Analyzing Russian Propaganda on Twitter during the Russia's Invasion of Ukraine Using Mixed Methods Network Analysis

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Abstract. This paper examines Russia's propaganda discourse on Twitter during the 2022 Russian invasion of Ukraine. The study employs natural language processing (NLP) techniques, network analysis, and qualitative analysis to identify key communities and narratives associated with the prevalent and damaging narrative of "fascism/Nazism" in discussions related to the invasion. The paper identifies the main topics, influential actors, and examines the most impactful messages in spreading this disinformation narrative. Overall, this research contributes to the understanding of propaganda dissemination on social media platforms and provides insights into the narratives and communities involved in spreading disinformation during Russia's invasion of Ukraine.

1   Introduction

The emergence of computational propaganda has led to a new phenomenon utilizing automation and algorithms, allowing for efficient dissemination and amplification of discourses on social media platforms, enabling ideological control and manipulation [1]. Governments and other entities exploit computational power, Internet resources, and big data to achieve information control and manipulation objectives. The use of social media for spreading disinformation, consolidating power, exerting social control, and promoting agendas has become a recognized strategy for many states [2, 3]. Propaganda strategies continuously adapt to technological and media changes [4], emphasizing the need to monitor media discourse, particularly on social media platforms. Recent trends, including the rise of bots, trolls, and other manipulative efforts [5, 6], underscore the importance of identifying and analyzing these activities, as well as the narratives and communities involved in disseminating malicious information.

The 2022 invasion of Ukraine by Russia highlights the significant role of social media in modern warfare, as both sides leverage online platforms to manipulate geopolitical dynamics and shape public opinion [7]. Russia-affiliated social media accounts propagate narratives aligned with their motives, downplaying support for sanctions against Russia and undermining support for Ukraine. Conversely, Ukrainian

social media aims to maintain Western support, highlight their own military efforts, and challenge perceptions of the Russian military [7, 8]. While extensive research exists on identifying malicious cyber activities, less attention has been given to investigating narratives and their role in broader conversations, specifically regarding Russia's invasion of Ukraine. This study focuses on identifying primary communities and narratives associated with the prevalent and damaging "fascism/Nazism" narrative in discussions related to Russia's invasion of Ukraine. To achieve this, we employ a mixed-methods pipeline for social media analysis, combining natural language processing, network science approaches, and community clustering. This comprehensive approach allows for the identification of key communities and examination of narratives related to this specific disinformation narrative.

2 Related Works

2.1 Unveiling the Tactics and Impact of Russian Propaganda

The strategies employed by Russian propaganda have been extensively studied in relation to events such as the 2016 US presidential elections and Brexit [2, 9, 10]. The Internet Research Agency (IRA), a Russian state-affiliated troll factory, has garnered attention for its malicious activities aimed at manipulating online opinions through divisive messages [6, 9, 10, 11]. Through social media platforms and algorithms, the troll factory actively promotes strategic narratives to generate destabilization, polarization, information chaos, and distrust [6, 11]. Key characteristics of IRA trolls include deception, sowing political discord and distrust, and employing online troll accounts to mimic grassroots activities (known as "astroturfing"). It is worth noting that various types of accounts are utilized, including automated bots, trolls, and sock puppets controlled by humans but presented as genuine social media users [9].

Modern computational propaganda demonstrates traditional propaganda tactics with the use of symbols, emotions, stereotypes, and pre-existing frames to shape perceptions and manipulate cognition and behavior to achieve the propagandist's objectives [12, 13]. In today's media landscape, propaganda techniques have evolved to include rapid distribution through multiple channels while remaining hidden, leading to the emergence of computational propaganda. This phenomenon leverages computational tools such as automation and algorithms to disseminate and amplify discourses and opinions on social media, serving the purpose of ideological control and manipulation [14]. Recent tactics employed to manipulate public opinion involve the convergence of social media platforms, autonomous bots, and big data [15]. These tools use algorithms to precisely and quickly target individuals, providing stakeholders with significant influence without fundamentally altering the nature of propaganda. Propaganda aims to sway and persuade through ideological symbols, seeking specific responses, solidifying identity, and fostering loyalty [15]. It primarily consists of persuasive communication aimed at promoting ideological objectives, shaping public opinion, and institutionalizing the loyalty of targeted groups.

