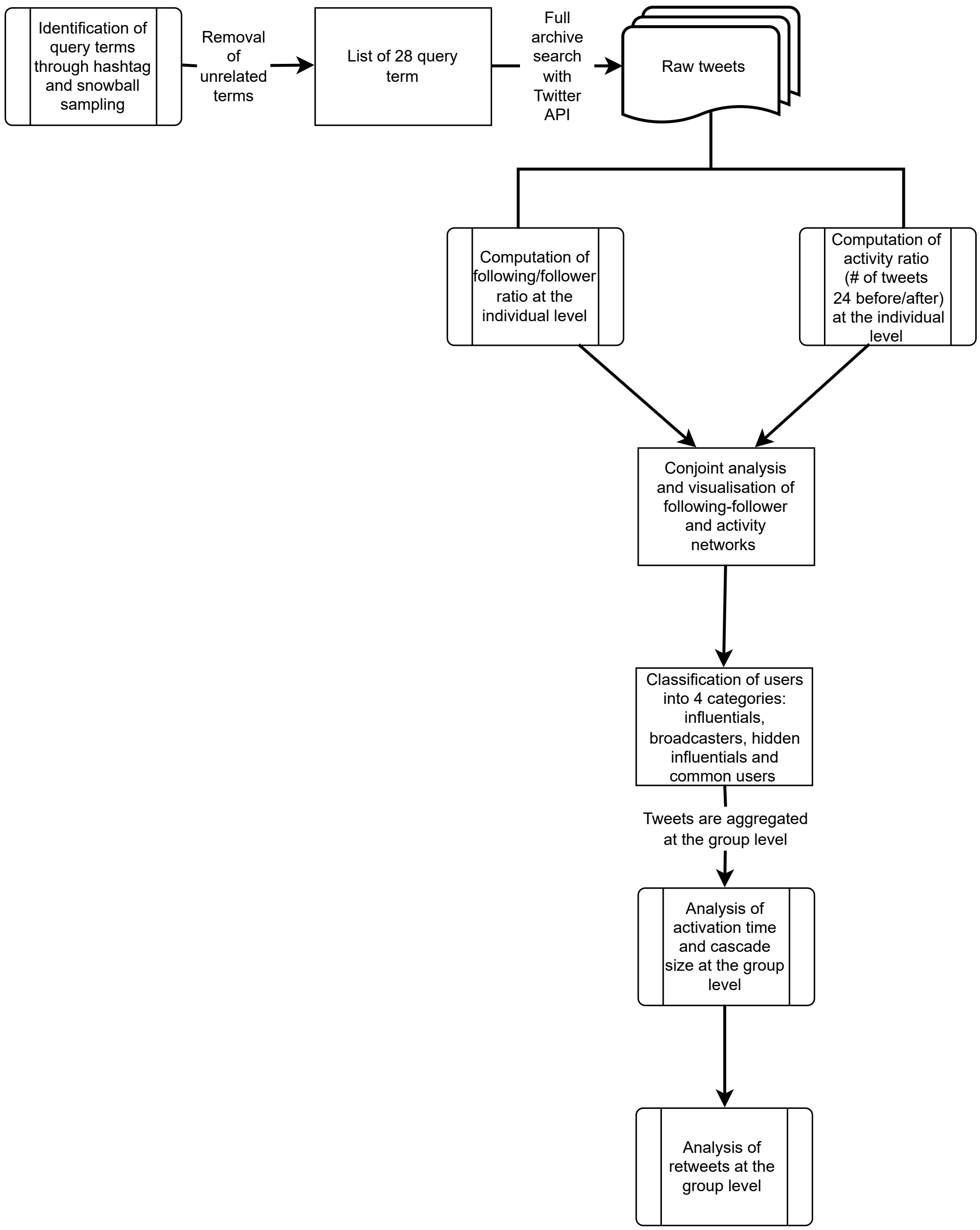



***Figure 5. Workflow.***

The study collects tweets posted between June and October 2019 using Twitter's academic API and the R package academictwitteR (Barrie et al., 2022). This observation window goes back more than two months before the peak in activity growth, allowing the study to track the online activity before the security message became widespread. Seeking to reconstruct the entire communication network, and in light of the discussion developed in the previous section pertaining algorithmic interventions, the search query fed to the API includes several keywords and N-grams related to the Amazon fires. The 28 query terms displayed in Appendix A[2] are the result of a combined hashtag and snowball sampling and the subsequent removal of unrelated stopwords, such as "amazonhelp" and "primeday" (the complete stopword list is reported in Appendix B).

