

Social Media and Presidential Campaigns – Preliminary Results of the 2018 Brazilian Presidential Election

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ABSTRACT

The use of social media within modern political activities is a new phenomenon that reshapes election races and the way in which politicians communicate with voters. During the last presidential campaign in Brazil, the elected candidate had almost no time on TV (8 seconds) and very little party support but focused his campaign on social networks. In this context, the objective of this paper is to study the relationship between social media and the electoral performance of candidates running in the 2018 Brazilian presidential election by analyzing how candidates used their social media profiles, assessing how citizens interacted with them and identifying the correlations between a candidate's performance on social media and votes received. For this, we collected and analyzed the numbers of followers and all posts from all 13 presidential candidates in the three major social networks, Facebook, Twitter and Instagram, from January–October 2018. As a result, more than 41,000 posts and 291 million interactions were analyzed, and our findings show that: (i) candidates heavily used social media throughout the year, but focused on engaging words and avoided sensitive topics; (ii) Instagram garnered a higher increase in followers and a higher rate of interactions via posts in comparison to Facebook and Twitter; (iii) there was found no correlation between the number of posts and votes received, with a very small negative correlation with posting about sensitive topics, and a strong correlation between votes and followers, and votes and engagement, mainly on Instagram; and (iv) more studies are needed to build a general prediction model using combined data from all of these networks.

CCS CONCEPTS

• **Applied computing** → **Voting / election technologies**; • **Mathematics of computing** → *Computing most probable explanation*; • **Human-centered computing** → *Social networks*; *Social network analysis*; • **General and reference** → *Measurement*; *Metrics*.

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KEYWORDS

Social Media, Social Network, Presidential Election, Facebook, Twitter, Instagram, Brazil

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1 INTRODUCTION

Social media has played a central role in political activities and elections throughout this decade. Political discourse has changed from an era in which (a) politicians' voices could mainly be heard in campaign rallies and on TV, (b) extra information about politicians could be obtained mainly through the press, and (c) citizens had very few opportunities to confront politicians. We have now entered a new era mediated by social media, in which (a) politicians no longer have geographic or time constraints because they can use their social media profiles to post content anytime, anywhere and to everybody; (b) extra information about them can be obtained not only by the press, but directly from their profiles and through other people sharing on social networks; and (c) ordinary people can use social networks to directly reach the politicians, amplify their voice (by sharing content), ask questions, confront them and get direct responses.

In this new scenario, social networks are being used extensively to campaign on referendums, engage in debates, provide information and gather votes on national elections, and the success of the online campaign can even decide elections. A large body of academic research has looked at this modern political campaign and activities [3][12], such as how well Facebook and Twitter users reflect the general voting public [12][17], how the sentiment of conversations is connected to real-world events affecting a political campaign [23] and whether or not it is possible to predict election results based on social media analysis [28][18][26].

Social media also presents some new challenges: the popularity of fake news, in which false content against candidates is rapidly disseminated [20]; the existence of social bubbles [7], a phenomenon showing that people are usually presented with content that

mainly agrees with their personal convictions and impart a sensation of majority or unanimity; and the use of automated software, known as Bots, to spread true or fake news, supporting allies or defaming opponents [6]. To deal with these problems, one approach is to directly reach candidates' social media profiles, which allows citizens to obtain official content instead of fake news, as well as to avoid the effects of a social bubble and a massive Bots exposition. Moreover, by using their own social media profiles, candidates may actively engage with supporters on their campaign, sharing and amplifying their voice. The potential of this engagement may be reflected on the number of votes they received, as occurred in the 2016 U.S. presidential election when Donald Trump focused his campaign on free media marketing [8].

This scenario also occurred in the 2018 Brazilian presidential election. The candidate with more followers in social networks (14.1 million followers on election day) and less time on TV (only 8 seconds in public propaganda) was elected (46.0% of votes in the first round), while the candidate with more time on TV (5 minutes and 32 seconds in public propaganda) and few followers (2.2 million) received only the sixth most votes (4.7% of votes).

Despite many initiatives aiming to study candidates' social media behavior and impacts on elections, many of them are constrained by the technical challenges of collecting social media data, especially from Facebook and Instagram social networks. As a result, the majority of studies are limited to a small timeframe (such as an elections period), and to Twitter posts, from which it is easier to collect data. Also, most studies are focused on the sentiment analysis of citizens' posts about candidates, forgetting the valuable amount of information that can be gathered in the candidate's networks.

In this context, this research aims to study the relationship between social media and the electoral performance of candidates running for president in Brazil in 2018 by analyzing how candidates used their social media profiles and how citizens interacted with them. Moreover, we try a new approach to find a correlation between candidates' social media performance and votes received. For this, we collected data about all 44,263 posts by candidates from January 1, 2018, to October 6, 2018, the first-round election day.

The remainder of this paper is organized as follows: Section 2 presents the conceptual background and related works, followed by a brief overview of the 2018 Brazilian elections in Section 3. Section 4 presents the research approach, including the research questions, data collection strategy and analysis methodology. In Section 5, the results are presented and discussed, followed by Section 6, which presents concluding remarks and future work.

2 BACKGROUND

Contemporary social media systems are new: Facebook launched for public access in 2006, Twitter debuted in 2006, and Instagram emerged in 2010. Therefore, the use of social media in modern political activities is a new phenomenon that already presents promising results. As the background for this research, we first explore the role of social media in elections and the use of social media by politicians and candidates. Then, research on correlating the use of social media and electoral performance is presented. Finally, the state of the art in this area is briefly discussed.

2.1 The Use of Social Media in Elections

The impact of social media on politics and elections all around the world is receiving attention. Smyth [27] studied how social media was used in the 2011 elections in West Africa, Nigeria and Liberia, concluding that social media helped to overcome a previous scarcity of information during the electoral process. In a study regarding the 2013 national election in Norway, Kalsnes [13] described the "social media interaction deadlock," which is increasing the disparity between the parties' expressed strategy and online performance. Moreover, it was determined that political parties identify three clear disadvantages when communicating with voters online: (a) online reputation risk; (b) negative media attention and (c) limited resources. In the 2014 Indian General Elections, Jaidka [11] studied official Twitter accounts of the top ten political parties and identified the new paradigms created by political parties to engage and inform voters, driven on modern ICT.

