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The role of social bots in the Brazilian environmental debate: an analysis of the 2020 Amazon Forest fires in Twitter

Abstract:

This paper examines the use of computational propaganda in the Brazilian environmental debate, focusing on the 2020 Amazon Forest fire discussions on Twitter. Through the use of a bot detector algorithm and social network analysis, the research aims to understand the role of social bots and the extent to which automated accounts reverberate certain ideological positions. The study found that Twitter discussions were highly polarized between supporters and critics of former far-right president Jair Bolsonaro. While the participation of international celebrities in the debate increased the visibility of a civil society awareness campaign against the forest fires, it also triggered a computational propaganda counterattack by Bolsonaro's supporters. Our analysis indicates that the anti-environmentalist reaction aimed at denying the existence of an environmental problem in the Brazilian Amazon was heavily amplified by automated and inauthentic accounts.

Keywords: Social Bots, Computational Propaganda, Deforestation, Amazon forest, Twitter.

Agenda:

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Introduction

Digital media platforms have become an important arena for disputes between political groups that intend to strengthen their narratives concerning environmental issues (Recuero and Soares 2020). While social media created channels for environmental education and advocacy, it also allowed the dissemination of problematic discourses and opinions, regardless of scientific proof (Treen et al. 2020). A wide range of studies has been showing the relevant role of social media in political conversation (Rossini et al. 2021), and in the last few years research has been paying attention to the centrality of such platforms in the spread of manipulative disinformation campaigns (Michael 2017). An evidence driven research agenda has emerged inside the digital communication field: the studies on computational propaganda.

For the present work, we are interested in the use of computational propaganda for interference in the environmental debate, focusing on the activity of inauthentic and automated Twitter accounts engaged with the topic of the 2020 Amazon Forest fires. The choice of the 2020 forest fires debate was due to the strong mobilization articulated by Brazilian civil society to draw international attention to the issue (Folha de São Paulo 2020). In the year of 2020, the Amazon accumulated new deforestation records (Agência Brasil 2021). The concern of NGOs and other entities drove them to actively promote online campaigns to hold Bolsonaro's government responsible for the increasing destruction.

Regarding the previously described scenario, by employing the combination of a bot detector algorithm (Santini et al. 2023) and social network analysis, our paper aims to analyze and answer the following research questions:

RQ1: What was the role of social bots in the 2020 Amazon Forest fire Twitter discussions?

RQ2: To what extent did automated accounts reverberate certain ideological positions?

Social bots and the environmental debate

The concept of computational propaganda refers to the use of algorithms, automation, and human curation to intentionally spread misleading information in social media (Woolley and Howard 2016). The most effective computational propaganda efforts are those that ally both automation and human curation (Woolley and Howard, 2018). Such strategies are often used to spread messages on a large scale and to emulate an online public opinion. They differ from traditional propaganda in their operational activity, amplification, anonymity (@DFRLab 2016) and in its transnational scale (Woolley 2020).

Social bots are fundamental elements of computational propaganda campaigns. They can be described as online fake identities that try to emulate and possibly influence human behavior using computational scripts to create content and interact in social media in an automated way (Ferrara et al. 2016). By mimicking human behavior to artificially inflate adherence to a specific agenda, social bots work as a kind of propaganda tool that so far has escaped from any kind of regulation or political control (Benkler et al. 2018). Because of the difficulty in identifying the humans that control the accounts, social bots act like a "black box" to campaign sponsors and their operators.

In what concerns the effects of social bots in public opinion, their impact in information spread has been associated with a complex contagion model. Different empirical studies have shown that when a message reaches the public from multiple sources, its influence and dissemination potential is increased (Mønsted et al. 2017). Herd behavior is also recognized as a key goal for coordinated campaigns that try, for instance, to artificially inflate specific hashtags (Nimmo 2018).

