Public Sentiment and Emotion Analyses of Twitter Data on the 2022 Russian Invasion of Ukraine

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Abstract:

With the aggravation of the Russia-Ukraine conflict and the rising involvement of foreign powers, it has become more substantial to identify whether an endorsement or condemnation of war efforts is the universal message. This goal is empowered by the clear literature on the vital linkage between public opinion and international relations. Thus, we investigated the sentiments and emotions of the international community on the Russian invasion of Ukraine. A total of 27,894 tweets posted within the first day in the #UkraineRussia hashtag were analyzed. Results show that "*war*", "*people*", "*world*", "*putin*", and "*peace*" were some of the most frequently occurring words in the tweets. There were more negative sentiments than positive sentiments, and sadness was the most salient emotion. To date, this study is the first to examine the Russo-Ukrainian War and one of the few sentiment and emotion analyses for exploring Twitter data in the context of modern war.

INTRODUCTION

After months of tensions and provocations, Russia launched a full-scale military invasion of neighboring Ukraine on the 24th of February 2022. People around the world are turning to various social media platforms to access the latest news and express their opinions and sentiments on the Russo-Ukrainian War. In policy reforms, public sentiment is significant because it allows elected officials to measure the approval of their citizens (Srivastava et al., 2018). However, when it comes to foreign policy, international conflict has been insulated from public influence and opinion. Moreover, research has expressed more interest in the statements of national leaders than in public sentiments concerning war (Hahn, 1970). When the conflict began in 2014, one study explored the public opinion on military intervention by Russians and independence by Ukrainians (Balzer, 2015). It concluded with an assertion that the Russian public may need to convince President Vladimir Putin to revisit their foreign policy. In democratic nations, public opinion carries more weight, and some experts postulated that this government system diverges from autocracies in alliances, military disputes, and other forms of international conflict and cooperation (Leeds, 2003; Mansfield et al., 2000; Russett & O'Neal, 2001). At an individual level, incumbents might worry that unfavorable public opinion and political outcry could result in defeat in the next election (Tomz et al., 2020). Therefore, the linkage between public opinion, local affairs, and international relations is prescriptively important (Efimova & Strebkov, 2020; Foyle, 1999; Gelpi, 2010; Holsti, 1992; Jacobs & Shapiro, 1999; Tomz et al., 2020).

A growing literature on foreign policy supports this view by extracting public opinion and inclination to acquire insights into international relations (Bell & Quek, 2018; Chu, 2018; Herrmann, 2017; Weiss & Dafoe, 2019). Although with valid reasons and dictated by their research designs, most of these studies focused only on public opinion in countries directly participating in the military conflict (e.g., Americans on the Iraq War (Gelpi, 2010)). One issue with this approach is the difficulty in accurately capturing "true" public opinion, conspicuously in territories with repressive and authoritarian forms of government. Often, citizens demonstrate their discontent and frustration with the policies of the national leadership by refusing to participate in public affairs rather than open forms of opposition and repression. One notable example is the low voter turnout (30%) during the 2018 Russian regional elections (Gudkov, 2019). With the escalation of conflict and involvement of foreign powers and influencing external actors in the Russian invasion of Ukraine (e.g., issuing economic sanctions and export controls), it has become more significant to distinguish whether an endorsement or condemnation of war efforts is the universal message. This is likewise a considerable gap given that global altruism shapes public support for sending troops into duty (Kim, 2014). Finally, scholars asserted the importance of understanding how people form opinions on matters of foreign affairs and decisions about military force (Tomz et al., 2020). Overall, these studies underscored the vital role of public opinion in government and politics.