The Russian propaganda apparatus involves both overt and covert participants. Overt actors openly disseminate propaganda and include state-funded media outlets like RT and Sputnik, as well as official political entities such as the Ministry of Defense, the Ministry of Foreign Affairs, and Russia's embassies. Covert actors, on the other hand,

operate through less transparent means. They include low-credibility news sources known as "pink slime media," influencers, automated bot accounts, and deceptive human-operated trolls. These covert actors play a role in spreading propaganda while maintaining secrecy and deception.

Russian propaganda deliberately lacks consistency and employs a deliberate strategy of confusion. It utilizes multiple explanations to cater to diverse audience preferences without providing clear guidance. The aim is to overwhelm readers with misleading information, making it challenging to discern the truth [16]. Furthermore, Russian propaganda relies on repetition to reinforce its desired narrative and promote familiarity with the message. It specifically targets groups with distinct identities, such as those with anti-West and anti-capitalist beliefs or those who mistrust government and institutions (e.g., conservative, conspiracy, and strongly left- or right-wing groups). By appealing to confirmation bias, Russian propaganda solidifies these groups' existing beliefs. Ultimately, its objective is often to erode trust and undermine the credibility of democratic institutions, sowing chaos and discord in Western societies [17].

2.2　　**Russian Propaganda in the Context of War in Ukraine**

Russia's invasion of Ukraine has prompted academic scrutiny of disinformation operations [7, 18, 19, 20, 21, 22]. Termed a "hybrid war," the invasion combines conventional warfare with unconventional disinformation tactics [7]. Tolz and Hutchings [22] describe narratives propagated by Russian state propaganda during the invasion. Exploiting distorted historical and cultural discourses, Russian state propaganda denies ethnic diversity and portrays Ukraine as an integral part of Russia, using national imperialistic identity narratives [22]. State-affiliated actors and opposition groups employ themes of colonization and fascism/Nazism, albeit with contrasting meanings. Russian state propaganda accuses the "collective West" of colonizing Ukraine, while opposition groups argue that Russia itself is a colonizing empire. Claims of a Nazi regime and genocide of the Russian population in Ukraine by Russian state propaganda are countered by the opposition, asserting that Russia is the perpetrator of the Ukrainian genocide [22]. Although Russian state propaganda disseminates distorted disinformation to manipulate audience attitudes, it is particularly persuasive among individuals with pre-existing pro-Russian sentiments, as well as conservative and alt-right groups worldwide. An example of widespread disinformation is the claim that the US has constructed military biolabs in Ukraine, allegedly developing bioweapons aimed at Russia. This false narrative gained significant traction on Twitter, with dissemination across conservative, alt-right, and anti-vax communities [23].

The predominant discourse surrounding the Russian invasion of Ukraine accuses the United States of imperialism, positioning Ukraine as a victim of American aggression. This narrative, along with the existing narrative of NATO expansion, portrays Western influence as a threat and provides justification for the ongoing war. It resonates with far-left, alt-right, and conservative groups by referencing NATO expansion, US imperialism, and traditional values. Ukrainian aspirations for cultural and national sovereignty, as well as closer ties with the West, are depicted as 'fascism/Nazism,' framing the invasion's main goal as 'denazification' and 'de-Westernization' [22, p. 13].

