

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies



Bachelor Thesis

**Detection of propaganda on Twitter after Russian
invasion in Ukraine**

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Thesis title

Detection of Propaganda on Twitter after Russian invasion in Ukraine

Objectives of thesis

The main objective of the thesis is to analyze a selected dataset captured after February 24, 2022 for online propaganda detection on Twitter.

Partial objectives:

- To identify hashtags that amplify the pro-Russia narrative to Twitter's trending list and to discern if there is an automated propagation of messages, e.g. using social bots.
- To identify relevant factors and a comparative analysis of the correlation between the specified hashtags before the start of the war (24 Feb.) and after that date.

Methodology

The theoretical part of the work is based on the study and analysis of pro-Russian hashtags on Twitter for selected countries.

The practical part of the thesis comprises a statistical analysis of the Twitter dataset and focuses on outcome interpretation.

Twitter was chosen as a social media platform because it is unbanned and free to use in the mentioned countries. Moreover, there is the ability to export a dataset for analysis via online services.

The proposed extent of the thesis

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Keywords

Twitter, Propaganda, Statistical analysis, Information, Hashtag, Internet

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Declaration

I declare that I have worked on my bachelor thesis titled "Detection of propaganda on Twitter after Russian invasion in Ukraine" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on March 15, 2024

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Detection of propaganda on Twitter after Russian invasion in Ukraine

Abstract

This thesis aims to analyse a dataset gathered after February 24, 2022, to uncover the landscape of online propaganda on Twitter. As digital communication grows in influence, it is crucial to understand the mechanisms and nuances of detecting online propaganda. This understanding is essential for ensuring the authenticity of information and preserving integrity in democratic discourse.

This study navigates the dynamic space of Russian reality in the present and the past as well as how propaganda works on Twitter, in which Russia takes a solid place in trying to engage with public opinion and sentiment.

The dataset, curated for this investigation, guides us through the propaganda tactics. We will have a look at the narratives woven by propagandists, unearth the key actors driving these campaigns, and scrutinize the tools and techniques employed to amplify their messages.

In a digital landscape where online propaganda continues to challenge the veracity of information, this thesis seeks to illuminate the evolving battleground of information warfare, providing insights into its impact on public discourse and offering valuable insights into the quest for transparent and truthful communication in the digital age.

Keywords: Twitter, propaganda, statistical analysis, information, hashtag, Internet, war.

Detekce propagandy na Twitteru po Ruské invazi na Ukrajinu

Abstrakt

Tato práce si klade za cíl analyzovat datový soubor shromážděný po 24. únoru 2022, aby bylo možné odhalit prostředí online propagandy na Twitteru. S rostoucím vlivem digitální komunikace je zásadní pochopit mechanismy a nuance odhalování online propagandy. Toto porozumění je nezbytné pro zajištění autenticity informací a zachování integrity v demokratickém diskurzu.

Tato studie se orientuje v dynamickém prostoru ruské reality v současnosti a minulosti a také v tom, jak funguje propaganda na Twitteru, kde Rusko zaujímá pevné místo ve snaze zapojit se do veřejného mínění a sentimentu.

Datový soubor, kurátorský pro toto vyšetřování, nás provede propagandistickou taktikou. Podíváme se na narativy utkané propagandisty, odhalíme klíčové aktéry, kteří řídí tyto kampaně, a prozkoumáme nástroje a techniky používané k zesílení jejich sdělení.

V digitálním prostředí, kde online propaganda stále zpochybňuje pravdivost informací, se tato práce snaží osvětlit vyvíjející se bojiště informační války, poskytuje pohled na její dopad na veřejný diskurz a nabízí cenné poznatky o hledání transparentní a pravdivé komunikace v digitálním světě.

Klíčová slova: Twitter, propaganda, statistická analýza, informace, hashtag, Internet, válka

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1 Introduction

The influence of social media on information dissemination

In the era of digital advancements, the Internet has brought about a paradigm shift in how people access and share information. According to Wearesocial's Global Digital Report, billions of individuals worldwide engage with social media platforms on a monthly basis. This widespread adoption of social media not only revolutionizes interpersonal connections but also significantly impacts traditional sources of news, including newspapers.

Even long-standing pillars of the media industry like newspapers have recognized the need for adaptation and embraced this digital transition by incorporating social media into their strategies. Social media platforms are no longer limited to personal communication; they have evolved into influential channels for disseminating news stories.

Based on recent surveys conducted by the Levada Center in August 2023, there appears to be a noticeable increase in domestic approval for the Kremlin's pro-war narrative (Levada, 2023).

Opinions on the actions of the Russian Armed Forces in Ukraine vary significantly, primarily based on approval or disapproval of the president's actions. Individuals who approve of these activities express a support level of 79%, whereas those who disapprove have a support level of only 29% (Levada, 2023).

Recently, there has been a substantial increase in President Vladimir Putin's approval ratings according to an independent Russian polling organization. The ratings have risen from 63 percent in November 2021 to an impressive 83 percent in March 2022. Furthermore, the latest poll indicates that a remarkable 81 percent of respondents expressed either strong or moderate support for the actions carried out by the Russian armed forces in Ukraine (Levada, 2023).

Russia's attempts to block Western social media networks such as Meta products such as Instagram, Facebook, etc. could explain some of the limited engagement, because television remains the main source of information for Russians, and respondents are more likely to trust this source. However, there are notable disparities among different socio-demographic groups. Simultaneously, the proportion of participants relying on Telegram channels for news updates on current events has increased (Levada, 2022).

However, a recent report from the pro-Kremlin online outlet RBC.ru analysed blocked social media outlets and found that millions of Russians were still using Facebook, Instagram, and Twitter, likely through virtual private networks (VPNs).

In 2022, a photograph taken by the James Webb Space Telescope in July went viral on social media. The subject of the image was French physicist Etienne Klein, and the celestial object was Proxima Centauri, a star considered to be the closest to our Sun. The

image, which resembles a close-up of a red star, generated an impressive response of more than 20,000 likes (IndianExpress, 2022).

Fake Proxima Centauri turned up as sliced chorizo, it's a type of pork sausage originating from the Iberian Peninsula. After that story two things are certain: scientists have a sense of humour and not all of them are vegetarians.

The effect of spreading fake news was demonstrated in a study of news posted on Twitter, in which news articles count like a false by fact-checking organizations spread to far more people than articles with real facts (MIT, 2018).

2 Objectives and methodology

2.1 Objectives

The main objective of the thesis is to analyse a selected dataset captured after February 24, 2022, for online propaganda detection on Twitter.

Twitter was chosen as a social media platform because it is not banned and is free to use in the specified countries. In addition, there is the possibility of exporting the dataset for analysis through online services.

Partial objectives:

1. To identify hashtags that amplify the pro-Russian narrative to Twitter (X) trending list and to discern if there is an automated propagation of messages, e.g. using social bots.
2. To identify relevant factors and conduct a comparative analysis of the correlation between the specified hashtags before the start of the war (24.02.2022) and after that date.

2.2 Methodology

The theoretical part of the work is based on the study and analysis of pro-Russian hashtags on Twitter for selected countries.

The practical part is to collect a dataset on Twitter (X) and then analyse and interpret the results.

3 Literature review

The chapter 3 serves as a compilation of literature authored by esteemed scholars in the field. It has pertinent works related to the research topic, addressing specific questions and providing an understanding of the problem at hand. This literature review not only highlights the insights of honourable authors but also forms a crucial foundation for the research endeavour, offering a comprehensive view of the subject matter.

3.1 Theoretical part

Propaganda, as noted by Stanley (2015), can take on both insincere and sincere forms. This duality works in shaping public opinion and political agendas, just as it has in the current Russian-Ukrainian war.

The impact of propaganda cannot be underestimated and if it were ineffective, it would not be used. In this study, we will focus on the negative side of propaganda, as there is also "healthy lifestyle" propaganda.

In the 20th century, there was the so-called "Cold War", a period of tension between the United States and the Soviet Union that started after the end of World War II in 1945 and lasted until 1991.

In the 21st century, propaganda is a tool of hybrid warfare, so studying and understanding its nature is essential to keep the public dialogue honest and ensure the credibility of information in contemporary conflicts like the one between Russia and Ukraine.

As M. Alyukov (Alyukov, 2022) explains in his paper, even though polls show that approximately 60-70% of Russian citizens express support for Russia's military actions, in an authoritarian society one cannot rely on polls (especially in times of war and political repression). Research indicates that individuals may be reluctant to participate in surveys and distort their true beliefs or opinions out of fear of reprisals. This can potentially lead to inflated survey results, as respondents may provide socially desirable responses rather than expressing their genuine perspectives.

There is clear evidence that a considerable portion of the population supports the invasion, also known as the "special military operation."

The current regime is known as an "information autocracy" that relies more on manipulating information through its sources such as TV to maintain its dominance.

Accordingly with Alyukov, over 60% of citizens rely on state-controlled television as their primary source of information, which is fully managed by the government. Russian television channels depict the invasion of Ukraine as a reaction to purportedly aggressive actions by the Kyiv government, characterized as nationalist and accused of committing genocide against its citizens in Eastern Ukraine.

Russia's efforts to restrict access to Western social media platforms like Instagram and Facebook may partially explain the low usage of these platforms among Russians.

The reliance on television as the primary source of information in Russia leads respondents to place more trust in this medium.

However, there are notable disparities among different socio-demographic groups. Simultaneously, the proportion of participants relying on Telegram channels for news updates on current events has increased (Levada, 2022).

The Russian and Belarusian presidents have on several occasions, publicly called Telegram a breeding ground for extremists. Nevertheless, according to a recent analysis from RBC.ru, despite being blocked in Russia, millions of Russian citizens are still accessing and using social media platforms like Facebook, Instagram, and Twitter through virtual private networks.

For the past ten years, mainstream channels have been combining intense political TW shows with entertainment formats to attract and engage viewers. Television narratives extend beyond the confines of television and permeate various media platforms, creating a cumulative impact across different channels.

The Russian government is making significant efforts to gain control over the Internet infrastructure, as we will discuss later in relation to the Internet Research Agency.

Research shows that manipulating information about popular support for the regime can affect overall citizen support. Putin's popularity is partly due to information emphasizing his broad appeal. The same is true for support for the war.

The perception of an artificially created consensus acts as a signal, encouraging other citizens to take pro-regime positions by shaping public opinion.

