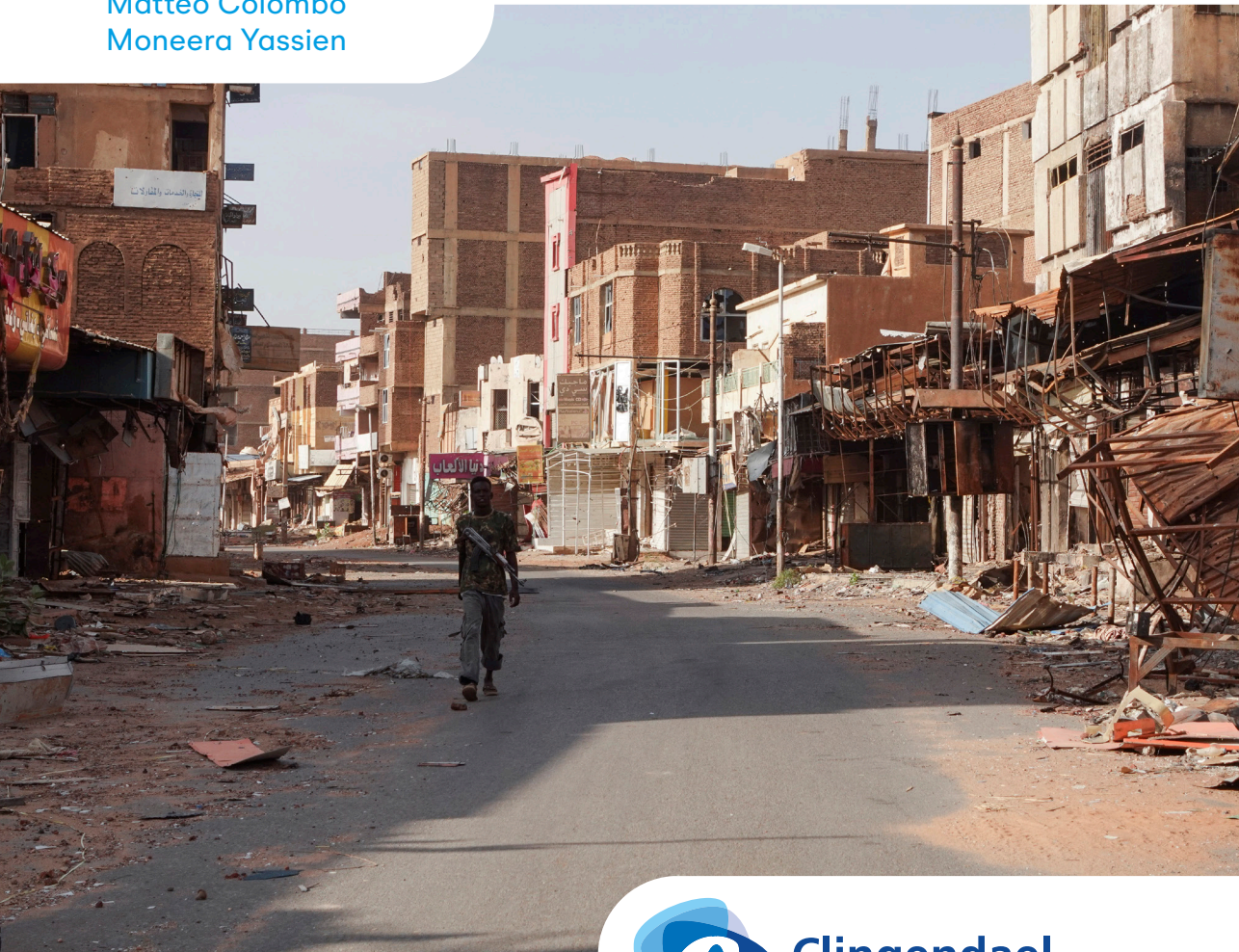


Storm Over the Nile

Understanding the Arabic Twitter Discussion on the Civil War in Sudan

Matteo Colombo
Moneera Yassien

CRU Report



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Abstract

This research explores how the Sudanese conflict between the Sudanese Armed Forces (SAF) and the paramilitary Rapid Support Forces (RSF) has been discussed on Arabic-speaking X (previously known as Twitter), focusing on the extent and causes of polarization, the participation of bots, and the involvement of Sudanese and non-Sudanese users. The study analyses 139,487 tweets collected from April 2023 to the end of the year, manually coding a training set of randomly extracted 900 tweets. Machine learning techniques, particularly a neural network with GPT-4 embeddings, were employed to categorize the tweets into several topics and identify user origins and bot activity. Findings reveal that the X discourse on the Sudanese conflict is highly polarized, with users divided into pro-SAF, pro-RSF and pro-peace camps. Support for the RSF decreased over time, while pro-peace sentiments increased, highlighting a growing awareness of the conflict's impact on civilians. Polarization is primarily driven by Sudanese users, who constitute 77.6 per cent of the identified accounts, while non-Sudanese users view the conflict through the lens of their own geopolitical interests. Bots account for 10.9 per cent of the total tweets, aligning with political agendas of Gulf countries, but their influence does not significantly alter the overall discourse trends. The study underscores the need for an alternative narrative on social media to strengthen the chances of a peaceful resolution of the conflict, focusing on empowering the active role of Sudanese civil society in shaping the narrative. The methodology also provides a replicable framework for analysing polarization in civil conflicts, offering insights into the dynamics of online discourse and the potential for machine learning in such studies.

Introduction

In the spring of 2019, Sudanese citizens took to the streets to demand political change, leading to the ousting of the autocratic ruler Omar al-Bashir. In the following months, a transitional government was established, incorporating both civilian and military elements. This significant political shift resonated widely throughout the MENA region. On the one hand, the civil society movement inspired new hope for other Arabs seeking political change. On the other, the prospect of a larger military involvement in politics and the end of a political regime that had hosted prominent Islamists was welcomed by governments in the Gulf and Egypt and their supporters as it marked yet another setback for their main political rival: political Islam. In October 2021, a military coup unseated the transitional government, ending the complex cohabitation between civilians and the military. Against this background, supporters of the political role of the army at the regional level welcomed this new development. Finally, the outbreak of violent conflict between the former allies – the Sudanese Armed Forces (SAF) led by Abdel Fattah al-Burhan and the paramilitary Rapid Support Forces (RSF) of Mohamed Hamdan Dagalo, known as ‘Hemetti’ – in April 2023 also resonated beyond Sudanese borders.