While the terms "disinformation" and "propaganda" have distinct meanings, they will be used interchangeably in this paper due to their shared use of false or distorted information to manipulate audience attitudes. Propaganda, however, carries a stronger political context and relies on emotional reactions through falsification. Propaganda actors leverage cultural and historical associations to create persuasive narratives. In the context of the Russian invasion, the utilization of the term "Nazism/fascism" holds significant cultural and historical connotations, justifying the invasion and reinforcing biases and anti-Ukraine narratives promoted by Russian state television since the annexation of Crimea in 2014.

Russian state propaganda narratives exhibit specific characteristics, including the adoption of identity-related discourses, cultural and historical narratives, induction of emotional reactions, falsification of facts, and widespread repetition across various media channels such as social media, TV, press, and messaging apps. Twitter is viewed as a platform where Russian opposition, individuals with liberal attitudes, and foreign audiences, who may not fully comprehend Russian propaganda discourse, are targeted with disinformation tropes. Analyzing these prevalent narratives, influential actors, communities, and propaganda strategies is crucial for understanding the mechanisms of state propaganda, discourse dynamics, and the consumption of disinformation and counter-disinformation efforts. This study focuses on examining the propagation and discussion of the 'fascism/Nazism' narrative specifically on Twitter, encompassing both the English and Russian segments of the platform. The following questions are presented for analysis:

RQ1: Who are the most influential and prominent actors and communities involved in the Twitter discourse about 'Nazism/fascism' in Ukraine in Russian and English Twitter discourses?

RQ2: What narratives and topics are identified in the discourse for each language?

3   Method

Python package *twarc* was used to collect tweets via an archive search with updated Twitter academic API version 2. Two datasets in English and Russian were collected using keywords such as 'nazi,' 'denazification,' 'Ukraine,' and others in both languages. As a result, two datasets were compiled with English (5,242,019 tweets from 1,016,126 users with 3,039,867 tweets as retweets) and Russian (883,225 tweets from 126,050 users with 577,635 as retweets) tweets. The data was collected for a period of one year, starting on December 24, 2021, and ending on January 24, 2023.

For data analysis, a mixed-method pipeline was employed, which included natural language processing, network analysis of Twitter data to detect key actors and influencers, as well as Leiden clustering to identify communities within the network. We used BERTopic modeling for natural language processing to identify the main topics in each conversation and generate topic networks. BERTopic employs the representation of text documents as vectors, a process that can be accomplished through the utilization of any semantic language model. Subsequently, these vectors undergo clustering in order to unveil topics, while diverse NLP methodologies can be employed to elucidate the characteristics of the resultant document clusters [29]. We employed a language-agnostic BERT embedding which allowed us to use an identical BERTopic

pipeline on both Russian and English tweets. The final representations of the extracted topics are translated and presented in English. The ORA software tool for network analytics [24] was used to analyze the data. ORA provides various metrics for Twitter data, such as identifying super spreaders (users who frequently generate and effectively spread shared content) and super friends (users who engage in frequent two-way communication, facilitating large or strong communication networks). ORA helps to identify key actors and communities for further qualitative analysis [25, 26].

Influencers are users whose tweets have a significant impact on the social network due to their follower count and network position. The narratives they disseminate can influence the opinions of other users within the network. Identifying key influencers is crucial for understanding the potential harm of information operations. By conducting Twitter network analysis in ORA, it is possible to detect super spreaders, super friends, and other influential users [27]. To identify network communities participating in conversations on Twitter, we used the Leiden clustering method [23]. The Leiden clustering algorithm involves network partitioning and node movement, ensuring the formation of well-connected communities. The Leiden algorithm has been proven to be more efficient than others, such as Louvain, as it is faster and provides better partitions [28]. After identifying the communities, qualitative methods were employed to compare the content and user characteristics between the groups.

4   Results

4.1   BERTopic Analysis

To identify general topics in the English and the Russian conversations, we used natural language processing approach with BERTopic modeling. For each language dataset such as English (Figure 1) and Russian (Figure 2), a topic network was generated with an edge meaning that a topic (target) was brought up in response to another topic (source). Node size is proportional to the number of times a topic appeared in the data and edge size is proportional to the number of edges that exist between topics. We can see that generated topics help us to understand general topics in the discussion.