Using this procedure, the final data set returned by the API consists of 3,806,624 tweets posted by 3,800,777 unique users. The frequency distribution of tweets collected from each query can be found in Appendix A.2. Twitter's academic API allows scholars to perform a full-archive search of publicly available tweets. This addresses previous concerns about selection bias and representativeness, which were a result of the limited data made available by Twitter and the obscure sampling techniques used by previous APIs (Morstatter, Pfeffer, Liu, & Carley, 2013; Pfeffer, Mooseder, Hammer, Stritzel, & Garcia, 2022). Based on the findings by Pfeffer et al. (2022), which suggest that the academic API delivers a comprehensive sample of tweets, I argue that the resulting data set provides a thorough—if not comprehensive—overview of the communication network that developed around the issue of the Amazon rainforest fires in 2019, excluding only the tweets that were deleted before the data collection took place.

With this information, the study reconstructs two types of networks. The first is the baseline following-follower network.[3] This network provides individual-level characteristics of the users involved in the securitization process by describing their position and saliency in the overall Twitter network based on the number of Twitter friends and followers. The Twitter following-to-follower ratio has been employed in previous research as an important factor that determines the influence of a person on Twitter (Cha, Haddai, Benevenuto, & Gummadi, 2010; González-Bailón et al., 2013; Indu & Thampi, 2019). Generally, users with a ratio smaller than 1 (i.e., # of friends/ # of followers < 1) are described as hubs or highly influential nodes, whereas a ratio bigger than 1 (i.e., # of friends/ # of followers > 1) indicates that the user is not significantly salient and can be categorized as a "normal" user (Indu & Thampi, 2019).

The second network explores the levels of activity in message exchange and reconstructs the information cascades using the time stamps of the messages sent. Previous studies on diffusion in online networks have focused on the number of followers, retweet chains, or direct responsiveness (i.e., mentions) between users to assess their influence and prominence in global trends of information diffusion and trace

[2] All scripts and appendixes are available for replication at the following Open Science Foundation (OSF) repository: osf.io/b83yc.

[3] The following-follower network is a snapshot of the Twitter network as it was at the date of the data collection (rather than when the securitization process took place). However, given that users tend to gain followers rather than lose them (Myers & Leskovec, 2014), the potential bias that may arise from the data collection goes against the expectations proposed in this analysis. Therefore, it does not undermine the results observed in this study.

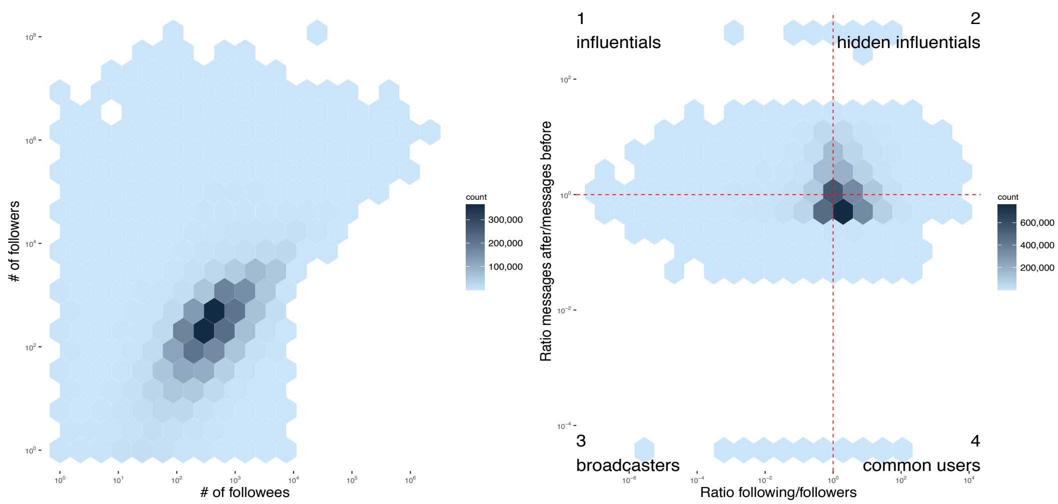
the diffusion paths of a message (Aslett, Webb Williams, Casas, Zuidema, & Wilkerson, 2022; Casas & Williams, 2019; Cha, Benevenuto, Ahn, & Gummadi, 2012; Downing & Dron, 2022; González-Bailón et al., 2013; Gupta, Ripberger, & Wehde, 2018; Indu & Thampi, 2019; Varol et al., 2014). However, two limitations stem from these approaches: First, although retweets provide an unambiguous measurement of diffusion, they do not capture instances where users choose to create original content (rather than sharing the content created by others) influenced by what they read in their feeds. Moreover, as noted by Riemer and Peter (2021), current changes in the functioning of social media platforms imply that, rather than speaking directly to a network of followers, as it was the case in the early days of social networking, messages are now subjected to an algorithm that amplifies or suppresses their circulation (p. 410). Thus, moving beyond the widely adopted retweet approach, the methodology developed here accounts for this new technological agent by assuming that any member of the Twitter sphere (regardless of their follower/following relations) may potentially be exposed to a message published on the platform.