Consequently, citizens tend to view state-controlled television narratives on the conflict as more credible when encountering similar content elsewhere, such as in manipulated news aggregators, search engines, or even pro-Kremlin Telegram channels. This may explain the unexpectedly high support for military action in Ukraine.

3.1.1 Twitter in 2023

You can have data without information, but you cannot have information without data.

Daniel Keys Moran

Around 5.3 billion individuals are actively connected to the Internet, representing approximately 59% of the global population. The compound annual growth rate for the period from 2018 to 2023 is forecasted to be six percent. It's worth noting that the most substantial growth within this timeframe occurred in 2019, with an estimated addition of 300 million Internet users and a growth rate of 7.7% compared to the previous year (Statista, 2023).

Twitter, founded in 2006 by co-founders Jack Dorsey, Noah Glass, Biz Stone, and Evan Williams, serves as a microblogging platform that facilitates the sharing of messages known as "tweets". Initially limited to 140 characters, the tweet length has now expanded to 280 characters. Twitter boasts an average of 500 million tweets generated daily and a

user base of 218 million active users per month, solidifying its position as the most widely utilized microblogging platform worldwide (Britannica, 2019).

On April 14, 2022, entrepreneur Elon Musk commenced the acquisition process of Twitter and successfully finalized it on October 27, 2022.

After its purchase by Musk, Twitter has recently undergone a rebranding and is now known as X. Elon Musk has the highest number of followers on Twitter, boasting a whopping 156.8 million followers. In 2023, Twitter will have 353.9 million monthly active users, making it one of the most popular sites in the world.

According to recent research, the largest portion of Twitter's user base, approximately 38.5%, falls within the age range of 25 to 34 years old (Demandsage, 2023). Young people are more likely than others to use this social platform.

Below is a breakdown of the age distribution among Twitter users:

Age	Group Share of Users
13-17	6.6%
18-24	17.1%
25-34	38.5%
35-49	20.7%
Over 50	17.1%

Tab. 1: Distribution of users on Twitter (X)

Source: Demandsage, 2023

Gender distribution on the platform is divided between males (56.4%) and females (43.6%). Geographically, the United States has the highest concentration of Twitter users, totaling 95.4 million. This is followed by Japan with 67.45 million users and India with 27.25 million users (Demandsage, 2023).

Official reports from Twitter indicate that the average daily duration a user spends on the platform is approximately 30.9 minutes. Over the course of a month, this accumulates to about 15.67 hours of monthly usage per user.

At present, Twitter/X is in the initial stages of conversations with notable figures from the realms of politics and entertainment. They are also engaging with payment service providers and publishers within the news and media sector. Recent data reveals that a substantial segment of Twitter users, comprising 55%, rely on the platform as their primary source of news. This preference for Twitter as a news source distinguishes it from other social media platforms.

According to an investor presentation by owners Elon Musk and Linda Yaccarino, the plan for the future is to implement additional functionalities on the platform, release its open-source algorithms, address spamming accounts, and advocate for free speech.

Elon has plans to shift the focus of his social media company towards video content, creators, and partnerships in commerce (Reuters, 2023). According to their presentation, vertical video on Twitter now constitutes over 10% of the total time spent by users.

Tweets can include links, images, and videos to provide more context or visual appeal (Twitter, 2022).

3.1.2 Day Z

On 24 February 2022, Russia's assault on Ukraine shook the world with an opportunity to start a full-scale war in Europe.

Russian propaganda tells how Russian forces are continuously “destroying”, “liquidating” or capturing Ukrainian “nationalists”, “neo-Nazis” and “Banderites”. Thousands of civilians died during the fighting and defence.

Following the onset of the Ukrainian invasion on February 24, the Kremlin intensified its propaganda efforts to secure and sustain public backing for the war. One striking development in this campaign was the adoption of the letter "Z" as a pro-war symbol by various elements within the Kremlin, including media outlets, officials, and supporters. This symbol originated from the Russian armed forces practice of marking their vehicles with a zig-zag "Z" pattern to minimize the risk of friendly-fire incidents (Medium, 2022).

The "Z" markings gained widespread attention and were soon embraced by pro-war advocates who began to display the symbol on their vehicles, buildings, and windows.

In March 2022 the Kremlin's state-owned news outlet, RT, published a report highlighting the growing prominence of pro-war symbols in Russia. According to RT, Russian entrepreneurs are actively exploring the branding of products featuring "Z" and "V" because these symbols have acquired the status of "patriotic emblems" within the country.

As the letter Z became an artificially created symbol of war, the RT TV channel itself began selling T-shirts with this symbol (Shop-rt, 2023).

An alternative interpretation, which gained popularity on social media, suggested that the "Z" symbol stood for "Eastern Forces of the Russian Federation," with "Z" representing troops from Crimea, "O" representing troops from Belarus, "V" indicating marines, "X" signifying units from Chechnya, and "A" denoting special forces.

Since Russia's extensive invasion of Ukraine, 23,600 civilians have suffered casualties and fatalities (United Nations, 2023). These official statistics were cited by Martin Griffiths, the United Nations Emergency Relief Coordinator, during a presentation to the Security Council. Griffiths further underscored that the actual number of casualties is likely even higher.

Griffiths highlighted the escalation of fighting, including rocket attacks, on both sides of the front line, which is leading to severe humanitarian consequences. Many areas along the

front line, as well as along the Ukrainian border and with Russia, are surrounded and their residents are cut off from water, food, and medical care.

It is impossible to get an official summary from the Russian side because all losses of the Russian armed forces are classified. The losses of the Russian army are monitored by the BBC news agency, which, based on open sources, has established the names of approximately 31,665 Russian military deaths confirmed by open sources in the war in Ukraine. The real losses of the Russian side could exceed 50,000 people (Aljazeera.com, 2023).

Yevgeny Prigozhin, the founder of PMC "Wagner" and a Russian government-linked organization known as the Internet Research Agency (IRA), made a claim that around 10 thousand convicts were killed during the storming of Bakhmut. In a significant turn of events, Prigozhin himself was shot down in August 2023 while aboard his airplane over Russian territory, although the circumstances of this incident remain unclear.

Notably, Prigozhin, who had been sanctioned by the U.S. in 2018, initially denied any associations with the IRA.

However, he later admitted this year that he had established and funded the company, stating that its creation aimed to safeguard the Russian information space from what he described as the West's crude and aggressive anti-Russian propaganda.

3.1.3 View from a certain angle

As Terence H. Qualter explained in his book *Propaganda and Psychological Warfare* – during the early 20th century, the significance of propaganda was not immediately recognized. Although some political scientists were beginning to understand its potential, it remained unfamiliar to those outside this specialized field. In 1914, for instance, there was an optimistic belief that World War I would be "over by Christmas," leading to a perception that long-term propaganda planning was unnecessary and wasteful.

Unofficial groups were the first to venture into propaganda efforts on the side of the Allies. It was only when governments and military leaders came to understand the staggering human and material costs of victory, along with the immense suffering caused by the war, that they started to take an interest in propaganda. At that point, anything that could potentially reduce these costs became a worthwhile endeavour.

During times of war, appeals to national pride and loyalty took on heightened significance, instilling courage in individuals to persevere and find purpose, even in the face of death. Governments recognized the need to employ experts who could manage the ideological aspects of the conflict.

It became evident that shaping people's perceptions and influencing their minds was as critical to victory as producing weapons, providing medical care, and damaging the enemy's resources. As the war extended beyond the front lines with the advent of aircraft, civilians also began to face the dangers of the conflict. However, civilians lacked the training and unity of purpose that soldiers had in confronting fear and adversity.

Propaganda, especially when designed to evoke emotions, emerged as a substitute for military discipline in guiding the nation through crises and unifying it into a single, organized fighting force. It played a vital role in galvanizing public support and maintaining morale during times of conflict.

In the contemporary digital age, social media platforms have gained substantial importance as mediums for distributing news, facilitating information exchange, and verifying facts. Surprisingly, automated accounts, commonly known as social bots, have begun to play an increasingly significant role in these processes by disseminating information.

These software applications, often referred to as social bots or social algorithms, possess the capability to automatically distribute news updates and provide assistance during critical situations (ScienceDirect, 2023). However, it represents essential to recognize that high technology can serve purposes beyond benevolence. In this context, bots are not merely technological tools but also instruments for amplifying messages.

As Caldarelli, De Nicola, Del Vigna, Petrocchi, and Saracco explain (Rome2019), social bots can manipulate public opinion by disseminating misinformation, propaganda, or biased narratives. The use of propaganda on social media platforms, particularly during times of crisis or conflict such as the Russian invasion of Ukraine, has raised concerns about the manipulation of information and the potential impact on public opinion such as the war support narrative in Russia itself.

As vehicles for spreading messages, bots are often seen merely as technological tools. However, it is important to recognize that the online world faces constant threats from nefarious automated accounts. These accounts have been implicated in manipulating discussions surrounding significant political events such as the 2016 US presidential elections and the UK Brexit referendum (Howard and Kollanyi, 2016). Howard and Kollanyi found that political bots play a strategic, role in discussions surrounding the referendum. They note that hashtags supporting the argument for leaving the EU are more prevalent. Additionally, they found that less than 1 percent of sampled accounts generate nearly one-third of all messages on the topic.

As evidenced by recent inquiries conducted by government entities like the US State Department and the UK Foreign Office, propaganda supported by technology plays a crucial role in crafting “unrest” in social and political arenas: "We have seen Russian-influenced actors fabricate Ukrainian provocations and falsely claim a deterioration of human rights in Ukraine, using both state-controlled media and social media to sow division and to justify a Russian intervention" (State.gov, 2022).

It is imperative to understand this highly complex challenge of mitigating social and political conflicts created by cyber propaganda. By seeking out "influence bots" on platforms like Twitter through scientific research efforts initiated by organizations such as Indiana University, was gained a deeper understanding of these manipulation tactics with hopes of combating them effectively (News, 2018).

According to a study conducted by Indiana University in 2017 (Indiana, 2019), it was found that social bots make up approximately 9% to 15% of active Twitter users. This significant percentage remains consistent over time as bots become more advanced. In an

extensive experiment, Cresci demonstrated that neither Twitter administrators nor technologically savvy social media users or advanced applications were able to successfully differentiate between evolving bots and genuine users.