International research on social bots and environmental communication is still rare and has shown different findings. A study that examined the period around the time of former USA President Donald Trump's

announcement of the country's withdrawal from the Paris Agreement, in 2017, found that suspected bots in Twitter conversations were more frequent in some topic areas than others, including denialist discourse (Marlow et al. 2021). Another work found that, on Twitter, discussions on 'global warming' (preferred expression between conservatives) are heavily influenced by automated accounts, unlike 'climate change' (preferred expression between liberals), in which the majority of the top users appear to actually be humans (Al-Rawi et al. 2021). With a dataset queried in English at the time of United Nations Climate Change Conference in 2018 (COP24), another study found that, in Twitter networks of both climate contrarians and climate accepters, bot-like accounts were equally active (Tyagi et al. 2020). Other research found that more than 80% of tweets posted by social bots supported climate change activism, even if contrarian bots were more strategic in launching conversations with opposingly-minded humans (Chen et al. 2021).

Despite Brazilians' biomes being crucial to the stability of the global climate and to biodiversity conservation (Kehoe et al. 2019), research is scarce on Brazilian contrarian movements and anti-environmentalist campaigns, especially with regard to the use of computational propaganda. Previous studies have shown that social bots have been influencing political discussions in the country (Santini et al. 2021). Thus, our work contributes to this research agenda by addressing the role of social bots in influence operations in the environmental issues relevant to Brazil.

Material & Methods

We gathered Twitter data from August 23 to September 30 2020, after designing a search query of keywords and hashtags related to the Amazon Forest fires and environmental matters in Brazil. We accessed data both from the Twitter Standard V1 Search API and the platform's Firehose Streaming API, which delivers all tweets that match our query design criteria in near real time. To identify automated accounts, we adopted a locally-developed framework (Santini et al., 2023) based on Botometer, the standard bot detection tool for the social sciences, and following the indications provided by the authors of the tool (Grimme et al. 2018).

As with research based on Botometer (Grimme et al. 2018), we also considered the threshold of 0.5 points to classify an account as inauthentically automated. We also carried out a social network analysis based on the retweets found in our dataset to better understand the debate dynamics and the role played by inauthentic accounts in the artificial amplification of specific claims and hashtags. In order to visualize the retweet network, we used the Gephi 0.9.2 (Bastian et al. 2009) and applied its Force Atlas 2 (Jacomy et al. 2014) algorithm to clusterize the profiles into communities. To ensure a better visualization of our results, we filtered out the nodes and edges that either were isolated or barely connected to the main clusters of our graph.

Results

As a means of understanding how automation impacted the socio environmental debate on Twitter during the 2020 Amazon Fire Season, we collected 247,876 tweets posted by 114,009 accounts. After removing 12,259 accounts that were unavailable we considered 101,750 different profiles that published 232,602 tweets. Regarding inauthentic profiles, we found that 15.25% of the accounts (15,519 profiles) presented a high degree of automation. These bots published 64,692 tweets, 27.81% of the analyzed publications. Our findings are in line with previous studies that estimated that 9% to 15% of all active Twitter accounts are bots (Varol et al. 2017).

The polarization of the two clusters can be understood by analyzing the campaigns #DefundBolsonaro, pro-environment, and #StopFakeNewsAboutAmazon, pro-Bolsonaro, that staged a hashtag war between users and organizations (Soares and Recuero 2021). #DefundBolsonaro appeared in 33,234 tweets, published by 19,966 accounts, whereas the #StopFakeNewsAboutAmazon was shared in 81,694 publications from 24,362 profiles.

#DefundBolsonaro was organized by civil society organizations to make foreign investors aware of the environmental situation in Brazil, proposing the suspension of investments in the country (Kafruni, 2020). The most shared tweets in the pro-environmental cluster promoted the campaign #DefundBolsonaro, to criticize how the then government handled environmental issues and to connect the forest fires and agribusiness interests. Our analysis reinforces the importance of celebrity influencers, who are the network's main hubs and who increase the reach and visibility of messages in an organic way.