In this study, we examined the public opinion on the Russian invasion of Ukraine by analyzing the textual-only tweets posted by people worldwide. Specifically, our analyses

concentrated on estimating the sentiment polarity and emotions. We focused on social media because of its higher interactivity and wider reach in crisis communication than traditional media (Xu, 2020). This choice also reflects the predilection of people toward interactive over static information during a crisis. Among the social networking websites, we selected Twitter because of its international appeal in terms of political discourse and activities (Duncombe, 2019; Huszár et al., 2022; Kasmani et al., 2014; McGregor & Mourão, 2016; Webster & Albertson, 2022). Through the years, various studies have also explored the consumption of social media in various crises, from health pandemics to natural disasters (Civelek et al., 2016; Eriksson, 2018; Garcia, 2020; Lambert, 2020; Westerman et al., 2014). This study contributes to the existing thread of social media literature by positioning the analysis in the context of war. For world leaders and their governments, understanding public opinion is vital because of the devastating consequences of war on the civilian population (Murthy & Lakshminarayana, 2006). Rather than the traditional procedures of obtaining public opinion (e.g., polls and surveys), we replicated the methodology employed in extracting the same information during the early outset of the COVID-19 pandemic (Garcia, 2020). Thus, it is not our goal to propose a novel method for these analyses but to utilize an existing one in a war context. With the application of sentiment and emotion analyses in this setting, we intend to catalyze discussions on utilizing automated processes in determining public opinion. Furthermore, we aim to promote digital transformations in governance systems where technology is at the forefront of operations. To the best of our knowledge, our study is the first to investigate the public sentiment regarding the ongoing war between Russia and Ukraine.
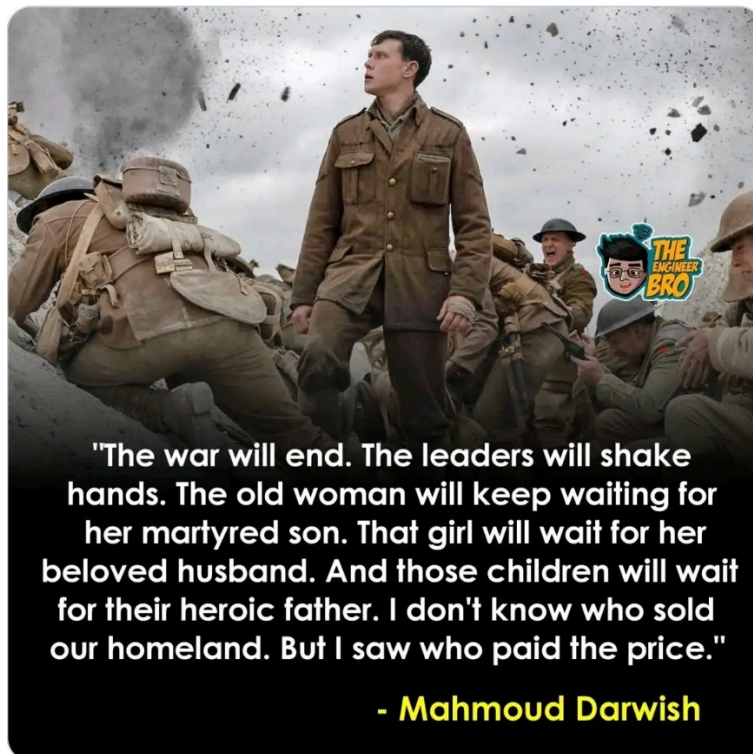
RELATED WORKS

Social Media

In recent years, social media platforms have materialized as a significant information conduit in moments of disaster, crisis, adversity, and uncertainty. One communication research posited that the immediacy of information, updates, and announcements is a crucial motivation why people utilize them for informational purposes (Garcia et al., 2022; Westerman et al., 2014). The increasing role of social media highlights the growing adoption among the public. For instance, the *Alaska Earthquake Center* created a Facebook group that operates as a forum for discussing volcanoes, earthquakes, and tsunamis (Lambert, 2020). The analysis of the virtual community indicates that the group served the primary functions of providing information, updates, and warnings (staff) and as a space to express emotions, support, and concerns (members), to name a few. Another social media is Twitter, which was utilized as a potential driver of democracy development in the context of war and media freedom during the 2010-2011 Ivorian crisis (Schreiner, 2018). Accordingly, this microblogging platform assumed the role of information-verification channels, although it was likewise exploited for dispersing fake news – a phenomenon that has become more prevalent nowadays (Bringula et al., 2021). Journalists also seek refuge in social media for news reportage of war and conflict (Sacco & Bossio, 2015). The dynamism of this media ecosystem has revolutionized the newsroom thus introducing opportunities for extended audience reach, pluralized voices in reportage, and fast news

broadcasting. These studies are among the plethora of research that illuminates how social media can easily assume a fundamental role in information dissemination and disaster risk and crisis communication (Eriksson, 2018; Lambert, 2020; Orehek & Human, 2016; Ulaş, 2021; Westerman et al., 2014).