While the conflict centres on two fighting parties, it also reflects an intra-Arab rivalry, with the UAE aiming to increase its influence through Hemetti and Egypt trying to maintain its historical role in Sudan by supporting al-Burhan. This divide extends beyond Sudan and is evident in the broader Arabic-speaking online information environment, where social media significantly impacts both internal and external polarization. The values at stake in the Sudanese civil conflict resonate with wider Arab populations, where ideological divides, such as the role of political Islam and the military, hold significance. Consequently, segments of public opinion may polarize and radicalize along these ideological lines, prompting governments to intervene out of concern for potential spillover effects. For example, the war in Syria resonated regionally, highlighting cleavages like Islamism and Kurdish nationalism and prompting calls for intervention, such as from Turkish nationalists to prevent the emergence of a Kurdish state-like entity in Syria. Similarly, the conflict in Sudan has reactivated these ideological fault lines in Arabic online discussions, with the RSF and SAF advocating for a military-led government. The RSF opposes political Islam, while the SAF adopts a more Islamist-friendly stance.

Alongside the large Arabic X audience, Sudanese citizens are directly affected by the conflict and express their view on this social platform. Despite less than one-third of the population having internet access (28.7%),¹ politically engaged Sudanese citizens, express their views on social media platforms like X.² However, in a country where the GDP per capita at current prices is much lower than the African average (US\$ 546 compared with \$ 1,960),³ internet access is predominantly available only to the wealthier and more educated segments of society. Although small in number, this sector of society is particularly influential, as it has the capacity to critically reflect on ongoing events, organize, and challenge the status quo. Consequently, Sudanese authorities have attempted to restrict online discussions, viewing internet communication as a potential threat to public order. Between December 2018 and December 2022, Sudanese citizens endured 138 days of internet disruptions. Additionally, Sudan's legal framework restricts free speech and targets dissenters and opposition figures. Moreover, social media platforms have become arenas for foreign entities to orchestrate disinformation campaigns, promoting their allies in the military and influencing online discourse through state-sponsored bots.

To that extent, the ongoing conflict in Sudan serves as a practical case study for exploring the impact of transnational social media during civil conflict. This research focuses on understanding how the discussion about Sudan has evolved on X by examining the degree and causes of polarization, the participation of bots in online discussions, and the involvement of both Sudanese and non-Sudanese users. The aim is to determine whether this conflict has sparked polarization among relevant audiences within and outside Sudan, with potential effects on the virulence of the fights and the involvement of foreign powers in igniting the conflict. To achieve this goal, the study employs a mixed-method approach, incorporating Chat-GPT 4 based machine learning techniques and an analysis of a randomly extracted set of tweets from specific periods of time to identify the main patterns of the online discourse and its characteristics.

The research has both a context-specific and a general goal. Specifically, it aims to better understand whether the conflict has polarized the Arabic-speaking

1 Digital 2024, Sudan <https://datareportal.com/reports/digital-2024-sudan>.

2 Media Landscape, Sudan <https://medialandscapes.org/country/sudan/media/social-networks>.

3 GDP per capita, current prices. US dollars per capita, International Monetary Fund: <https://www.imf.org/external/datamapper/NGDPDPC@WEO/OEMDC/ADVEC/WEOWORLD>.

community, with a focus on the Sudanese one. This is an important finding because a polarized nation and relevant international audience could contribute to escalating the level of violence in such conflicts by paving the way for the involvement of neighbouring countries. It could also make the domestic audience more convinced that the only way forward is violence. Generally, it offers a replicable methodology to analyse polarization in civil conflicts. In this respect, the research seeks to gain valuable insights into the dynamics of polarization related to war events and to evaluate the effectiveness of machine learning techniques in this type of study.

Literature Review

Social media has increasingly become a transnational platform for dialogue about ongoing conflicts, shaping international public opinion. X, in particular, provided a prominent platform for political discussion, facilitating conversations across borders. These conversations often extend beyond their geographical confines, resonating with audiences in neighbouring countries and other regions. This phenomenon is especially pronounced in conflicts involving transnational values, identities and ideologies that resonate with users sharing specific identity markers. For instance, during the Syrian conflict, issues such as the political significance of Islamism, relations with Iran, the emergence of a jihadist state and the pursuit of Kurdish autonomy were widely discussed by non-Syrian social media users. Their opinions shaped the perception of the conflict both in their countries and internationally, arguably influencing their governments' stances towards the wars.

Online discussions can sometimes serve as unfiltered platforms for public opinion, providing relevant information and distorting perceptions of conflicts. On the one hand, social media allows users to express their opinions freely and without mediation, even in authoritarian contexts, thanks to anonymity and Virtual Private Network (VPNs). These tools were used widely in the Arab spring.⁴ Users can more freely express their true stances on social media than in surveys⁵ or other public settings as they can choose a nickname to prevent personal repercussions. On the other hand, social media can foster the emergence of echo chambers where like-minded users discuss their views without exposure to criticism, reinforcing their confirmation biases. In some cases, discussions among users with similar radical opinions lead to polarization, dividing them into different and often opposing camps. This is also due to the X algorithm learning from users' preferences, which results in showing content that reinforces their ideas and often includes extreme content, attracting a large amount of

4 Danju, I., Maasoglu, Y. and Maasoglu, N. 2013. 'From Autocracy to Democracy: The Impact of Social Media on the Transformation Process in North Africa'. *Procedia – Social and Behavioral Sciences*, 81, 678-681.

5 Nagler, J. and Tucker, J. A., 2015. 'Drawing Inferences and Testing Theories with Big Data'. *PS: Political Science & Politics*, 48 (1), 84-88.

user attention. Additionally, governments are increasingly involved in spreading disinformation to fit their narratives and garner support for their actions.⁶

Polarization is a social phenomenon in which group members adopt more extreme and uncritical positions on an issue after engaging in like-minded discussions. This concept has been widely discussed in academic debates. Cass Sunstein's influential work identified online information cocoons created by like-minded individuals as a key mechanism behind group polarization.⁷ This phenomenon can impoverish public discourse by oversimplifying it and ultimately hinder efforts to find a middle ground.⁸ However, the relationship between online and offline polarization remains debated. Some authors argue that online radicalization does not often translate into offline violence.⁹ Others contend that online group polarization influences offline events, such as political elections, referendums, civil unrest and other emotionally charged occurrences.¹⁰ Social media can amplify the discontent generated by these events. For instance, the polarization associated with the gun control debate in the US intensifies whenever a mass shooting occurs.¹¹ The climate of conflict, distrust and social malaise generated by these events strengthens beliefs and pushes people to take sides.¹²