Considering U.S. Elections, in an analysis of 2012 U.S. presidential candidates' Facebook pages, Bronstein [2] shows that, in addition to the mobilization of supporters, campaigns used to post information only on a small number of non-controversial subjects, discouraging dissent and encouraging affective allegiances between the candidate and his supporters. Regarding the same elections, Mascaro [16] studied conversational features in Twitter and concluded that, although candidates and media are the most talked about and talked to, these interactions elicited no response.

More recently, Hall [9], analyzed the role that social media played in the outcome of the 2016 U.S. presidential election and the Brexit referendum. In their conclusions, they argued that discussions on social media only represent a small portion of the overall discussions in a political campaign and play a minor role in the overall ecosystem. However, the analysis of social media platforms is increasingly showing their impact on the outcome of the vote. Further regarding the 2016 U.S. presidential election, Morris' results [19] suggested that campaign messages about candidates sent via Twitter—regardless of the candidate of focus—resonated just as strongly with potential voters as those sent via the traditional media.

In the end, in one of the very few studies including Instagram, Aminolroya [1] highlighted that in 2016 the flow of information from followees to followers in Instagram presented a significant role in the Iranian parliament election.

2.2 The Use of Social Media and Electoral Performance

The correlation between social media performance and electoral performance is also the focus of research. Regarding this topic, in 2010 Kruike-meier [15] investigated content characteristics and candidates' style of online campaigning during the Dutch national elections of 2010. Their findings showed that using Twitter has positive consequences for political candidates: Candidates who used Twitter during the campaign received more votes than those who did not and using Twitter in an interactive way had a positive impact as well. In same year, Tumasjan et. al. [28] presented a study in the context of the German federal election aiming to predict elections. They collected all tweets that contained the names of either the 6 parties represented in the German parliament or selected prominent

politicians of these parties and compared the volume of tweets with the election result. They observed that the relative volume of tweets closely mirrored the results of the federal election. Then, they claimed that the mere number of tweets mentioning a political party can be considered a plausible reflection of the vote share and its predictive power even comes close to traditional election polls.

Effing [5] studied the impact of social media in elections in the Netherlands, showing that although social media did not significantly influence voting behavior during the local elections (2010 / 2011), during the national elections (2010) politicians with higher social media engagement received relatively more votes within most political parties. In 2013, DiGrazia et. al. [4] showed that there is a statistically significant association between tweets that mention a candidate for the U.S. House of Representatives and his/her subsequent electoral performance, indicating that data about political behavior can be extracted from social media. Later, Ramadhan [25] analyzed social media utilization in 2014 Jakarta Legislative Election, showing that the usage of social media, especially Facebook and Twitter, is strongly correlated with the number of votes gained by the candidate.

In addition, Prasetyo [24] provided a comprehensive argument for the use of Twitter-based election forecasting in the developing world, presenting Indonesia's presidential elections in 2014 as its use case. They claimed that in their use case, the most basic Twitter predictor outperformed the majority of traditional polls, while the best-performing predictor outperformed all traditional polls on the national level.

Many studies, ranging from 2011 to 2018, follow the approach presented by [28]. In general terms, they combine Twitter sentiment analysis and the volume of posts related to a candidate and correlate the volume of positive/negative posts gathered on Twitter with electoral results, as presented in [18][26][10][29][21]. In these studies, the main challenge is usually the data gathering and automatic sentiment analysis.

2.3 State-of-the-Art Discussion

Based on the conclusions of the presented studies, we can surmise that social media analysis, especially Twitter analysis, already plays an important role in democracies all around the world. Further, politicians and parties have already moved to online candidatures. Indeed, contemporaneous political activity is strong based in the concept of the “permanent campaign”: campaigns having a permanent nature, including the execution of campaign-like activities by the political actors during non-election periods. In addition, many studies correlating social media data and election outcomes are also performed. However, some limitations can be highlighted:

a) Data-gathering barriers: In this area, data gathering is a very challenging task. Facebook, which also owns Instagram, and Twitter have strong restrictions to access their data through APIs (Application Programming Interface), such as the number of queries in a time window and the number of results returned, and limits in the search dates. For instance, Twitter's standard API only searches against twitter published in the last 7 days, and open queries do not guarantee that all tweets are returned. Furthermore, due to

the Cambridge Analytica data scandal¹, the process of collecting data from Facebook and Instagram become more difficult and now requires Facebook's explicit consent after it has analyzed the system requiring consent. This barrier leads to other study limitations, presented next.

b) Focus on Twitter data: Most of studies focus on Twitter not because it is the more relevant social network, but just due to it is easier to collect data from their API than from Facebook/Instagram API. As a result, large sets of data and indicators of other social networks are just being ignored.

c) Temporality: A great deal of research effort is spent only during campaign periods, despite the fact that currently there are “permanent campaign” activities. Considering that in Brazil many presidential candidates are usually also members of the Parliament, the analysis of their online activities during their mandate can lead to a better understanding. For example, in Brazil, considering that the 2018 elections were held in October and the official campaign period started in August, in January 2018 it more than 10 pre-candidates, the majority members of parliament, who were informally acting in a permanent campaign. Moreover, they can use social media analysis methods and techniques to adapt their online behavior according to public response in an effort to foster more support. In addition, the majority of studies also fail to obtain data from all campaign period, restricting data collection to one day or few weeks.

Agreeing with authors of [14], whom stated that “*researchers should refrain from automatically generalizing the results of single-platform studies to social media as a whole*,” we can conclude that studies regarding politicians' behavior on ‘social media’ covering other networks besides Twitter, as well as studying the correlation of this behavior and elections results, is very necessary to better frame and understand this new scenario.

3 A BRIEF OVERVIEW OF THE 2018 BRAZILIAN ELECTIONS

There were 13 candidates running for president in a judicialized and controversial campaign that was polarized by two main candidates: Fernando Haddad and Jair Bolsonaro.