3.2 Twitter (X) and propaganda

As mentioned earlier, a many of Twitter's user activity originates from the United States, and a notable instance of propaganda is linked to this country. The Twitter administration has expressed concerns about possible interference in the 2016 United States general election, which resulted in Donald Trump's victory.

Research provides evidence suggesting that specific accounts might be connected to a propaganda campaign orchestrated by the Internet Research Agency (IRA), an organization with ties to the Russian government (Buzzfeednews, 2018).

This study suggests that these efforts, in conjunction with bot activity, have the potential to shape public opinion and, conceivably, influence the outcomes of elections.

A report by New Knowledge (NewKnowledge, 2019), indicates that the IRA's backing of Donald Trump during the 2016 campaign began in the Republican primaries. There was apparent favouritism towards then-candidate Trump evident throughout their dataset.

Moreover, a notable portion of political content produced by the IRA conveyed unfavourable opinions about Hillary Clinton among both right-leaning and left-leaning communities they had formed.

During the following general election, President Trump was defeated by his opponent, Joe Biden. Subsequently, in response to concerns about the validity of the vote count, President Trump made several statements on Twitter. Unfortunately, some individuals who followed him interpreted these messages as starting to storm the Capitol building in Washington D.C., leading to significant unrest and disruption in January 2021 (Time, 2021). After this incident administrators of Twitter blocked his account (NYTimes, 2021).

After being acquired by entrepreneur Elon Musk, Twitter reinstated Donald Trump's account. However, the former president decided to not return until August 24, 2023, when he shared a mugshot photo – a photograph capturing the portrait of an individual from the shoulders up, usually taken following an arrest (Twitter, 2023)

According to some research, it is arguable that Russian trolls were not successful in spreading discord as they primarily engaged with individuals who were already strongly polarized. The extent of the influence of IRA accounts on the 2016 presidential election remains uncertain and has implications for future studies examining social media influence campaigns, political polarization, and computational social science (Pnas, 2019).

As Twitter's official policy states: "Twitter exists to serve the public conversation. For our part, we are committed to understanding how bad-faith actors use our services. We will continue to proactively combat nefarious attempts to undermine the integrity of Twitter while partnering with civil society, government, our industry peers, and researchers to

improve our collective understanding of coordinated attempts to interfere in the public conversation" (Twitter, 2018).

Hashtags are a key feature that helps organize and categorize tweets by filtration and search. By placing a "#" symbol in front of a word or phrase (e.g., #Russia or #Ukraine, #BlackLivesMatter), users can make their tweets discoverable to a broader audience interested in that topic. Hashtags also enable users to join trending conversations and engage with a global audience.

Popular hashtags reflect public opinion and often appear for a while. For example, the hashtag #BlackLivesMatter appeared during the US nationwide protests after the death of George Floyd – who was killed during a police incident (PewResearch, 2020).

Hashtags play a crucial role in extending the reach of tweets. When users click on a hashtag or search for it, they gain access to all tweets featuring that specific tag, irrespective of whether they follow the users responsible for those tweets. Consequently, this widens the audience for the content.

This is important to be aware that propagandists can craft and promote hashtags that align with their narrative or agenda. Through the persistent use of these hashtags across various social media platforms, their objective is to strengthen their message and enhance its visibility among a wider audience.

Twitter tracks the usage of hashtags in real time and identifies which ones are being used most frequently. These popular hashtags appear in the "Trending Topics" section on the left-hand side of the Twitter homepage. Trends vary by location and can be global, national, or specific to a city. Hashtags can be used to spread false or misleading information. Propagandists may create hashtags to promote fabricated stories or conspiracy theories, to sow confusion and distrust.

Twitter allows users to engage with tweets through "retweets" and "likes". A retweet is a way to share someone else's tweet with your followers, amplifying its reach. Liking a tweet signifies your approval or agreement with its content. Accordingly, retweets can be used for propagandistic aims in several ways to amplify a specific message or agenda. These retweets have been used to promote specific political candidates or parties, amplify political narratives, and manipulate public opinion during elections or major political events.

Propagandists employ careful strategies to strategically retweet content that supports their desired narrative or agenda to maximize its visibility and influence. This strategic approach enables messages to gain momentum and potentially reach a wider audience.

Furthermore, propagandists may selectively retweet content that affirms their preferred viewpoint while disregarding or suppressing dissenting perspectives. Such deliberate actions have the potential to shape public discourse in their favour, influencing the overall direction of discussions.

Propagandists may employ techniques such as automated or bot-driven retweets to artificially boost engagement metrics. This tactic can create a deceptive perception of popularity and influence for their content. Similarly, hashtags can be utilized in

propagandistic endeavours to manipulate public opinion and foster a sense of solidarity among followers who align with a particular cause or ideology.

As we see, one method to amplify reach is retweeting and liking posts. Popular hashtags appear in the "Trending Topics" and after all, popular posts appear in the Trending Topics which will make them even more popular.

Bot-driven retweets are primarily used to amplify the reach and visibility of specific tweets or hashtags. Propagandists may use bots to make their content appear more popular and influential than it is.

Sometimes bots are not only software applications but real people who write comments for the salary. The IRA is a prime example. The salary of Russian network trolls is about 570 euros a month. At the same time, former employees of the Internet Research Agency note that their colleagues who know English and are busy writing paid comments on Facebook receive about twice as much (DW, 2019).

The United States took action against this organization, placing 13 executives, including Yevgeniy Prigozhin, on its sanctions list in 2018 (Justice, 2018).

In February 2023, Yevgeny Prigozhin, the leader of the private military company Wagner Group publicly acknowledged his involvement in the creation of the IRA, stating, "I've never just been the financier of the Internet Research Agency. I invented it, I created it, I managed it for a long time" (CNN, 2023).

This admission came years after Prigozhin had previously confessed to Russian interference in the U.S. elections in 2016. Alongside Prigozhin, the list of individuals accused included 12 others who worked for him, such as Mikhail Bystrov, Mikhail Burchik, Alexandra Krylova, Anna Bogacheva, Sergei Polozov, Maria Bovda (also known as Belyaeva), Robert Bovda, Jeyhun Aslanov, Vadim Podkopaev, Gleb Vasilchenko, Irina Kaverzina, and Vladimir Venkov (CNN, 2023).

These 13 individuals are under the command of an entire team of "trolls" who monitor and comment on social media, including Twitter, around the clock.

Former worker admits to journalists, that for the sake of investigative journalism, she had to practically abandon her university and personal life to write propagandistic Twitter posts all day long (Svoboda, 2018).

To give the deceptive impression that the account is real some bot technics are designed to impersonate real Twitter users, complete with profile pictures and bios. These bots can interact with real users, including retweeting their content or replying to their tweets, making it difficult to distinguish them from genuine accounts.

When tweets receive a high number of retweets and engagement, they often appear more credible and trustworthy to other users. It creates the illusion of social proof, making content seem more influential and reputable.

In some cases, bots have been used to amplify hate speech, harassment, and malicious content, targeting individuals or groups.

Propagandistic accounts or squads of bots can be programmed to promote specific political agendas, candidates, or parties. These bots often spread messages, hashtags, and content that align with a particular political narrative.

3.2.1 What does propaganda say about Ukraine?

Hashtags can significantly expand the reach of tweets. When users click on a hashtag or search for it, they can discover all tweets that include that particular tag, regardless of whether they follow the users who posted those tweets. This broadens the audience of content.

Knowing this, propagandists can create and promote hashtags that support their narrative or agenda. By consistently using these hashtags across social media platforms, they aim to reinforce their message and make it more visible to a broader audience.

The propaganda surrounding Ukraine often aims to manipulate public opinion and portray a specific narrative that aligns with the interests of Russia.

The Atlantic Council, a US think tank that conducts research on international relations and global security, has published a report on Russian propaganda between 2014 and the start of a full-scale invasion of Ukraine by the Russian army in February 2022. The report describes the most common claims about Russia, Ukraine, and the West made by pro-government media (Atlanticcouncil, 2022).

According to a report, propaganda portrays Ukraine as an unstable and corrupt country, with a weak government that is unable to effectively govern, but Russia has a moral obligation to protect the region's security and the Russian-speaking population.

Propaganda says that Ukraine is an aggressive and neo-Nazi country and far-right Ukrainian nationalist Stepan Bandera is often mentioned as an ideological hero for nowadays Ukraine (Jpost, 2022).

Pro-Kremlin media cited that the West is creating tensions in the region, that Ukraine has weapons of mass destruction (RG, 2022).

In addition, one of the tactics of the pro-Russian media is to quote foreign media outlets for use on their platforms, which lends legitimacy to the message and creates an impression of worldwide support and interest in the pro-Russian narrative.

For example, a two-hour interview by journalist Tucker Carlson (TuckerCarlson, 2024) with Vladimir Putin on February 9, 2024, explaining the reasons for a full-scale invasion, Putin going deep into the story.

Americans, like Russians many times before, had the opportunity to get a thorough understanding of the issue: 23 minutes of the two-hour interview with Vladimir Putin, spent on an excursion into the history of Russia and Ukraine with arguments why Ukrainian territory should belong to Russia by historical right.

The main one is that allegedly it was not Russia that started the war in Ukraine, Russia is just trying to finish the war that was started without it. Traditionally, according to Putin's version, everything started with Maidan. And so, according to Vladimir Putin, history has brought the two countries to February 24, 2022.

Carlson himself said the following on his Twitter/X page: "Elon Musk, to his great credit, has promised not to suppress or block this interview once we post it on his platform X, and we are grateful for that. Western government, by contrast, will certainly do their best to

cancel this video on other less-principled platforms, because that's what they do. They are afraid of information they can't control" (Tucker Carlson, 2024).

Before, during and after the arrival, Russian media widely publicized Carlson's arrival in Moscow.

Through the use of information warfare tactics, the Kremlin strategically spread false and deceptive narratives in order to provide a justification for its military actions against Ukraine, conceal its operational strategies, and disclaim any accountability for the impending conflict.

3.3 Chapter summary

In today's fast digital age, social media platforms like Twitter/X have tremendous influence, particularly within the context of ongoing conflicts such as the Russia-Ukraine war. This chapter delves into Twitter's multifaceted role and navigates the complex interplay of propaganda, political manipulation, and social bots within this digital landscape.