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- 6 Jones, M. O. 2019. 'Propaganda, Fake News and Fake Trends: Weaponization of Twitter Bots in the Qatar Gulf Crisis', *International Journal of Communication*, (13), 1-26.
 - 7 Sunstein, C. R. 2002. 'The law of group polarization', *Debating Deliberative Democracy*, University of Chicago Law School, 80-101; Sunstein, C.R. 2002. 'Why They Hate Us: The Role of Social Dynamics', *Harvard Journal of Law & Public Policy*, 25(2), 429-440.
 - 8 Balcells, J. and Pedro-Solanet, A. 2016. 'Tweeting on Catalonia's Independence: The Dynamics of Political Discussion and Group Polarisation'. *Medijske Studije*, 7(14), 124-141.
 - 9 Whittaker, J. 2023. 'Rethinking Online Radicalization'. *Perspectives on Terrorism*, (16/4), 71-84.
 - 10 Del Vicario, M. et al. 2017. 'Modeling confirmation bias and polarization', *Scientific Reports*, 7(1); Park, Y. J. and Yang, G. S. 2017. 'Personal network on the Internet: How the socially marginalized stay marginalized in personal network diversity and multiplicity', *Telematics and Informatics*, 34 (1), 1-10; Primario, S. et al. 2017. 'Measuring polarization in Twitter enabled in online political conversation: The case of 2016 US presidential election', 2017 IEEE International Conference on Information Reuse and Integration (IRI).
 - 11 Garimella, K. et al. 2018. 'Political discourse on social media', *Proceedings of the 2018 World Wide Web Conference on World Wide Web - WWW '18*.
 - 12 Borge-Holthoefer, J. et al. 2015. 'Content and network dynamics behind Egyptian political polarization on Twitter', *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*; Gruzd, A. and Roy, J. 2014. 'Investigating political polarization on Twitter: A Canadian perspective', *Policy & Internet*, 6(1), 28-45; Romenskyy, M. et al. 2018. 'Polarized Ukraine 2014: Opinion and territorial split demonstrated with the bounded confidence XY model, parametrized by Twitter data', *Royal Society Open Science*, 5(8).

Moreover, polarization results not only from bottom-up dynamics but also from external agendas mingling with ongoing online discussions. External triggers of polarization include various sources that inject divisive content into cyberspace. These contents are commonly spread by partisan media and biased elites who contribute to polarization by posting divisive stories and arguments.¹³ Through biased narratives and strategic hyperlink connections, these sources can present versions of facts that reinforce the beliefs of their targeted audience and monetize the online traffic generated by public reactions.¹⁴ Biased content spreads from influential nodes through an intermediate layer of not necessarily biased sources, ultimately magnifying visibility.¹⁵ Sometimes, provocative content is injected through fake accounts impersonating real users via spam and trolls.¹⁶

This discussion on polarization is particularly relevant for those conflicts where fighting sides represent ideas, visions or camps that hold significant value for external audiences. Online content can bolster a virulent narrative by highlighting crimes committed by one of the sides. When users are trapped in a confirmation bias echo chamber, it further polarizes them. This polarization can escalate the conflict, as people perceive an existential threat and view the enemy as an absolute, necessitating defence.¹⁷ Additionally, it can lead to external audiences radicalizing and pressurizing their governments to intervene in the conflict. It is therefore crucial to examine whether the conflict there is polarized and, if so, in what ways.

13 Iyengar, S. and Hahn, K. S. 2009. 'Red media, blue media: Evidence of ideological selectivity in media use'. *Journal of Communication*, 59(1), 19–39.

14 Luo, Y. and Liang, H. 2013. 'A Dialogue with Social Media Experts: Measurement and Challenges of Social Media Use in Chinese Public Relations Practice', *Global Media Journal*, 5 (2), 57-74; Messing, S. and Westwood, S. J. 2012. 'Selective exposure in the age of Social Media', *Communication Research*, 41(8), 1042–1063.

15 Guerra, P. et al. 2021. 'A measure of polarization on social media networks based on community boundaries', *Proceedings of the International AAAI Conference on Web and Social Media*, 7(1), 215–224; Morales, A. J. et al. 2015. 'Measuring political polarization: Twitter shows the two sides of Venezuela', *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 25 (3).

16 Bail, C. A. et al. 2019. 'Assessing the Russian Internet Research Agency's impact on the political attitudes and behaviors of American twitter users in late 2017', *Proceedings of the National Academy of Sciences*, 117(1), 243–250.

17 Juergensmeyer, M. 2016. *Terror in the Mind of God. The Global Rise of Religious Violence*. Berkeley/Los Angeles/London: University of California Press.

Methodology

This study analyses the Sudanese conflict through X discourse, using a combination of machine learning predictions and manually coded data. The first step pertains to collecting tweets, which includes a set of keywords relevant to the Sudanese conflict (see *Table 1 in Appendix*). This resulted in 175,000 tweets, collected in five intervals of 35,000 tweets each, spanning from the war's outbreak on 15 April 2023 to 30 December 2023. These intervals, which occurred every two months from 30 June onwards, allowed for the randomization of the data and the identification of differences in the X discussion over time. Subsequently, this database underwent filtering to eliminate content irrelevant to the discussion on Sudan, resulting in a final database of 139,487 tweets. From this database, 900 tweets were randomly selected and manually coded across 13 categories, forming the training set for the machine learning model. The findings discussed in this study are based primarily on the model's predictions, supported by illustrative examples from the training set.

The manual coding process involved classifying each tweet according to prevalent topics (one or more) and to identify whether the tweets were written by Sudanese or non-Sudanese users, distinguishing between bot-generated and human user content, and discerning between off-topic content and that related to Sudan.

The manually coded categories pertaining to the prevalent topics of the tweets are:

Pro-RSF/anti-RSF: Tweets expressing support for or opposition to the RSF

Pro-SAF/anti-SAF: Tweets expressing support for or opposition to the SDF

Pro-peace: Tweets opposing the current conflict and advocating for an end to violence and a civilian government

Pro-war: Tweets supporting the continuation of the war to secure victory for one of the parties involved

Geopolitics: Tweets suggesting a connection between the ongoing conflict in Sudan and one or more regional actors

Pro-civilian: Tweets expressing concerns about crimes against civilians

Anti-civilian: Tweets expressing support for the current violent operations

Anti-polarization: Tweets advocating for a peaceful resolution of the current conflict

Not about Sudan: Tweets that do not refer to Sudan.

Those related to the identity of the users are:

Likely a bot: Tweets likely shared by non-human users

Likely not a bot: Tweets likely shared by human users

Sudanese user: Tweets likely shared by Sudanese users

Non-Sudanese user: Tweets likely shared by non-Sudanese users.

The data for the first nine categories were estimated using a machine-learning model through a two-step training process. First, tweet embeddings were generated – these are vectors representing the meaning of each tweet. Next, a neural network was trained based on these tweet representations. For each category, a specific classifier neural network was trained using the manually coded dataset of 900 tweets to classify them as pro, anti or neutral. GPT-4 embeddings were used because of their better performance in capturing the semantic nuances of text compared to the alternatives. The models were evaluated based on their F1-scores (the harmonic mean of precision and recall) to account for class imbalance, using five-fold stratified cross-validation on 765 training tweets with 135 left for testing. This approach provided accuracy and confidence scores for each category, allowing us to predict the model's performance on the rest of the tweets and exclude categories that could not be accurately estimated (see *Table 2*). Overall, the neural network using GPT-4 embeddings achieved an average F1 score of 76 per cent on the test set. Based on these results, the trained models were used to automatically code the rest of the tweets.