Based on the expectation that messages that are sent within short time spans are part of the same chain (González-Bailón et al., 2013), the study reconstructs the entire communication network and proposes to measure users' influence by calculating the proportion of tweets shared the 24 hours before and 24 hours after a user joined the securitization process. The logic behind this approach is that the information we share on Twitter is not always captured by other users. In fact, first-movers rarely have an advantage when it comes to spreading information online, particularly if they do not have large follower networks. However, first-movers will be seen to be influential in instances when their seed messages are captured by other sets of users who, in turn, reproduce the security message, allowing it to scale up rapidly and reach global proportions. Influence is, therefore, calculated as the ratio between the number of tweets that were posted within a time span of 24 hours after and 24 hours before a given user joined the securitization process (i.e., # of tweets shared after/ # of tweets shared before). As a result, influential first-movers will have an activity ratio bigger than the less influential laggards. This applies to all messages, regardless of the query term employed. Overall, this approach serves to explore the chain reactions at a granular level and, rather than constraining influence to a chain of retweets or a users' immediate neighborhood (see Bakshy, Hofman, Mason, & Watts, 2011; Cha et al., 2010; Downing & Dron, 2022; González-Bailón et al., 2013; Sun, Rosenn, Marlow, & Lento, 2009), it accounts for the creation of related original content and Twitter's algorithmic amplification practices (Huszár et al., 2022; Riemer & Peter, 2021).

## Analysis

As discussed above, the study focuses on both the structure of the Twitter network and the dynamics of message exchange. Although the former, visualized in Figure 6A, creates the possibility of communication and provides individual-level characteristics of users, the latter offers an assessment of the communication dynamics in the context of this securitization process. Most saliently, previous studies have sought to identify cutoff points to rank users on a scale of influence by focusing on the number of followers, retweets, or mentions of users to assess their influence and prominence in global trends of information diffusion (see, Cha et al., 2012; Downing & Dron, 2020; Indu & Thampi, 2019; Varol et al., 2014). However, these cutoff points are, to an extent, arbitrary, and the categories they create do not help disentangle a user's potential to disseminate information and the user's actual influence in a given diffusion process (González-Bailón et al., 2013). Indeed, although the results shown in Figure 6A indicate that a significant number of users involved in the securitization of the Amazon fires possess a large network of followers (i.e., outgoing ties), they do not explain whether these highly followed users were central to the diffusion of the security message or not.

Building on the methodology developed by González-Bailón and colleagues (2013), this article proposes to use the following-follower network in conjunction with the activity network to create a typology of users that differentiates between common users and prominent personalities and identifies the actors that were more relevant in the spread of the security discourse. The assumption is that influence is domain-specific (Stritzel, 2014, p. 28), which is why a mere analysis of the structural position of actors is not informative enough to determine who is more consequential in this particular context. Although the following-follower network offers the potential for diffusion, this analysis seeks to investigate whether that potential is a sufficient and/or necessary condition for the spread of securitization.




**(a)** Distribution of friends and followers of users involved in the securitization of the Amazon fires. **(b)** Distribution of users according to network position and message activity.

***Figure 6. Distribution of users according to network position and message activity. (A) Distribution of friends and followers of users involved in the securitization of the Amazon fires. (B) Distribution of users according to network position and message activity.***

The heatmap in Figure 6B summarizes this typology. Both axes are expressed as ratios, making it easier to identify outliers. The vertical axis tracks the number of security messages that were sent in the timespan of 24 hours before a given user engaged with the securitization process by the number of security messages that were sent within the 24 hours that followed. Recall that the assumption is that we can assess the dynamics of the communication network and the chain reactions generated by a user by comparing the number of tweets sent immediately before and immediately after that given user tweeted about the Amazon fires. Users who triggered larger chains of reaction are above the horizontal dashed line. The horizontal axis tracks the number of accounts a user follows (i.e., number of Twitter friends) by the number of followers that the user has. The most popular users in this baseline network are on the left of the vertical dashed line. The color of bins is proportional to the number of users who fall in the binned area. Therefore, the heatmap shows that the larger group of users falls around the intersection of the dashed lines, indicating that most users have roughly the same number of followers and friends (although the network tends to be asymmetrical in favor of hubs or prominent personalities), and roughly the same number of messages were sent before and after they engaged with the securitization process.