Twitter's influence in the digital realm is big. In times of conflict, it serves as a battleground for propaganda and manipulation, with social bots amplifying narratives and hashtags to sway public opinion. Understanding these complexities is paramount for maintaining the integrity of public discourse and safeguarding the authenticity of information in our digital sphere.

Propaganda content paints Ukraine as a country in turmoil, often portrayed as a pawn in larger geopolitical games.

The pro-Russian narrative emphasizes themes of liberation and protection, positioning Russia as a stabilizing force against Western aggression. At the same time, it demonizes the Ukrainian resistance, governance and key actors, portraying them as corrupt, fascist or malicious.

The full-scale Russia-Ukraine invasion, stands as an example of the power of propaganda. Previous studies have demonstrated the active deployment of bots and trolls for propaganda purposes in conflicts, such as the Russia-Ukraine war, these bots and trolls play a significant role in spreading disinformation, shaping narratives, and influencing public opinion.

The dynamic nature of social media platforms necessitates continuous adaptation. Propaganda tactics evolve, as do the algorithms and policies of social media companies. Staying informed about these changes is vital for developing effective detection methodologies.

It is obvious that there is propaganda on social networks, but how to detect it?

4 Practical Part

For solving the practical part it was decided to use tools for detecting bot activity, such as **Botsentinel** which is a comprehensive tool for identifying and analysing Twitter bot accounts.

Social media algorithms are crafted to promote content that gains popularity and to keep users engaged for extended periods, which can be monetized. Unfortunately, this system can be manipulated by malicious parties who seek to amplify certain hashtags or tweets to introduce their narrative to a wider audience, one that may not typically encounter such content.

For collecting the dataset and data extraction, the scraper **Apify** was chosen.

A scraper is a software tool or script designed to automatically extract information from websites. These programs are used to collect data from web pages, which can then be stored, analysed, or processed for various purposes. Web scrapers work by simulating human interaction with web pages, fetching the desired content, and organizing it in a structured format, such as a CSV file, database or Excel file.

Two programs were used to construct the graphs: **SAS® OnDemand** and also **Python** and a library for statistical calculations - **Pandas**.

4.1 Twitter bot Account search

To initiate the research process, the primary step involved the collection of search profiles using specific hashtags using **Apify Tweet Flash (Twitter Scraper)**.

These hashtags were selected to capture a comprehensive snapshot of online discourse related to global issues connected with the Russian Ukrainian War.

The hashtags included:

#StandWithRussia / IstandWithRussia: Assessing the sentiment and discourse surrounding support for Russia within the context of the Russia-Ukraine conflict.

#StandWithPutin / IStandWithPutin: Assessing sentiments supporting President Putin within the same conflict.

#Donbas / Donbass: Focusing on the Donbas region, part of the propaganda narrative of the Kremlin.

#RussiaUkrainianWar / UkrainianWar: Association with conflict either in support Russia or Ukrainian side.

#ZelenskyWarCriminal: Accusations against President Zelensky and the war in Ukraine.

#Ukraine: This hashtag addressed on support of Ukrainian side.

#NATO: focus on sentiment about the organization.

#ZionismIsNazism: This hashtag addressed the Israel-Palestine conflict, and criticism of Israel.

#FreePalestine: Assessing sentiments surrounding the Israel-Palestine conflict and tendency to Support Palestine against Israel.

#Gaza: Reflects sentiment around conflict in the region.

These hashtags facilitated the systematic collection of data about diverse geopolitical conflicts. The selection of hashtags allowed for a comprehensive examination of global issues and their intersection, such as the connection between support for Palestine and Russia.

This approach ensured the possibility to find several large accounts from different countries, with similar Tweets, hashtags and narratives such as support for Palestine and anti-Ukrainian sentiment.

4.2 Bot score checking

For checking the proportion of bots for the given account a tool for detecting and monitoring potential bots was chosen – **BotSentinel**. It is a platform designed to identify and analyze accounts for the number of bots (bot score), the data is provided as a percentage.

As Bot Sentinel authors explain it web page, they employ machine learning algorithms and various heuristics to analyse account behavior, tweet frequency, content originality, and interaction patterns, among other metrics. The higher the bot score, the more likely it is that the account is automated or involved in suspicious activities.

"We trained Bot Sentinel to classify Twitter accounts using thousands of accounts and millions of tweets for our machine learning model. The system can correctly classify accounts with an accuracy of 95%" (BotSentinel, 2024).

Here are the details of the most frequent accounts from the dataset and their corresponding bot scores, presented in percentages as of 10/10/2023:

Accounts supporting Russia (with **#StandWithRussia**):

- 1 GabeZZOZZ - Bot Score: 42%
- 2 TamrikoT - Bot Score: 35%
- 3 NoMoreNATO - Bot Score: 33%
- 4 joiedevivre789 - Bot Score: 12%

For instance, the account “GabeZZOZZ” received a bot score of 42%, implying there is a 42% likelihood that this account exhibits bot-like behavior based on BotSentinel's analysis criteria. The bot score is an estimate based on observable online behaviors and patterns, and while it is indicative, it is not definitive proof that an account is a bot.

Account supporting President Putin, but mostly focuses on supporting Julian Assange (**#IstandWithPresidentPutin, #FreeAssange**):

6. TaraCleary13 - Bot Score: 44%

Account critical of Zelensky and supporting Russia (**#ZelenskyWarCriminal, #StandWithRussia**):

7. SororInimicorum - Bot Score: 52%

Accounts-related to **#FreePalestine, #ZionismIsNazism, #Gaza_Under_Attack:**

8. Bernadotte22 - Bot Score: 38%. Mainly supports Palestine side. This account posts one tweet every 5 minutes, which is most likely bot-driven activity.

9. euroboma - Bot Score: 23%. Mainly supports the Russian and Palestine sides and criticizes in the West, the EU and Zelensky.

10. PalestineEye - Bot Score: 1%. This account advocates for Palestinian perspectives and issues. It shares news and content related to Palestine, aiming to raise support for Palestinian causes and viewpoints.

11. UltraMagaKingW1 – Bot Score: 70%. This appears supports former President Donald Trump, indicated by the term "MAGA" (Make America Great Again), which was his campaign slogan. Posts content in favour of Trump's policies and support for his political activities and viewpoints.

The bot scores provided indicate the likelihood of these accounts being automated or exhibiting bot-like behaviour. A lower bot score suggests a lower likelihood of automation, while a higher bot score indicates a higher likelihood of bot-like activity.

As the authors of Bot Sentinel write on their page: “We rate accounts based on a score from 0% to 100%, the higher the score the more likely the account engages in targeted harassment, toxic trolling, or uses deceptive tactics engineered to cause division and chaos. We analyze several hundred tweets per account, and the more someone engages in behavior consistent with problematic accounts, the higher their Bot Sentinel score is. We feel since problematic accounts are likely violating Twitter rules, most Twitter users would want to report and avoid these accounts because they offer little value to meaningful public discourse” (BotSentinel, 2024).

Here are the rating details for the provided scores:

Normal (0% - 24%)

Normal accounts typically engage in regular tweeting activities and do not partake in targeted harassment, toxic trolling, or deceptive tactics aimed at causing division or chaos. Interacting with most normal accounts is generally safe (BotSentinel, 2024).

Satisfactory (25% - 49%)

Accounts that fall under the satisfactory category exhibit fairly typical patterns of tweeting behavior. These accounts actively engage in online discussions and often deviate from the average frequency of tweets. While their activity levels may be slightly higher than usual, we still consider these accounts to be moderately reliable for interaction (BotSentinel, 2024).

Disruptive (50% - 74%)

Disruptive accounts are characterized by engaging in harmful tweeting behavior. These accounts often engage in harassment, use offensive language, spread misinformation, and spam hashtags. Inauthentic accounts and toxic trolls are commonly associated with disruptive activity (BotSentinel, 2024).

Problematic (75% - 100%)

Problematic accounts, which are often classified as harmful, engage in harmful tweet activity that targets other accounts and employ malicious tactics to harass them. These

problematic accounts also contribute to the spread of disinformation and frequently violate Twitter's rules. A large majority of fake accounts and toxic trolls receive a rating indicating their problematic behavior (BotSentinel, 2024).

4.3 Creation of the dataset

Using a dataset of 14,666 tweets using Apify.com, a dataset beginning in late 2015 and ending in early 2024 was assembled.

Tweets also included relate to the Palestine-Israel conflict, suggesting that there are connections between these different topics and the use in propagating these narratives. Since statistical programs work with input data like text and numbers, it was decided to remove from the dataset major part of tweets containing only a picture or only a video or pictures, without accompanying text with a hashtag.

The dataset contains text-based data, such as the following tweets:

#StandwithRussia #UkraineCrisis Russia will overrun the Ukraine in two weeks. And none of the cowardly westerners will do *anything* about it. #fucktheusa

Euro-Med: İsrail Gazze'de 100 günde 100 bin kişiyi öldürdü ve yaraladı.

#GazaHolocaust #gaza #freepalestine #GazaGenocide #GazzeDirenişi #GazaMassacre #Palestine #100thday #100gün

Thus, after extracting the tweets, the data row in the database will have the following form:

likes	replies	retweets	timestamp	tweet_hashtags/0	tweet_hashtags/1	tweet_hashtags/2	tweet_mentions/0	url	username
1	0	0	2022-01-26	#StandwithRussia	#UkraineCrisis	#fucktheusa		https://twitter.com/army_antifa/status/1486461548495310851	@army_antifa
16	0	7	2024-01-15	#GazaHolocaust	#gaza	#freepalestine		https://twitter.com/mikailciftci63/status/1746977734104920483	@mikailciftci63

Tab. 2: Dataset's row examples

Source: Author's work, 2024

4.4 Correlation analysis

To assess the dataset's integrity and ensure its accuracy, an examination of the potential relationships between relatively straightforward variables was undertaken. This analysis sought to determine whether observable patterns could be established, such as the expectation that a higher number of likes on tweets would generally correlate with fewer replies and an increased number of impressions.

One of the purposes of this investigation was to uncover correlations and dependencies among these key variables as part of the data quality assessment.

	likes	retweet	replies
likes	1.000	0.817	0.578
retweets	0.817	1.000	0.469
replies	0.578	0.469	1.000

Tab. 3: Correlation analysis of the variables **likes**, **retweets**, **replies**

Source: Author's work, 2024

Where:

- **likes:** The count of favourites for the tweet.
- **retweets:** The count of retweets for the quoted tweet.
- **replies:** The count of replies that a specific tweet has received.