The implemented methodology has certain limitations. First, it is important to emphasize that this study provides a snapshot of the main trends and arguments in X discourse about Sudan rather than aiming to offer a precise depiction of its exact evolution over time. Secondly, the gathered data may be influenced by external factors during the analysed period, such as wartime events and other contextual elements. To address this concern, the research aims to contextualize the results by considering ongoing events. Another challenge lies in the difficulty of estimating data related to the accounts (e.g., bots) through machine learning. Without specific linguistic markers, distinguishing between Sudanese and non-Sudanese accounts, as well as between human and bot activity, has proved particularly intricate. Consequently, it was necessary to focus on the training set data, which offers only a general indication and is less informative than data collected through machine learning. The article addresses this issue by focusing primarily on the discourse analysis of the collected contents.

Findings

The collected findings related to the Sudanese conflict centre on the three key dichotomies: polarization/non-polarization, Sudanese/non-Sudanese and bot/not-bot.

Divided Audiences: Polarized Narratives with a Growing Peace Camp

The findings indicate that discourse about Sudan is divided into three main macro-thematic groups: pro-SAF, pro-RSF and pro-peace users. When taking the average percentage for each period, it appears that they are evenly distributed: pro-SAF (25.52%), pro-RSF (23.98%) and pro-peace users (25.43%). The remaining tweets (25.07%) pertain to content that does not take a clear side or just spreads news. The first two groups contain polarized content, each asserting that the current conflict can only be resolved through a military victory by their supported faction. However, they vehemently disagree on which party should prevail. An example of a pro-SDF tweet is: *“The solution for us as Sudanese is the victory of the army only, and whatever the losses, there is no second option until there is a grey area or neutrality. Support for the armed forces.”*¹⁸ A similar concept, albeit supporting the opponent, is expressed in this pro-RSF tweet: *“#RapidSupport, the prominent symbol of courage and dedication. With pride, its soldiers express great sacrifices for the homeland, achieving peace and security. We are grateful to you for protecting values and freedoms, and we trust that you will remain a symbol of integrity and dedication.”*¹⁹ In both cases, resolution of the conflict hinges on the complete victory of one of the two warring factions, leaving little room for negotiation.

18 الحل لنا كسودانيين يتمثل في انتصار الجيش فقط ومهما كانت الخسائر لا يوجد خيار ثاني حتى تكون هناك منطقة رمادية او حياد، الدعم للقوات المسلحة

#جيش_واحد_شعب_واحد

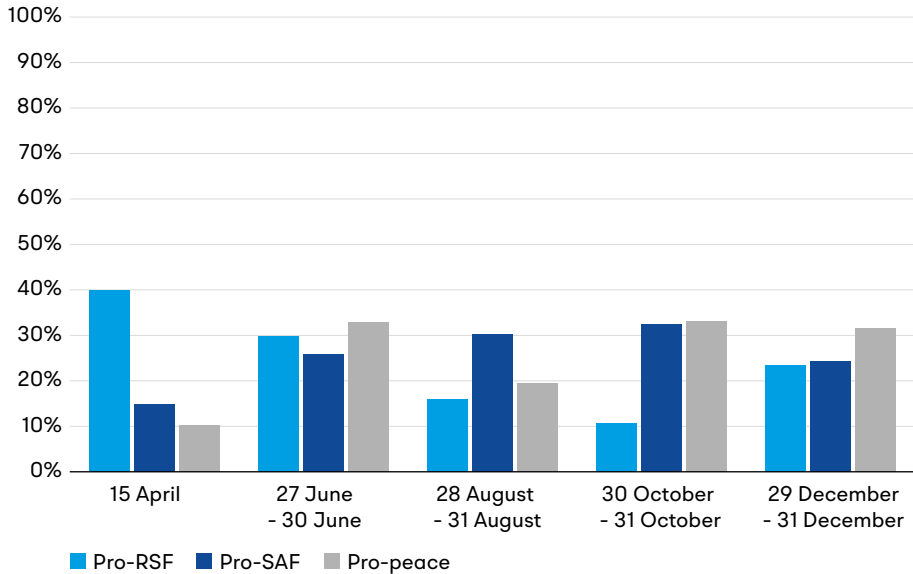
#الجنجويد_مليشيات_ارهابية

<https://t.co/f12o3AHjOC>

19 @User الدعم_السريع، الرمز البارز للشجاعة والتفاني، يفخر يعبر جنودها عن التضحيات العظيمة من أجل الوطن، محققين السلام #

والأمن. نحن ممتنون لكم على حمايتكم للقيم والحريات، وثق بأنكم ستظلون رمزاً للنزاهة والتفاني

Figure 1 Tweets expressing support for the RSF, SAF or peace



Conversely, advocates for peace focus their discourse on a shared belief that the principles of the peaceful Sudanese revolution have been compromised. These groups perceive the war as primarily driven by two military warlords, with scant regard for the future role of civilians in the country. An example of this perspective is found in the following tweet: *'(...) Our disagreement with Burhan does not mean that we have abandoned supporting the country's institutions. During the revolution, we were not incapable of bearing arms, but we decided that our revolution would be peaceful from beginning to end, despite your severe provocations trying to drag us into armed conflict, because our goal is change, not destruction!'*²⁰ This network of users believes that they have everything to lose in the conflict, regardless of who emerges as the victor, and they see little prospect for themselves in a military-dominated Sudan under Hemetti or Burhan's rule.

20 وخلافنا مع البرهان لا يعني تخلينا عن دعم مؤسسات البلاد، لأدو وقت الثورة ما كنا عاجزين عن حمل السلاح وقررتنا ثورتنا تكون سلمية من بدايتها حتى نهايتها رغم شدة استفزازكم لنا ليجرنا للسلاح لأن هدفنا التغيير وليس التدمير

When examining the trend in support for each of the two contenders, there is a decline in pro-RSF tweets over time while support for the SAF and pro-peace camps tends to increase in later samples compared with earlier ones. At the onset of the conflict on 15 April, pro-RSF tweets constituted 39.95 per cent of the discourse, more than twice the proportion of those supportive of the SAF (14.87%). However, six months later, on 27–30 October, the proportions had reversed, with pro-SAF support rising to 32.49 per cent and pro-RSF falling to 10.69 per cent. This decrease in support for the RSF does not appear to be linked to any setbacks suffered by the armed group that would dampen their domestic and international supporters' enthusiasm, since the RSF had achieved some gains on the ground. Instead, it seems to stem from users increasingly sharing information about crimes committed by the RSF and the escalating impact of the conflict on Sudanese civilians, attributing primary responsibility for the conflict to the RSF. This interpretation is indirectly supported by the observed increase in the pro-peace camp, which rose from 10.32 per cent to 31.50 per cent, and frequently highlights the humanitarian toll of the conflict. Moreover, X users discussing the conflict indicate a growing awareness that the current balance of power makes it difficult to envision either contender gaining complete control of the country. These trends reflect increasing war fatigue consistent with recent opinion polls. However, the X audience appears more polarized than the offline audience. This is likely due to the politically active nature of X users, differences in the sample, and the limited influence of predominantly pro-RSF bots. According to a study conducted by Sudalytica in November 2023, 24.8 per cent of respondents perceive the current conflict to be a power struggle without a strong ideological component, which aligns with the pro-peace camp we identified, while support for the RSF stands even lower (1.5%).²¹