Despite the ex-President Lula's imprisonment in April 2018, polls pointed to him as the favorite to win the election in all scenarios. He was officially launched as candidate, but after the campaigns started, Lula's candidacy was denied by the Superior Electoral Court; he was replaced by former São Paulo mayor Fernando Haddad, who used the slogan “Haddad is Lula.” Both Lula and Haddad are from the Workers' Party, which won the last four presidential elections, but members and government entities have been involved in many corruption scandals. Economically, the party is left-wing oriented and strongly aligned with human and minority rights.

The second most prominent candidate (elected as president) was Jair Bolsonaro. He had been Federal Deputy since 1991 and is well known as a veteran and for his non-politically correct opinions and speeches. He moved to a new party (PSL) in 2018 to get support for his candidature. In contrast to Lula/Haddad's campaign, Bolsonaro presented a right-wing economical proposal. In the beginning of

¹<https://www.theguardian.com/news/2018/mar/17/cambridge-analytica-facebook-influence-us-election>

his campaign, he was stabbed in the stomach while interacting with supporters. His condition prevented him from returning to public activities and debates for the remainder of the first round.

Many candidates presented themselves as third options: Ciro Gomes (center-left) and Geraldo Alckmin (center-right) presented themselves as moderate options for left and right-wing voters. João Amoêdo, a right-wing businessman, was the “non-political candidate.” Cabo Daciolo (far-right) was often the “comic candidate.” Henrique Meirelles (center-right) represented the current government, which was very unpopular because of the impeachment of last president. Marina Silva (center-left), the 3rd most popular in 2014, and Alvaro Dias (center-right) completed the list of “third-way” candidates.

Guilherme Boulos (ultra-left), Vera Lúcia (ultra-left), Eymael (center-right) and João Goulart Filho (center-left) composed a group of candidates with very few supporters.

It is important to note that initially, the two most popular candidates were the Workers’ Party candidate (Lula/Fernando Haddad) representing the left and having the second most time on TV (2’23”), and Geraldo Alckmin, representing the right and with the most time on TV (5’32”), similar to previous elections (2014). Geraldo Alckmin was confident that after the beginning of his campaign on TV, he would perform better; this was shown to be incorrect (he came in 4th). Most of other candidates had little time on TV and had to concentrate their campaigns on the internet. Jair Bolsonaro had only 8” of TV time. As he was also prevented from participating in debates and public events, his campaign was mostly based on social networks—he even published from the hospital.

4 RESEARCH APPROACH

The main objective of this research is to study the relationship between social media and the electoral performance of candidates running in Brazil’s 2018 presidential election by focusing on the candidates’ use of social media and the impacts of this use. From this objective, we derived the following research questions:

RQ1: How did candidates use their social media in 2018?

RQ2: How did citizens interact with the official profiles of candidates during the year and during campaign?

RQ3: Is there a correlation between social media performance and votes received by candidates?

The approach for this research is based on gathering all data regarding candidates’ activities on Facebook, Twitter and Instagram during the year of 2018, from the first round of the elections. This data will be analyzed according to the following measures.

4.1 Data Collection

For this study, data was collected from the three major social networks, Facebook, Twitter and Instagram, from the period of January 1, 2018, to October 6, 2018. Data was collected through the system *AlcancePolitico* (alcancepolitico.com), which collected:

4.1.1 Followers. The number of followers of any candidate’s public accounts on these three social networks was collected. As these networks’ APIs do not provide this number for previous days, it must be gathered on a day-by-day basis. Then, data about some

candidates, such as Fernando Haddad, was not gathered from January 1, but data about all official candidates was gathered at least by the beginning of the official campaign.

It is important to notice that, at the beginning of data collection, the accounts of Cabo Daciolo, Eymael and João Goulart Filho on Instagram were personal accounts, and it is only possible to automate data gathering from business accounts. Then, some of their data about Instagram followers were projected according to Facebook and Twitter variance.

4.1.2 Posts and interactions. The system collected posts and their ensuing interaction, which consisted of:

- From Facebook: likes (including subcategories such as sad, wow and lol), shares and comments;
- From Twitter: number of likes and retweets;
- From Instagram: number of likes and comments;

Social networks’ APIs allow for the gathering of data about past posts. Then, when a (pre)candidate was included in the system, all of the posts since January 1 were collected. In addition, considering that these metrics change in real time, the strategy consisted of updating data from the last 200 posts of all candidates every day. Then, the system was able to keep posts updated for 2 months after publishing, on average, without overloading the system or overcoming the APIs’ limits.

4.2 Data Analysis

Data analysis started in December 2018, in an effort to direct answers the research questions. Quantitative and statistical analysis was primarily performed.

For “*RQ1: How did candidates use their social media in 2018?*”, we performed quantitative analysis, regarding the total number of posts, by day and by platform, as well as the most used hashtags and words. We also analyzed the number of posts related to sensible topics at the moment in Brazil, such as healthcare, unemployment, education, public security and social security.

For “*RQ2: How did citizens interact with the official profiles of candidates during the year?*”, we conducted analysis that focused on the variation of candidates’ followers in each network, and the quantitative analysis of citizens’ interactions (likes, shares/retweets, and comments) regarding the candidates’ posts.

For “*RQ3: Is there a correlation between social media performance and votes received by candidates?*”, a statistical analysis was performed to correlate data regarding candidates’ activities and received votes, as well as data that pertained to citizens’ interactions and received votes. The analysis was performed in two steps: (i) correlation analysis between each pair of variables (for example, likes versus votes received) in order to find the strength of the relationship between vote intentions and the variables related to social media performance; and (ii) linear regression in order to find a preliminary prediction function.

5 STUDY RESULTS

This section presents the analysis and discussion of the collected data. First, we provide an overall summary of the results. Then, the findings and answers to defined research questions are presented and discussed.

5.1 Overall Results

There were 13 candidates running for president. On election day, all of them had accounts on major social networks Facebook, Twitter and Instagram. These accounts are listed in Table 1.

The night before election day, the presidential candidates had, in total, 30.2 million followers in their social media. The candidate with most followers was Jair Bolsonaro, with a total of 12.5 million followers, and the candidate with fewer followers was João Goulart Filho, with 17,099 followers.