Following the classification by González-Bailón and colleagues (2013), the study employs this typology to identify four types of users: Influentials, broadcasters, hidden influentials, and common users. Influentials fall in Quadrant 1 not only because they are prominent personalities with large follower networks but also because they triggered large information cascades (i.e., more security messages were sent immediately after these users tweeted about the Amazon fires than before they did so). Users in Quadrant 3 are identified as broadcasters because they have a more-central-than-average position in the following-follower network but their relative contributions to the spread of the security message were limited. By contrast, users located in Quadrant 2 do not have network positions that would a priori identify them as globally visible (i.e., they do not have many followers), and yet they trigger larger cascades than the average user, making them very prominent in the securitization process. This is why they are called "hidden influentials": They are at the center of the process of diffusion, but they are at the margins of the underlying Twitter network. Finally, the largest set of users falls into Quadrant 4, which includes grassroots users with relatively smaller audiences and a limited role in the securitization process.

The question, however, remains: Was the process of securitization an effect of the small chain reactions generated by the mass of common users who, in the aggregate, bolstered global cascades, or were the few prominent personalities more important for the diffusion of the security message? In light of the discussion developed in previous sections, three possible expectations could be described: (1) Influentials and broadcasters triggered the securitization process by being the first to tweet about the Amazon rainforest fires and produce on average the largest cascades; (2) securitization developed from the bottom-up, spurred by hidden influentials and common users who tweeted about the Amazon before the message reached prominent personalities and hubs; and (3) securitization benefited from a mixture of the first two dynamics, by which prominent and lay users became active at similar times and produced on average equally influential tweets. Although findings supporting the first expectation would evidence the Copenhagen School's approach, the second and third expectations align with the mechanisms described by the sociological framework, offering empirical evidence of the prominent position of influence taken by lay actors in the process of securitization.

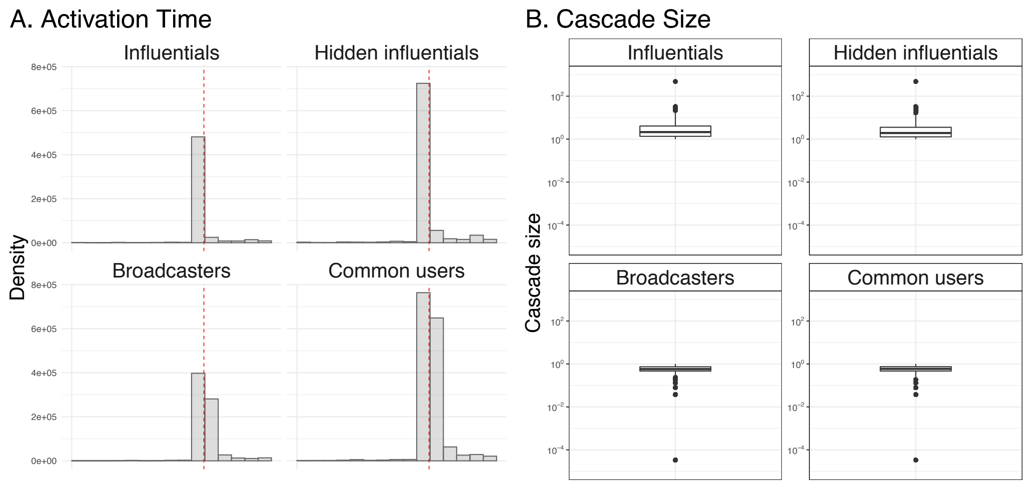



***Figure 7. Distribution of activation time and cascade sizes. (A) Activation time. (B) Cascade size.***

*Note.* The dotted vertical red lines indicate the date and time when Macron's tweet was published (August 22, 20:15 hs).

Figure 7A shows the histograms of activation times for each of the four types of users identified in this study. Activation time is defined as the moment when a user posted a security message. To ease comparison, the vertical axes are expressed as densities. As seen in Figure 7A, most users joined the securitization process around the same time, regardless of their position in the network. Although most influential and hidden influential users became active before the activity growth peaked on August 22 (i.e., the same day that Macron tweeted about the Amazon fires) and inactive soon after, the opposite is true for broadcasters and common users. Analyzed in conjunction with Figure 3, these results suggest that although influential and hidden influential users had an active role in the surge of the securitization process, broadcasters and common users prolonged the process over time, which is consistent with previous findings that propose that peripheral participants are critical in increasing the reach of online messages (Barberá et al., 2015; Bastos et al., 2013; Chadwick, 2017; Hemsley, 2019; Nahon & Hemsley, 2013; Vaccari & Valeriani, 2015).