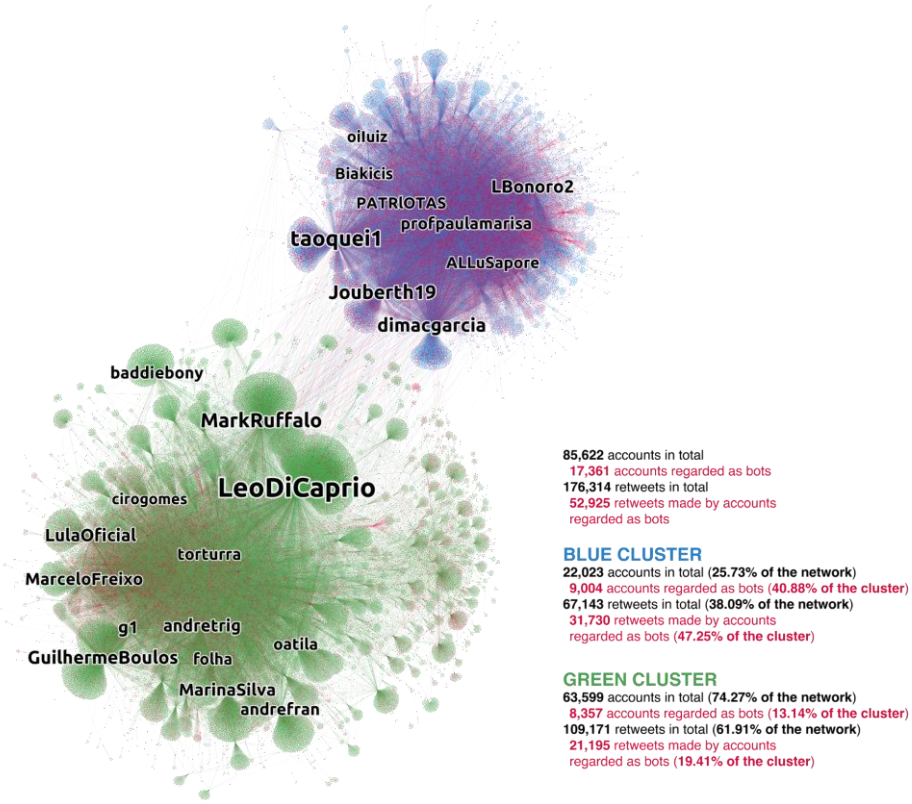

Figure 1. Retweet network of the 2020 Amazon fire season discussions on Twitter.

In the green cluster (figure 1), international celebrities engaged with environmentalism, namely Leonardo DiCaprio and Mark Rufallo. Other hubs were left-wing Brazilian politicians, such as president Lula, environmental minister Marina Silva, and parliamentarians Guilherme Boulos and Marcelo Freixo. Both actors, DiCaprio[1] and Ruffalo[2], retweeted a video from the Brazil's Indigenous People Articulation (APIB) (Figure 2). The tweets had the hashtags "#DefundBolsonaro" and "#AmazonOrBolsonaro".

[1] @LeoDiCaprio. "#DefundBolsonaro #AmazonOrBolsonaro #WhichSideAreYouOn." *Twitter*, 9 Sep. 2020, 2:29PM, https://twitter.com/LeoDiCaprio/status/1303747439271137281

[2] @MarkRuffalo. "#AmazonOrBolsonaro #DefundBolsonaro." *Twitter,* 8 Sep. 2020, 1:05 PM, https://twitter.com/MarkRuffalo/status/1303363797596475392

Figure 2. Tweets posted by Mark Rufallo and Leonardo DiCaprio as part of the campaign #DefundBolsonaro.

Former environment minister, Ricardo Salles reacted to the #DefundBolsonaro campaign, releasing a counter-narrative video with a pro-government tone[3]. After this post, the campaign #StopFakeNewsAboutAmazon started as an orchestrated attempt to get into trending topics, a milestone widely celebrated by the main hubs of this side of the discussion, such as @Jouberth19 and @dimacgarcia. The anti-environmentalist campaign was highly automated and relied on inauthentic amplification to gain relevance: 47.99% of the #StopFakeNewsAboutAmazon retweets were made by bots. Most profiles shared very similar content at the same time, from the same sources, an indication that the discourse on the network was orchestrated between influencers, supporters and automated accounts. This strategy threatens the integrity of popularity mechanisms on social media platforms, such as Trending Topics on Twitter, by inauthentically promoting a hashtag.