mr Faizi😉 ✔️
@Faizanawan1235

In the end!! Only the innocent people and soldiers will pay the price🙂💔
#Ukraine #UkraineRussia #Putin #UkraineInvasion #Ukrainian #แตงโม #Russia #UkraineRussiaConflict #ยูเครน

"The war will end. The leaders will shake hands. The old woman will keep waiting for her martyred son. That girl will wait for her beloved husband. And those children will wait for their heroic father. I don't know who sold our homeland. But I saw who paid the price."

- Mahmoud Darwish

3:08 PM · Feb 25, 2022 · Twitter for Android

6.3k Likes   **1.8k** Retweets   **81** Replies

Figure 1. Most Retweeted Tweet in #*UkraineInvasion*

Sentiment Analysis

With the ever-increasing volume and variety of opinion-rich, user-generated content on various social media platforms, more researchers have become fascinated with assessing the

meaning and significance of the data. One approach that has been covered consistently in social media literature is sentiment analysis (Drus & Khalid, 2019). This natural language processing technique is the computational study of sentiments, attitudes, emotions, and opinions of people towards entities and their attributes. It involves a broad concept that consists of different tasks (e.g., opinion spam detection and sentiment classification), methods (e.g., machine learning and lexicon-based), and types of analysis (e.g., document-level and sentence-level). Many researchers employ sentiment analysis to acquire an overview of the wider public opinion behind certain topics. For instance, during the start of the COVID-19 pandemic in 2020, many researchers have examined the Twitter platform. Through sentiment analysis, it was established that most people expressed negative sentiments and exhibited negative emotions, which presents a line of communication for providing real-time situation updates (Garcia, 2020). In relation to the context of this study, this technique was also used to explore Ukrainian and Russian news. Accordingly, they learned that keywords such as *Russia*, *offshore*, and *Crimea* show politicization of news content, while *football* holds leadership since it is available in both sentiment orientations (Bobichev et al., 2017). Both studies highlight the extreme importance of sentiment analysis in social media monitoring as well as the quantification of the attitudes, emotions, and opinions related to current events. Thus, the utilization of sentiment analysis in the recent Russian invasion of Ukraine is an appropriate approach to identify which side the international community stands on.

Emotion Analysis

In contemporary world politics, a cursory examination of events implies that people interact with government institutions and political leaders through an emotional state (Webster & Albertson, 2022). In Russia, for example, emotions such as anger, joy, fear, sadness, disgust, and surprise manifest over the Russian-Ukrainian crisis (Smetanin, 2020). Placing the discussion in this perspective, the *Situational Crisis Communication Theory* posits that crisis responsibility raises feelings of schadenfreude and anger while reducing feelings of sympathy (Kim & Cameron, 2011). This emotion-based standpoint on crisis implies that emotions are anchors in interpreting crises. Aside from the essential role of emotions in shaping public opinion on foreign policy as well as deciphering crisis situations, politicians are recognizing emotions as integral to the age of post-truth politics and potentially more significant than rationality and facts (Chatterje-Doody & Crilley, 2019). In parallel, emotions affect how people perceive, evaluate, and feel about the different types of response messages published by public and private institutions. These studies emphasize the importance of analyzing emotions in a time of crisis.

METHODS

To determine the public opinion on the Russian invasion of Ukraine based on tweets (a slang term referring to a message posted on Twitter), we replicated the methodology employed in extracting the same information in the context of the COVID-19 pandemic [25]. The collection, processing, and analysis of data were accomplished using *R* Programming.