Table 1: Candidates’ Official Accounts

Candidate	Party	Facebook Account	Twitter Account	Instagram Account
Alvaro Dias	PODE	/ad.alvarodias/	@alvarodias_	@ad.alvarodias
Cabo Daciolo	PATRI	/depudadocabodaciolo/	@CaboDaciolo	@cabodaciolo
Ciro Gomes	PDT	/cirogomesoficial/	@cirogomes	@cirogomes
Eymael	PSDC	/eymaelOficial/	@Eymaeloficial	@eymael_presidente27
Fernando Haddad	PT	/fernandohaddad/	@Haddad_Fernand	@fernandohaddadoficial
Geraldo Alckmin	PSDB	/geraldoalckmin/	@geraldoalckmin	@geraldoalckmin_
Guilherme Boulos	PSOL	/guilhermeboulos.oficial/	@GuilhermeBoulos	@guilhermeboulos.oficial
Henrique Meirelles	PSD	/hmeirellesoficial/	@meirelles	@henriquemeirelles.real
Jair Bolsonaro	PSC	/jairmessias.bolsonaro/	@jairbolsonaro	@jairmessiasbolsonaro
João Amoêdo	NOVO	/joaoAmoedoNOVO/	@joaoamoedonovo	@joaoamoedonovo
João Goulart Filho	PPL	/joaogoulart54/	@joaogoulart54	@joaogoulartfilho_oficial
Marina Silva	REDE	/marinasilva.oficial/	@MarinaSilva	@_marinasilva_
Vera Lúcia	PSTU	/verapstu/	@verapstu	@vera_pstu

In total, the candidates published 44,263 posts, with 12,774 (29%) on Facebook, 23,312 (53%) on Twitter and 8,177 (18%) on Instagram. These posts generated 291 million interactions, corresponding to 143 million on Facebook (49%), 33 million on Twitter (11%) and almost 116 million on Instagram (40%). Detailed results and discussions are presented next.

5.2 RQ1: How did candidates use their social media in 2018?

This research question aims to identify how candidates used their social media profiles throughout 2018 with regard to their total number of posts, by day and by platform; most used hashtags; most used words; and their posts about sensible topics of the moment in Brazil, such as healthcare, unemployment, education, public security and social security.

The 13 candidates made 44,263 posts on the social networks. The majority of the posts were issued in Twitter, followed by Facebook and, lastly, Instagram. In addition, it is relevant to note that the main candidates, Jair Bolsonaro and Fernando Haddad, were not the candidates whom posted more often. Also, considering the quantity of days until the election (279), each candidate posted an average of 4.3 times in each platform, as shown in Figure 1.

Regarding content, the most used hashtags and most used words, excluding stop words, are presented in Table 2. From the list of the 30 most used hashtags, it is clear that institutional hashtags prevail in one of the two categories: (i) a “team post”, indicating that the post was made by a candidate’s team, but not the candidate himself (e.g., #ADCOMUNICACO, which refers to the Alvaro Dias team, or #EQUIPEHM, referring to the Henrique Meirelles team) or (ii) a slogan created for the campaign, such as #VoteSemMedo, meaning “vote without fear”, used by Guilherme Boulos. Only two hashtags do not fall into this category, #AoVivo, which was related to live content, and #Eleicoes2018, a general hashtag referring to elections.

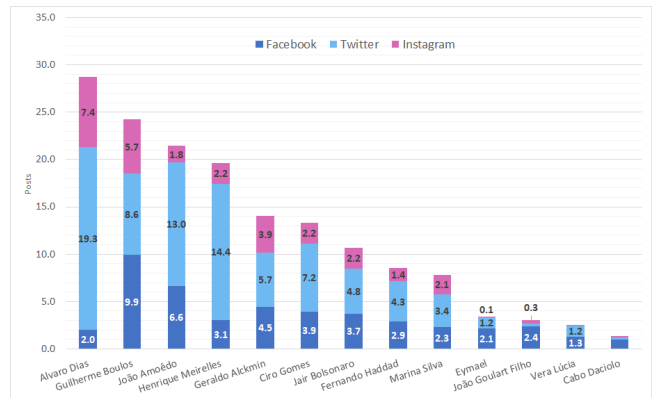


Figure 1: Number of daily posts made by candidates

Figure 2 presents a word cloud related to the frequency of the 100 most used words, excluding most basic stop words. The most frequently used words were Brazil (in Portuguese Brasil; 9,459 occurrences) and country (in Portuguese País; 3,999 occurrences). The analysis of the other 98 most frequently used words indicates some conclusions:

- Candidates used plural engaging words, such as all of us (todos, 3rd most frequent), we go (vamos, 4th most frequent), we (nós, 14th), our (nosso, 21th), and together (juntos, 22th), among others;
- The ex-president Lula, who is currently serving a 12-year jail sentence but was considered a candidate until August 31, was the 32th most frequent word, with 1.567 occurrences;
- Sensible topics appear after the 50th position, such as employment (trabalho, 54th and empregos 73th), education (educação, 55th), healthcare (saúde, 65th), economy (economia, 76th), public security (segurança, 81th), and corruption (corrupção, 89th).



Figure 2: Word cloud of most used posted words

Going further in the content analysis, we assessed how each candidate posted about specific sensible topics of the moment in Brazil: healthcare, unemployment, education, public security and social security.

Overall, the number of posts was well balanced among sensible topics, with two exceptions: employment was the most approached,

