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Civic bots: An analysis of automation technologies as an activist repertoire on X/Twitter

*Bots cívicos: uma análise sobre tecnologias de automação como repertório ativista no X/Twitter**Bots Cívicos: un análisis de las tecnologías de automatización como repertorio activista en X/Twitter*

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Abstract

This study aims to understand the extent to which civic bots constitute an activist communication repertoire on Twitter, based on an analysis of Brazilian initiatives. The hypothesis explored by this article is that these initiatives have simultaneously helped to establish a professional field, related to the datafication of civil society organizations and data journalism, and also to form specialized audiences. Based on approximately 130,000 tweets that mention or react to at least one of 14 different civic bots in Brazil, over the last five years, the investigation aims to (1) identify possible networks of actors that occur among the audiences, and (2) compare the reach and effects of each initiative. The initial results indicate the existence of a group of users extremely engaged in interacting with these tools.

Keywords: Civic bots; civic technologies; Twitter; digital activism; digital democracy.

Resumo

O objetivo principal deste estudo é compreender em que medida bots cívicos constituem um repertório comunicacional ativista no Twitter, a partir de uma análise de iniciativas brasileiras. A hipótese explorada por este artigo é de que essas iniciativas têm ajudado simultaneamente a constituir um campo profissional, relacionado à dataficação das organizações da sociedade civil e ao jornalismo de dados, e também a formar audiências especializadas. Partindo de aproximadamente 130 mil tweets que mencionam ou reagem a ao menos um de 14 diferentes bots cívicos do Brasil, nos últimos cinco anos, a investigação se propõe a (1) identificar eventuais redes de atores que ocorrem entre as audiências, e (2) comparar o alcance e os efeitos de cada iniciativa. Os resultados iniciais dão conta da existência de um conjunto de usuários extremamente engajados em interagir com essas ferramentas.

Palavras-chave: Bots cívicos; tecnologias cívicas; Twitter; ativismo digital; democracia digital.

Resumen

El objetivo principal de este estudio es comprender en qué medida los bots cívicos constituyen un repertorio de comunicación activista en Twitter, a partir de un análisis de iniciativas brasileñas. La hipótesis que explora



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este artículo es que estas iniciativas han contribuido simultáneamente a constituir un campo profesional, relacionado con la datificación de las organizaciones de la sociedad civil y el periodismo de datos, y también a formar audiencias especializadas. Basándose en aproximadamente 130.000 tuits que mencionan o reaccionan a al menos uno de 14 bots cívicos diferentes en Brasil durante los últimos cinco años, la investigación tiene como objetivo (1) identificar posibles redes de actores que ocurren entre las audiencias y (2) comparar el alcance y los efectos de cada iniciativa. Los resultados iniciales muestran la existencia de un grupo de usuarios extremadamente comprometidos en la interacción con estas herramientas.

Palabras clave: Bots cívicos; tecnologías cívicas; Twitter; activismo digital; democracia digital.

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Introduction

At the center of the controversy surrounding billionaire Elon Musk's acquisition of X/Twitter, bots have been framed as a clear example of the pernicious use of digital media. Against a broad backdrop shaped by the resurgence of far-right movements in different regions of the world and by practices of computational propaganda and astroturfing that have characterized their mode of political action on social media platforms (Silva, 2013; Woolley & Howard, 2018; Keller et al., 2020), the use of bots has been condemned as an anti-democratic repertoire. At the same time, there has been a recent effervescence of new uses and appropriations of social bots as civic technologies (Da Costa, 2022; Sabbatini, 2022), which were, in fact, discouraged by Musk when he decided to impose high fees for access to the platform's API. This policy change undermined years of development and put an end to a number of "good bots," which may find in this article one of the last records of their activity, given the date on which the data were collected.

These bots are operated by collectives, think tanks, civil society organizations, independent media actors, and a range of other players and institutions that have invested in automating processes through accounts on social media platforms in order to ensure greater transparency, openness, and accountability in the democratic environment (Da Costa, 2022). Civic bots thus serve to report forest fires in the Amazon, to monitor the activity of Brazilian women legislators or the progress of bills related to LGBTQIA+ causes, to retrieve tweets deleted by Brazilian politicians, and so on. This study proposes an analysis of this incipient ecosystem and seeks to introduce a discussion of the strategies involved in the creation and development of these tools, as well as the ways in which they have been adopted by civil society actors to oversee public power.

The main goal of this article is to understand how and to what extent civic bots constitute an activist communicational repertoire, which tools of this kind have been developed in Brazil, and how civil society actors have appropriated them.

The hypothesis explored in this investigation is that these initiatives have simultaneously contributed to the constitution of a professional field related to the datafication of civil society organizations and to so-called data journalism, while also helping to form specialized audiences engaged in the refinement of these data and in organized responses as an extension of their agendas.

Based on a dataset of approximately 130,000 tweets that mention or react to at least one of 14 different civic bots active in Brazil between 2012 and 2022, this investigation aims to (1) identify possible networks of actors that co-occur across the audiences of these tools, and (2) compare the reach and effects of each initiative.

The initial results point to the existence of a group of users who are extremely engaged in interacting with these tools, often mentioning them hundreds of times in their social media comments. Despite this, there is relatively little overlap among the networks composed of users who interact with such initiatives, suggesting a high level of audience specialization.

The article is structured into four main sections, in addition to the introduction and conclusion. The first discusses the concept of civic technology and presents bots as a political repertoire. It then contextualizes the development of these initiatives in Brazil, followed by a presentation of the methodology and the results of the study.

Context for the emergence of civic technologies

Discussions around the concept of civic technologies are not exactly new in the literature (Dahlgren, 2011; Benkler, 2006). Fundamentally, four important dimensions have been highlighted by different scholars (Fariniuk, Firmino & Luque-Ayala, 2022): the development of non-proprietary solutions (so-called free/open-source software); movements advocating for the opening of public data; the use of technology and online social networks to disseminate civil society voices and agendas; and the construction of platforms aimed at mobilizing resources and/or promoting greater participation, transparency, and accountability.