Hashtag Selection

To extract a representative image and create the corpus, we used the #UkraineRussia hashtag. In social media, a hashtag is a metadata tag used to index and locate topics. In our procedure of selecting the hashtag, we specifically avoided some hashtags (e.g., *#StopPutin* and *#StandWithUkraine*) that may cause a bias against one country. The hashtag *#RussiaUkraine* was excluded because it had fewer tweets and was not included in the top ten most frequent hashtags (Figure 3). Unlike our previous method in the COVID-19 study (Garcia, 2020), we did not use keywords and opted for a hashtag instead as it offers a simpler way to find targeted content. The communicative functions of hashtags also posit that people use them to share experiences and express emotions (Laucuka, 2018).

Data Collection

Following the hashtag-based crawling, we compiled tweets and their metadata (e.g., source, favorites, retweets, etc.) from Twitter's official API by employing the *rtweet* package. Tweets posted before February 24, 2022, were excluded because we are only interested in the reactions of the international community to the arrival of Russian troops in Ukraine, indicating the start of the war. We likewise excluded retweets on the search results to avoid analyzing duplicate content. It is important to note that we collected our dataset during the first day of this war, which means that our results represent preliminary reactions. People were reacting based on their beliefs (e.g., Pro-Russia) and could be influenced by what little they knew. Thus, they could have switched sides after more information and developments (e.g., Russia being accused of bombing hospitals and other civilian targets). The total number of tweets was 39,525 and the most frequent words are presented in Figure 2.

Data Processing and Analysis

For each tweet in the final dataset, we performed a series of text preprocessing techniques to prepare the text data. The exact techniques (e.g., removing special characters, stop words, noise letters, and URL) from our previous study were applied (Garcia, 2020). In addition, we used the lexicon-based approach to classify tweets in terms of polarity and emotion using Bayesian classifiers in the sentiment package. We deepened the meaning behind the tweets through emoticons (e.g., sad emoji signifies sadness), degree modifiers (e.g., very conveys more intensity), negation (e.g., 'not' means the opposite of whatever emotion is extracted), and abbreviations (e.g., WW3 means Third World War). As stated in our objective, we applied an existing technique because we did not intend to propose a novel method but to contextualize the sentiment and emotion analyses in a war setting. By doing so, we are positioning these techniques as valid tools for informing decisions while considering public opinion.

Figure 2. Most frequent words before data processing

RESULTS AND DISCUSSION

In total, we collected 27,894 tweets from 22,286 users during the first day of the Russian invasion of Ukraine. Excluding the main hashtag used in the data collection (i.e., *#UkraineRussia*), the most frequent hashtag used concurrently were *#Ukraine* (n = 6,581), *#UkraineInvasion* (n = 6,720), and *#Russia* (n = 6,234), to name a few (Figure 3). Only two hashtags did not use Russia or Ukraine (i.e., *#Putin* and *#worldwar3*). In terms of sentiment polarity, there were more negative sentiments (n = 19,724, 70%) than positive sentiments, which is an expected response because of the devastating consequences of war on everyone.