Table 2: Most Used Hashtags

Hashtag	Facebook	Twitter	Instagram	Total
1 #ADCOMUNICAÇÃO	217	1,786	1,025	3,028
2 #EQUIPEHM	17	2,811	15	2,843
3 #CHAMAOMEIRELLES	302	2,025	309	2,636
4 #ALVARODIAS	120	775	1,052	1,947
5 #CIRO12	397	721	312	1,430
6 #MEIRELLES15	110	1,205	88	1,403
7 #ALVARODIAS19	188	592	489	1,269
8 #VOTEMEIRELLES15	187	898	170	1,255
9 #BOULOSESONIA	622	39	474	1,135
10 #BOULOSESONIA50	459	133	442	1,034
11 #PSOL2018	592	29	382	1,003
12 #VAMOSSEMEDO	547	28	399	974
13 #PSOL	445	26	377	848
14 #EQUIPEJA	28	789	9	826
15 #CHAMAOMEIRELLES15	68	681	75	824
16 #GERALDO45	316	239	226	781
17 #VEMCOMJOÃO30	184	449	61	694
18 #EQUIPEGA	376	109	196	681
19 #AOVIVO	462	157	5	624
20 #PREPARADOPARA0BRASIL	211	137	211	559
21 #HADDADPRESIDENTE	235	125	112	472
22 #VAMOSRENOVARTUDO	33	391	46	470
23 #VOTEMARINA18	127	174	169	470
24 #CIROPRESIDENTE	169	168	132	469
25 #CHAMAOMEIRELLES		423		423
26 #CIROSIM	106	197	77	380
27 #ELEICOES2018	59	169	119	347
28 #GERALDOPRESIDENTE	65	53	226	344
29 #VAMOS2018	194	125		319
30 #VOTE13	145	80	86	311

while the urgent and necessary reform of social security was almost forgotten, as shown in Figure 3 and Figure 4.

Analysis indicates that the main candidates, Jair Bolsonaro and Fernando Haddad, posted little about sensitive topics. Fernando Haddad focused on education and employment, and Bolsonaro on corruption, public security, education and the economy. On extremes, Alvaro Dias focused mainly on corruption, and candidates associated with economic liberalism (Geraldo Alckmin and Henrique Meirelles) focused on employment and the economy.

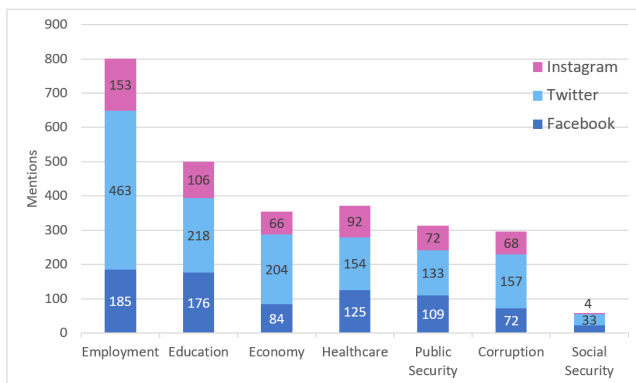


Figure 3: Total of posts about sensible topics

This result is partially compliant with [2], which concluded that “campaigns wanted to retain control ... by posting information on a small number of non-controversial subjects”, and [22], which

presented that “campaign debates have been focused on campaign slogans and on the candidates rather than their political program”. In fact, the analysis of hashtags indicates a focus on campaign slogans. But the analysis of sensitive words indicates that some less expressive candidates are more willing to discuss sensible topics, while the main candidates avoid these subjects. The exception is the very sensible topic of social security, with very few mentions.

5.3 RQ2: How did citizens interact with official profiles of candidates in 2018?

This research question aims to identify how citizens interacted with official profiles in two ways: (i) by the number of followers in each social network, and (ii) by the reach of posts issued by each candidate, as a means to measure their impact and ability to mobilize voters. We collected the number of candidates’ followers on two periods: the first day of the campaign and election day. We were unable to use the number of followers in January because some candidates were not yet considered then (i.e., Fernando Haddad) and we did not collect data about them. Also, we performed quantitative analysis on the number of citizens’ interactions (likes, shares/retweets and comments) of posts that the candidates made since January.

The number of followers of candidates’ accounts increased from 21 million on the first campaign day to 30 million on the last campaign day, an increase of 43%. Instagram presented the highest increase rate (147%), followed by Facebook (34%) and Twitter (16%). Ciro Gomes (135%) and João Amoêdo (128%) received the most noticeable general increase in followers, while the president elect, Jair Bolsonaro, increased his number of followers by 49% and Fernando Haddad by 67%. Also, most noticeable network-specific increase occurred on Instagram: João Amoêdo (326%), Fernando Haddad (282%), Ciro Gomes (230%) and Jair Bolsonaro (143%). This data suggests the beginning of a behavior change in Brazil, with people who use Instagram becoming more interested in political content. Table 3 presents the detailed data. Followers of João Goulart Filho on Instagram and Twitter was not collected due to technical problems.

Candidates’ posts generated 291 million interactions, corresponding to 142.6 million on Facebook (49%), 32.7 million on Twitter (11%) and almost 116 million on Instagram (40%). Considering performance by social network, it is evident that Facebook is the social network with the most impact, followed by Instagram and then Twitter. Despite the higher number of posts on Twitter, as indicated in Section 4.2, the performance of all candidates was very low on this social network, obtaining a maximum of 20% interactions. Moreover, two candidates performed better on Instagram: Jair Bolsonaro and Ciro Gomes. All other candidates performed better on Facebook. Nevertheless, the fact that the first and third most voted-for candidates performed better on Instagram supports the previous assumption that Instagram may be gaining greater relevance in the political context in Brazil. Detailed data is shown in Table 4.

From these 291 million interactions, 194 million (67%) was made during the campaign, as illustrated in Figure 5 (which shows the total number of interactions in both periods). From this data we can observe that (i) the impact of candidates Fernando Haddad (92%), Ciro Gomes (87%), and Eymael (75%) mainly occurred during the

