The impact of bots on human communication patterns in online activism

Keywords: political communication, bots, social media, information cascades, collective action

Extended Abstract

Social bots are becoming a significant element in influencing political participation and communication on social media as automation becomes more prevalent. It was estimated that in some political events like the 2016 U.S. presidential election and the Brexit referendum (Bastos & Mercea, 2019; Keller & Klinger, 2019), about 10% to 40% of all tweets were generated by automated users. The high amount of hyper-partisan or inflammatory messages generated by bots could have a significant influence on political processes by their potential ability to shape public opinion. However, only a few previous studies investigated bots' specific behaviours and strategies and their influence on human behaviour on social media platforms during political events (González-bailón & Domenico, 2018; Stella et al., 2018a). Furthermore, most of those studies focused on institutionalised political events like elections and referendums, while only a limited number of those examined the role of bots in activism-related discussions. However, collective action is also a very essential component of political processes that shapes modern-day democracy (Freelon et al., 2018; Jennings & Saunders, 2019), and modern day contentious politics rely on social media as an important tool for information diffusion and protest mobilisation (Bastos et al., 2015; Jost et al., 2018).

As such, our research attempts to identify, describe and understand automated agents (social bots) in the protest-related discourse on Twitter from a computational social science perspective. We aim to answer two questions: a) what are the actions of social bots on Twitter in protest communication? b) What are the effects of these bot activities on human behaviour in political communications? To answer these questions, we used data from Twitter discourse related to the case of Extinction Rebellion (XR) in 2019. Extinction Rebellion (XR) is a UK-originated, grassroots-originated worldwide anti-climate change that used Twitter as one of the main platforms of their campaign and organisation.

With a self-trained random forest-based model, we found a significant number of (54%) users showed bot-like behaviour in the XR Twittersphere (66,160 out of 122,130 users). Roughly 34% of the tweets were generated by bots in our dataset, and this figure remained similar for each topic. The activities of bots were predominately (31% out of 34% of all tweets by bots) posting original messages or retweeting each other, and only a small proportion of the tweets by bots (3% out of 34%) were reposting messages by human-like users. Human-like users, at the same time, spread more messages (16% out of the total 66%) produced by bot users than vice versa.

Further examination of the tweets demonstrated that bots were creating information cascades on Twittersphere, hence diverting human attention. As for the content of the discussion, we identified seven distinct topics related to XR protests on Twitter. Topics are associated with news events, political campaigns or outbursts of sentiments (e.g. climate change denial) about the protests. We identified four information cascades in those topics, and examined which

could be used to predict which for the number of tweets by bots and humans with granger causality test (Figure 1). In three of those four cascades, the number of tweets by bots during those cascades could be used to predict the number of tweets by humans after introducing a 30 or 35 minutes time lag. One of those cascades, however, was created by humans and caught bots' attention after 6-time lags (30 minutes). Bots and their strategies successfully diverted human attention and therefore created information cascades online.

DiD models show that compared to the matching group, our sample's sentiment of their tweets related to XR became more extreme in the next 30 days after interacting with bots. Furthermore, users interacted with botsposted less than the matching group about the protest in the next month (Figure 2 and Figure 3). This was done with a matching method and Difference-in-Difference (DiD) regression methods. We first filtered out users who directly commented on or quoted a bot's tweet in our dataset, and created a matching group of users with similar profile metrics and who were active at the same time but did not interact with bots. In other words, the effect of bots' activities on human behaviour on the Twittersphere and potentially during political processes is prolonged.

Overall, these results added to the burgeoning literature of social bots, political communication and contentious politics by shedding light on the descriptive traits and their impact on communication in the realm of online protests. Our findings that social bots generated information cascades is coherent with existing studies (Stella et al., 2018). We also measure and quantify the impact of those cascades with empirical data, both immediately and in the long run. Those results suggest that automated agents have the potential to shape political communication and the public sphere with their actions, which have profound theoretical and practical implications.