According to Magallón (2014), civic technologies can be classified along two main axes, based on their purpose: tools for participation and internal communication, whose primary objective is to support the deliberation of social movements and the expansion of democratic mechanisms; and technologies for civic empowerment, capable of ensuring greater transparency, literacy about the functioning of democratic institutions, and stronger incentives for collaboration among these institutions, civil society actors, and the press, including for the monitoring of public officials' activities and accountability.



In Brazil, mobilization around so-called civic technologies initially drew inspiration from the international debate surrounding the free software movement. The movement gained significant momentum in the country, particularly with the rise of progressive governments, most notably in the city of Porto Alegre and, more broadly, with the first Lula administration in 2002. Historically, it involved the participation of state bureaucracies, hacktivist groups, entrepreneurs, and civil society collectives, engaged in an internal competitive dynamic. The movement's agenda was especially important in mobilizing this network around discussions of the role of technology in society (Evangelista, 2014). Beyond free software, debates also encompassed free licenses such as Creative Commons, copyright issues, and, later, the drafting of Brazil's Marco Civil da Internet (Lemos, 2005; Branco & Brito, 2013; Santarém, 2022).

From this point onward, a diverse set of repertoires, technologies, and actions emerged. Owing to the prominence of initiatives led in Porto Alegre, these experiences expanded throughout the state of Rio Grande do Sul, with the development of Participatory Budgeting and the Rio Grande do Sul Digital Cabinet initiative (Sampaio, 2018; Wu & Sampaio, 2021). Other initiatives at the local level were also developed. Among numerous cases, *Meu Rio* (My Rio), *Nossa São Paulo* (Our São Paulo), and *Ouvindo Nosso Bairro* (Listening to Our Neighborhood) in Salvador stand out (Rosseto, Almada & Carreiro, 2011; Penteadó, Santos & Araújo, 2014; Matos, Barros & Carreiro, 2018), which are now integrated into the Nossas network, focused on building collective agendas through political pressure. In the field of mobilization, one initiative deserving special mention is *Avaaz Brasil*, used primarily to mobilize support through petition signing and the sending of emails to government officials and legislators (Castañeda, 2018).

Another field of civic technologies that has grown over the past ten years in Brazil is the open data movement. This development followed the opening of government data in open formats through the approval of the Access to Information Law and Brazil's entry into the Open Government Partnership, a multilateral initiative that establishes commitments among participating countries. Alongside the opening of government data, third-sector organizations, the press, academia, companies, and other social actors began to develop technologies at different levels, such as charts, websites, platforms, and applications, for a wide range of purposes, including tracking legislative proposals and monitoring public data and information in real time. These actors thus came to constitute an important network that assumed an intermediary, or "infomediary", role between the production of public data and its consumption by society at large. Over time, this process became increasingly professionalized due to the need for technical expertise, and one of its main offshoots was data journalism. Among the most prominent initiatives are *Fiquem Sabendo* (Stay Tooned)¹, promoted by the Brazilian Association of Investigative Journalism (Abraji) and Open Knowledge Brasil, as well as the Consortium of Media Outlets² and Brasil I.O, which used public and open data to report on Covid-19³ (Da Costa, 2022).

It is also worth highlighting the promotion of technological civic initiatives rooted in traditional Brazilian political movements. For example, the Landless Workers' Movement (MST, in Portuguese acronym) maintains a "Digital Front" that provides and coordinates the operation of nearly one hundred Telecenters and Digital Lan Houses across the country. The Homeless Workers' Movement (MTST, in Portuguese) likewise has its own "Technology Unit." Among the initiatives developed by this group is *Contrate Quem Luta* (Hire Those Who Struggle; CQL, in Portuguese), a virtual assistant that connects activists with individuals in need of service provision (Grohmann, 2022).

Finally, it is important to note newer forms of appropriation, such as the use of chatbots to promote feminist activism. Scholar Letícia Sabbatini has examined the agency and repertoires of two such initiatives: *Fabi Grossi*, produced by UNICEF Brazil and the NGO SaferNet in partnership with Talk2U and Facebook; and *Beta Feminista* (Feminist Beta), developed by the NGO Nossas (Sabbatini, 2022).

In this article, we seek to understand how these civic technologies, particularly those that make use of bots, have come to constitute an important repertoire for digital activism that expands civic participation, provides large-scale data, and enables a model of continuous agenda-setting around specific issues. These initiatives systematize information and ensure access not only for policymakers but also for civil society actors who are able to hold them to account.

¹ <https://fiquemsabendo.com.br/>

² <https://especiais.g1.globo.com/bemestar/coronavirus/estados-brasil-mortes-casos-media-movel/>

³ <https://brasil.io/home/>



Civic bots in Brazil

In recent years, social bots have gained notoriety and visibility amid growing concern over the potentially pernicious effects of practices rooted in what has come to be known as computational propaganda. As service-providing devices, there has been increasing adoption of bots, including more recent forms of chatbots that rely on artificial intelligence, in customer service, in experiences of sociability on online social networks, and even in interfaces for interaction with government (Parisi & Fazi, 2014; Gunkel, Trento & Gonçalves, 2017). The use of terms such as bots, algorithms, and artificial intelligence has become commonplace, and fears of a new “machine age” have taken on renewed form.

Bots perform different functions, but in general they are fueled by large layers of data that serve as input to generate specific algorithmic responses. There are also different types of systems, ranging from conversational agents, which require more direct interaction, to fully automated profiles. Between these extremes are so-called “cyborgs,” that is, accounts which, although controlled by human agents, perform automated actions. Regattieri (2016; 2019) defines “cyborg profiles” on online social networks as users performing as human-robots or robot-humans, data-driven, acting on the network within a specific time interval and reshaping agencies and online information ecosystems.