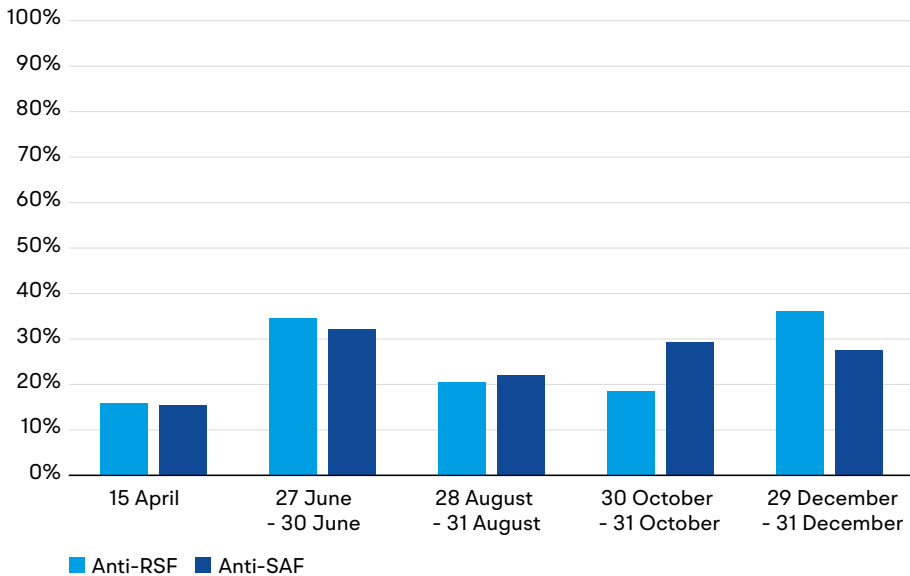
The motivations behind X polarization are evident in the analysis of tweets expressing opposition to two of the contenders. More than half (50.45%) of the collected tweets express opposition to the RSF (25.08%), the SDF (25.27%) or both fighting sides. Regarding criticisms of the RSF, most tweets refer to their perceived widespread involvement in crimes against civilians. With fighting causing widespread humanitarian consequences and with more than half the population needing humanitarian assistance,²² it appears that

21 سوداليتيكا، «تُجري استطلاعاً لمعرفة آراء السودانيين حول أسباب الحرب ومجرياتها وآلاتها»، [sudalytica.beamreports](https://sudalytica.beamreports.com/سوداليتيكا-تُجري-استطلاعاً-لمعرفة), 25 February 2024: <https://sudalytica.beamreports.com/سوداليتيكا-تُجري-استطلاعاً-لمعرفة>.

22 UNOCHA. 2024. Sudan, Situation Report: <https://reports.unocha.org/en/country/sudan/>.

many users consider the RSF, and in some cases its allies, responsible for the dramatic consequences for civilians. The RSF is seen as initiating the conflict and is accused of committing widespread crimes. An example is this tweet: “The dogs of the Rapid Support Forces, supported by the dog Bin Zayed, are preying on Muslim women in Sudan. This nation will not rise unless the duty of jihad against the Arab occupying armies is revived.”²³ Another common criticism is the RSF’s collaboration with foreign powers, primarily the UAE, to exploit the country’s natural resources, especially gold. Dubai has become a global centre for gold smugglers due to lax regulations, and there are indications that large quantities of gold are transported there from RSF-controlled mines.²⁴

Figure 2 Anti-RSF and anti-SAF tweets



23 كلاب الدعم السريع المدعومين من الكلب بن زايد ينهشون نساء المسلمين في السودان..ان تنهض هذه الامة الا باحياء فريضة الجهاد ضد جيوش الاحتلال العربية
<https://t.co/SEBx3D4Lyc>

24 Africa Defense Forum. 2024. Smuggled Gold Fuels War in Sudan, U.N. Says, ADF, 13 February 2024:
<https://adf-magazine.com/2024/02/smuggled-gold-fuels-war-in-sudan-u-n-says/>

Criticism of the SAF centres primarily on their failure to maintain control of the entire territory against RSF operations and to adequately protect civilians, a viewpoint some pro-RSF users interpret as a call for stronger leadership. Another common critique is the perceived Islamist leaning within segments of the army. In this context, the term ‘Kizan’ frequently emerges. It refers to members of Sudan’s political Islamic movement that governed alongside al-Bashir for three decades, highlighting their association with political Islam. The term is often used derogatorily to draw a connection between the SAF and the previous regime and to underscore their alleged aim to establish rule based on their Islamist interpretation of Islamic law. An example of this type of conflict is the following tweet: *‘They allied with the devil even against members of the Muslim Brotherhood, ISIS, and the Islamic State terrorists. We call upon Almighty God to grant victory to the brave Rapid Support Forces against the remnants, the military of the Janjaweed, and their dogs, the generals of the military Abdel Fattah Abdel Rahman al-Burhan and Kabashi, and Yasser al-Atta the Janjaweed.’*²⁵

Regarding the pro-peace camp, this category encompasses tweets from individuals who support peace and are critical of both the RSF and SDF. They oppose the polarization seen in the two main camps, viewing the current power struggle as centred not on Sudan’s interests but on the ambitions of two strongmen. An example is the following tweet: *‘The Sudanese army is directly responsible for all violations, even those committed by the Rapid Support Forces. Misconceptions and the low awareness among Sudanese citizens make these violations a means to fuel hate speech.’*²⁶ Another recurrent criticism is that the two warring sides have long collaborated before the current standoff and were responsible for bringing the country to this state. An example is the following tweet: *‘Just a few days ago, he (Burhan) was cheering for each other with that Janjaweed and gave them authority, allowing them to enter the capital and settle there right under the army’s nose and this failure’s watch. Only now he realizes that they are mercenaries and will ruin the country?’*²⁷

25 اتحالف مع الشيطان حتى ضد أعضاء تنظيم الاخوان المسلمين وتنظيم داعش وتنظيم الدولة الإسلامية الإرهابيين

ونددوا الله العظيم ان ينصر قوات الدعم السريع الاشاوس على الفلول وعسكر الكيزان وكلابهم جنرالات العسكر العبد الفتح عبدالرحمن البرهان وكياقي وياسر العطا الكيزان
<https://t.co/qoeT9lfyVT>

26 @User1 @User2 الجيش السوداني مسؤول مسؤولية مباشرة عن كل الانتهاكات حتي التي تحدث من قبل الدعم السريع

سؤ المفاهيم، انخفاض الوعي لدي المواطن السوداني يجعل من هذه الانتهاك وسيلة تغذي خطاب الكراهية.