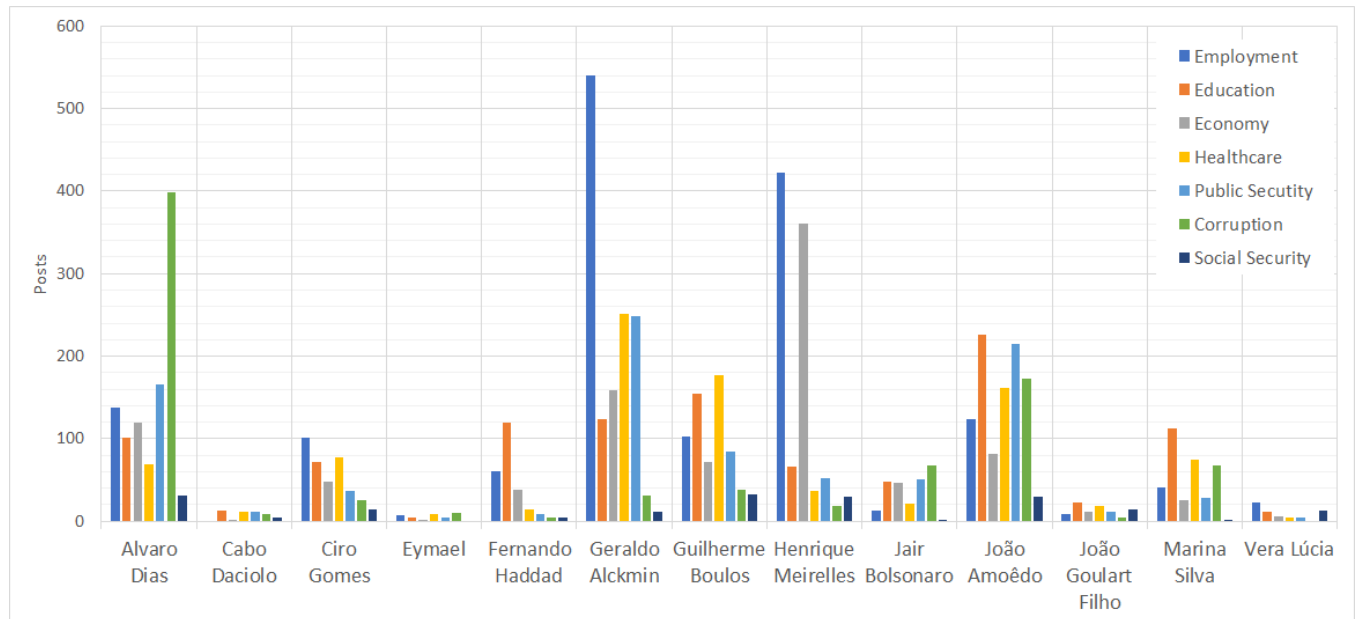


Figure 4: Posts about sensible topics, detailed by candidate

Table 3: Followers in the Beginning and End of the Campaign

	Beginning of Campaign - August 16				End of Campaign - October 6				Increasing Rate			
	Facebook	Twitter	Instagram	Total	Facebook	Twitter	Instagram	Total	Facebook	Twitter	Instagram	Total
Alvaro Dias	1,154,175	353,671	34,032	1,541,878	1,189,736	358,484	53,567	1,601,787	3%	1%	57%	4%
Cabo Daciolo	220,595	54,357	161,158	436,110	405,137	99,830	295,977	800,944	84%	84%	84%	84%
Ciro Gomes	318,175	198,944	179,927	697,046	672,327	376,030	594,619	1,642,976	111%	89%	230%	136%
Eymael	13,465	22,036	1,319	36,820	22,716	23,757	2,170	46,473	69%	8%	65%	26%
Fernando Haddad	364,882	617,853	111,124	1,093,859	691,049	711,891	424,418	1,827,358	89%	15%	282%	67%
Geraldo Alckmin	933,559	970,833	119,134	2,023,526	1,106,053	991,959	137,874	2,235,886	18%	2%	16%	10%
Guilherme Boulos	345,237	98,287	140,817	584,341	520,523	163,586	260,821	944,930	51%	66%	85%	62%
Henrique Meirelles	198,235	54,393	21,018	273,646	249,672	65,896	31,328	346,896	26%	21%	49%	27%
Jair Bolsonaro	5,496,048	1,265,397	1,596,822	8,358,267	6,995,358	1,606,036	3,886,599	12,487,993	27%	27%	143%	49%
João Amoêdo	1,399,838	110,658	147,602	1,658,098	2,932,508	220,645	628,153	3,781,306	109%	99%	326%	128%
João Goulart Filho	5,469	-	-	5,469	17,099	-	-	17,099	213%	0%	0%	213%
Marina Silva	2,331,855	1,877,026	108,419	4,317,300	2,386,091	1,905,002	155,484	4,446,577	2%	1%	43%	3%
Vera Lúcia	16,680	489	632	17,801	23,729	1,815	1,129	26,673	42%	271%	79%	50%
Total	12,798,213	5,623,944	2,622,004	21,044,161	17,211,998	6,524,931	6,472,139	30,206,898	34%	16%	147%	44%

Table 4: Number and Rate of Interactions in Each Network

Candidate	Facebook	FB%	Twitter	TT%	Instagram	IG%	Total
Alvaro Dias	1,847,192	51%	462,932	13%	1,280,210	36%	3,590,334
Cabo Daciolo	3,743,816	78%	351,352	7%	676,601	14%	4,771,769
Ciro Gomes	7,510,919	33%	3,914,286	17%	11,063,266	49%	22,488,471
Eymael	231,409	91%	17,963	7%	3,593	1%	252,965
Fernando Haddad	9,397,914	48%	2,218,716	11%	7,954,733	41%	19,571,363
Geraldo Alckmin	3,750,337	62%	573,458	9%	1,745,166	29%	6,068,961
Guilherme Boulos	6,863,614	41%	3,252,681	20%	6,554,500	39%	16,670,795
Henrique Meirelles	2,545,814	83%	223,011	7%	280,404	9%	3,049,229
Jair Bolsonaro	68,513,894	43%	16,429,951	10%	74,924,710	47%	159,868,555
João Amoêdo	31,880,171	71%	4,151,272	9%	8,624,668	19%	44,656,111
João Goulart Filho	103,572	85%	5,700	5%	11,951	10%	121,223
Marina Silva	6,226,585	63%	1,087,872	11%	2,624,265	26%	9,938,722
Vera Lúcia	94,735	93%	5,908	6%	1,749	2%	102,392
Total	142,709,972	49%	32,695,102	11%	115,745,816	40%	291,150,890

campaign, while other candidates, such as the elected Jair Bolsonaro (64%), started their campaign and mobilized their network before. It is also important to highlight the results of Alvaro Dias, whose campaign interactions were only 39% of the total. This finding is explained by the fact that he is already a senator, and his social media impact while in such an office was not very different from the impact during the campaign.

Furthermore, a common hypothesis regarding to relationship between interactions on social networks and received votes cannot be easily observed. Although the most voted candidate was also the one with more interactions on social media, the second candidate with the most interactions (João Amoêdo) only received the fifth most votes. This lack of direct correlation, but other correlations, are better presented and discussed in the next subsection.

