Exploring Public Opinion Dynamics on the Verge of World War III using Russia-Ukraine war - Tweets Dataset

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ABSTRACT

The invasion of Russia on Ukraine on February 24, 2022, raised the global concern for world war III. With social media being the prominent platform to influence public psychology, another information warfare emerged in the digital domain. During the war, the reports flooded across the globe via several social media channels such as Facebook, Twitter, Instagram, etc. These platforms are utilized to gain support and spread war insights and diverse opinions with different sentiments and perspectives. Following this, it is critical to analyse and understand the potential of such information to mould public behaviour. In light of this, the present work aims to analyse such dynamic sentiments by performing exploratory data analysis with several visualizations using tweets acquired during the peak war period, December 31, 2021, to March 03, 2022.

CCS CONCEPTS

• **Human-centered computing** → **Visualization**.

KEYWORDS

Ukraine Russia war, Twitter data analysis, Sentiment analysis, Visualization

1 INTRODUCTION

In today's world, information is a vital component that drives a public understanding and psychology. With the tremendous growth in social medial platforms, such information spreads at exponential rates. Due to this, these platforms may result in producing a significant quantity of sentiment data. The manual analysis of such huge data is not feasible and hence several computer-assisted applications are developed to perform exploratory data analysis and acquire the distribution of different varieties of information to understand the hidden information. Considering the situation today, during the COVID-19 outbreak [1] and the Russo-Ukrainian

war [17] such analysis is an essential part to avoid any kind of miscommunication and false panic situations. Concerning such events, the information that is being flooded on social media pertains a huge influence on the general public. Hence it is necessary to prevent the spread of false information with offensive context which may harm the sentiments of others.

1.1 Russo-Ukrainian war

The conflicts between Ukraine and Russia have been building for the past decades. On August 24, 1991, Ukraine proclaimed its independence following the disintegration of the Soviet Union [2]. Later, Ukraine intended to join European Union (EU) and become independent like other European countries. On the other side, there were many people who had a great deal of compassion for the Russians. They considered themselves Russians and felt that Russians and Ukrainians are ethnically similar since they are both Slavic. For these people, the event of 1991 was like a partition and a tragedy. Vladimir Putin was one of such people. In December 2021, Putin said that the collapse of the Soviet Union was a major humanitarian tragedy [11] in which more than 25 million 'Russians' were suddenly cut off from Russia and had to disperse into various independent countries. Putin claims that Ukraine and Ukrainians, are an indispensable part of Russian history and culture, and he considers Ukraine to be a part of Russia.

The people living in eastern Ukraine, the area that lies beside Russia's border, are mostly Pro-Russian as shown in Fig. 1. But in the overall country more than the majority of people were in joining the EU as an independent country. This also follows the creation of two political groups: one is the Pro-Europian Union and the other is Pro-Russia [10]. According to a survey [8], 53% of the Ukrainians were in the favour of joining the European Union and 46% of Ukrainians favoured joining NATO [7]. In the same survey [8], 27% of Ukrainians were against joining NATO and the others did not have a strong opinion; thereby making 20-30% of people favour Russia. In 2017, Ukraine's parliament adopted legislation which stated that adopting NATO membership is a major objective for the foreign and security policy of Ukraine [14]. Following these events, Russia started to support Pro-Russian separatist groups in Donetsk and Luhansk that favour Ukraine to be part of Russia. More than 14,000 people were killed in this proxy war. However, Ukraine still seeks to join NATO.

From late 2021 through early 2022, it was evident that Russia was amassing its forces near the Russian-Ukrainian borders. A similar invasion was performed after Viktor Yanukovich was deposed in 2014 after opting out of a deal with the EU in favour of a better relationship with Russia [5]. Later, Russia seized Crimea from Ukraine

Figure 1: Pro-Russian unreset in Ukraine [16].

Figure 2: Data pre-processing stages.

against the wishes of the West, further escalating the tensions between the two countries. Though Russia claimed this action was supported by the Crimean people, Western countries and Ukrainian authorities denounced it as a fraudulent vote [3]. Following such events, Russia invaded Ukraine on February 24, 2022, prompting rapid criticism from numerous world leaders, including EU and NATO members.

The Russian-Ukrainian conflict has produced and continues to create a humanitarian catastrophe for the people residing in Ukraine. Russia gained possession of Kherson on March 2, 2022, making it the first major Ukrainian city to fall to Russian forces [12]. Many Western governments have placed sanctions on Russia in response to the Russian invasion in an attempt to discourage and reverse Russian aggression, and Western firms have begun to remove their activities from Russia.