For Sabbatini (2022), in line with Regattieri’s (2019) perspective, social bots can operate as social media profiles through automated accounts, interacting with platforms and the content that circulates within them, and helping to amplify the circulation of certain discourses at the expense of others. The author studied feminist chatbots and proposes an analytical framework that divides them into three types: governmental, electoral, and activist, the latter generally maintained by NGOs, institutions, and startups. According to the author, “activist bots” seek to “encourage and enable diverse political actions, ranging from those aimed at raising awareness around social causes to those that seek to pressure public authorities or promote debate” (p. 70).

This perspective is grounded in the classic definition of digital activism. According to Ugarte (2008), “cyberactivism” is a strategy that seeks to change the public agenda through discourse, tools, or by increasing the reach and visibility of specific issues. These windows of opportunity pursued by activist groups (Jasper, 2016) lead to the inclusion of new topics on the public agenda through the “word-of-mouth” dissemination of messages or via electronic media and publication channels (Ugarte, 2008, p. 55). This view is corroborated by Sæbø, Rose, and Flack (2008), who identify “e-activism” as the effort of voluntary organizations and interest groups to use digital tools to promote their interests and influence the political system.

In this study, civic bots are understood as social robots that disseminate messages and content and carry out, collectively or individually, through algorithms, artificial intelligence tools, or automated profiles, operations that culminate in collective or connective action. Such bots constitute central elements of contemporary activist repertoires.

This category can be more clearly apprehended through the case described below, which presents the first Brazilian civic bot. In February 2019, *Robô Rosie* (Rosie Robot), from the *Operação Serenata de Amor* (Operation Love Serenade) project, whose function was to tweet, that is, to automatically publish, every time it identified, through image recognition of receipts, irregular spending in Brazilian legislators’ parliamentary allowances, issued a first-person statement across seven tweets on its account:

Many of you may have noticed that I stopped tweeting, right? I’ve been trying, but @TwitterBrasil suspended my API keys, and that prevents me from continuing to tweet automatically. #DesbloqueiaRosie follows in this thread. I’m a robot, but not the kind that tweets without sources or tries to pass as human to promote a message. Everything I tweet is based on data made available by @CamaraDeputados through the Access to Information Law (LAI). And I’ve never hidden the fact that I’m a robot :) My code is open, I’m 100% open source, and I was created by Operation #SerenataDeAmor. You can even help this team keep this great project going here. I had stopped tweeting (...) and went through improvements so that this would be possible again. What’s preventing me now, however, is @TwitterBrasil itself. Let’s speak up! Use #DesbloqueiaRosie so we can draw attention and have Rosie’s automated tweets released again. Tag a politician who supports transparency so they can show their support as well. Transparency notice: only this thread on this profile was written by a human, Tati (also known as Russa), who is responsible for communications at Operação Serenata do Amor.⁴

⁴ <https://twitter.com/RosieDaSerenata/status/1097497396890734597>



In February 2019, Twitter launched a campaign against fake accounts on the platform and, through a deliberate action, restricted a number of automated accounts. The bot Rosie, which, far from posing any threat to the democratic environment, was committed to transparency in public spending, was, along with other similar initiatives, barred from publishing. At the time, the current Minister of the Environment, Marina Silva (2019), tweeted in support of the bot:

Rosie is a robot created to monitor reimbursements from the parliamentary allowance of federal deputies and senators and helps combat abuses of public money. The @rosiedaserenata account was blocked. Society wants more transparency, not less. #DesbloqueiaRosie.⁵

This initiative was one of the first Brazilian civic technologies to use artificial intelligence and to self-identify as a robot or bot. *Operação Serenata de Amor* (OSA, in the Portuguese acronym) emerged in 2015 from the initiative of a group of young people who saw the possibility of monitoring reimbursements made through the Parliamentary Activity Allowance (*Cota para o Exercício da Atividade Parlamentar*, CEAP), a fund that covers legislators' expenses such as food, transportation, accommodation, and even cultural expenditures and television subscriptions. Initially, the project, launched in 2016, had a team of 10 people, but it engaged a community of more than 800 developers and collaborators. One year after gaining wide public attention, the founders decided, for security reasons and to ensure the project's continuity, that it should be managed by an institution. Thematic proximity and shared interests led to the robot's incorporation by Open Knowledge Brasil (OKB), which has since been responsible for managing and communicating the project (Nohara & Colombo, 2019; Da Costa, 2022). Within this community are individuals from diverse backgrounds, with a predominance of specialists in technology and communication, including developers, journalists, managers, and designers.

After some time, Twitter reinstated Rosie's ability to tweet. Three years later, in 2022, in an effort to distinguish harmful automated bots from harmless ones, Twitter introduced a labeling system allowing pages to be tagged as "Automated by," through which the provider could link a human profile as responsible for the account. However, at the beginning of the following year, in another reversal, Twitter announced that it would begin charging for access to its API. This move significantly hindered tools that relied on the API to collect data and/or publish information and opened the way for an increasing proliferation of malicious bots, often associated with private, and frequently opaque, funding of initiatives marked by low levels of transparency.

Methods

This study began with an initial survey of a prospective and non-exhaustive nature, which identified a set of civic bots developed by Brazilian individuals and organizations. Although bots are currently labeled as "automated" accounts on Twitter, there is no mechanism that allows the entire platform to be systematically searched for such profiles. As a result, the list of automated accounts used as seeds for this investigation was derived from ethnographically inspired observations and took into account the visibility achieved by some of these bots, both in news coverage and among the platform's own audiences. The 14 initiatives mapped are presented in the Table 1.

The next step was to collect all mentions of these initiatives on Twitter between 2012 and 2022, specifically considering their current usernames. Data were collected through Twitter's API 2.0, using the academic access tier, which has since been discontinued. This process resulted in a dataset of approximately 130,000 messages, containing 216,000 mentions of the bots, an average of 1.7 mentions per tweet.