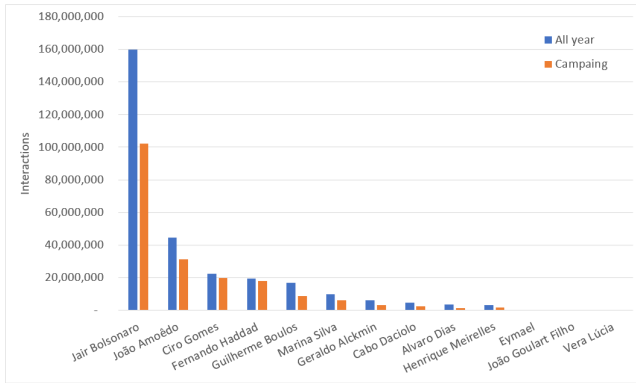


Figure 5: Interactions only during the campaign and throughout the entire year

We also analyzed the rate of interactions by each candidate’s post, as shown in Figure 6. This data indicates that for the most prominent candidates, the impact of a post on Instagram is higher than any other type of post; that is, although the use of Facebook was higher than any other social media platform, Instagram is more effective.

Also, an unexpected result was the interaction rate of Cabo Daciolo. He was the candidate with fewer number of posts (as shown in Figure 1), but he received the second best interaction rate by post. This outcome can be explained by the fact that Daciolo was identified as a “comic candidate”. Most of his posts were also humorous; people used to view his posts as a pleasant escape from the extremist duality observed in the election period and many of them became “memes”.

5.4 RQ3: Is there a correlation between social media performance and votes received by candidates?

Table 5 presents number of votes received by each candidate during the first round of elections. A correlation analysis was performed in order to calculate the relationship among all studied variables and the number of votes. Table 6 presents the Pearson correlation coefficient (PCC) of each of them.

Regarding the candidates’ behavior, we found absolutely no correlation between the number of posts on social networks and the number of votes that were received. In fact, the first and second most voted-for candidates were only ranked seventh and eighth in number of posts issued. In addition, there is a very small negative correlation between mentions of sensitive topics, such as employment and social security, and vote performance. This data reinforces existing theories that it is preferable to focus on campaign slogans and non-controversial subjects [2][22]. It is important to highlight that the stronger correlation related to sensitive topics, even though it is not statistically significant, was a negative correlation with one of the most sensitive topics in Brazil: social security.

Regarding citizens’ interactions, strong correlations between the number of followers and votes, as well as interactions and votes, were found. Regarding followers, despite the higher number of

Table 5: Number of votes received by each candidate

Candidate	Votes
Jair Bolsonaro	49,276,990
Fernando Haddad	31,342,005
Ciro Gomes	13,344,366
Geraldo Alckmin	5,096,349
João Amoêdo	2,679,744
Cabo Daciolo	1,348,323
Henrique Meirelles	1,288,948
Marina Silva	1,069,577
Alvaro Dias	859,601
Guilherme Boulos	617,122
Vera Lúcia	55,762
Eymael	41,710
João Goulart Filho	30,176
Total	107,050,673

followers on Facebook, the strongest correlation was found with number of followers on Instagram and the weaker correlation was found with followers on Twitter. In addition, the rate of followers’ increases was not significant, probably because for minor candidates, just a few new followers have a big impact on this number.

Table 6: Pearson Correlation Coefficient between Variables and Received Votes

Independent Variable	PCC	Independent Variable	PCC
Posts on Facebook	0.01127	Followers on Facebook	0.72046
Posts on Facebook during campaign	0.09422	Followers on Twitter	0.53266
Posts on Twitter	-0.10526	Followers on Instagram	0.86044
Posts on Twitter during campaign	-0.09839	Total Followers	0.78086
Posts on Instagram	-0.05281	Followers difference - begin/end campaign	0.79645
Posts on Instagram during campaign	0.00989	Followers difference - begin/end campaign - in %	-0.01545
Sum of posts in all networks	-0.07971	Interactions on Facebook	0.78173
Sum of posts in all networks during campaign	-0.05463	Interactions on Facebook during campaign	0.78605
Mentions to Employment	-0.17218	Interactions on Twitter	0.84239
Mentions to Education	-0.01284	Interactions on Twitter during campaign	0.86459
Mentions to Economy	-0.12212	Interactions on Instagram	0.86629
Mentions to Healthcare	-0.21736	Interactions on Instagram during campaign	0.88144
Mentions to Public Security	-0.14406	Sum of interactions in all networks	0.83923
Mentions to Corruption	-0.10419	Sum of interactions in all networks during campaign	0.86387
Mentions to Social Security	-0.39742	Average interactions by post	0.85055
		Average interactions by post during campaign	0.84741

In the same way, we found a strong correlation between citizens’ interactions on social networks and received votes, almost all higher than 0.8. The main correlations are the number of interactions on Instagram during the campaign period, followed by the total number of interactions on Instagram since beginning of the year. This data reinforces previous discussions indicating that Instagram is gaining relevance in the political context and is already outperforming Facebook.

Despite the high PCC, it was not possible to find a linear model to describe election results based on number of followers or the increase of followers during campaign. By applying linear regression on these data, using all attributes individually and evaluating on the (all) training set, the best model encountered is:

$$V = 12.4984 * I + 2,012,231.8$$

V = votes received; I = number of followers on Instagram on elections day.