Fig. 1. A topic network for the English dataset.

Fig. 2. A topic network for the Russian dataset.

These networks show similar discussions in both English and Russian tweets that include many of the expected propaganda narratives. A notable difference is the English topics tend to focus on the word "Nazi" while the Russian topics use a variation of "fascist" in narratives that seek to justify the invasion for similar reasons.

4.2   Twitter Influencers and Leiden Communities in the English Dataset

To gain a deeper understanding of the narratives, we utilized network science analysis and conducted textual qualitative analysis of the topics. Our analysis involved identifying the main influencers in the overall conversation within each language and the largest Leiden groups. The list of super spreaders encompasses accounts belonging to influential figures such as POTUS, President Zelensky, Elon Musk, as well as various influencers and newsrooms reporting on the invasion. Additionally, the list includes users who propagate anti-West and anti-Ukraine narratives associated with Russia's invasion. We also observed the presence of low-credibility news accounts disseminating narratives that are anti-Ukraine, antisemitic, anti-West, anti-NATO, and promoting pro-Russia and pro-China propaganda (for instance, the Grayzone News and its bloggers). It is worth noting that the account of Russia's Ministry of Foreign Affairs holds a prominent position in terms of out-degree centrality, indicating a substantial number of out-links to other users.

   Among the super friends, there are users who exploit narratives about the war in Ukraine and Western support to undermine the West and exploit political polarization in the US. These users often engage with others who aim to promote Russian propaganda narratives about neo-Nazis in Ukraine and other conspiracy theories. In general, anti-Ukraine and pro-Russia users attempt to justify Russia's invasion of Ukraine by presenting arguments and propaganda narratives, such as defending the Russian population in Ukraine, claiming discrimination, and labeling Ukraine's government as Nazi. Other identified propaganda narratives include portraying Ukraine, its government, and its partners as weak, blaming the West for NATO

expansion, mentioning corruption in Ukraine, asserting Western domination and hegemony, and highlighting the perceived inability of the West to unite. Additionally, the narratives label Ukraine as a Nazi or totalitarian state, undermining the Western countries that support it. Other propaganda themes involve accusing Ukraine of war provocations, criticizing the US and other partners for ignoring internal problems while providing financial support to Ukraine, referring to Crimea and other occupied territories as 'historically Russian', and blaming Ukraine for 'ethnic cleansings' in Eastern Ukraine. Many propaganda narratives are disseminated through replies in two-way communication, possibly aiming to resemble real-life conversations and avoid Twitter suspensions.

In the top super friends' list, there are users who actively debunk the Nazi narratives, engaging with disinformation and presenting counterarguments. Overall, among the counter narratives, users highlight that many countries, including Russia, have a neo-Nazi problem. They also point out that Ukraine has a Jewish president, making it unlikely for the Ukrainian government to be Nazi. Additionally, many users mention that Russia instigated the conflict in Eastern Ukraine with pro-Russia separatists and that there is no real discrimination against the Russian population in Ukraine. The main counter narrative emphasizes that Putin's regime itself behaves like Nazis and resembles Nazi Germany.

Through the analysis of influencers in Leiden groups, the largest group demonstrates pro-Ukraine attitudes and includes Ukrainian media, Ukrainian and US politicians, and other pro-Ukraine users. The second and third groups among the top influencers consist of alt-right political activists, bloggers, low-credibility websites, conspiracy theorists, and trolls. The fourth group encompasses accounts of Western politicians and accounts demonstrating support for Ukraine. Group 5 comprises accounts of Russian officials, including the Ministry of Foreign Affairs, Russia's embassies in various countries, Russian state-affiliated media (RT), and other pro-Russia accounts.