References

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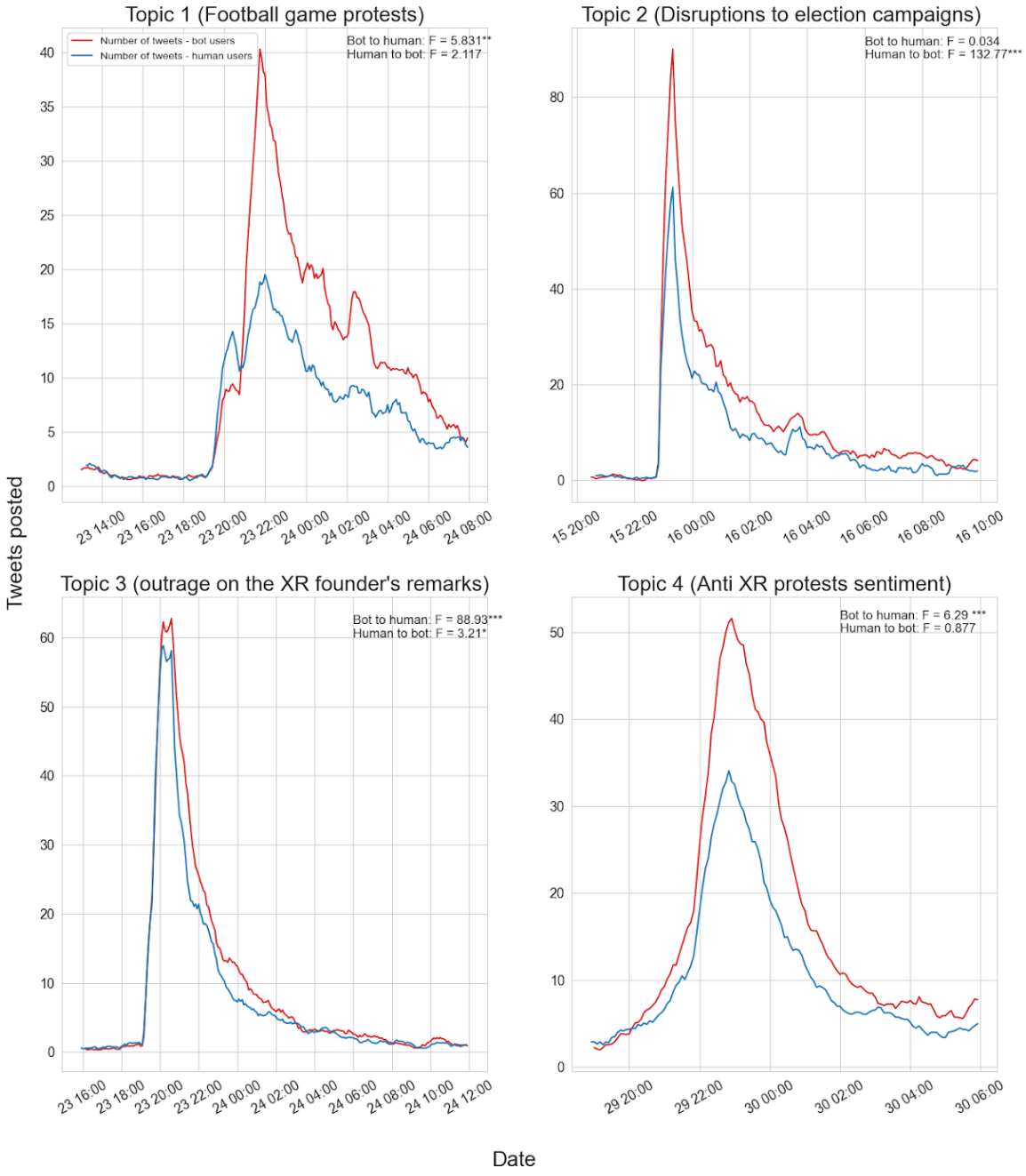

Figure 1. Number of tweets posted by bots (red line) and humans (blue line) in the four cascades identified. The numbers are rolling average of 12 windows aggregated on 5-minute windows. *:p<0.05; **: p<0.01; ***: p<0.001.