Each cell represents the correlation coefficient between the respective pair of variables. Correlation coefficients range from -1 to 1, with -1 indicating a perfect negative correlation (i.e., as one variable increases, the other decreases), 1 indicating a perfect positive correlation (i.e., as one variable increases, the other increases), and 0 indicating no correlation between the two variables.

If correlation is greater than 0.75, it suggests a strong correlation between the variables, which indicates that the model is appropriate for predictions.

As seen in Tab. 3, likes and retweets have a very high positive correlation of 0.817 (81.7%).

The moderate positive correlation between likes and replies is 0.578 (57.8%).

The lower moderate positive correlation between retweets and replies is 0.469 (46.9%) indicates that tweets that are widely shared also tend to elicit a number of replies.

Although less strong than the correlation between likes and retweets, this relationship hints at the conversational momentum generated by retweets, as they expose the tweet to a broader audience, thereby potentially increasing the number of replies.

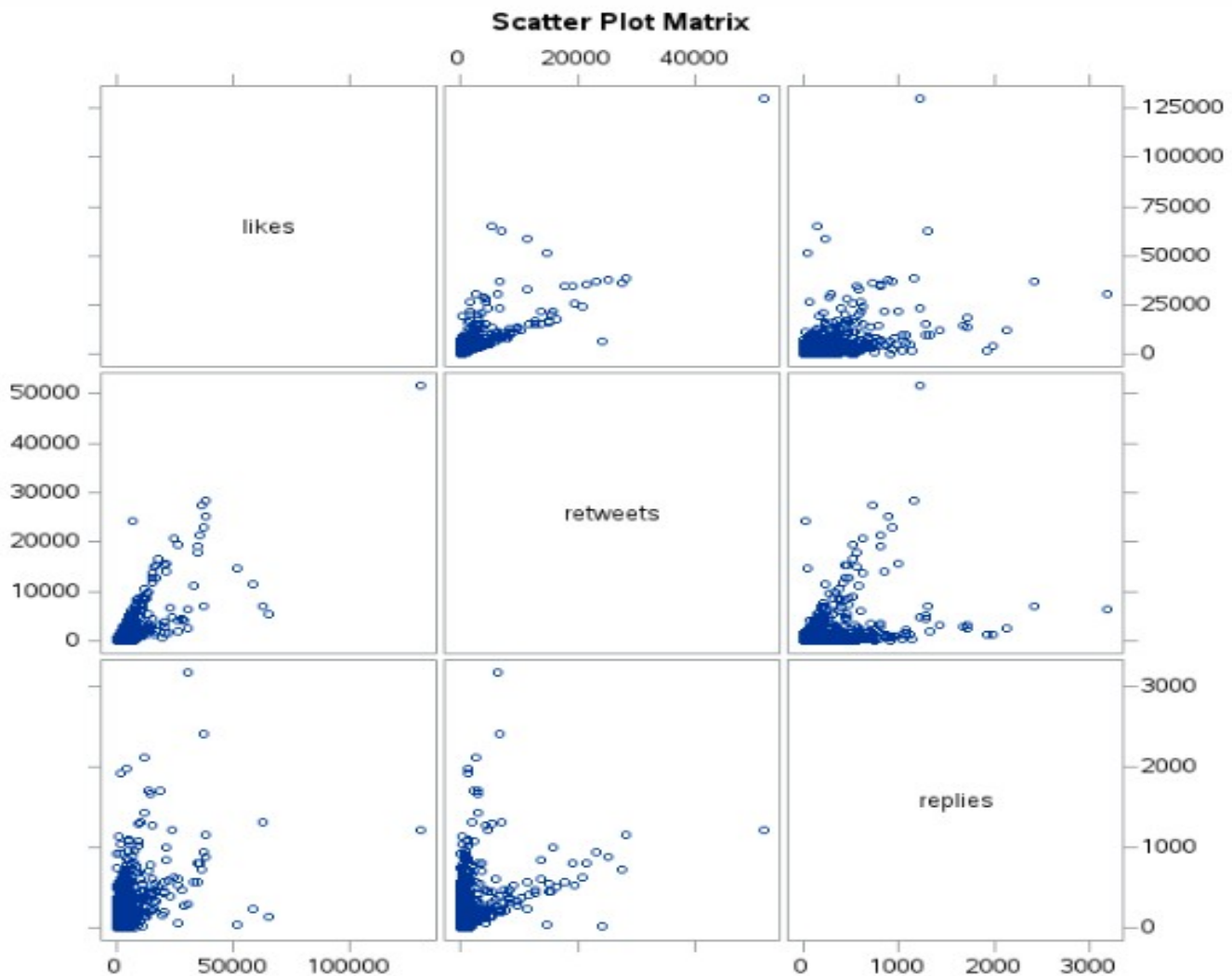


Fig. 1: Scatter Plot Matrix for correlation analysis
Source: Author's work, 2024

These correlations suggest that tweets that perform well on one engagement metric (likes, retweets, replies) tend to perform well on others.

The strongest correlation is between likes and retweets at 81.7%, which is common as retweets can be a way of endorsing or liking content.

The scatter plots show points clustered along a line if there's a strong linear relationship. The more scattered and less linear the points are, the weaker the relationship. Additionally, the presence of outliers can be visually assessed in these plots.

The plots show a clustering of data points near the origin (indicating many tweets with low engagement) and some points further away (indicating tweets with high engagement), which are more spread out.

4.5 Charts

Python's **pandas** library was utilized to create visual representations of data through the use of charts.

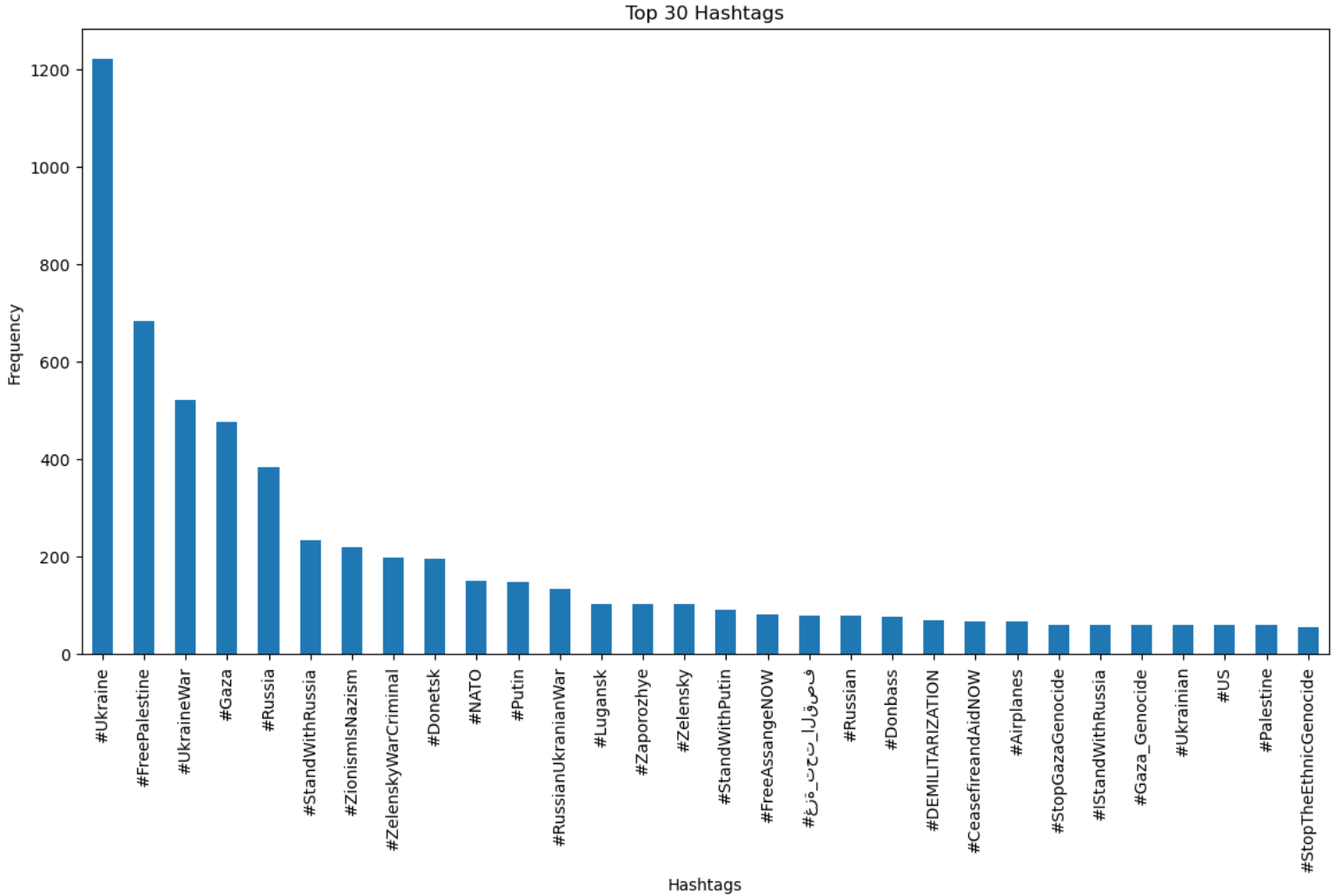


Fig. 2: Frequencies of specific hashtag for period from 2015 till end 2024

Source: Author's compilation, 2024

The Figure 2 presents the top 30 hashtags in entire dataset. The leading hashtag in terms of frequency is **#Ukraine**, indicating either support or critical sentiment towards the Ukrainian side.

Pro-Russian hashtags: **#Donbas / #Russia / #StandWithRussia, #StandWithPutin**, depicted in a supportive direction.

Pro-Palestinian hashtags: **#FreePalestine, #Palestine, #Gaza**: express support for Palestinian statehood and opposition to Israeli policies in Palestinian territories. It often accompanies discussions on the Israeli-Palestinian conflict.

Chart shows the presence of hashtags #NATO and #US, etc., mostly critical of these organizations and countries.

Hashtag #Zelensky has a critical targeting to Volodymyr Zelensky, the President of Ukraine. His name appeared before 2022, but not as often as after the conflict started.