The first and fourth largest groups propagate narratives that express solidarity with Ukraine, promote support for Ukraine, and advocate for sanctions against Russia. These narratives also accuse Putin and Wagner (a Russian military group) of being Nazis, highlight Russia's war crimes, civilian casualties, and provocative actions. In contrast, the narratives spread by alt-right activists and conspiracy theorists in Groups 2 and 3 revolve around Hunter Biden's emails, alleging Biden's corrupted interests in Ukraine. They also complain about and undermine financial support to Ukraine, mention corruption in Ukraine, discuss global elites and world order, military biolabs in Ukraine, and other conspiracy theories. Group 5 propaganda accounts primarily disseminate Russian propaganda narratives. These narratives blame the US for its participation in previous conflicts like Iraq and Syria, mention NATO bombings of Yugoslavia, highlight conspiracies about neo-Nazis and military biolabs in Ukraine, criticize NATO expansion, undermine Ukraine and its partners, accuse Ukraine of attacks on its own civilians, complain about Russophobia, and promote anti-West sentiments.

4.3 Twitter influencers and Leiden communities in the Russian dataset

In the Russian datasets, the list of top superspreaders includes satire accounts and influencers promoting pro-Ukraine content in both Russian and Ukrainian languages.

The super friends' list comprises pro-Ukraine accounts and Russian propaganda bloggers spreading Nazi disinformation discourse and hate speech. The posting of disinformation narratives about Nazis in Ukraine began two months before the war, based on the start date of our data collection. Additionally, many pro-Russia accounts share Telegram links to promote their Telegram channels, redirecting their audience from Twitter to alternative platforms.

Among the main propaganda narratives, there is an undermining of Ukraine, its politicians, and its supporters, with claims of a corrupted government and allegations that Ukraine is governed by Nazis. More typical propaganda narratives include referring to Russia's invasion of Ukraine as a "special military operation" necessary to prevent an attack from Ukraine or to stop war and discrimination against the Russian population, aligning with Russia's official position. Propaganda also presents arguments highlighting the alienation of Ukraine, suggesting that Americans and citizens of Western countries do not support military aid for Ukraine. Pro-Russia accounts also accuse Ukrainian military forces of war crimes and killing their own citizens. They depict the invasion as a "liberation" of Ukraine from "Ukrofascists" and "Ukronazis," terms commonly used by Russian propaganda accounts. These narratives often assert that Russia only targets military objectives and deny responsibility for civilian casualties. Furthermore, there is a narrative that criticizes Western sanctions as unjust or ineffective, accompanied by mockery of the West and Ukraine. In general, there is significant two-way communication as narratives are promoted through replies in direct communication with other users. Quotes from Russian politicians and officials are extensively utilized to support these narratives.

Pro-Ukraine accounts actively share narratives about Russia's war crimes in Ukraine, labeling Russian politicians as fascists, drawing comparisons between Russian actions and Nazi Germany. They also mock Russia, state propaganda, and state media narratives, likening Putin to Hitler and referring to Russia as a Nazi regime. These narratives also advocate for sanctions against Russia, referencing previous conflicts and Russian war crimes in Chechnya and Syria, and describe the war in Ukraine as a genocide. Pro-Ukraine accounts aim to expose Russian propaganda and promote counter narratives, particularly targeting Russian-speaking audiences. They also commend the Ukrainian military forces, urging for increased support and criticizing the West for not imposing sufficient sanctions and measures against Russia.

In the analysis of influencers within the Leiden communities, we identified distinct groups. The first group primarily consists of pro-Ukraine influencers and experts. The second group comprises Russia's liberal opposition figures and media entities that support Ukraine. The third group consists of Russia's propaganda actors and accounts, while Group 5 includes Russia's state-affiliated propaganda media and government entities. Group 4 comprises journalistic organizations covering the war.