However, this model is far from a reasonable model, with a relative absolute error (RAE) and root relative square error (RRSE) of 42% and 50%, respectively. Statistically, although the results show

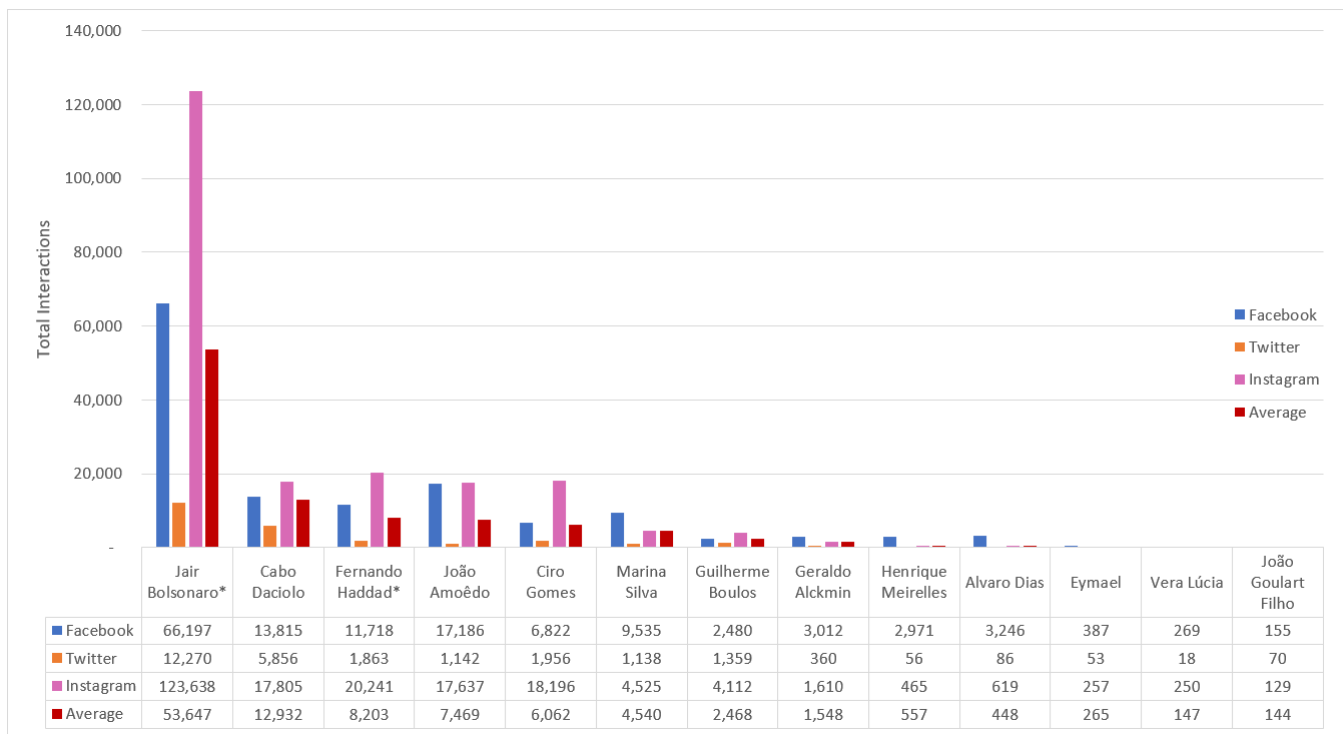


Figure 6: Rate of interactions by each candidate’s post

a correlation between these variables, this model is not better than chance, and other methods must be tested.

In addition, it was also not possible to describe election results by applying linear regression on interactions’ data. By applying linear regression using all presented attributes and evaluating on the (all) training set, the best model is:

$$V = 0.8917 * I + 2,171,208.6$$

V = votes received; I = number of interactions on Instagram during campaign.

This model is also very far from reasonable, with relative absolute error (RAE) and root relative square error (RRSE) of 38% and 47%, respectively. This analysis indicates that, despite finding high correlations between citizen engagement on candidates’ social media profiles, further studies are needed to create a model to describe these relations.

6 SUMMARY OF CONCLUSIONS AND FUTURE WORKS

This paper presented a study on the relationship between social media and the electoral performance of candidates running in the Brazilian presidential election in 2018 by analyzing how candidates used their social media profiles and the ways in which citizens interacted with them. Moreover, we tried a new approach to find a correlation between candidates’ social media performance and votes received by using metrics from the three major social networks: Facebook, Twitter and Instagram. For this effort, we collected data about all 44,263 posts from candidates within these networks from

January 1, 2018, to October 6, 2018, election day. This study is novel in that it combines metrics from the three major social networks, which contrasts most studies that focused only on Twitter data.

Regarding “RQ1: How did candidates use their social media in 2018?,” we can summarize the findings as: (i) the candidates used social media very heavily, with an average of 4.3 posts every day in each platform, totaling 12.9 posts per day; (ii) the main hashtags that were used were identification of a post as a “team post”, or campaign slogans; (iii) the most used words were engaging words, the ex-president Lula was frequently cited, and sensitive topics (e.g., employment, education and healthcare) are not prominent; (iv) one candidate focused on posts about corruption and economic liberalists focused on employment, but the candidates who received the most votes avoided posts about such sensitive issues.

Considering “RQ2: How did citizens interact with official profiles of candidates during the year and during the campaign?,” we can resume our conclusions that: (i) Instagram users are increasing the attention given to political content. During the campaign, the rate at which the number of followers increased was 147%, while on Facebook it was 34% and on Twitter only 16%; (ii) most interactions occurred on Facebook, just because there were more posts in this social network. However, considering reactions by post, Instagram was more relevant for all main candidates, even with less followers; (iii) although Twitter was the most used network for posting, its impact was very low; (iv) some candidates’ performance was very concentrated on the campaign period (including the candidate who received the second highest number of votes), while others (i.e., the candidate who was elected) got citizens’ attention early.

Finally, for “RQ3: Is there a correlation between social media performance and votes received by candidates?,” the statistical analysis found that: (i) there were no correlations between received votes and number of posts; (ii) there was a very small negative correlation with regard to posts about sensitive topics; (iii) there was a strong correlation with respect to the number of followers, especially on Instagram and (iii) there were strong correlations with all variables related to interactions with posts, mainly interactions with posts on Instagram, both in the elections period and all year; and (iv) despite strong correlations, further studies are necessary in order to create a model to describe these relations.

In terms of future work with the objective to effectively forecast electoral results, we can point to the development of a specific model to analyze political data by including new datasets, such as campaign pools and demographic data, and performing domain driven data mining (D3M). Further, as this study can only draw conclusions about one election that occurred in Brazil, future work is suggested to replicate this study with data from other elections around the world, such as the general elections in Argentina, Bolivia and Uruguay scheduled to October 2019.

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