Now part of Twitter's core set of affordances, the practice of mentioning other users through the use of the @ symbol was incorporated after the platform's initial launch. According to Burgess and Baym (2020), it was in November 2006, about eight months after Twitter began operating, that @ was first used as a marker to identify a user profile. Although this convention is now fully established and has even been exported to other platforms, appearing natural to newcomers, it originally ran counter to more intuitive uses, such as indicating location, since @ in English is generally translated as "at." Today, the symbol is an integral part of the conversational modes instituted on Twitter and allows for relatively precise tracing of interactions among different users on the network.

⁵ <https://twitter.com/MarinaSilva/status/1096881226525433856>



Table 1 - Mapped initiatives

NAME	DESCRIPTION	DEVELOPER	DATA SOURCE	ACCOUNT
<i>Amazônia Minada</i> (Undermined Amazon)	Monitors mining applications in Indigenous lands and conservation units	NGO	Applications submitted to the National Mining Agency (ANM)	@amazonia_minada
<i>Bot Amazônia Sufocada</i> (Suffocated Amazon Bot)	Monitors wildfire alerts	NGO	INEP	@botqueimadas
<i>Bot ponto</i> (bot dot)	Monitors YouTube disinformation	Press Organization	YouTube	@bot_ponto
<i>Colaborados</i> (Collaboradata)	Monitors the access to governmental portals of public transparency	Activist Collective	Transparency Portals	@colabora_bot
<i>Elas no Congresso</i> (Women in Congress)	Monitors parliamentary proposals related to women's rights	Press Organization	National Congress	@elasnocongresso
m0nabot	Monitors the progress of LGBTQIA+, related bills in State Legislative Assemblies and in the Federal District Chamber	Activist Collective	National Congress	@m0nabot
orobotox	Monitors the Official Gazette for pesticides	Press Organization	<i>Diário Oficial</i> (Official Gazette)	@orobotox
Pegabot	Identifies likely automated accounts	NGO	Twitter	@pegabots
Project 7c0	Monitors tweets deleted by political actors	Press Organization	Twitter Accounts	@projeto7C0
Rosie	Monitors expenditures reimbursed through the Parliamentary Activity Allowance (CEAP) of federal deputies and senators	NGO	National Congress	@RosieDaSerenata
ruibarbot	Monitors stalled cases at the Supreme Federal Court (STF)	Press	STF (Supreme Court)	@ruibarbot
science pulse	Monitors topics published by scientists and science communicators on Twitter	Press Organization	Twitter Accounts	@thesciencepulse
tramitabot	Monitors the legislative process of bills	NGO	National Congress	@tramitabot
weber bot	Monitors the activity of politicians' Twitter accounts	Press Organization	Twitter Accounts	@weber_bot

Fonte: Elaboração própria.

This preamble is important to note that the strategy of mapping mentions of civic bots follows a methodological principle according to which it is through mentions that one can capture, at least in part, interactions with these technologies. Accordingly, the study sought to identify which bots received the most mentions, from which users, when, and what level of reach these interactions achieved. The analysis focused on descriptive statistics and metadata provided by the API itself, as well as on relational data analysis, used to identify the networks formed around these automated accounts. The data were processed using the R programming language and the social network analysis software Gephi.

The results, as shown below, suggest that a large share of interactions with civic bots is largely mechanical and that their reach remains limited. Nevertheless, monitoring mentions of these technologies makes it possible to signal recent episodes of contention and distinct repertoires of political action.

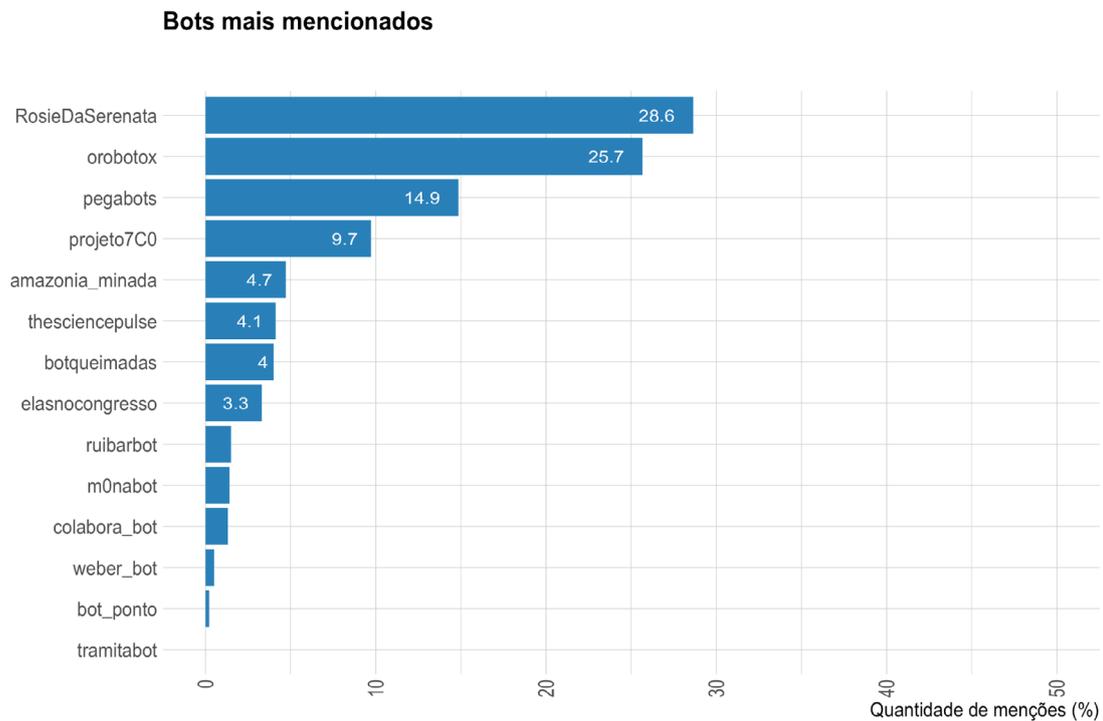


Results and discussion

Civic bots exhibit an uneven distribution of public attention over the period analyzed. Some bots concentrate a higher number of mentions in the sample, that is, they receive more tweets directed to or responding to them. This is the case of the bots @RosieDaSerenata and @orobotox (see Chart 1), which together account for more than 50% of all mentions collected on Twitter.

