

User Sentiments on Ukraine conflict on Twitter

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ABSTRACT

Russia's assault on Ukraine started the biggest conflict in Europe in decades. In addition to the suffering and humanitarian crisis caused, the entire world has been feeling the effects of slower growth and faster inflation. Therefore, we decided to look at how people's attitudes to this conflict differ in diverse social environments and how it changes over time. We traced how the sentiment of Twitter users changed during the conflict, and how the conflict is portrayed in liberal and conservative media. Our data suggest that the general sentiment regarding the conflict became more negative over time. In addition, we found that the sentiment differed between Russian and English users. Furthermore, we found that liberals were generally more concerned about the conflict, whereas conservatives were more concerned about domestic problems in the US.

CCS CONCEPTS

• Human-centered computing; • Social media;

KEYWORDS

Ukraine invasion, Twitter, sentiment analysis, media bias

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1 INTRODUCTION

On February 24th, 2022 Russia launched an invasion of Ukraine following a massive military build-up at the Ukrainian border for several months, triggering the biggest conflict since WWII in the European continent. Since then, the world's attention has been focused on Ukraine and Russia. As one of the prominent social media platforms, Twitter has been the center of discussion regarding the conflict, involving a large number of people, ranging from

individual users to Ukrainian officials such as President Volodymyr Zelenskyy. In this paper, we attempt to:

- (1) Trace the general sentiment regarding the conflict and see how it is changing over time
- (2) Find whether there is any sentimental difference in conflict-related tweets in English and Russian.
 - Find whether there was a change in sentiment in Russian tweets after Twitter got banned in Russia
- (3) Find whether the conflict is portrayed differently in liberal and conservative media in the US

We collected a large number of Ukraine conflict-related tweets, ran a deep-learning-based sentiment analysis model to label each tweet's sentiment and finally analyzed and visualized the data using R to answer our research questions. We found some interesting patterns in user behavior and the representation of the conflict in different media outlets.

2 RELATED WORK

Twitter has been used before to track user reaction to global disasters [9][3][4]. There are some publicly available datasets containing Russia-Ukraine conflict tweets[6][1] and one analysis of the effect of the Ukrainian conflict on economic indicators using Twitter[7].

However, so far we could not find any work that had attempted to explore our research questions using Twitter.

3 METHODOLOGY

3.1 Dataset and Data Collection

We scraped publicly available tweets using a Python web scraper. Our analysis restricted tweets from December 24th 2021 to May 24th 2022. Although the conflict started on February 24th, we analyzed the sentiment both before and after the date, since the tension has been simmering for months before the invasion and evolved over the following months.

For the first research question, we collected 75,500 tweets with the keywords "Russia" and "Ukraine".

For the second question, we collected tweets to generate two datasets, one in English and one in Russian. The datasets were divided into three subsets per language: one containing the keyword "putin", another containing "zelenskyy" and the third containing "nato". 250 daily tweets were collected for each subset, resulting in 226,500 tweets.

For the third research question, we take Fox News to represent conservative media outlets and The New York Times (hereinafter

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referred to as "NY Times") as the representative of liberal media outlets. We collected two sets of data for this question. Our first dataset contains all tweets by NY Times and Fox News accounts in our time frame, excluding replies. Our second dataset contains conflict-related tweets only, filtered by keywords "Russia" or "Ukraine", that were sent in reply to New York Times and Fox News accounts in our time frame.

3.2 Sentiment analysis

We used the roBERTa base model trained on 124M tweets from January 2018 to December 2021 [5] fine-tuned for English tweet sentiment analysis. This model gives output in three levels: Positive, Negative and Neutral. For the Russian language, we used RuBERT for the Sentiment Analysis [8] model with similar output labels. For emotion analysis, we used Emotion English DistilRoBERTa [2], which predicts 6 basic emotions plus a neutral class: anger, disgust, fear, joy, sadness, surprise, and neutral.

Prior to the analysis, we preprocessed our tweets by removing duplicates, replacing all hyperlinks with "http" and mentions with "@user". Our scrapped dataset with corresponding emotion labels can be found in our GitHub repository.

<https://github.com/Bensas/UkraineConflictOnTwitter>

4 HOW IS PEOPLE'S SENTIMENT CHANGING OVERTIME?

The sentiment towards the conflict changed to negative, as shown in Figure 1. Weeks with sharp increases were usually caused by significant events during the conflict, and we marked the x-axis of Figure 1 accordingly to the dates of such events. For example, February 24th (beginning of the invasion), shows a sharp increase in negative sentiment, as well as January 14th (Russian cyberattack on Ukrainian websites) and April 7th (Russia started targeting civilians according to US intelligence).