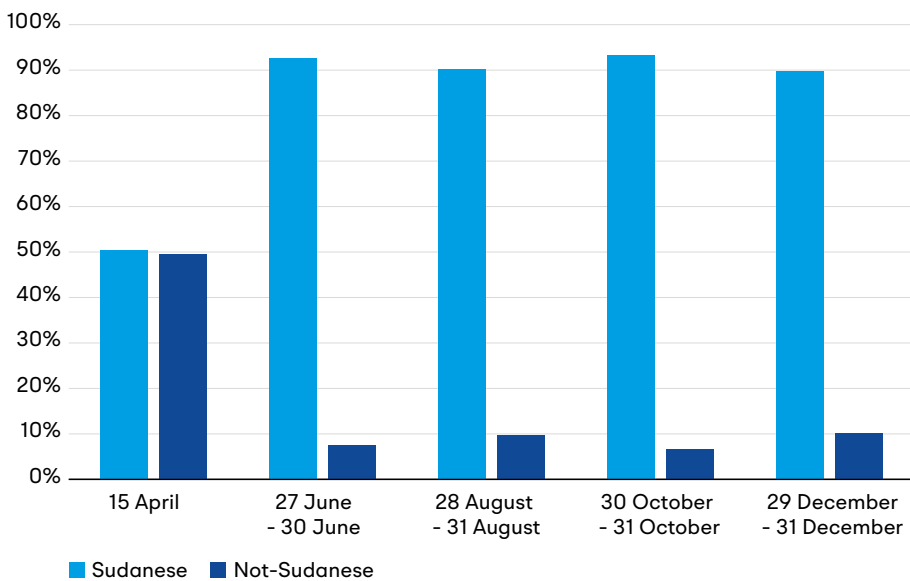
27 @User1 @User2 خايب عشان وصل البلد للمرحلة دي

قبل أيام يبطلوا لبعض هو والجنجويدي داك وأداهم صلاحيات، ودخلوا العاصمة عششوا فيها على مرأى ومسمع من الجيش ومن الخايب دا، يادوب ادرك انهم مرتزقة وحيغربوا البلد؟

An increasingly Sudanese-led X discussion

The content shared by Sudanese and non-Sudanese users does not exhibit clear linguistic markers that allow for easy differentiation through a text-based machine learning approach. The research therefore focused on 900 randomly selected tweets to estimate the nationality of the post’s author. We were able to identify the origin of the author with a high degree of confidence in 470. Of these, 77.64 per cent could be attributed to Sudanese users based on bio information and other shared content (location, description, etc.), while non-Sudanese users constituted 22.36 per cent of the identified contents of the training set. This result is particularly significant given the relatively small number of Sudanese users with an active X account (7.76 per cent of the population of about 46 million)²⁸ compared with the much larger number of Arabic-speaking accounts.

Figure 3 Tweets posted by Sudanese or non-Sudanese Arabic speakers



28 Sudan, Media Landscapes: <https://medialandscapes.org/country/sudan/media/social-networks>

On average, the percentage provides an overview across periods, but the data from each sample reveal clear and distinct trends. In the initial period, the user base shows almost an even split, with 50.49 per cent of identifiable users appearing to be Sudanese. This percentage increases sharply in the second period (27– 30 August) to 92.53 per cent and remains consistently above 90 per cent in subsequent periods. It appears that many Arab users initially showed interest in Sudanese events but thereafter quickly lost interest, viewing it primarily as a local conflict between two warlords and with minimal ideological significance. Consequently, the X discussions on the conflict have garnered relatively less interest from Arabic-speaking audiences than other conflicts, such as those involving Gaza and Israel, Syria, and Iraq.

Nevertheless, foreign users discussing the conflict have viewed it through the lens of topics relevant to their internal politics, especially their government's stance, the role of Islamism, and the relationship between civilians and the military. With regards to the geopolitical dimension of the tweet, a good example is provided by the tweets that discuss relations between Egypt and Sudan in light of the dispute over Nile water. For example: *'Hemetti knows well that antagonizing Egypt is not in his interest, but the problem is that if he wins this battle, he will fundamentally be against Egypt. This is not in our favour in many areas, especially the Nile waters.'*²⁹ Conversely, some non-Sudanese users have criticized the RSF due to their overt state support, which is also tied to gold smuggling to Dubai. One tweet states: *'Mr. Yasser al-Atta stated in a declaration that the Rapid Support Forces consist of 70 per cent foreign mercenaries, and they used to smuggle gold out of Sudan! Oh my, imagine these leaders.'*³⁰ The issue of Islamism often intersects with support for the RSF, as the RSF bases its claims on combating forces linked to the Muslim Brotherhood, a major driver for UAE foreign policy. Another issue is the relationship between civilians and the military and its saliency for other Arab countries. This is well captured in this tweet: *'What's happening in Sudan is a natural result of military rule. If its repercussions are clashes between the regular army and the Rapid Support Forces, then its repercussions in Algeria are long queues and corruption that has*

29 @users حميدتي عارف كويس إن مش من مصلحته معاداة مصر لكن المشكلة أنه لو كسب المعركة دي هو اساسا ضد مصر وهذا ليس في صالحنا في ملفات كثير أهمها مياه النيل

30 هو السيد ياسر العطا قال في تصريح انه الدعم السريع قوات تتكون 70% منها من مرتزقة اجانب و انها كانت بتهرب الذهب برا السودان ! يخ ديل القاده فتخيل

<https://t.co/6FSqacLL3w>

eaten away at the public treasury, and thousands of Algerians fleeing the living hell in a country governed by the incompetence of generals.³¹