Both Rosie and orobotox have a long operational history. The former has been active since 2017, and the latter since 2019. However, length of activity is not a determining factor in the volume of mentions received, as other initiatives with similar trajectories are relatively less mentioned on the platform. What stands out in both cases is that these bots are directly involved in monitoring activities whose primary purpose is to enhance public transparency around specific issues. In the first case, the automated account monitors parliamentary expenditures; in the second, it tracks records of the federal government's approval of new pesticides.

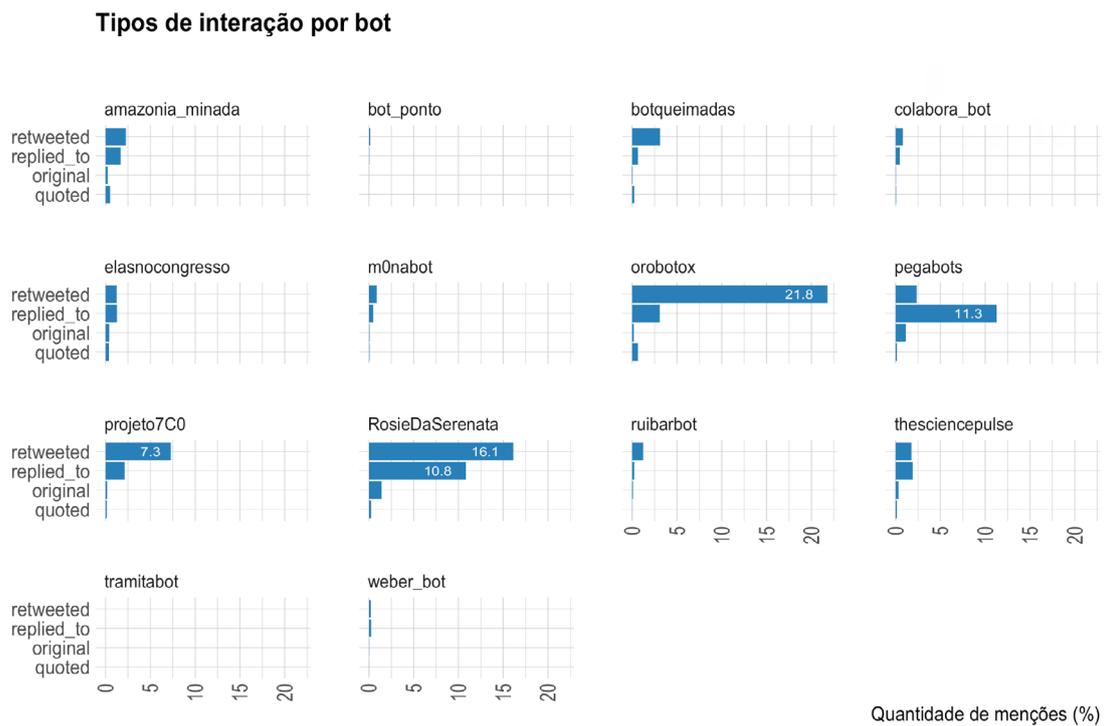
Chart 1 - Most mentioned bots (bots x number of mentions %)



Fonte: coLAB/UFF

Source: The authors.

The other two most prominent bots in the sample, @pegabots and @projeto7c0, respectively, correspond to a different kind of repertoire. These are tools whose monitoring activities stem from an *ad intra* perspective on Twitter's functioning as a political platform. Pegabot is a bot whose main goal is to identify the likelihood that another account is automated, even when it is not labeled as such. In other words, it aims to construct a set of parameters that allow other Twitter users to detect inauthentic behavior and, in doing so, to safeguard the health of public debate within the platform itself. Projeto 7c0, in turn, is a bot whose primary purpose is to track tweets deleted by politicians, in order to draw attention to attempts to conceal evidence, a tactic that is highly characteristic of extremist political groups when they are on the verge of facing repercussions for their actions.

Chart 2 - Types of interaction per bots (types of interaction x number of mentions %)

Fonte: coLAB/UFF

Source: The authors.