Table 1. Most Occurring Word and Sample Tweets

Rank	Words	Frequency	Sample Tweets
1	war	4155	• *If you trust America and Europe and declare **war** on Russia and Putin, you will be left like a statue. Those who trust America and Europe in Turkey and other countries, read well. - @55MUSTAFAEVCCCE* • *The mainstream media in the UK almost seem to want World **War** Three to start asap. **War** mongering, blood thirsty zealots, utterly shameful beyond measure. - @Mdreadedtwit*
2	people	1655	• *What will you win at the end of the war? Fight against all the evil which makes it difficult for **people** to place food on plate for their family! War is a luxury this world cannot afford anymore! - @SusanSock* • *If you didn't started the chaos, there is no war, and **people** dying. They are living peacefully yet you chose to seize their country for what? Selfish reasons? Security threat? - @BaoxianB*
3	world	1391	• *The funeral of humanity is taking place. All countries need to communicate this problem and solve it, otherwise it can be a threat to the whole **world**. It destroys humanity. - @SOHAILct* • *To all on the left who say Russia is going to take over the **World**. Russia is having difficulties just invading a small country with minimal military. - @ric22812704*
4	putin	1263	• ***Putin** is like a narcissistic ex BF full of narc-rage that Ukraine and other countries want to be free of him. If he can't have them no one can. This is an insecure **Putin** issue, not a Russian one. - @lokiesteve* • ***Putin** is trying to avoid a future war by neutralizing the foundations being set; yes there will be casualties... But there were also casualties in Iraq, Afghanistan, Palestine and Libya. - @Hon_Omondi*
5	peace	1096	• *If you're reading this, give out a prayer for **peace** in the world. That peace fill all hearts. And all homes. And all lands.Everyone deserves to live in **peace** and happiness. - @Suryakant_hindu* • *Endorse and spread the appeal: Demand Russia to Stop Military Operation against Ukraine. Demand **Peace**. Say No to War. Sign the appeal. - @ravinitesh*
6	stop	989	• *Putin want a war not Russia. Russian stand with Ukraine. Russian protest Moscow and st Pittsburgh to **Stop** invasion. - @AmanSinghSaluja* • *If you can't **stop** the ongoing war and Killing of innocent people,you have no right to lecture people and to call yourself world leaders. - @KaiserShafi_*
7	nato	959	• *The moral of the story is war should always be fought in your own strength, not in the hopes of others specially if it's America or other fraudulent organization like **NATO** or UN. - @muftkhordilli* • *If **NATO** under the U.S. does not prevent the invasion of Ukraine now, it will open the door to the same occupation of other countries in the future. - @CICOMOCANCA*
8	president	662	• *Demonstrators in several major U.S. cities protested the invasion of Ukraine, calling on Russian **President** Vladimir Putin to halt the missile and troop assault. - @Vipinsrivasta15*

			• *Involve Ukrainian citizens in war is foolish and selfish act of **President** Zelenskyy. This act will give Licence to Russian Forces to kill Ukrainian Citizens.* - @faisal_navy
9	country	661	• *Don't rely on any **country** this is proven that even strongest nations won't help you in your difficult time , I say it again built your **country** so strong that you don't need anyone's help.* - @NikhilJadhav144 • *What we are witnessing is a war of aggression. We must reconsider what the **country** should be and how we should face the international community.* - @pazhide
10	live	565	• *Dear God, we pray for the innocents who **live** in the shadow in this, especially the frightened children, Be their shelter, strength and hope.* - @sachinrf • *Let people **live**, everyone is already devasted for Covid & they lost so many for last 2years. How will u forgive urself after letting so many people go!!* - @sanzida_akter6

Table 1 shows the ten most frequent words in the text corpus, excluding Ukraine (n = 4633), Russia (n = 3, 2237), Russian (n = 1862), and Ukrainian (n = 984). For presentation purposes, we omitted metadata (e.g., links and hashtags) to make the sample sentences concise and clear. Unsurprisingly, *war* was the most occurring word, reflecting the current situation. This finding reaffirms the authenticity of social media as a real-time medium of information and communication. Steered by an assumption that it was used together with the third most frequent word (i.e., *world*) as evident on the #*WorldWar3* hashtag, we supervised a keyword in context concordance analysis. Based on the results, the keyword *world* was mentioned in 85% of occurrences of *war*. This finding indicates the increasing fear that the Russia-Ukraine crisis might trigger or be a prelude to World War 3 (e.g., *In order to save humanity, war must be stopped. Otherwise, the third world war will sink everything.* - @MaLakafridii). We can only conclude that this indication reinforces the significant role of social media outlets like Twitter as widely used platforms for self-expression (Orehek & Human, 2016) even in times of war and violence.