Concerning the content, tweets attempted to prove that the Amazon fires were not really taking place and, in fact, were part of anti-Bolsonaro activists propaganda strategies. Most publications made by the profiles in the blue cluster employed the hashtag #StopFakeNewsAboutAmazon, such as the post from far-right deputy Bia Kicis[4] attempting to deny the existence of forest fires in the Amazon. In a tweet from a right-wing influencer @taoquei1[5], the "gringos" are warned that the Amazon Forest's riches are not available for foreign exploitation. The argument is that other countries pretend to be worried about forest fires and deforestation and promote a disinformation campaign against Brazil in order to facilitate a foreign takeover. As well as claiming sovereignty, extreme-right politicians took part in the campaign by denying the fires, suggesting that international interests were at play in the exploitation of Amazon soil and stating that the Amazon Forest belongs to Brazilians.

[3] @rsallesmma. "Recebi este vídeo, 'Amazônia não está queimando' ... " *Twitter*, 9 Sep. 2020, 3:19 PM, https://web.archive.org/web/20200909222009/https://twitter.com/rsallesmma/status/1303820431166705665

[4] @Biakicis. "#StopFakeNewsAboutAmazon Amazon Is not on fire. Period." . *Twitter*, 10 Sep. 2020, 6:24 AM, https://twitter.com/Biakicis/status/1304002890630131713

[5] @taoquei1. "Atenção gringos... o que tem na Amazônia e embaixo do solo dela, É NOSSO!!!!#StopFakeNewsAboutAmazon." *Twitter*, 10 Sep. 2020, 7:53 AM, https://web.archive.org/web/20200910145439/https://twitter.com/taoquei1/status/1304070581428588550