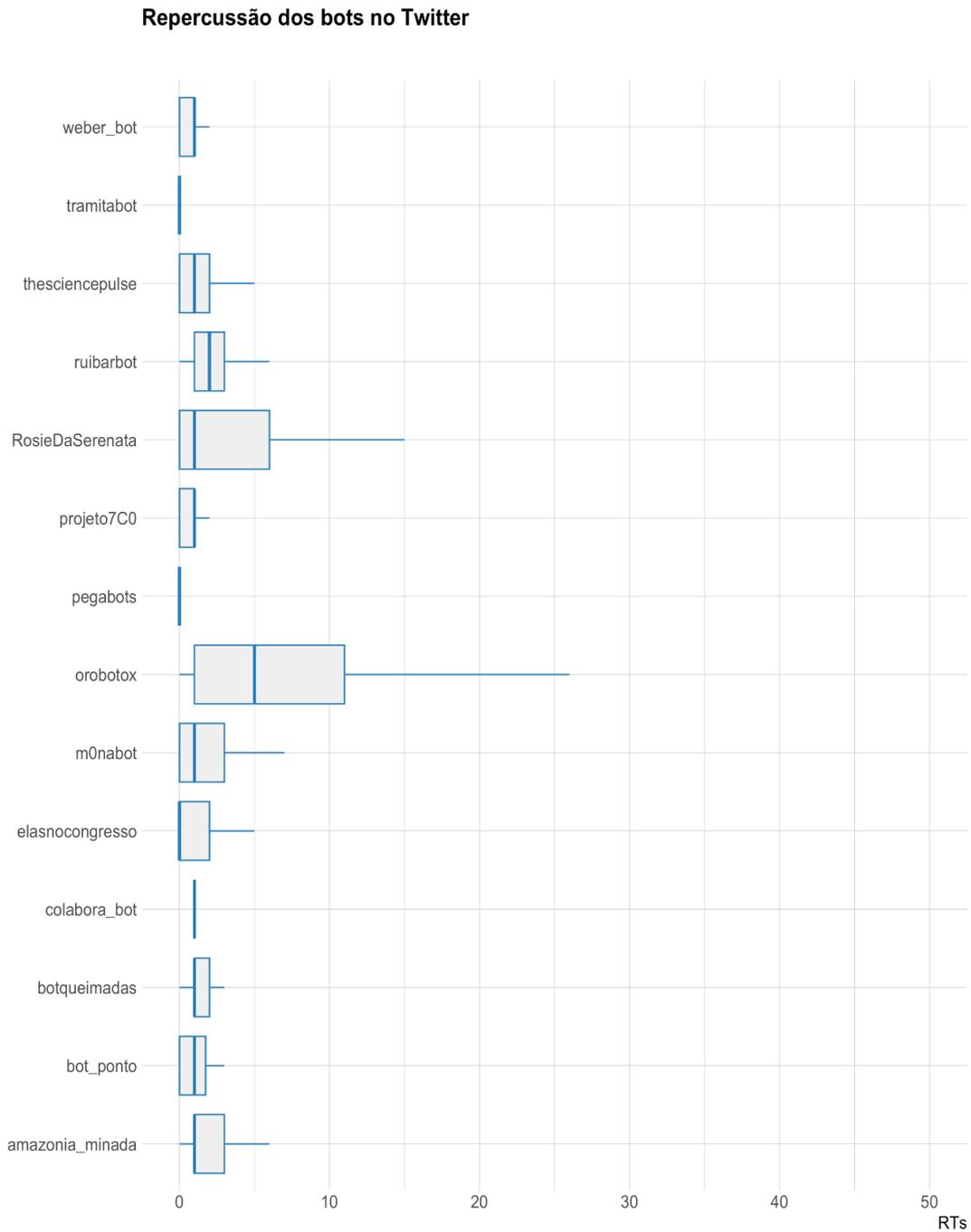
The bots also display different levels of interaction among themselves. Although, overall, retweets (59.3%) and replies (34.2%) clearly predominate when compared to original tweets (4.1%) and retweets with comments, or quotes (2.4%), a bot-by-bot analysis reveals striking discrepancies in some cases (Chart 2). For instance, @orobotox is the bot with the highest proportion of retweets relative to other possible forms of interaction on Twitter. It is a tool fundamentally designed to generate content to be replicated by activists. By contrast, @pegabots relies on a completely different mechanism, with a greater prevalence of replies. In this case, the bot is primarily intended for individual use, following a model of connective action. This is because, in order to “activate” the bot, it must be mentioned in reply to another user’s tweet. There is, therefore, an important distinction between bots designed to generate replicable content and those that require direct interaction.

This result is similar to what is observed when analyzing engagement and reach for tweets that mention each bot. As shown in Chart 3, the number of retweets is markedly higher in the case of @orobotox and @RosieDaSerenata. Among the remaining bots, retweet performance is relatively similar, with slightly higher levels for @m0nabot and @amazonia_minada, the former associated with LGBTQIA+ agendas and the latter with environmental issues. This finding suggests that more cohesive communities can help leverage specific agendas, such that civic bots may serve as a stepping stone for activist groups and thus function as mechanisms for exerting pressure on public opinion.

Although the aim of this study is not to develop an exhaustive typology, it is possible to draw a parallel between this finding and the two axes along which civic technologies are divided, according to Magallón (2014). Bots that create content designed to be replicated can be understood as tools for promoting political participation. Their main objective is to expand the reach and visibility of agendas and to serve as a contentious repertoire and a pressure device for social movements and interest groups in the struggle over the public sphere. By contrast, bots that require direct user interaction align more closely with the logic of technologies for civic empowerment, which are geared toward facilitating public transparency and political literacy, as well as monitoring the activities of public officials in relation to civil society.

The empirical recognition of these two axes lends greater consistency to the literature and reinforces the importance of nuancing our understanding of the different modes of operation of these civic technologies in the promotion and maintenance of public debate. Moreover, it also represents an effort to assess strategies

Chart 3 - Bots impact on Twitter (bots x retweets amount)