The distributions of cascade sizes initiated by each of these types of users are shown in Figure 7B. Although it is expected for influential and hidden influential users to have triggered the largest cascades, these results are supported by Figure 8, which displays the distribution of retweets obtained by each group. As argued above, retweets alone are insufficient to study diffusion in online networks since they offer a distorted account of the diffusion paths of a message. However, retweets can provide an unambiguous short-term measure of influence (e.g., Aslett et al., 2022; Downing & Dron, 2020; González-Bailón et al., 2013; Gupta et al., 2018). Thus, the combined analysis of the distributions of cascade sizes and the number of retweets offers a more comprehensive measure of influence. What Figure 8 shows is that influential and hidden influential users did not only initiate the largest cascades but, on average, they also obtained the largest number of retweets. Although it is expected for hubs and prominent personalities with large audiences to obtain high numbers of retweets from their many followers, it is less common for grassroots users to do so. Yet, although broadcasters received a limited number of retweets, hidden influential users, who do not have network positions that would identify them as globally visible, were as widely retweeted as influential users. This key finding, therefore, not only strengthens the typology developed in this study but also provides strong evidence in favor of the salient role taken by lay users in the securitization process. In other words, based on these results, it is possible to conclude that, as proposed by the sociological approach, securitization develops from the joint efforts of elite and non-elite actors, who contribute to the spread of the security message and collectively define security problems.

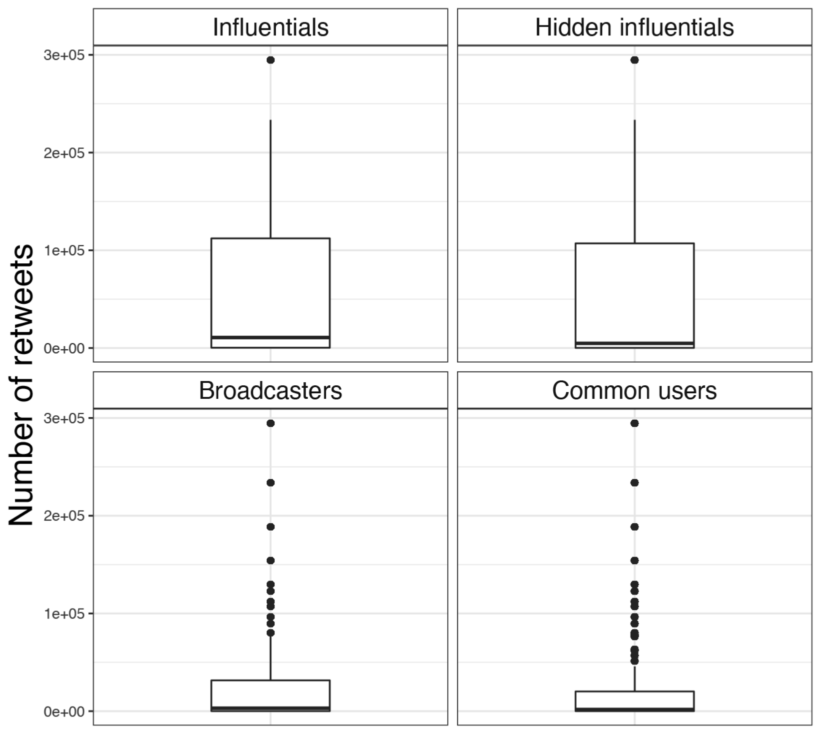



***Figure 8. Distribution of number of retweets.***

Overall, this analysis provides an empirical implementation of the sociological approach by studying securitization through a lens of diffusion. The results obtained serve to strengthen the claim that social media has reduced the gatekeeping power of the political elites (Gilardi et al., 2021; Makhortykh, 2018). Moreover, regardless of previous theoretical and empirical expectations that securitization might behave differently as particular case of online political communication, the results highlight the active role of grassroot users as securitizing agents. However, it would be misleading to identify a single group as responsible for the spread of the security message in the case of Amazon rainforest fires. Instead, the data suggest that securitization is a product of the reinforcing interactions between opinion leaders and grassroots users that develops from the constant information transfer between the periphery and the core of the network (Barberá et al., 2015; Bastos et al., 2013; Chadwick, 2017; Hemsley, 2019; Nahon & Hemsley, 2013; Vaccari & Valeriani, 2015).

## Discussion

Overall, this study is motivated by the puzzle that the advent of social media has created for securitization scholarship. Although securitization has significantly evolved since it was first conceptualized by the Copenhagen School (Buzan et al., 1998) and Wæver (1995) to move beyond the single speech act and consider a wider range of actors, the theory has been slow to adapt to the modern dynamics of political communication induced by social media platforms. Thus, taking a sociological stance (Balzacq, 2008, 2010, 2015), which conceives of securitization through a lens of diffusion, this study has focused on the case of the Amazon rainforest fires to analyze how social media networks facilitate the spread of security discourse and who are the actors involved in this process.