Group 1 predominantly spreads pro-Ukraine narratives, highlighting Russia's war crimes, exposing the Nazi nature of Putin's regime, and debunking Russian propaganda. Group 2 focuses on promoting anti-war narratives. Groups 3 and 5 primarily disseminate Russian propaganda, blaming Ukraine for killing its own civilians, undermining Western support, and assigning blame to the West for escalating the conflict. Pro-Russia users in these groups express support for Russian troops and propagate propaganda narratives about military biolabs, a supposed Nazi government in Ukraine, and claim that the US, West, and NATO support Nazi groups. These

propaganda narratives present the invasion as an ideological war against NATO and Western hegemony. Group 4 consists of journalists covering the war in Ukraine.

5   Conclusion and Discussion

This paper examines Russia's propaganda discourse on Twitter during the 2022 Russian invasion of Ukraine, focusing specifically on the narrative of "fascism/Nazism." Through a mixed-methods approach incorporating natural language processing, network analysis, and community clustering, the study aims to identify the prominent actors, communities, and narratives within this discourse.

The findings of this study contribute to the broader understanding of disinformation campaigns employed by governments on social media. By shedding light on the strategies, narratives, and communities associated with Russia's propaganda discourse during the invasion of Ukraine, it enhances our knowledge of the evolving tactics used to manipulate public opinion and shape geopolitical dynamics.

Moving forward, it is crucial to continue research and efforts aimed at developing effective countermeasures against disinformation campaigns. This includes raising awareness among social media users about the presence and impact of computational propaganda, promoting media literacy, and improving the transparency and accountability of social media platforms. Collaboration between researchers, policymakers, and technology companies is essential in developing comprehensive strategies to combat the spread of harmful disinformation and protect the integrity of information in the digital age.

References

1. Woolley, S., Howard, P.: Computational propaganda worldwide: Executive summary. Computational Propaganda Project. https://ora.ox.ac.uk/objects/uuid:d6157461-aefd-48ff-a9a9-2d93222a9bfd (2017).
2. Nyst, C., Monaco, N.: How governments are deploying disinformation as part of broader digital harassment campaigns. Institute for the Future. Retrieved from https://bit.ly/2Mi8DYm (2018).
3. Weedon, J., Nuland, W., Stamos A.: Information operations and Facebook. Menlo Park, CA: Facebook. (2017).
4. Wanless, A., Berk, M.: The changing nature of propaganda: Coming to terms with influence in conflict. The World Information War. pp 63-80. Routledge (2021).
5. Starbird, K.: Disinformation's spread: bots, trolls and all of us. Nature 571(7766), 449-450 (2019).
6. Linvill, D. L., Warren, P. L.: Troll factories: Manufacturing specialized disinformation on Twitter. Political Communication 37(4), 447-467 (2020).
7. Smart, B., Watt, J., Benedetti, S., Mitchell, L., Roughan, M.: # IStandWithPutin versus #IStandWithUkraine: The interaction of bots and humans in discussion of the Russia/Ukraine war. In Social Informatics: 13th International Conference, SocInfo 2022, Glasgow, UK, Proceedings, pp. 34-53. Cham: Springer International Publishing (2022).
8. Geissler, D., Bär, D., Pröllochs, N., & Feuerriegel, S.: Russian propaganda on social media during the 2022 invasion of Ukraine. arXiv preprint arXiv:2211.04154 (2022).
9. Badawy, A., Addawood, A., Lerman, K., & Ferrara, E.: Characterizing the 2016 Russian IRA influence campaign. Social Network Analysis and Mining, 9, 1-11 (2019).

10. Lukito, J., Suk, J., Zhang, Y., Doroshenko, L., Kim, S. J., Su, M.- H., Xia, Y., Freelon, D., and Wells, C.: The wolves in sheep's clothing: How Russia's Internet Research Agency tweets appeared in US news as vox populi. The International Journal of Press/Politics, 25(2), pp. 196-216 (2020).