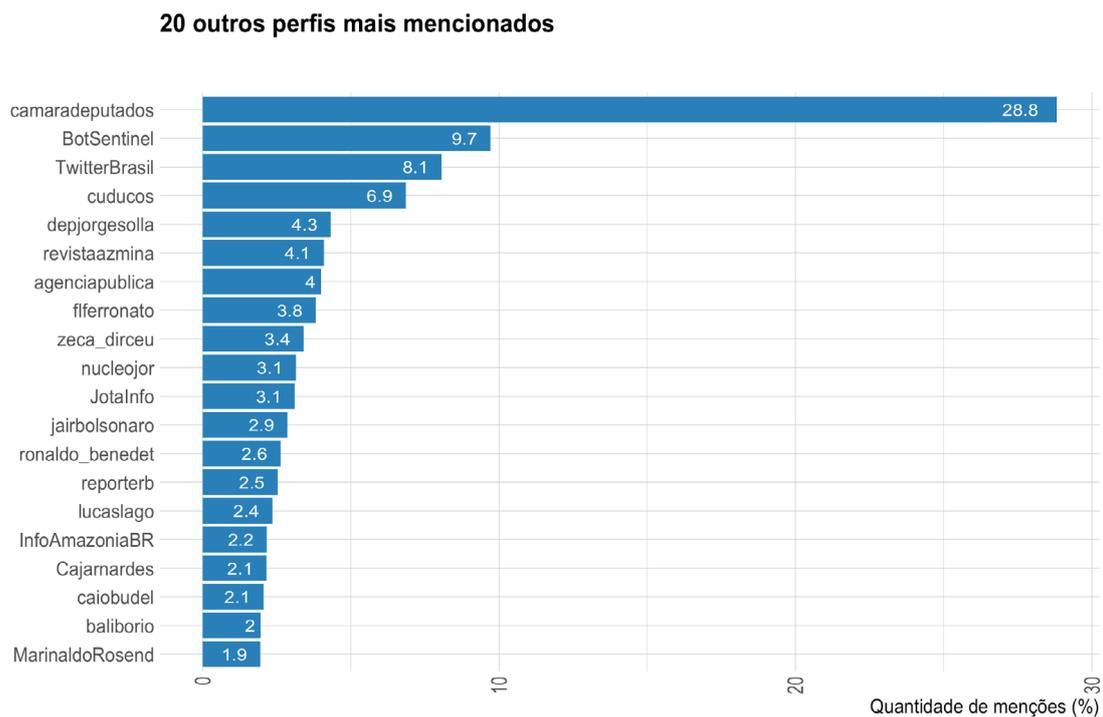


Fonte: coLAB/UFF

Source: The authors.

for developing repertoires that alternately target individuals, in the case of interactive bots, and collectives, in the case of replicative bots.

Another noteworthy finding is that bots are often mentioned alongside other profiles, either to react to a specific action or statement or to activate a public authority or another accountability mechanism. Chart 4 highlights the accounts most frequently mentioned in conjunction with the monitored bots. The Chamber of Deputies is, by far, the most frequently invoked institution (28.8%). Next, another civic bot, this time a foreign one, also shows a high incidence of co-mentions: Bot Sentinel. Created by Christopher Bouzy, the initiative gained notoriety for identifying and tracking inauthentic behavior on Twitter. The third most frequently co-mentioned account is Twitter’s Brazilian office, in tweets that function as a form of pressure or demand for action.

Chart 4 - Top 20 most mentioned third-party profiles (profiles x number of mentions %)

Fonte: coLAB/UFF

Source: The authors.

The incidence of third-party accounts co-mentioned in tweets referring to some of these bots is an important indicator of what Fariniuk, Firmino, and Luque-Ayala (2022) conceptualize as dimensions of civic hacktivism. According to the authors, hacker culture is grounded in four core dimensions or movements, which can be summarized as follows: non-proprietary solutions, advocacy for open data, pluralism of agendas, and accountability. Chart 4 shows the predominance of democratic institutions (the Chamber of Deputies) and political actors (Congressman Jorge Solla, Zeca Dirceu, Jair Bolsonaro); independent media outlets associated with social movements (Agência Pública, Revista AzMina, Núcleo Jornalismo, Jota); initiatives dedicated to tracking and monitoring inauthentic behavior (BotSentinel); and software developers (Cuducos, Lucas Lago).

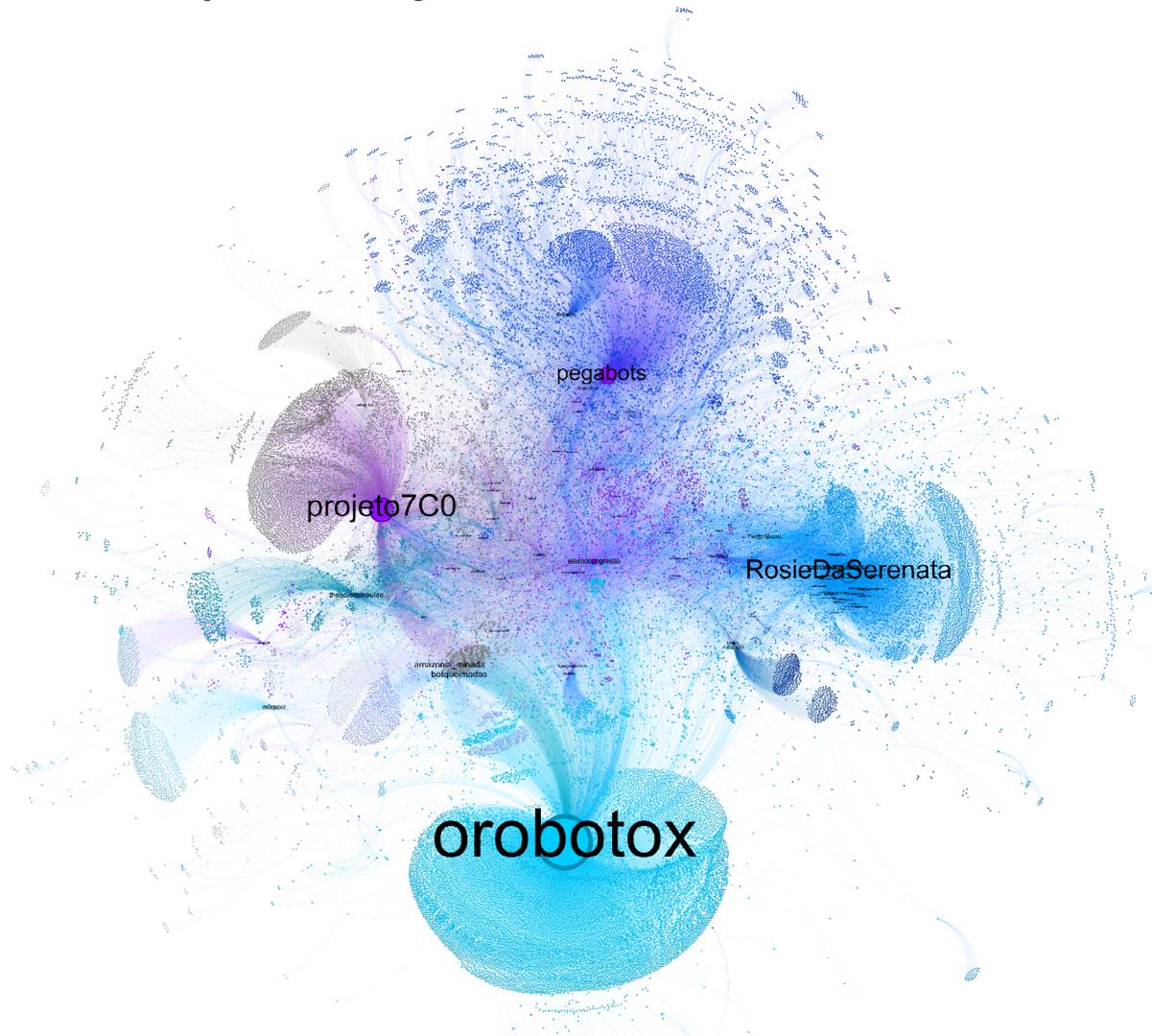
Broadly speaking, the bots included in the analyzed sample can be understood as tools embedded within an activist repertoire. They engage directly and purposefully with other players in civil society in order to maximize the effectiveness of their actions. And although they derive legitimacy from automation-based practices, they seek to establish dialogical relationships with institutions and actors in the public sphere.