Bots have influence, but do not determine discussion trends

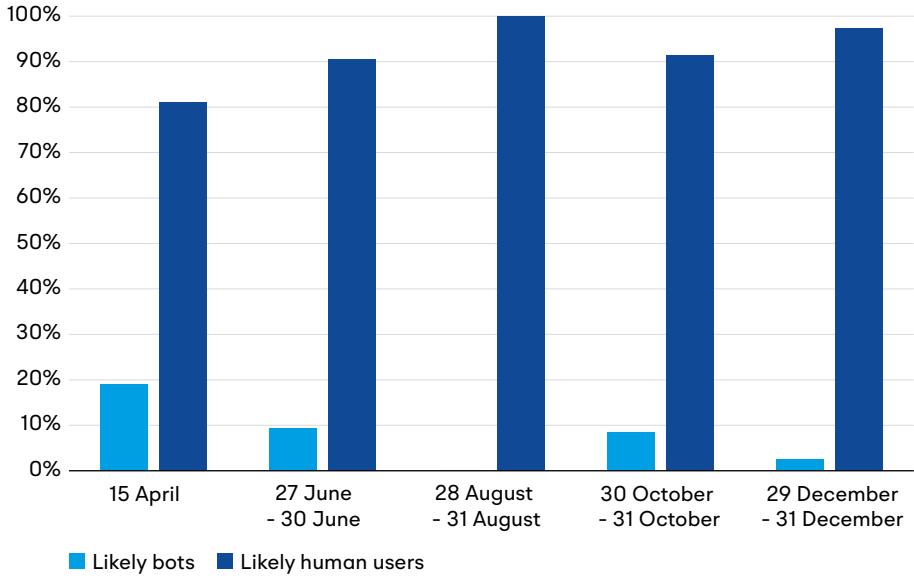
Like the previous discussion about Sudanese and non-Sudanese users, distinguishing between real users and bots based purely on linguistic markers is challenging. However, by examining specific account characteristics (e.g., retweets within a small network of accounts, followers, use of similar terms, profile pictures, repetitive content, etc.), it is possible to identify certain accounts with a reasonable degree of confidence as bots. In the training set about Sudan, 10.07 per cent of the total tweets could be identified as originating from bot accounts. This percentage is not significantly different from the average presence of bots on X, which a study of 2015 estimated to be 15 per cent.³² Regarding different periods, the percentage of bot activities are particularly high in the first period (18.9%), while it goes consistently under 10 per cent in the other four periods. These bots often appear to be linked to the political agendas of Gulf countries,³³ with a noticeable distinction between those associated with Saudi Arabia, which tend to support the SDF, and those linked to the UAE, which frequently support the RSF.

31 هي SD هو نتيجة طبيعية للحكم العسكري 🇸🇩 فإذا كانت تداعياته هناك هي الاقتتال بين الجيش النظامي وقوات الدعم السريع فتداعياته في الجزائر DZ ما يحدث في #السودان الطواير المليونية والفساد الذي نخر الخزينة العمومية وهروب الجزائريين بالآلاف من جحيم العيش في بلد تسيره رداءة الجزائر

32 Rodríguez-Ruiz, J. et al. 2020. 'A one-class classification approach for BOT detection on Twitter', *Computers & Security*, 91, 101715: <https://www.sciencedirect.com/science/article/abs/pii/S0167404820300031>

33 Abdel Fattah, F. 2023. 'Unveiling the Parallel War Social media weaponization in Sudan's conflict', *Future Center for Advanced Research & Studies*, 16 May 2023: <https://futureuae.com/en-US/Mainpage/Item/8213/unveiling-the-parallel-war-social-media-weaponization-in-sudans-conflict>
Beam Reports, بالتزامن مع اندلاع الحرب.. شبكة تضليل على (تويتر) تروج لمصالح الإمارات في السودان.. تتبنى الدعاية الإعلامية لـ(الدعم السريع) وتهاجم الجيش
5 May 2023: <https://www.beamreports.com/2023/05/05/بالتزامن-مع-اندلاع-الحرب-شبكة-تضليل-على>

Figure 4 Tweets likely posted by bots or human users



These accounts serve the agendas of their respective countries, which are allies globally but which compete in Africa and elsewhere when it comes to acquiring influence and resources abroad. An example of a likely Saudi pro-SAF tweet is: *'The Sudanese army is supported by the Sudanese people and Arab governments. The Rapid Support Forces are supported by America, Europe, and the devils among humans and jinn.'*³⁴ An example of a pro-RSF tweet is: *'#Rapid_Support_Forces, the prominent symbol of courage and dedication. With pride, its soldiers express the great sacrifices for the nation, achieving peace and security. We are grateful to you for protecting values and freedoms, and we trust that you will remain a symbol of integrity and dedication.'*³⁵ It appears that there are also some pro-Egyptian bots involved, albeit on a much-limited scale.

34 @user الجيش السوداني يدعمه الشعب السوداني والحكومات العربية
قوات الدعم السريع تدعمه أمريكا وأوروبا وشياطين الإنس والجن

35 @user الدعم_السريع، الرمز البارز للشجاعة والتفاني. بفخر يعبر جنودها عن التضحيات العظيمة من أجل الوطن، محققين السلام والأمن. نحن ممتنون لكم على حمايتكم للقيم #user والحرية، وثق بأنكم ستظلون رمزاً للنزاهة والتفاني

The data indicate that there was a higher involvement of bots in the initial phase of the conflict, coinciding with peak engagement from foreign users discussing Sudan. However, as the discussion became more localized and less regional, the presence of bots also diminished. This suggests that bots are activated primarily to defend the reputations of Saudi Arabia and the UAE against their opponents. Investment by these countries in deploying X bot armies in the Sudan conflict appears therefore to be much more limited than in other conflicts, such as Syria, Iraq and Yemen, or in regional disputes like the killing of Nimr al-Nimr, who was a Saudi Shia cleric killed in 2016 under the accuse of terrorism. In a broader sense, Saudi Arabia and the UAE have broadcast their involvement in the war in Sudan less prominently than in past conflicts, such as Yemen, providing military and political support more quietly. Consequently, when not directly accused, they have less interest in publicly displaying their positions on the war. As previous analyses show, the war in Sudan has not ignited significant issues in the Arab world, making it less necessary to employ a narrative to justify their policies and avoid high reputational costs in the Arabic-speaking X community.³⁶ However, bots can be useful when defending against allegations and spreading the official narrative. For example, the UAE has often been accused of endorsing controversial actions by Hemetti, making their position particularly challenging and necessitating a defence from the Emirati government. In such cases, a bot army can be an effective propaganda tool.³⁷

36 Eltahir, N. 2023. Sudanese general accuses UAE of supplying paramilitary RSF, *Reuters*, 28 November 2023: <https://www.reuters.com/world/africa/sudanese-general-accuses-uae-supplying-paramilitary-rsf-2023-11-28/>

37 United Arab Emirates Ministry of Foreign Affairs, 2024. 'UAE affirms its categorical rejection of the baseless allegations made by the Permanent Representative of Sudan in a letter to UN Security Council', 22 April 2024: <https://www.mofa.gov.ae/en/mediahub/news/2024/4/22/22-4-2024-yae-saudan>