We see that neutral tweets are decreasing, while negative tweets are increasing. Our interpretation is that people who were initially neutral towards the situation are becoming negative.

We further used an alternative sentiment model on our dataset (Figure 2). We can observe that fear and anger are the most prevalent emotion, while joy and sadness are the least. Over time, fear is decreasing and anger is increasing. A similar trend holds for neutrality and sadness. On the contrary, surprise remains mostly consistent, but with several peaks.

5 SENTIMENT DIFFERENCE IN ENGLISH AND RUSSIAN LANGUAGE

The sentiment towards Zelenskyy was more negative in Russian tweets than in English. For Putin, we were able to determine him to be a more polarizing figure in Russian than in English tweets, due to the smaller proportion of neutral tweets. The same observation was found with tweets related to NATO: Russian tweets were more polarized than English tweets.

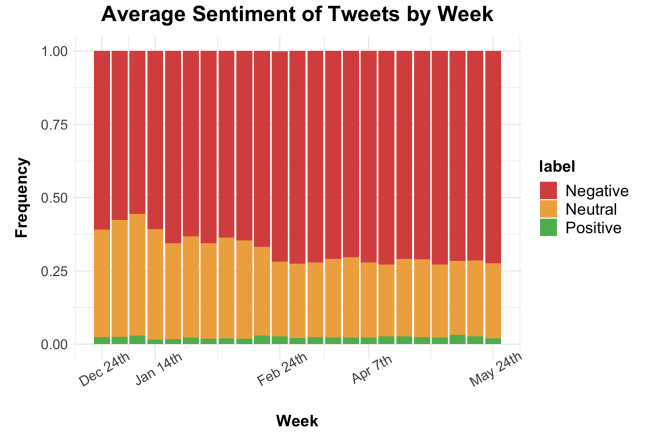


Figure 1: Sentiment by week

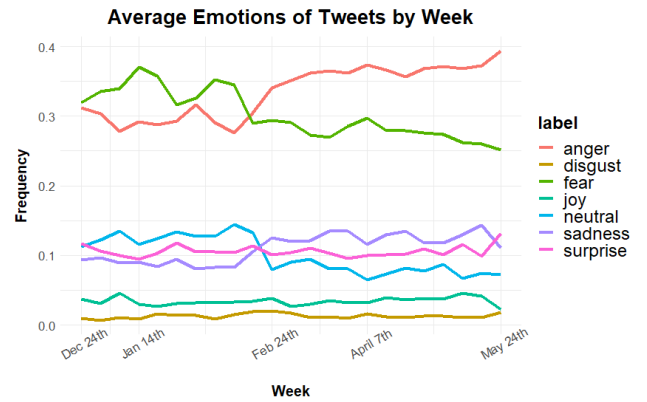


Figure 2: Emotions by week

5.1 Effect of Twitter Ban on Russian Tweet Sentiments

On March 4th 2022, the Russian government banned Twitter. We made a comparison of the sentiment in Russian tweets regarding "Zelenskyy", "Putin" and "NATO", 2 weeks before and after the ban.

For the terms 'Zelenskyy' and 'Putin', the Chi-square test resulted in no statistically significant ($p\text{-value} > 0.05$) difference between the sentiment before and after the ban. On the other hand, we found that tweets containing NATO became more polarized in the Russian language after the ban in a statistically significant way ($p\text{-value} = 0.00012$).

6 IS THE CONFLICT PORTRAYED DIFFERENTLY IN LIBERAL AND CONSERVATIVE MEDIA?

6.1 Portrayal of conflict

As soon as the invasion started, both NY Times and Fox News showed a spike in the number of conflict-related tweets (Fig. 3).¹

¹ Fox News on average posts twice as much as NY Times on Twitter, and the difference in peaks can be attributed to this