1.2 Public opinion dynamics

Today, media (especially social media) play essential roles in shaping the perceptions and attitudes of people. Human minds are often complex and illogical, and their thoughts are continuously influenced by the input of social media. As the internet and mobile internet continue to expand in popularity, everyone now has the ability to publish information and express views, which is rapidly transforming the means of information and opinion distribution [6]. Therefore, the internet has captivated researchers researching national politics, elite communication, and citizen involvement, and subsequently that emphasis has shifted to social media as an arena for the expression – and hence measurement – of public opinion becomes a topic of attention.

Digital platforms have played an essential and rising role in crises, conflicts, and war for over a decade [15]. People utilise platforms to expose human rights violations in crises, criticise crimes, appeal to the international community for action, and crowdsource relief and aid. Platforms are also places where governments and others disseminate news, encourage peace, plan activities, and recruit warriors. The Ukrainian conflict is no exception.
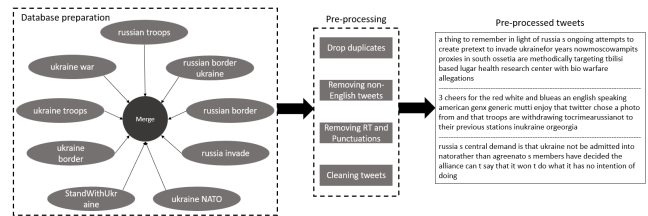
1.3 Social media activity

Information warfare and campaigns have persisted throughout the conflict. This followed several social media platforms such as Facebook, Twitter, etc. Russian disinformation operations are conducted both locally and internationally; nevertheless, Ukrainians have launched a social media war against Russia by utilising social media platforms to promote the Ukrainian cause and draw worldwide attention and support [4]. In the aftermath of the violence, social media sites have made steps to counteract misinformation and disinformation [13]. With this motivation, following the critical war period from December 31, 2021, to March 03, 2022, in this research work, the aim is to perform exploratory data analysis on tweets that were posted using visualization techniques and sentiment analysis.

The rest of the paper is organized into several sections. Section 2 presents the dataset details, followed by the conducted exploratory data analysis and its corresponding findings are presented in Sections 3 and 4. Finally, the concluding remarks are provided in Section 5.

2 DATASET DESCRIPTION

In the present work, the analysis is conducted on the Kaggle Russia-Ukraine war - Tweets Dataset [9] that consists of tweets with several hashtags for 65 days from December 31, 2021, to March 03, 2022. The overall dataset comprises 1,316,605 tweets acquired by querying various keywords for the search such as 'ukraine war', 'ukraine troops', 'ukraine border', 'ukraine NATO', 'StandwithUkraine', 'russian troops', 'russian border ukraine' and 'russia invade'. For each day maximum of 5,000 tweets per day and dedicated .csv files are created for each keyword.

To perform further analysis, data preprocessing as shown in Fig. 2 is performed. Initially, the tweets with each keyword are merged to form an aggregated collection of data. The tweets are posted in various languages such as English, Spanish, French, German, etc. As observed in Fig. 3 the most prominent language utilized is English, thereby at the initial stage, the tweets that use the English language are extracted. Later, these tweets are pre-processed by deleting the duplicate information, punctuations, stop words, etc. These pre-processed tweets are later utilized to perform exploratory data analysis.

3 EXPLORATORY DATA ANALYSIS

The processed tweets acquired from the actual dataset are utilized to perform further analysis to identify the hidden patterns, information and data distribution. In order to understand the most
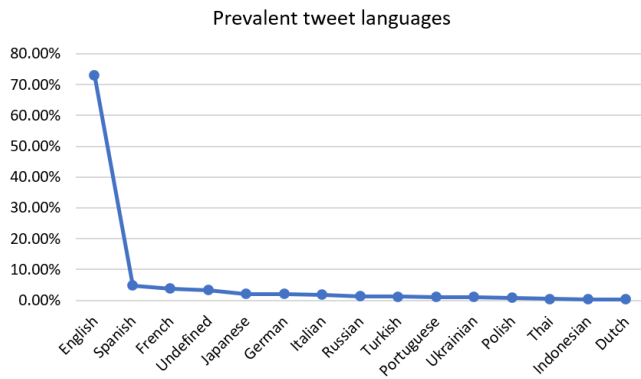
Figure 3: Language distribution of tweets.

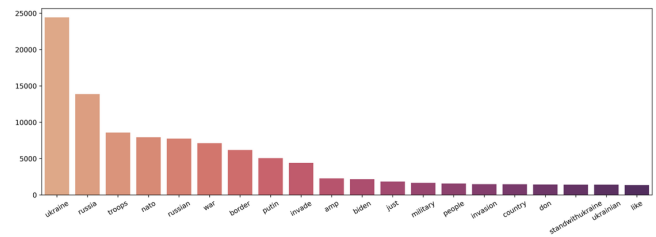Figure 4: Word cloud representation of the tweets during the war period.