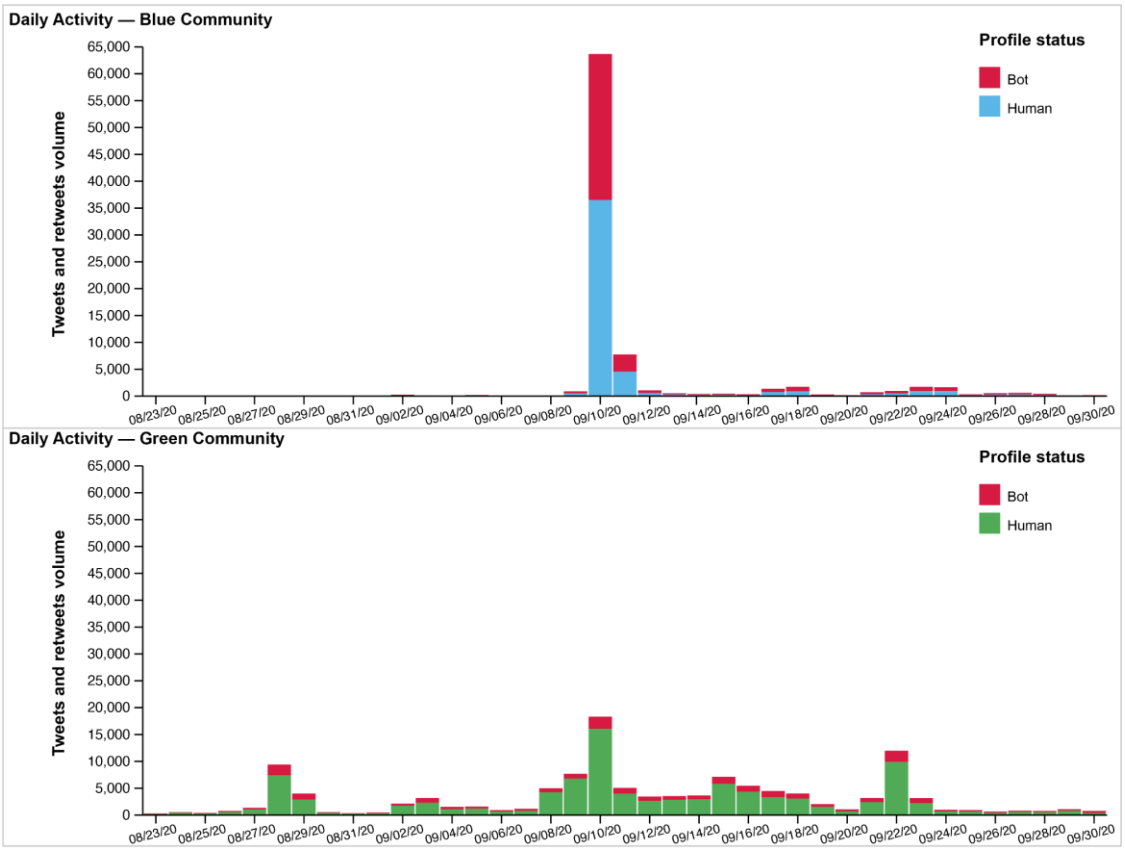

Figure 3. Timeline of tweets and retweets, divided by the network graph clusters.

Figure 3 shows the distribution of each clusters' profiles tweets and retweets over time, singling out the automated posts for each campaign. The pro-environmental campaign was characterized by progressive growth in the volume of tweets and its permanence in the public debate during the entire fire season. Besides the low automation rates, only 13.78% of the publications with #DefundBolsonaro were made by automated accounts, our data shows that the campaign had a sustained activity throughout the fire season. These pieces of evidence, when taken together, demonstrate that #DefundBolsonaro achieved impact through organic adherence.

Conversely, for #StopFakeNewsAboutAmazon, activity grows suddenly, mainly due to the high levels of automation and the coordinated response to the insertion of celebrities in the debate. With posts concentrated in only a few hours, the hashtag is abandoned, disappearing after the campaign. This demonstrates that the pro-Bolsonaro hashtag was coordinated as an instant response and counterattack to capitalize on the visibility international actors granted to the Amazon Forest fires in Brazil.

Discussion

Our findings indicate that inauthentic profiles artificially inflated Twitter's discussion on the Amazon Forest fires in 2020, acting especially in the amplification of the #StopFakeNewsAboutAmazon campaign. Automated accounts promoted environmental disinformation, denied the existence of the fires and shared nationalist discourse, claiming Brazil's sovereignty over the Amazon Forest and suggesting an international conspiracy to take the Amazon from Brazilians. These automated publications attempted to attribute the criticisms of the government's environmental policies to an international defamation campaign. Overall, social bots were part of an automated content-sharing tactic to amplify right-wing influencers promoting anti-environmentalist and pro-Bolsonaro narrative frames (Regattieri 2021).

The network analysis has shown a polarized debate, in which environmentalist publications dominated the discussion. Even with the artificially inflated support, the right-wing cluster was smaller than the other. It is important to notice there is a difference in how each cluster approaches the campaigns. Anti-environmental engagement, including publications amplified by automated accounts, is concentrated on reacting to the opposition's campaign in an attempt to reframe the agenda and get the hashtag #StopFakeNewsAboutAmazon into trending topics. Overall in the debate, the majority of posts were pro-environmental, mainly relying on organic participation from a broader set of profiles, with DiCaprio and Ruffallo guaranteeing visibility and engagement to the civil society campaign. Besides the celebrities, environmentalist discussion also involved NGO's, journalists, local media outlets, activists and ordinary users.

On the one hand, the presence of celebrities was essential for increasing the popularity of the organic campaign #DefundBolsonaro. On the other hand, this presence and the consequent increase in the campaign's visibility also triggered a counterattack by Bolsonaro's supporters, who were not previously engaging in the forest fire debates on Twitter. With the aid of inauthentic accounts, Bolsonaro's supporters hashtag #StopFakeNewsAboutAmazon managed to surpass the engagement numbers of #DefundBolsonaro.

Our work shows that while the actors increased the visibility of the pro-environment campaign driven by civil society, they also triggered a strong reaction from the other side of the discussion. This reaction heavily employed computational propaganda strategies to promote its hashtag, relying on the use of inauthentic and automated profiles. Even if #StopFakeNewsAboutAmazon surpassed the numbers of #DefundBolsonaro, we understand that the very decision to orchestrate this counterattack may indicate that the campaign #DefundBolsonaro succeeded in drawing attention to the environmental problem.

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