Finally, it is worth noting that the bots examined in this study do not operate in isolation. They are embedded in a socio-technical environment that largely shapes their own effectiveness. Some of these tools naturally address segmented audiences and do not share many followers with one another. Others, by contrast, display a kind of twin or complementary functioning. Chart 5 allows for the observation of some of these patterns.

The clusters that form marginally around each initiative, such as those surrounding the bots @orobotox, @projeto7c0, and @RosieDaSerenata, correspond to users who mention only one of these accounts. By contrast, the bots @amazonia_minada and @botqueimadas largely share their audiences, as do @pegabots and the international @BotSentinel. In addition, collectives and individuals responsible for developing some of these tools also appear as co-mentioned accounts. In this way, many of these projects contribute to enhancing the visibility of their creators. As social robots, civic bots fulfill three fundamental agendas, previously outlined by Sabbatini (2022): they support and exert pressure on governmental actors, capitalize on and amplify electoral interests, and propagate activist strategies.

The literature on social bots, however, frequently associates this type of tool with manipulative dynamics (Woolley & Howard, 2018), rather than understanding them as infrastructures of accountability. All the initiatives examined here are situated in a liminal zone between activism, data journalism, and algorithmic



Chart 5 - Network of profiles mentioning civic bots on Twitter

Source: The authors.

governance, developing, in a dialogical and responsive manner, a particular ecology of civic surveillance. In this ecology, the bots themselves function as brokers of public information, translating technical data into communicable events. Thus, unlike bots that simulate inauthentic behavior, such as those widely deployed in astroturfing and computational propaganda, civic bots produce legibility (Scott, 1998) with regard to the state and the political sphere, and foster a connective fabric linking social movements, independent media outlets, and political institutions in the service of democratic promotion.

Final considerations

This study examined the ecosystem of Brazilian civic bots. Through the analysis of more than 130,000 Twitter mentions related to 14 mapped initiatives, we found that although the overall reach of these initiatives remains limited, they nonetheless constitute distinct activist communicational repertoires.

With regard to visibility, significant disparities were observed. Two of the analyzed bots concentrated more than 50% of all mentions and interactions recorded on Twitter. The article explains this prominence by highlighting, on the one hand, the novelty and pioneering role of Rosie, from the Operação Serenata de Amor, and, on the other, the political context surrounding the approval of new agrochemicals, which heightened public attention toward @orobotox. Both initiatives operate as intermediaries, or infomediaries, by monitoring publicly available open data and translating it into disclosures and denunciations aimed at society at large.

We also identified distinct tool genres and agenda orientations among the initiatives analyzed. Whereas @orobotox stands out for its high proportion of retweets, reflecting its role as a tool designed to

generate content for collective activist replication, @pegabots shows a predominance of replies, since its mode of action is primarily individual and interaction-based.

Additionally, we observed that more cohesive communities, such as those surrounding @m0nabot, linked to LGBTQIA+ issues, and @amazonia_minada, focused on environmental agendas, played an important role in amplifying activist visibility. These communities function as mechanisms of pressure on both public opinion and parliamentary actors.

Our findings confirm that audiences are segmented, yet clusters form marginally around individual initiatives as well as groups of initiatives. One cluster centers on the bots @orobotox, @projeto7c0, and @RosieDaSerenata, comprising users who mention only one of these accounts. A second cluster brings together @amazonia_minada and @botqueimadas, both focused on environmental issues. A third cluster links @pegabots with the international initiative @BotSentinel.

The analysis further reveals a tendency among users to mention civic bots alongside other profiles, suggesting interactions not only among bots themselves, but also with public authorities, the Twitter platform, tool developers, and other actors. The Chamber of Deputies emerges as the most frequently mentioned official account. This finding is consistent with Da Costa (2022), who identifies the Brazilian lower house as the country's primary provider of public open data.

In light of these findings, we argue that the article's objectives were achieved by identifying networks of actors formed around civic bots and by comparing the reach and effects of each initiative. Nonetheless, the study has clear limitations. The mapping presented here does not capture the full universe of Brazilian civic bots and should be understood as a non-representative, exploratory sample. It is also important to note the drastic changes in platform governance, particularly Twitter's rebranding as X and the severe restrictions imposed on API access, which have effectively forced many initiatives to suspend their activities. Despite its exploratory nature, this study sheds light on the modes of action adopted by civil society actors who employ civic bots as part of their activist repertoires.

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