11. Bastos, M., Mercea, D.: The public accountability of social platforms: Lessons from a study on bots and trolls in the Brexit campaign. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 376(2128), 20180003 (2018).

12. Hemánus, P.: Propaganda and indoctrination; a tentative concept analysis. Gazette (Leiden, Netherlands), 20(4), pp. 215– 223 (1974).

13. Jowett, G. S., O'Donnell, V.: Propaganda & persuasion. Sage publications. (2018).

14. Woolley, S. C., Howard, P. N.: Computational propaganda: Political parties, politicians, and political manipulation on social media. Oxford University Press. (2018).

15. Hyzen, A.: Revisiting the theoretical foundations of propaganda. International Journal of Communication, 15 (18) (2021).

16. Pena, M. M., Klemfuss, J. Z., Loftus, E. F., Mindthoff, A.: The effects of exposure to differing amounts of misinformation and source credibility perception on source monitoring and memory accuracy. Psychology of Consciousness: Theory, Research, and Practice, 4(4), 337. (2017).

17. Paul, C., Matthews, M.: Defending against Russian propaganda. The SAGE handbook of propaganda, 286. (2019).

18. Ablazov, I., Karmazina, M.: Disinformation as a form of aggression: Ukraine and its partners amidst the Russian fake news. Political Science and Security Studies Journal, 2(2), pp. 65-72. (2021).

19. Leitenberg, M.: False allegations of biological-weapons use from Putin's Russia. The Nonproliferation Review, 27(4-6), pp. 425-442. (2020).

20. Maschmeyer, L.: Digital disinformation: Evidence from Ukraine. CSS Analyses in Security Policy, 278. (2021).

21. Pomerantsev, P., Gumenyuk, N., Kariakina, A., Borzylo, I., Peklun, T., Yermolenko, V., Rybak, V., Kobzin, D., Montague, M., Barbieri, J., Innes, M., Budu, V., & Dawson, A.: Why Conspiratorial Propaganda Works and What We Can Do About It: Audience Vulnerability and Resistance to Anti-Western, pro-Kremlin Disinformation in Ukraine. (2021).

22. Tolz, V., Hutchings, S.: Truth with a Z: disinformation, war in Ukraine, and Russia's contradictory discourse of imperial identity. Post-Soviet Affairs, pp. 1-19 (2023).

23. Alieva, I., Ng, L. H. X., Carley, K. M.: Investigating the Spread of Russian Disinformation about Biolabs in Ukraine on Twitter Using Social Network Analysis. In 2022 IEEE International Conference on Big Data (Big Data) pp. 1770-1775. IEEE. (2022).

24. Carley, K. M.: ORA: A Toolkit for Dynamic Network Analysis and Visualization. In Reda Alhajj and Jon Rokne (Eds.) Encyclopedia of Social Network Analysis and Mining, Springer. (2014).

25. Alieva, I., Carley, K. M.: Internet Trolls against Russian Opposition: A Case Study Analysis of Twitter Disinformation Campaigns against Alexei Navalny. In 2021 IEEE International Conference on Big Data (Big Data), pp. 2461-2469. (2021).

26. Alieva, I., Moffitt, J. D., Carley, K. M.: How disinformation operations against Russian opposition leader Alexei Navalny influence the international audience on Twitter. Social Network Analysis and Mining, 12(1), 80. (2022).

27. Carley, L. R., Reminga, J., Carley, K. M.: ORA & NetMapper. International conference on social computing, behavioral-cultural modeling and prediction and behavior representation in modeling and simulation, Springer, vol. 3, no. 3.3, p. 7. (2018).

28. Traag, V. A., Waltman, L., Van Eck, N. J.: From Louvain to Leiden: guaranteeing well-connected communities. *Scientific reports*, 9(1), pp. 1-12. (2019).

29. Grootendorst, M.: BERTopic: Neural topic modeling with a class-based TF-IDF procedure. *arXiv preprint arXiv:2203.05794*. (2022).