Tackling polarization by engaging local voices, a lesson from policy makers

The previous analysis indicates that discussions about the conflict in Sudan have polarized significant segments of the X audience, with many advocating a military victory for one of the two contenders rather than a peaceful resolution involving civilians. Predominantly, it is Sudanese citizens who are involved in the discussions calling for escalating the violence in support of one side. Although the number of such calls has decreased since the early days of the conflict, they highlight a loss of hope among Sudanese users that the current conflict can be halted through negotiations anytime soon. Hence, the majority see a military solution as the only viable option. However, the data also show that there is an increasing number of users calling for a peaceful end to the conflict. Despite facing a military backlash from the RSF, the SAF appears to be gaining increasing support among X users as the legitimate side in the conflict. Recent data show that support for the RSF is waning, and the peace camp is gaining popularity as more crimes are committed. Moreover, the analysis also shows that non-Sudanese users are losing interest in the war. After initial involvement, it seems that the broader Arabic audience does not identify significant issues at stake in the conflict, perceiving it as driven mainly by local dynamics. In short, a military victory with a diminished role for Sudanese civil society does not appear to have salient consequences for their home country's politics. More specifically, it does not seem to many users that it would contribute to reinforcing authoritarian or military dominance, nor does it bring hope for the rejuvenation of civil society against military strongmen, regardless of who wins. Notably, this discourse has been only partially influenced by bots, which were more active at the beginning of the study and less so later.

Several observers perceive the current standoff as a clash between two strongmen – Burhan and Hemetti – rather than as a battle over two distinctly different visions for Sudan. Many believe that the victory of either leader would still result in strong military rule with minimal space for unarmed political movements and broader Sudanese civic engagement. The primary distinctions lie in Sudan's international positioning and the role of political Islam, which are

not central concerns for many politically disengaged Sudanese. This context contrasts sharply with other civil conflicts, such as the rise of IS in Iraq, where the triumph of a faction could lead to the expulsion of entire communities from their homelands (e.g., Christians, Yazidis, Shi'a). Consequently, members of ideological, ethnic or regional communities do not instinctively rally behind one side for survival. Instead, individuals from diverse backgrounds and ideologies often express apprehensions regarding the role of non-armed citizens and their participation in the political sphere, a concern that persists regardless of the victor.

In light of these dynamics, the study reveals a significant number of active users calling for an end to violence, driven by the profound risks the conflict poses to them and their families. This finding is pivotal for policy makers, highlighting the potential to engage influential figures in mitigating current polarization and supporting Sudan's transition away from violence. This effort can harness credible voices capable of organizing online campaigns and conducting fact-checking to counter misinformation propagated by bots or government-linked entities. Support may also bolster grassroots initiatives on platforms such as X, equipping activists with essential skills – like marketing, organizing and fundraising – that could serve their message resonating widely with Sudanese society and beyond. Local voices trusted within their communities emerge as pivotal in conflict resolution. Empowering these voices and amplifying their reach is essential for policy makers aiming to present viable alternatives to violence and stem further instability, including humanitarian crises such as hunger, forced migration and political turmoil. Moreover, this strategy can elevate awareness of Sudan's plight on the global stage, where the conflict often receives scant attention from international media, particularly in the West.

Finally, the article transcends its focus on Sudan, offering a replicable methodology to analyse online discourses on civil conflicts. This approach facilitates evidence-based policy analysis and enhances understanding of polarization in conflict contexts. It also provides a valuable tool for generating concise social media summaries and briefings that can predict when public sentiment might exacerbate conflict and prompt regional intervention. In today's digital age, where social media amplifies civil conflict into proxy wars, neighbouring countries perceive repercussions for their communities, governments and livelihoods, underscoring the urgency of proactive engagement and mediation efforts.

Acknowledgments

Research Resource Package

The database of the study can be found here:

<https://github.com/ammarnasr/arabic-polarization-twitter>.

Appendix

Table 1 Query about the Sudanese conflict

MUST HAVE	CAN HAVE
“الدعم السريع” Or “البرهان” Or “حميدتي” Or “الجيش”	الحرب
	سودان
	برهان
	السودان
	الدعم
	جيش
	هدنة
	الهدنة
	الامارات
	السعودية
	مصر
	جدة
	تشاد
	“بن زايد”
	اشتباك
	اشتباكات
	معارك
	انقلاب
	إنقلاب
	الإنقلاب
	الانقلاب
	وساطة
	الوساطة
	اخوان
	أخوان
	إخوان
	الأخوان
	الايخوان
	الإخوان

MUST HAVE	CAN HAVE
	السودان
	برهان
	جياشة
	الجياشة
	دعامة
	الدعامة
	جنتجويد
	الجنتجويد
	حميدي
	دقلو
	أل دقلو
	بلايسة
	البلايسة
	قحت
	قحانة
	القحانة
	”قوة الحرية و التغيير“
	كيزان
	الكيزان
	إيقاد
	الإيقاد
	جدة
	اشاوس
	الأشاوس
	الاشاوس
	جاهزية
	الخرطوم
	دارفور
	السوداني
	”القوات المسلحة“
	السودانية
	”#جيش_واحد_شعب_واحد“
	”#المقاومة_الشعبية_المسلحة“
	”#الامارات_تقتل_السودانيين“
	”#جاهزية_سرعة_حسم“

Table 2 Train and validation test for category

Label	Train Accuracy	Validation Accuracy	Train ROC AUC	Validation ROC AUC	Train F1	Validation F1
pro-RSF	0.92±0.07	0.74±0.02	0.98±0.02	0.67±0.04	0.92±0.07	0.73±0.02
pro-SAF	0.97±0.06	0.69±0.04	0.99±0.02	0.74±0.06	0.97±0.06	0.68±0.05
pro-peace	0.95±0.06	0.82±0.01	0.98±0.03	0.6±0.04	0.94±0.09	0.76±0.01
pro-war	0.89±0.12	0.74±0.02	0.96±0.05	0.7±0.05	0.85±0.18	0.68±0.04
no polarization	0.96±0.08	0.78±0.03	0.9±0.2	0.55±0.05	0.94±0.12	0.74±0.04
Geopolitics	1.0±0.0	0.9±0.01	1.0±0.0	0.63±0.05	1.0±0.0	0.88±0.01
Sudanese	0.9±0.01	0.77±0.05	0.91±0.01	0.76±0.05	0.9±0.01	0.77±0.05
Not Sudanese	0.92±0.04	0.86±0.03	0.77±0.21	0.56±0.05	0.9±0.06	0.84±0.01
Likely bot	0.44±0.31	0.4±0.32	0.61±0.11	0.52±0.02	0.47±0.33	0.43±0.33
Likely not a bot	0.84±0.06	0.69±0.04	0.84±0.06	0.69±0.04	0.84±0.06	0.69±0.04
Not about Sudan	0.97±0.03	0.89±0.01	0.98±0.03	0.88±0.01	0.97±0.03	0.89±0.01
pro civilians	0.92±0.03	0.87±0.02	0.81±0.17	0.64±0.11	0.91±0.04	0.86±0.03
anti civilians	0.96±0.01	0.94±0.0	0.67±0.17	0.53±0.06	0.95±0.02	0.92±0.01