Although the existent scholarship offers an important first glimpse into how securitization may be conceived on social media (see, for example, Downing & Dron, 2020), the analysis developed here advances upon previous studies in three ways: First, prior work has analyzed Twitter's retweet chains to understand securitization's spread but has neglected original content creation, which is also crucial for diffusion. Second, this study better accounts for social networks' technological roles, such as Twitter's algorithm, which filters and amplifies security messages (Bennett & Segerberg, 2012; Riemer & Peter, 2021). Last, instead of focusing on a few influential users, this research considers securitization as a widespread, intersubjective process with numerous actors and acts (Huysmans, 2011), thus exploring global diffusion dynamics more broadly.

Contrary to the top-down approach proposed by the Copenhagen School, the results show that structural centrality (in the underlying Twitter network) is not a necessary condition for users to behave as securitizing actors. Indeed, both prominent personalities and grassroots users contributed significantly to the process of diffusion, becoming central to the process of securitization. These findings provide support for the claim that social media has reduced the gatekeeping power of elites. Moreover, although not all grassroots users and hubs managed to trigger global cascades, the sheer number of broadcasters and common users that continued to tweet about the Amazon fires after the security discourse had become widespread helped prologuing the process of securitization. This shows that, rather than developing in a top-down fashion with a formal organization and central authority, the process of securitization benefits from both fast-growing information cascades and numerous foci of action, creating synergies between the minority of hubs and the majority of grassroots users.

One immediate conclusion of these findings is that research on securitization can benefit greatly from the larger body of work on diffusion in online networks. Studying securitization through a lens of diffusion provides a better account of intersubjective element of security, offering the empirical tools to analyze the working mechanisms that foster the spread and definition of security problems. Another conclusion is that more research is needed on the diffusion dynamics of securitization, especially to test whether the same mechanisms apply to different cases and domains. This could refine securitization theory and our understanding of contagion mechanisms at play, while also bridging the gap between theoretical progress and empirical applications. Online networks are not unique in facilitating this process, but they can be more efficient than their offline counterparts. At the very least, they generate the data to trace back how online networks help securitization develop and shed light on how lay actors (together with the elites) contribute to the definition of security problems.

Overall, this study enhances our understanding of securitization from theoretical and methodological perspectives. It challenges the notion that security is solely a discourse of elites, as previously thought, by highlighting the significant role of non-elites in defining security threats. Moreover, it proposes a new empirical approach that bridges securitization theory with information diffusion studies on online platforms, employing computational social science methods to reassess theoretical debates in security studies and illustrating the profound influence of our online interactions on the security domain.

## References

Aradau, C., Huysmans, J., Neal, A., & Voelkner, N. (Eds.). (2014). *Critical security methods: New frameworks for analysis*. London, UK: Routledge.

Aslett, K., Webb Williams, N., Casas, A., Zuidema, W., & Wilkerson, J. (2022). What was the problem in Parkland? Using social media to measure the effectiveness of issue frames. *Policy Studies Journal, 50*(1), 266–289. doi:10.1111/psj.12410

Austin, J. L. (1975). *How to do things with words* (Vol. 88). London, UK: Oxford University Press.

Bakshy, E., Hofman, J. M., Mason, W. A., & Watts, D. J. (2011, February). Everyone's an influencer: Quantifying influence on twitter. In *Proceedings of the Fourth ACM International Conference on Web Search and Data Mining* (pp. 65–74). New York, NY: ACM. doi:10.1145/1935826.1935845

Balzacq, T. (2008). The policy tools of securitization: Information exchange, EU foreign and interior policies. *JCMS: Journal of Common Market Studies, 46*(1), 75–100. doi:10.1111/j.1468-5965.2007.00768.x

Balzacq, T. (Ed.). (2010). *Securitization theory: How security problems emerge and dissolve*. New York, NY: Routledge.

Balzacq, T. (2015). The 'essence' of securitization: Theory, ideal type, and a sociological science of security. *International Relations, 29*(1), 103–113. doi:10.1177/0047117814526606b

Barberá, P. (2015). Birds of the same feather tweet together: Bayesian ideal point estimation using Twitter data. *Political Analysis, 23*(1), 76–91. doi:10.1093/pan/mpu011

Barberá, P., Wang, N., Bonneau, R., Jost, J. T., Nagler, J., Tucker, J., & González-Bailón, S. (2015). The critical periphery in the growth of social protests. *PLoS One, 10*(11), e0143611. doi:10.1371/journal. pone.0143611

Barrie, C., & Ho, J. (2021). "academictwitteR: An R package to access the Twitter Academic Research Product Track v2 API endpoint." *Journal of Open Source Software*, *6*(62), 3272. doi:10.21105/joss.03272

Bastos, M. T., Raimundo, R. L. G., & Travitzki, R. (2013). Gatekeeping Twitter: Message diffusion in political hashtags. *Media, Culture & Society, 35*(2), 260–270. doi:10.1177/0163443712467594

Bennett, W. L., & Segerberg, A. (2012). The logic of connective action: Digital media and the personalization of contentious politics. *Information, Communication & Society, 15*(5), 739–768. doi:10.1080/1369118X.2012.670661

Bennett, W. L., & Segerberg, A. (2015). Communication in movements. In D. Della Porta & M. Diani (Eds.), *The Oxford handbook of social movements* (pp. 367–382). Oxford, UK: Oxford University Press.