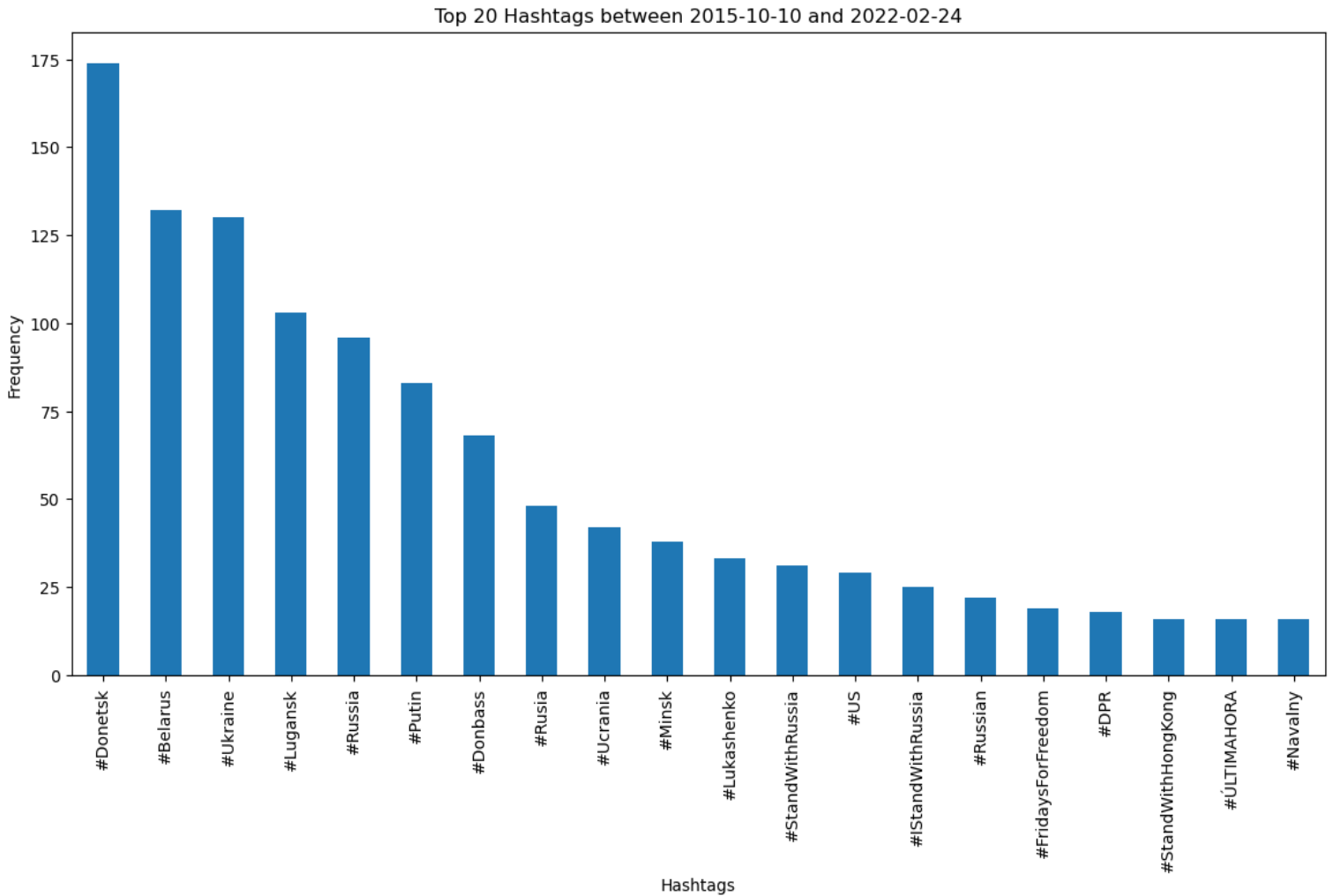


Fig. 3: Frequencies of specific hashtag between 2015 and 2022

Source: Author's compilation, 2024

#Donetsk: Related to the city of Donetsk, which is a significant location in the conflict in Eastern Ukraine. The high frequency suggests that Donetsk was a focus of many discussions or posts during this time.

#Belarus: Pertains to the political unrest and protests in Belarus, possibly related to the 2020 presidential elections and the subsequent demonstrations.

It is noteworthy that the hashtag **#StandWithBelarus**, which is not included in this dataset, as it has no relation to the topic of the thesis, was used by those who supported the regime change in Belarus, i.e. democratic and anti-totalitarian media.

#Ukraine: Includes broad range of topics related to Ukraine, possibly including its politics, conflict in the Eastern regions, or its relations with Russia.

#Lugansk: Similar to Donetsk, Lugansk is another region in Eastern Ukraine that has been a focal point of the conflict in the area. The hashtag indicates conversation about events in this region.

#Russia: General discussions related to Russia, which could encompass a variety of topics from politics, international relations, to cultural events.

#Putin: Refers to the president of Russia. Corresponds to discussions about Putin's personality, decisions, actions.

#Navalny: Refers to Alexei Navalny, a Russian opposition figure and critic of the Kremlin. The frequency of use of this hashtag in discussions related to his political activities between 2015 and 2022, his anti-corruption campaigns, or reactions to his court challenges and imprisonment in Russia.

The dataset does not include social media reactions related to Alexei Navalny's death, nor social media reactions related to his death (Reuters, 2024) and subsequent events, as the time period of the dataset considered is from the end of 2015 to the end of January 2024, while Alexei's death occurred on February 16, 2024, which has caused widespread public outrage (Reuters, 2024) and discourse in social media.

The remaining hashtags represent a mix of political, regional, and international issues, reflecting the diverse and interconnected nature of global conversations on social media. The chart visually demonstrates the presence of hashtags such as **#IStandWithRussia** or **#StandWithRussia** before 2022 in social media discourse preceding the special war operation. Hashtags **#Russia** and **#Putin** were also long used in the past.

Top 20 Hashtags between 2022-02-24 and 2024-01-24

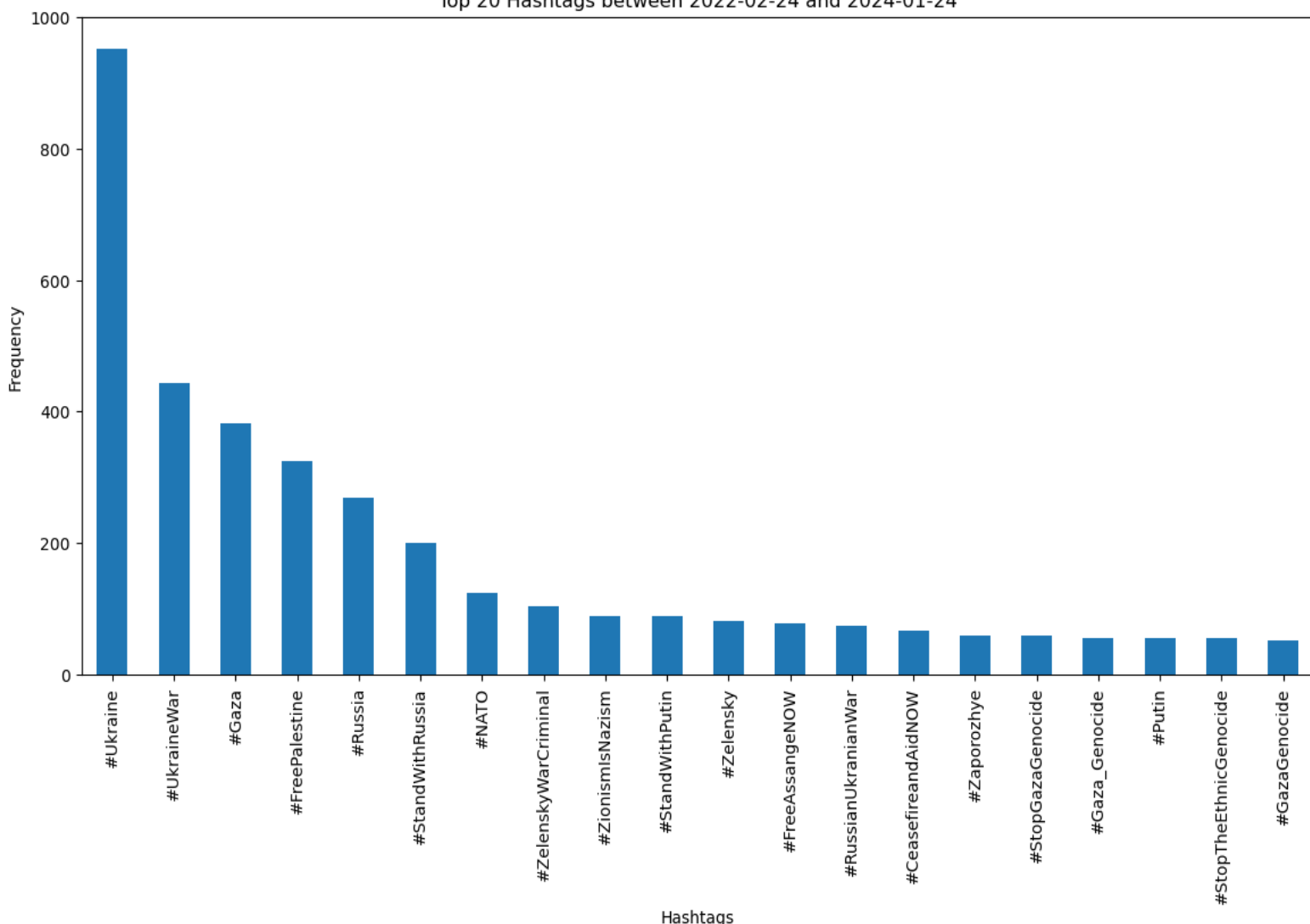


Fig. 4 Frequencies of specific hashtags between 2022 and 2024

Source: Author's compilation, 2024

Fig. 4 displays the biggest level of engagement in terms of frequencies to the hashtags **#Ukraine**, **#UkraineWar** **#RussianUkranianWar** up to the year 2024.

Hashtags like **#Gaza** and **#FreePalestine** have been in use for many years, often used to express support for the Palestinian people and to comment on the Israeli-Palestinian conflict.

While the hashtag **#ZionismIsNazism**, associated with anti-Israeli sentiment and anti-Semitic views and did not appear until the conflict in October 2023.