Figure 5: Word cloud representation of the tweets during the war period.
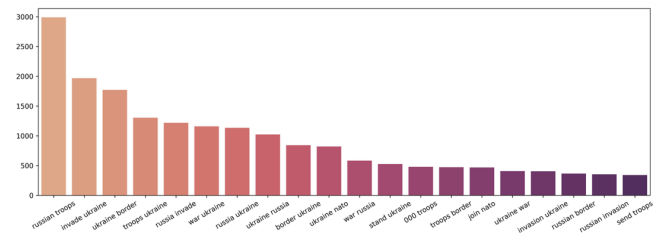

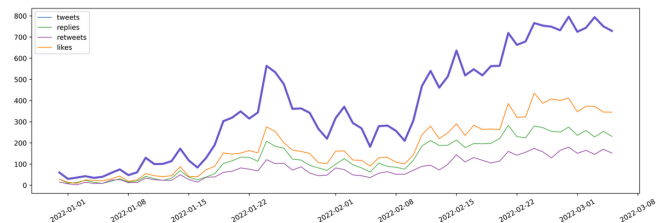Figure 6: Popular two-words group utilized in tweets.

Figure 7: Summary of the number of tweets, replies, retweets and likes.
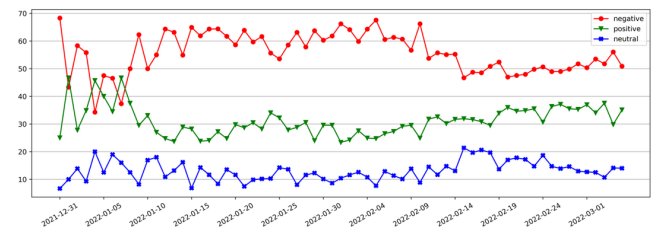

Figure 8: Frequency of positive, negative and neutral tweets by performing per day sentiment analysis.

popular keywords that are utilized in writing tweets, a word cloud is generated as shown in Fig. 4. The tweets are mostly composed of "ukraine", "russian troop", "putin", "nato", "invasion", etc. keywords that indicate the pressure, tension, and issues being experienced by the Ukranians and Russians.

Another analysis is conducted to understand which words are most frequently used as shown in Fig. 5. It is evident that in most of the tweets "ukraine" keyword is most widely utilized, indicating the Russian-Ukraine war to be the most critical matter of concern worldwide. Followed frequent words are "russia", "troops", "nato", "war" and so on. This analysis is further extended to perform two-words analysis to analyse how often two words grouped together are utilized in the tweets that may express more contextual information. Fig. 6 presents the two-words group analysis in the tweets where "russian troops", "invade ukrain", "war ukraine", etc. are used. From this, it can be seen most of the public opinions were thriving towards the concern of tension and war between Ukraine and Russia.

Fig. 7 presents another per-day statistical summary of the posted tweets, the number of replies they received, the number of retweets that are produced and how many likes the tweets received over the

period of 65 war days. It can be seen that while the tension between Ukraine and Russia was building (the time before the invasion) the statistical parameters were saturated. Later, when the Russian army started amassing its forces near the borders and invaded Ukraine on February 24, 2022, social media such as Twitter was flooded with war related tweets and there was a tremendous increase in the tweets over the period.

Since the content and context of the tweet play a vital and critical role that can psychologically influence any individual. With this motivation, in this work, sentiment analysis is also performed to
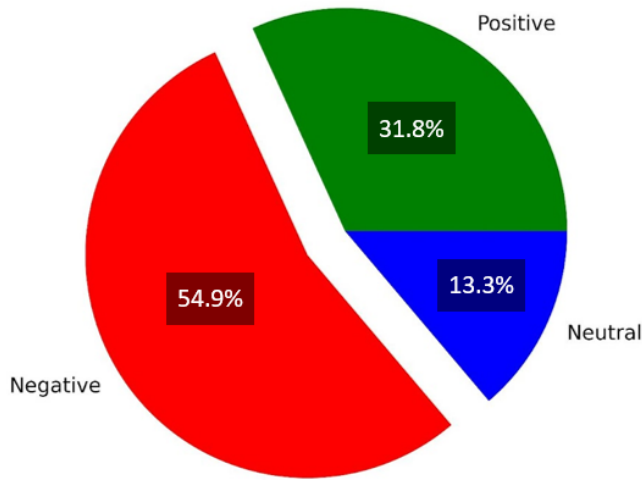
Figure 9: Distribution of positive, negative and neutral tweets.

determine whether the content of a tweet reflects the positive, negative or neutral opinions that may affect the ideology of some other individual. The sentiment analysis is followed by using Natural Language Toolkit (nltk) python library and vader lexicon analyser. Fig. 8 describes the number of occurrences of positive, negative and neutral tweets observed per day. In addition, the class distribution of these tweets is shown in Fig. 9, which comprises 31.8% positive, 54.9% negative and 13.3% neutral tweets. It can be seen that the number of negative tweets is relativelzy higher as compared to positive and neutral tweets.