Burgueño Salas, E. (2023). *Number of wildfires in the legal Amazon area in Brazil from 2000 to 2022*. Statista. Retrieved from https://www.statista.com/statistics/1044328/number-wildfires-legal-amazon/

Butler, J. (2010). Performative agency. *Journal of Cultural Economy*, *3*, 147–161.

Buzan, B., Wæver, O., & De Wilde, J. (1998). *Security: A new framework for analysis*. Boulder, CO: Lynne Rienner Publishers.

Casas, A., & Williams, N. W. (2019). Images that matter: Online protests and the mobilizing role of pictures. *Political Research Quarterly*, *72*(2), 360–375. https://doi.org/10.1177/1065912918786805

Cha, M., Haddadi, H., Benevenuto, F., & Gummadi, K. P. (2010, May). Measuring user influence in twitter: The million follower fallacy. In *Fourth International AAAI Conference on Weblogs and Social Media* (pp. 10–17). Washington, DC: AAAI. doi:10.1609/icwsm.v4i1.14033

Cha, M., Benevenuto, F., Ahn, Y. Y., & Gummadi, K. P. (2012). Delayed information cascades in Flickr: Measurement, analysis, and modeling. *Computer Networks*, *56*(3), 1066–1076. https://doi.org/10.1016/j.comnet.2011.10.020

Chadwick, A. (2017). *The hybrid media system: Politics and power*. New York, NY: Oxford University Press.

Comunello, F., & Anzera, G. (2012). Will the revolution be tweeted? A conceptual framework for understanding the social media and the Arab Spring. *Islam and Christian–Muslim Relations*, *23*(4), 453–470. doi:10.1080/09596410.2012.712435

Downing, J., & Dron, R. (2022). Theorising the ‘security influencer’: Speaking security, terror and Muslims on social media during the Manchester bombings. *New Media & Society, 24*(5), 1234–1257. doi:10.1177/1461444820971786

Ferrara, E. (2017). Contagion dynamics of extremist propaganda in social networks. *Information Sciences, 418–419*, 1–12. doi:10.1016/j.ins.2017.07.030

Filadelfo, E. (2019, December 9). *#ThisHappened in 2019* [Tweet]. Twitter. Retrieved from https://blog.twitter.com/en_us/topics/insights/2019/ThisHappened-in-2019

Gilardi, F., Gessler, T., Kubli, M., & Müller, S. (2021). Social media and political agenda setting. *Political Communication, 39*(1), 39–60. doi:10.1080/10584609.2021.1910390

González-Bailón, S., Borge-Holthoefer, J., & Moreno, Y. (2013). Broadcasters and hidden influentials in online protest diffusion. *American Behavioral Scientist, 57*(7), 943–965. doi:10.1177/0002764213479371

Gupta, K., Ripberger, J., & Wehde, W. (2018). Advocacy group messaging on social media: Using the narrative policy framework to study Twitter messages about nuclear energy policy in the United States. *Policy Studies Journal*, *46*(1), 119–136. doi:10.1111/psj.12176

Hemsley, J. (2019). Followers retweet! The influence of middle-level gatekeepers on the spread of political information on Twitter. *Policy & Internet, 11*(3), 280–304. doi:10.1002/poi3.202

Huszár, F., Ktena, S. I., O’Brien, C., Belli, L., Schlaikjer, A., & Hardt, M. (2022). Algorithmic amplification of politics on Twitter. *Proceedings of the National Academy of Sciences, 119*(1), e2025334119. doi:10.1073/pnas.2025334119

Huysmans, J. (2011). What’s in an act? On security speech acts and little security nothings. *Security Dialogue, 42*(4–5), 371–383. doi:10.1177/0967010611418713

Indu, V., & Thampi, S. M. (2019). A nature-inspired approach based on Forest Fire model for modeling rumor propagation in social networks. *Journal of Network and Computer Applications, 125*, 28–41. doi:10.1016/j.jnca.2018.10.003

Léonard, S., & Kaunert, C. (2010). Reconceptualizing the audience in securitization theory. In T. Balzacq (Ed.), *Securitization theory* (pp. 71–90). London, UK: Routledge.