Notably, the second most frequent word was *people*. History is filled with examples of how people (from citizens to soldiers) are the primary casualties of war (Mueller, 1991). This result shows that the public sentiment is leaning against the aggressor country, which is evident in the fifth and sixth most occurring words (*peace* and *stop*). The united call for peace and the expanding movement to stop the war by the international community accentuates social media as a space to communicate group cohesiveness. Likewise, it provides citizens an accessible platform to broadcast and share their sentiments, which is evident during the Israeli war on Gaza Strip (Zein & Abusalem, 2015). Despite some e-safety concerns on social media (Alcober et al., 2020), Twitter users have been expressing negative views of Russia and its president, Vladimir Putin (*Putin* was the fourth most frequent word). In the eyes of outsiders, whether the Russian invasion is justified or not (e.g., to prevent NATO's expansion eastward to Russia's borders), the invaded country deserves their support. This inclination towards the former Soviet territory reflects the *no one wins in a war* belief, which might explain why the tweet in Figure 1 was the most retweeted in the hashtag.
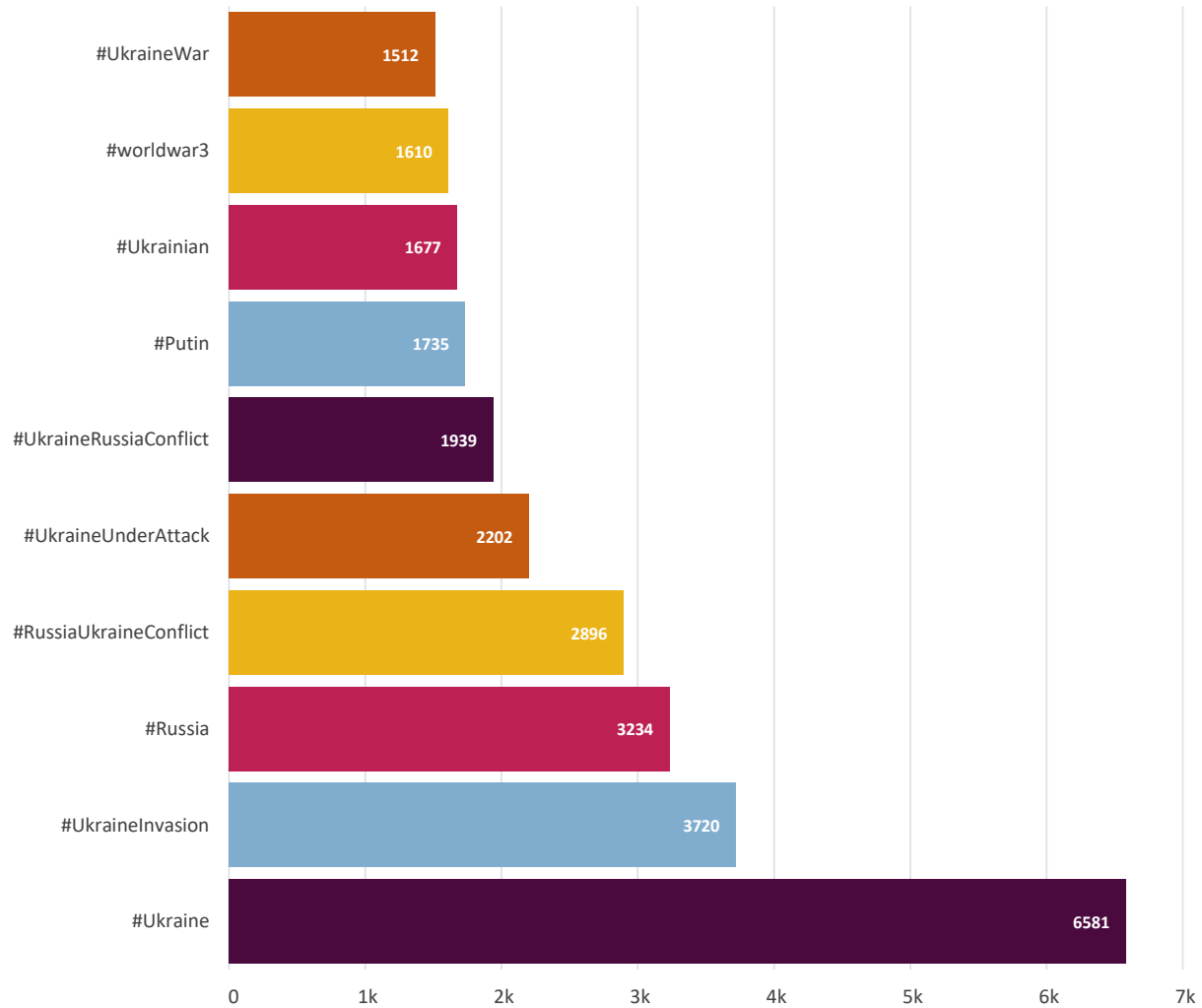
Hashtag	Count
#UkraineWar	1512
#worldwar3	1610
#Ukrainian	1677
#Putin	1735
#UkraineRussiaConflict	1939
#UkraineUnderAttack	2202
#RussiaUkraineConflict	2896
#Russia	3234
#UkraineInvasion	3720
#Ukraine	6581