4 CONCLUSION

The increasing tension between Ukraine and Russia, followed by Russia's invasion also led to social media warfare where individuals shared their opinions to influence, and draw the support and interest of others. Twitter is one such social medial platform that was flooded with tweets concerning the Russian-Ukraine war. Following the crucial initial 65 days of the war, in this work, an exploratory data analysis is conducted to understand the spread and influence of different categories of tweets. It was observed that from the period of rising tension of war to the invasion and following days, there was a huge increase in the war-related tweets. Moreover, with the sentiment analysis, it was observed that were more negative tweets as compared to positive and neutral sentiment tweets.

REFERENCES

[1] Sonali Agarwal, Narinder Singh Punn, Sanjay Kumar Sonbhadra, M Tanveer, P Nagabhushan, KK Pandian, and Praveer Saxena. 2020. Unleashing the power of disruptive and emerging technologies amid COVID-19: A detailed review. *arXiv preprint arXiv:2005.11507* (2020).
[2] Mariana Budjeryn. 2014. The Breach: Ukraine's Territorial Integrity and the Budapest Memorandum. *Woodrow Wilson Center NPIHP, September. https://www.wilsoncenter. org/publication/issue-brief-3-the-breach-ukraines-territorial-integrity-and-the-budapest-memorandum* (2014).
[3] Matt Clinch. 2022. How Russia invaded Ukraine in 2014. And how the markets tanked. https://www.cnbc.com/2022/01/27/how-russia-invaded-ukraine-in-2014-and-how-the-markets-tanked.html. [Online; accessed May 28, 2022].
[4] Roger Cohen. 2022. A Surge of Unifying Moral Outrage Over Russia's War. https://www.nytimes.com/2022/03/01/world/europe/zelensky-ukraine-war-outrage.html. [Online; accessed May 28, 2022].
[5] Jeremy Kahn. 2022. Who is Viktor Yanukovych, the former Ukrainian president Putin reportedly wants to put back in power? https://fortune.com/2022/03/02/viktor-yanukovych-yanukovich-putin-put-back-in-power-ukraine-russia/. [Online; accessed May 26, 2022].
[6] Philip M Napoli and Jonathan A Obar. 2014. The emerging mobile Internet underclass: A critique of mobile Internet access. *The Information Society* 30, 5 (2014), 323–334.
[7] Ivan Pereira and Patrick Reevell. 2022. What to know about Ukrainian President Volodymyr Zelenskyy. https://abcnews.go.com/International/ukrainian-president-volodymyr-zelenskyy/story?id=83085078. [Online; accessed May 25, 2022].
[8] Steven Pifer. 2017. How Ukraine views Russia and the West. https://www.brookings.edu/blog/order-from-chaos/2017/10/18/how-ukraine-views-russia-and-the-west/. [Online; accessed May 25, 2022].
[9] Daria Purtova. 2022. Russia-Ukraine war - Tweets Dataset (65 days). https://www.kaggle.com/datasets/foklacu/ukraine-war-tweets-dataset-65-days. [Online; accessed April 24, 2022].
[10] Reuters. 2022. Timeline: The events leading up to Russia's invasion of Ukraine. https://www.reuters.com/world/europe/events-leading-up-russias-invasion-ukraine-2022-02-28/. [Online; accessed May 22, 2022].
[11] A Saranya Antony. 2022. Escalation of Ukraine Crisis and Russia-West Geopolitical Rivalry: Implications for Regional Stability, Security and Peace. (2022).
[12] Michael Schwirtz and Richard Pérez-Peña. 2022. First Ukraine City Falls as Russia Strikes More Civilian Targets. https://www.nytimes.com/2022/03/02/world/europe/kherson-ukraine-russia.html. [Online; accessed May 28, 2022].
[13] Mark Scott. 2022. As war in Ukraine evolves, so do disinformation tactics. https://www.politico.eu/article/ukraine-russia-disinformation-propaganda/. [Online; accessed May 28, 2022].
[14] James Sperling and Mark Webber. 2017. NATO and the Ukraine crisis: Collective securitisation. *European journal of international security* 2, 1 (2017), 19–46.
[15] Karin Wahl-Jorgensen. 2020. An emotional turn in journalism studies? *Digital journalism* 8, 2 (2020), 175–194.
[16] Wikipedia. 2022. 2014 pro-Russian unrest in Ukraine. https://en.wikipedia.org/wiki/2014_pro-Russian_unrest_in_Ukraine. [Online; accessed May 26, 2022].
[17] Wikipedia. 2022. Russo-Ukrainian War. https://en.wikipedia.org/wiki/Russo-Ukrainian_War. [Online; accessed May 22, 2022].