The hashtag **#ZelenskyWarCriminal** is used to criticize the Ukrainian president. It is noteworthy that this hashtag did not exist before the war started.

In addition, the chart shows that the hashtags **#StandWithPutin** and **#StandWithRussia** continue to be actively used after February 2022.

4.6 The Main Hypothesis

Null Hypothesis (H0): There is no significant difference in the number of 'Likes' on tweets with pro-Russian hashtags before and after February 24, 2022.

If this hypothesis is true, then any difference in the number of likes before and after this date is insignificant.

Alternative Hypothesis (H1): There is a significant difference in the number of 'Likes' on tweets with pro-Russian hashtags before and after February 24, 2022.

A significant difference suggests that there is a difference before and after this date.

For analysis, the data were divided into two time periods: before and after February 24, 2022. To test the difference in the usage of pro-Russian Twitter hashtags before and after, we can state that the data does not fit the normal distribution.

T-tests are not suitable for this data, however non-parametric test like the Mann-Whitney U test can be used in this case.

Thus, the original dataset view should be converted to a view with a before and after column:

likes	replies	retweets	date	period	tweet_hashtags/0	tweet_hashtags/1	tweet_hashtags/2	tweet_mentions/0	url	username
361	34	525	2015-10-12	before	#IStandWithRussia	#ISIS	#Turkey		https://twitter.com/actionScript3/status/669153269118205953	@actionScript3
110	10	72	2017-12-104	before	#Russia	#NoRussiaNoGames	#IStandWithRussia	yelenaisinbaeva	https://twitter.com/varyagi/status/937743620148486144	@varyagi
42	1	37	2022-04-03	after	#StopKievNaziRegime				https://twitter.com/TamrikoT/status/71642896276504170496	@TamrikoT
1822	150	283	2023-05-14	after	StandWithPutin	StandWithRussia			https://twitter.com/NoMoreNATO/status/1657687211469406209	@NoMoreNATO

Tab. 4: Dataset's row examples

Source: Author's work, 2024

In addition, a new **supportsRussia** column was created for the dataset, marking 1 for those who support Russia by hashtag or profile information, and 0 for those who disagree or criticize the Russian side. Support refers to hashtags or profile information indicating it.

Out of the total of 5,549 unique users, the supportsRussia column included tweets from 153 users.

After preprocessing and selection of tweets, the dataset of 14,666 tweets accumulated 3,778 tweets which support Russia via hashtags or profiles information between 2015 and 2024.

By employing both hashtag analysis and profile examination, a subset of 3,778 tweets has been flagged as pro-Russian.

Bot score is based on the BotSentinel rating. This score is indicative of the likelihood that the account in question engages in automated behavior or propaganda dissemination.

From this dataset, the following actors can be identified as actively supporting Russia:

GabeZZOZZ – Strongly supports, bot score: 42%.

TamrikoT - Strongly supports, bot score: 35%.

NoMoreNATO - Strongly supports, bot score: 33%.

SororInimicorum – Strongly supports Russia, mainly criticizes on the Ukrainian side. Bot score: 52%.

Accounts moderately supporting Russia based on hashtags:

Euroboma - Supports Russia and Palestine, criticizes on Ukrainian and Israeli sides. Bot Score: 23%.

likes	replies	retweets	date	period	tweet_hashtags/0	tweet_hashtags /1	tweet_hashtags /2	tweet_mentions/0	url	username	Supports Russia
28	0	5	2022-02-23	before	#February23	#RussiaStandsStrong			https://twitter.com/TamrikoT/status/1628618657981992961	@TamrikoT	1
1822	150	283	2023-05-14	after	#StandWithPutin	#StandWithRussia			https://twitter.com/NoMoreNATO/status/1657687211469406209	@NoMoreNATO	1

Tab. 5: Pro-Russian dataset row examples

Source: Author’s compilation, 2024

Of the 3,778 tweets - 379 tweets were made before the full-scale invasion began and 3,399 were made afterward.

Even though there is a significant difference in the amount before and after, this amount is sufficient to make the followed analysis.



Fig. 5 Results of statistical tests
Source: Author's compilation, 2024

The Wilcoxon test compares the medians of two independent groups and provides the following statistics:

- Before the beginning of a full-scale invasion, there were 379 tweets supporting Russia with a total of Mean Score = 1960.92.
 - After the beginning of a full-scale invasion, the number of such tweets increased to 3,399 with a total of Mean Score = 1881.53
- The average scores are pretty much the same.

Wilcoxon Two-Sample Test and Kruskal-Wallis Test:

- Pr > |Z|: The p-value for a two-tailed test is 0.1783.
- The Z-score and corresponding p-values indicate that there is not a statistically significant difference in the number of likes per tweet before and after, given that the p-values are greater than the typical alpha level of 0.05.

Both tests take into account the ranks of the data rather than the data's raw values, which is particularly useful when the data does not follow a normal distribution. The tests look for differences in the central tendency of the likes across the two periods.

The data indicates that although the number of tweets increased significantly after the war began, the total number of likes only slightly decreased, and the average likes per tweet dropped.

However, from a statistical standpoint, this change in likes per tweet was not significant enough to reject the null hypothesis that the two samples come from the same distribution of likes.

Following box plots provides a visual comparison of the distribution of likes before and after the date.

- The median value (central line in the box) appears higher in the 'after' period compared to 'before', which suggests that the central tendency of likes has increased.
- The interquartile range (height of the box) is also larger in the 'after' period, indicating greater variability in the likes data following the date.
- The presence of outliers (circles) in both periods suggests there are some tweets that had an high or low number of likes compared to the rest.

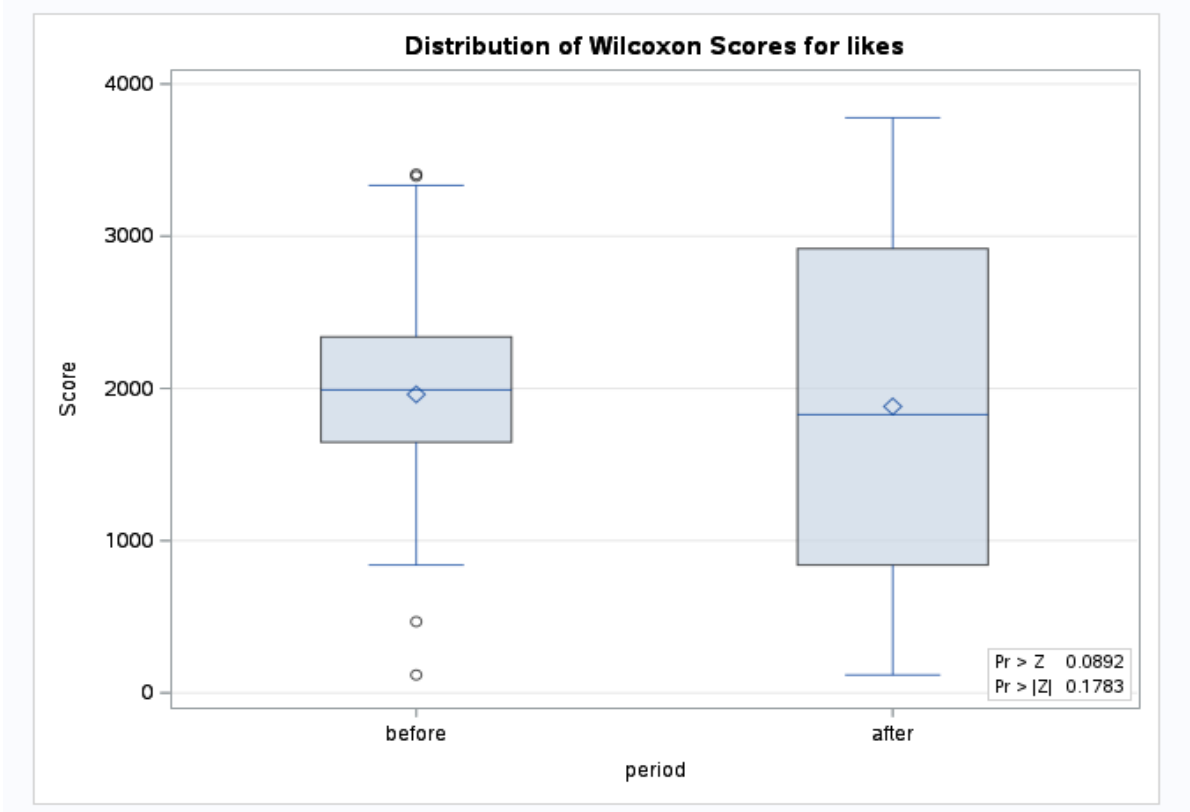


Fig. 6 Box-Plot of Wilcoxon Scores for Likes Before and After 24 Feb, 2022

Source: Author's compilation, 2024

The median value, indicated by the horizontal line within the box, is higher for the 'after' period than for the 'before' period. This is observed as the line inside the 'after' box appears above the line in the 'before' box.

- The interquartile range (IQR), represented by the height of the box, is larger for the 'after' period than for the 'before' period. This suggests that there is a greater spread in the distribution of likes after the date.
- Outliers, shown as individual circles outside the box and whiskers, are present in both periods.

The plot also includes diamond shapes inside the boxes, which typically represent the mean score of likes. Both the means and medians are higher in the 'after' period compared to the 'before' period.

While Kruskal-Wallis Test and Wilcoxon Two-Sample Test show a value of 0.1783 at a significance level of 0.05, indicating that there was no significant difference. Which indicates that there is no statistically significant difference in the distribution of likes between the 'before' and 'after' periods.

Thus, there is no difference between the number of "likes" on tweets with pro-Russian hashtags before February 24 and after.

4.7 The Specific Hypothesis

Null Hypothesis (H0): There is no significant association between accounts that support the pro-Russian narrative and support for the pro-Palestinian narrative on Twitter.

Alternative Hypothesis (H1): There is significant association between accounts that support the pro-Russian narrative and support for the pro-Palestinian narrative on Twitter.

The sample size for this analysis is 14,666 tweets, a dataset starting in 2015 and ending in 2024.

In addition, a new **supportsPalestine** column was created for the dataset, marking 1 for those who support Palestine by hashtag or profile information, and 0 for those who does not.

Support refers to hashtags or profile information indicating it.

Accounts, which strongly supports Palestinian based on profile and hashtags:

Bernadotte22 – Strongly supports Palestinian and criticises Israel. Bot Score: 38%.