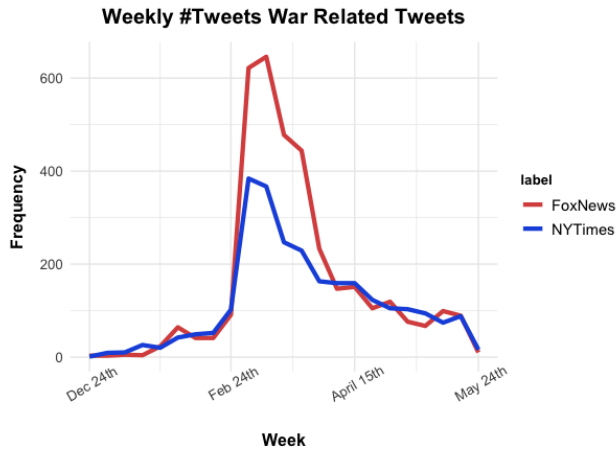


Figure 3: Weekly conflict related tweets by Fox News and NY Times

Interestingly, as the invasion began, the average sentiment of NY Times tweets became sharply more negative, but not for Fox News. On average, a larger portion of Fox News tweets (over 60%) are neutral throughout our time frame.

6.2 Perception of the conflict

Both followers of liberal and conservative media outlets view the conflict overwhelmingly negatively (Fig. 4), as a very small portion of these tweets was labeled positive ($< 4\%$). Moreover, there is no significant difference between the distribution of the sentiments ($p>0.5$).

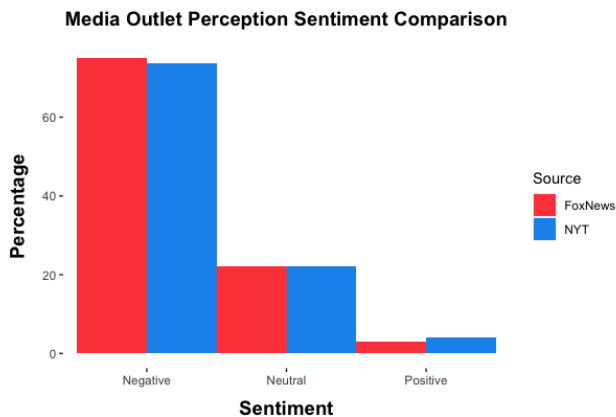


Figure 4: Sentiment Comparison Across Media

However, when we ran a bigram analysis (we removed words such as "russia", "ukraine", "http", "fox news", "new york times" from our bigrams), we found an interesting pattern: there is a difference in the topic on which they are focused. As the bigram word cloud suggests, followers of NY Times are focused on the conflict itself, with the most frequent keywords being "war crimes", "russian people", "join nato", "nuclear weapons" etc, while Fox News followers are more concerned about the conflict's impact on the US itself.



(a) Fox News

(b) NY Times

Figure 5: Most frequent bigrams by Fox News and NY Times

Fox News followers' most frequent discussions revolved around "joe biden" and his administration, which can be observed from "gas prices", "military aid", and "war crimes". The discussion also revolved around the "southern border" crisis and the "hunter biden".² Many of the negative comments from Fox News were actually criticism of the Biden administration, while some of them were concerned with domestic problems, such as gas prices. Positive tweets, a small portion of total tweets, was mostly about good wishes for Ukraine and contain keywords such as "god bless", "stay strong" or "god save".

7 LIMITATIONS

We used 2 different models for English and Russian language sentiment analysis, which is prone to bias. Future work needs to utilize a bilingual model. Word cloud analysis often strips off the context in question, so conclusions drawn from them should be taken with a grain of salt. We only analyzed two media outlets as representative of liberal and conservative media outlets, which is not very rigorous. Future work needs to address a wider range of media outlets.

8 CONCLUSION

As expected, there was a sharp increase in negative sentiment after significant events, such as the start of the invasion. There is a growing negative sentiment about the conflict as neutral users started to change their attitude toward conflict. Before the invasion, there was growing fear, but when the conflict started, fear began to transform into anger. The sentiment key conflict figures such as Putin, Zelenskyy and NATO is different in Russian and English. Interestingly, there is no significant difference between the reactions from liberal and conservative media, but there are differences in the topics on which they focus. Future work on this problem should use a larger dataset and a multilingual model to compare sentiment across languages. Additionally, further research may analyze more languages and more media outlets. We hope that our findings will motivate the research community to continue research on this topic to uncover more insights.

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²Political commentator Tucker Carlson was mentioned the most by Fox News followers in our dataset. However, we disregarded "Tucker Carlson" from the wordcloud, as it took too much space and provided little insight. Over 80% of these discussions are negative, many of which described Tucker as "pro-putin" or "anti american".

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