Macron, E. [EmmanuelMacron]. (2019, August 22). *Our house is burning. Literally. The Amazon rain forest – The lungs which produces 20% of our planet's oxygen – Is on fire. It is an international crisis. Members of the G7 Summit, let's discuss this emergency first order in two days! #ActForTheAmazon* [Tweet]. Retrieved from https://x.com/emmanuelmacron/status/1164617008962527232?s=46&t=Sgb_o7Q02JQ17jOSgSOT7Q

Makhortykh, M. (2018). #NoKievNazi: Social media, historical memory and securitization in the Ukraine crisis. In V. Strukov & V. Apryshchenko (Eds.), *Memory and securitization in contemporary Europe* (pp. 219–247). London, UK: Palgrave Macmillan.

McDonald, M. (2008). Securitization and the construction of security. *European Journal of International Relations, 14*(4), 563–587. doi:10.1177/1354066108097553

Morstatter, F., Pfeffer, J., Liu, H., & Carley, K. (2013). Is the sample good enough? Comparing data from Twitter's streaming api with Twitter's firehose. *Proceedings of the International AAAI Conference on Web and Social Media*, *7*(1), 400–408. https://doi.org/10.1609/icwsm.v7i1.14401

Myers, S. A., & Leskovec, J. (2014, April). The bursty dynamics of the twitter information network. In *Proceedings of the 23rd International Conference on World Wide Web* (pp. 913–924). New York, NY: ACM. doi:10.1145/2566486.2568043

Nahon, K. (2015). Where there is social media there is politics. In A. Bruns, E. Skogerbo, C. Christensen, O. A. Larsson, & G. S. Enli (Eds.), *The Routledge companion to social media and politics* (pp. 39–55). New York, NY: Routledge.

Nahon, K., & Hemsley, J. (2013). *Going viral*. Cambridge, UK: Polity.

Onnela, J. P., & Reed-Tsochas, F. (2010). Spontaneous emergence of social influence in online systems. *Proceedings of the National Academy of Sciences, 107*(43), 18375–18380. doi:10.1073/pnas.0914572107

Pfeffer, J., Mooseder, A., Hammer, L., Stritzel, O., & Garcia, D. (2022). This sample seems to be good enough! Assessing coverage and temporal reliability of Twitter's Academic API. arXiv preprint arXiv:2204.02290.

Riemer, K., & Peter, S. (2021). Algorithmic audiencing: Why we need to rethink free speech on social media. *Journal of Information Technology*, *36*(4), 409–426. https://doi.org/10.1177/02683962211013358

Rogers, R. (2018). Digital traces in context| Otherwise engaged: Social media from vanity metrics to critical analytics. *International Journal of Communication, 12*, 450–472.

Sayre, B., Bode, L., Shah, D., Wilcox, D., & Shah, C. (2010). Agenda setting in a digital age: Tracking attention to California Proposition 8 in social media, online news and conventional news. *Policy & Internet*, *2*(2), 7–32. doi:10.2202/1944-2866.1040

Stritzel, H. (2014). *Security in translation: Securitization theory and the localization of threat*. London, UK: Palgrave Macmillan.

Sun, E., Rosenn, I., Marlow, C., & Lento, T. (2009, March). Gesundheit! Modeling contagion through facebook news feed. In *Proceedings of the International AAAI Conference on Web and Social Media* (Vol. 3, No. 1, pp. 146–153). San Jose, CA: AAAI. doi:10.1609/icwsm.v3i1.13947

Tudoroiu, T. (2014). Social media and revolutionary waves: The case of the Arab spring. *New Political Science*, *36*(3), 346–365. doi:10.1080/07393148.2014.913841

Vaccari, C., & Valeriani, A. (2015). Follow the leader! Direct and indirect flows of political communication during the 2013 Italian general election campaign. *New Media & Society, 17*(7), 1025–1042. doi:10.1177/1461444813511038

Varol, O., Ferrara, E., Ogan, C. L., Menczer, F., & Flammini, A. (2014, June). Evolution of online user behavior during a social upheaval. In *Proceedings of the 2014 ACM Conference on Web Science* (pp. 81–90). Bloomington, IN: ACM. doi:10.1145/2615569.2615699

Wæver, O. (1989, June). *Security, the speech act: Analysing the politics of a word* (Working paper 19). Copenhagen, Denmark: Center for Peace and Conflict Research.

Wæver, O. (1995). Securitization and desecuritization. In R. D. Lipschutz (Ed.), *On security* (pp. 46–86). New York, NY: Columbia University Press.

Watts, D. J., & Dodds, P. S. (2007). Influentials, networks, and public opinion formation. *Journal of Consumer Research, 34*(4), 441–458. doi:10.1086/518527

Wullweber, J. (2013, September). The molecular practices of security: Thinking security bottom-up (working paper). In *8th Pan-European Conference on International Relations* (pp. 18–21). Warsaw, Poland: EISA.