Figure 3. Most frequent hashtags concurrently used with #*UkraineRussia*

Regarding the emotions expressed through tweets (Figure 5), the analysis revealed sadness (e.g., "*So so sad what is happening to the people of Ukraine just cant wrap my head around it how can this be happening in 2022...*" - @Sireland82) as the most frequent and salient emotion, followed by fear (e.g., "*We are in a VERY scary time, but I just cannot fantom, that as a world order, we do nothing more against Russia...*" - @jasonqdillion) and anger (e.g., "*NATO, USA and western Allies used Ukraine to provoke Russia. They used Ukraine for their own interest and left it when it's in trouble...*" - @kumar99prakash). Fear, anger, and sadness offer significant viewpoints due to their association with aggressive acts. For instance, anger is a positive predictor of and carries explanatory power for war, military support, and endorsement of killing (Cheung-Blunden & Blunden, 2008). One example is the outrage toward the events of 9/11 (i.e., September 11 attacks) that channeled the overwhelming support of Americans for military action. This is the opposite of fear, which encourages the avoidance of conflict.
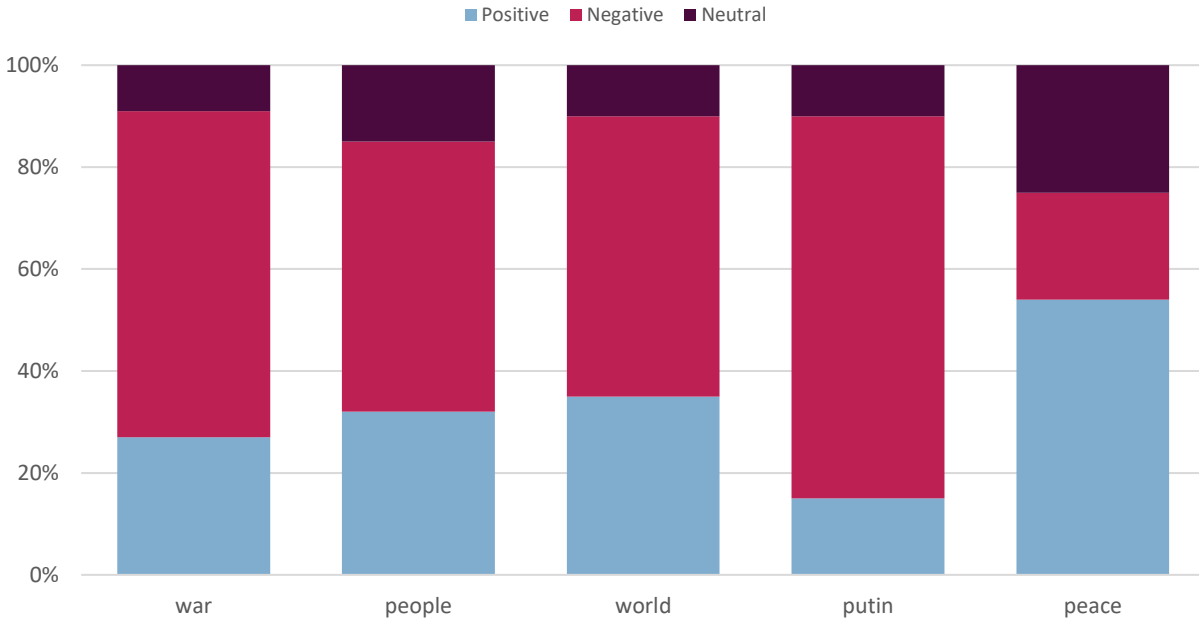
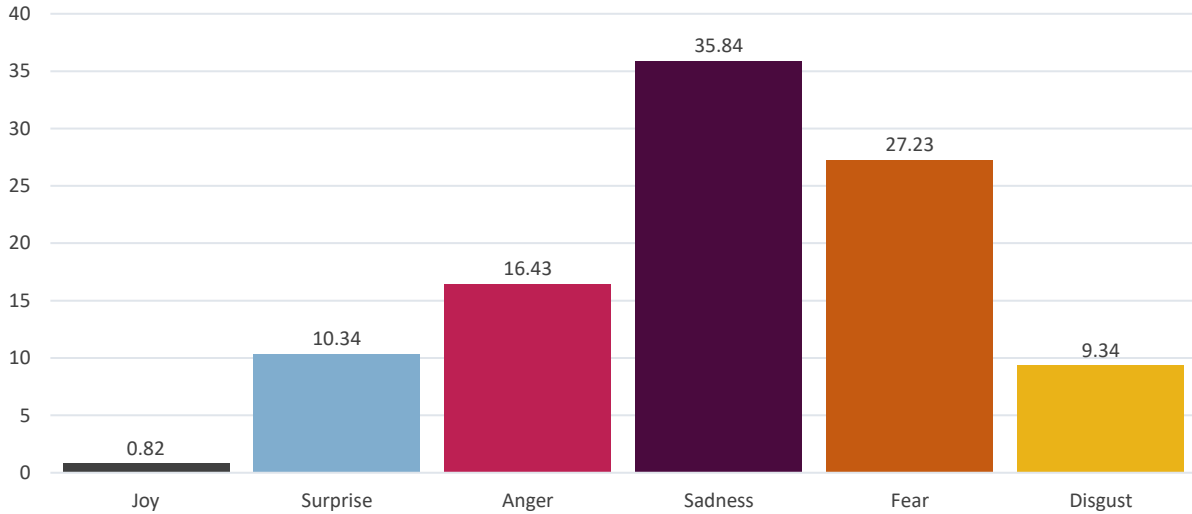**Figure 4. Category Wise Sentiment Analysis of the Top Five Words**

Figure 5. Emotion Analysis of Tweets Related to Russian Invasion of Ukraine

CONCLUSION

In this study, we investigated the public sentiments from the international community on the Russian invasion of Ukraine. To the best of our knowledge, our study is the first to scrutinize the Russo-Ukrainian War and one of the few sentiment analyses for exploring Twitter data in this

situation. Consequently, our study contributes to the thread of knowledge on social media mining by using sentiment analysis in the context of war. Our findings showed more negative sentiments than positive sentiments, and sadness was the most salient emotion. There is also an indication that the public sentiment is leaning against the aggressor country through the *no one wins in a war* belief. With Twitter evolving as a platform for political, informational, and social exchange, it is our understanding that social media can be a vehicle for mass communication. The ample availability of daily conversations, chatters, and even political debates means that governments and politicians can maximize Twitter as a source of public opinion. This trend is evident on various analyses of politician-to-public exchange and how people utilize it as a platform to express their sentiments, emotions, and opinions. Ideally, future research will advance our understanding by continue examining the platform as a channel for public participation in peacemaking. In the case of the *2022 Russian Invasion of Ukraine*, it is our hope that this study may contribute to peace in its own little way by unfolding public sentiments and emotions of the international community.

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