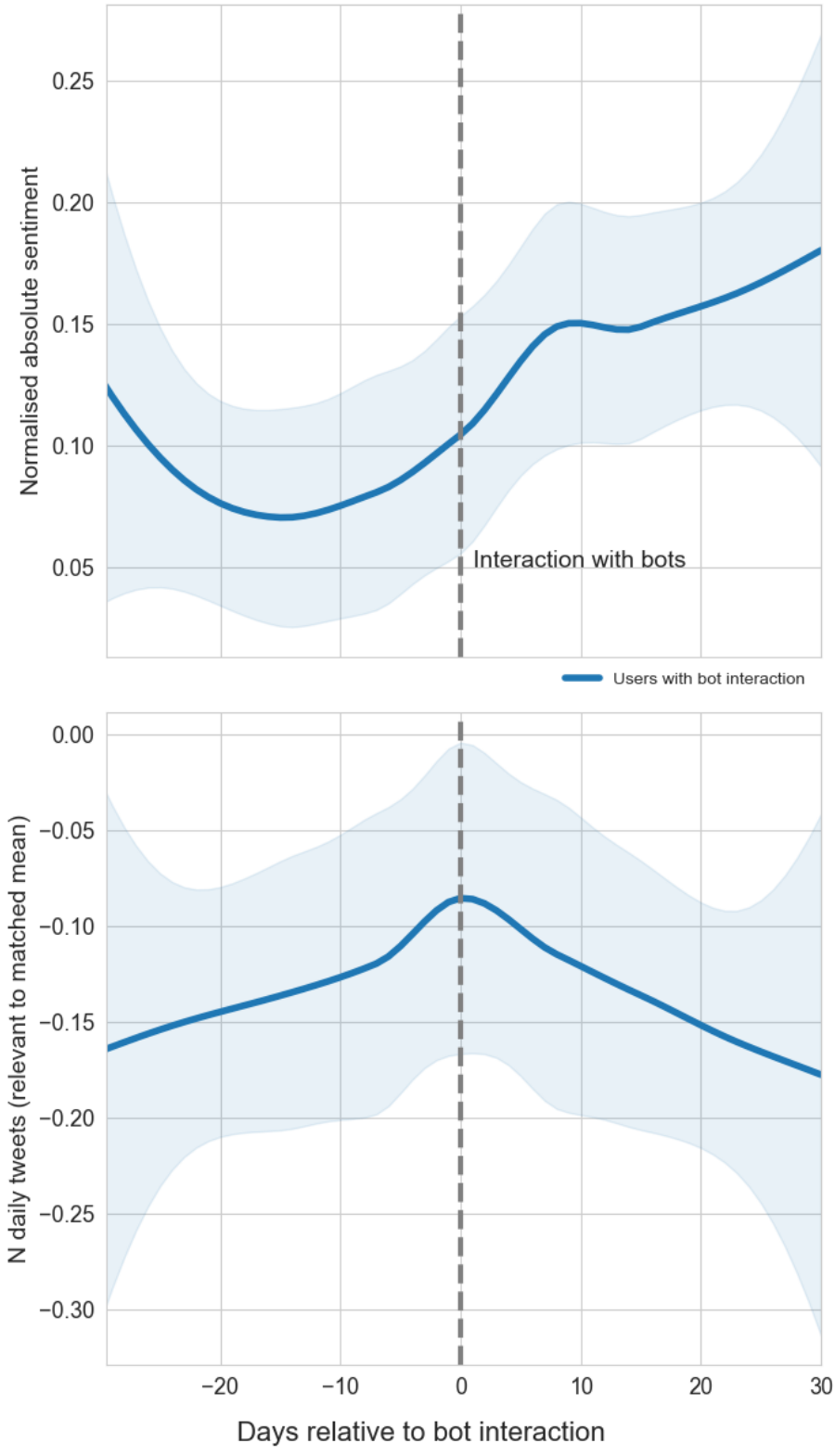

Figure 2. Average absolute sentiment (above) and number of daily tweets by sample group (relevant to matched mean, lowess smoothed).

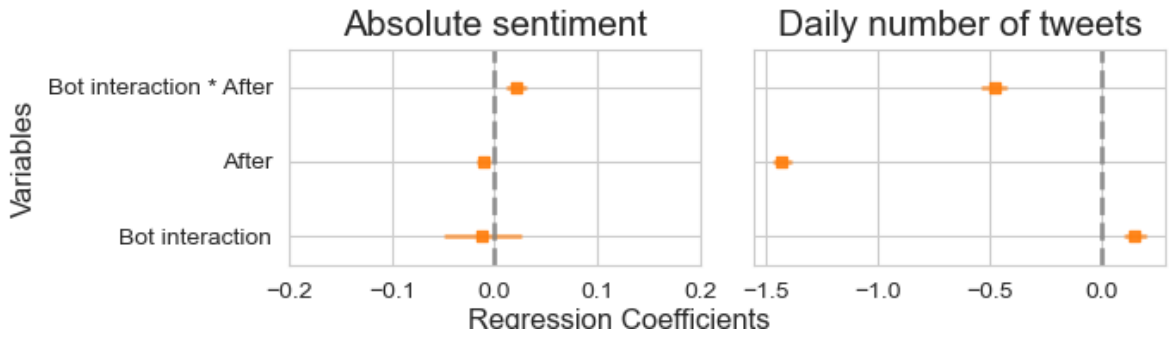

Figure 3. Regression coefficients of the Difference-in-Difference models of bot interaction's effect on sentiment and tweeting frequency.