FreePalestine - Does not support Russia, mainly criticises Israel and supports Palestinian. Bot Score: 36%.

PalastineEye - Does not support Russia, mainly criticises Israel and supports Palestinian. Bot Score: 1%.

Overall, two columns with binary values 0 and 1 were created - **supportsPalestine** and **supportsRussia**, where 0 - does not support and 1 - supports.

likes	replies	retweets	date	period	tweet_hashtags/0	tweet_hashtags/1	tweet_hashtags/2	tweet_mentions/0	url	username	supports Russia	supports Palestine
816	19	457	2020-08-15	before	#Hongkongers	#Belarusians	#HKers		https://twitter.com/joshuawongcf/status/1294443533630353408	@joshuawongcf	0	0
1822	150	283	2023-05-14	after	#StandWithPutin	#StandWithRussia			https://twitter.com/NoMoreNATO/status/1657687211469406209	@NoMoreNATO	1	0
127	5	28	2022-12-29	after	#FreePalestine	#freeKashmir				@MuslimMoony	0	1
1	1	1	2023-10-18	after	#StandWithPalestine	#ZionismIsNazism	#ZelenskyWarCriminal		https://twitter.com/euroboma/status/1714537751930966208	@euroboma	1	1

Tab. 6: Dataset's row examples
Source: Author's compilation, 2024

Accounts like the PalastineEye, FreePalestine and Bernadotte22 by default were marked '1' in the column - supportsPalestine, based on profile information.

For instance, hashtags:

#StandWithRussia and **#NoMoreNato** counts like supports Russia (1) and don't supports Palestine (0).

#Zionism or **#FreePalestine** counts like supports Palestine (1) and don't supports Russia (0).

#Freepalestine and **#Zionnazi** and **#iStandWithPutin** or **#standWithRussia** counts like support Palestine (1) and support Russia (1).

#Belarusians or **#FreeTheTruth** or **#FreeJulianAssange** or **#NewYear2023** counts like nor support Palestine (0) neither Russia (0).

Thus, there can be four combinations:

The MEANS Procedure							
Analysis Variable : likes likes							
supportsRussia	supportsPalestine	N Obs	N	Mean	Std Dev	Minimum	Maximum
0	0	8330	8330	371.2714286	1980.30	0	65016.00
	1	2558	2558	663.3373729	3663.46	0	130056.00
1	0	3273	3273	357.9544760	943.7332605	0	13846.00
	1	505	505	83.1267327	366.6416439	0	4120.00

Fig. 7 Means procedure output for each group
Source: Author's compilation, 2024

Tweets that do not support Russia or Palestine (0,0):

There are 8,330 observations in this category with an average of approximately 371 likes per tweet, a standard deviation of around 1980 (which suggests a wide variation in the number of likes).

These could be neutral tweets or tweets discussing other topics entirely.

Tweets that do not support Russia but Palestine (0,1):

There are 2,558 observations with an average of approximately 663 likes per tweet. The standard deviation is quite high at around 3663, indicating a large variability in the number of likes.

These tweets have a much higher average number of likes at approximately 179.83, and the standard deviation is large at 1209.73, suggesting there are some tweets with a very high number of likes skewing the average.

Have higher engagement levels, compared within all groups.

Tweets that support Russia but not Palestine (1,0):

Includes tweets that support Russia but not Palestine. It consists of 3,273 observations with an average of around 357 likes per tweet. The standard deviation is about 943.

Tweets that support both Russia and Palestine (1,1):

Tweets that support both Russia and Palestine are in this smallest group, with 505 observations. They have the lowest average likes of approximately 83, a standard deviation of around 366, and a range from 0 to 4120 likes.

Combining both analyses, we can conclude that tweets supporting Russia only or Palestine only receive more likes on average than those that support neither.

However, tweets that express support for both narratives receive significantly fewer likes on average. The wide error bars for the 1 - 1 category suggest a high variability in likes for these tweets, which could be due to a few tweets with very high likes or very low likes

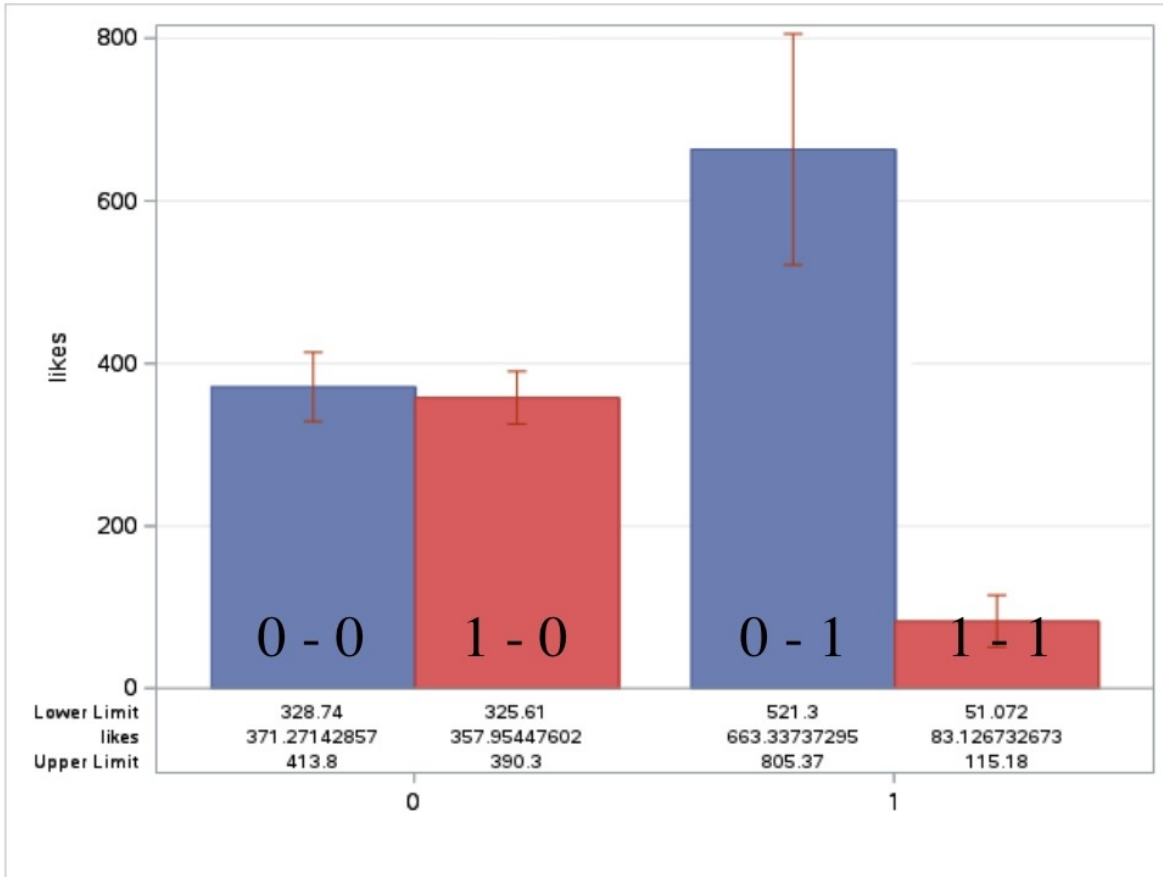


Fig. 8 Bar-chart with error-bars
Source: Author's compilation, 2024

Tweets that do not support (0-0) either narrative option receive the highest level number of likes comparing with group 1-0 and 1-1.

Tweet that supports only Russia (1-0) shows average number of likes around 357.

Tweets that supports only Palestine (0-1) show higher engagement level.

The fourth group (1-1) shows the lowest value in terms of likes with average number around 83.

The error bars indicate the range of the confidence interval, giving a sense of the reliability of the average likes estimation. The wider the error bar, the greater the uncertainty about the average likes.

Statistics for Table of supportsRussia by supportsPalestine

Statistic	DF	Value	Prob
Chi-Square	1	174.0832	<.0001
Likelihood Ratio Chi-Square	1	187.0893	<.0001
Continuity Adj. Chi-Square	1	173.4709	<.0001
Mantel-Haenszel Chi-Square	1	174.0714	<.0001
Phi Coefficient		-0.1089	
Contingency Coefficient		0.1083	
Cramer's V		-0.1089	

Fig. 9 Results of statistical tests of Pro-Russian and Pro-Palestinian Support
Source: Author's compilation, 2024

The statistical tests suggest that there is a significant association between the two support variables.

The value of the Chi-Square statistic is 174.0743 with 1 degree of freedom, and the associated p-value is less than 0.0001, which indicates a statistically significant association between the variables supportsRussia and supportsPalestine. This means that there's a measurable relationship between the two variables: tweets that express support for Russia are related in some way to tweets that express support for Palestine (whether it is a positive or negative association).

Phi Coefficient, Contingency Coefficient, and Cramer's V: three measures of the strength of association. They have the same value of -0.1089, indicating a weak negative association between the two variables.

That statistical significance does not necessarily imply a strong or meaningful relationship, as the strength of the association, as indicated by the Phi Coefficient, Cramer's V, and Contingency Coefficient, is relatively weak.

It is graphically and statistically verified and allowing us to reject the null hypothesis in favour of the alternative.

While each individual may have personal preferences, whether they support Russia or Palestine, this does not explain the fact that many accounts have similar behavior and write the same way.

Thus, there is a significant association between accounts that support the pro-Russian narrative and support for the pro-Palestinian narrative on Twitter.

5 Results and discussion

5.1 Introduction

The study examined whether there was a statistically significant relationship between support for the pro-Russian narrative in Twitter (X) discourse following the invasion of Ukraine in 2022 and whether there pro-Russian and pro-Palestinian supports connections. Through meticulous examination and data analytics, we have met our primary and partial objectives as outlined.

Firstly, we had a look at dataset which was collected after the Russia invasion in Ukraine, which has created the largest conflict in Europe since the Second World War. As of 2023, according to Britannica, about 100,000 Ukrainian troops were killed in combat and 200,000 Russian troops had been killed (Britannica, 2023).

Our analysis identified several hashtags that played an important role in amplifying the pro-Russian narrative on Twitter. There were indications of dissemination, probably by social bots or hired employees fulfilling an order, suggesting a systematic approach to influencing public opinion. The use of analysis tools allowed us to identify patterns consistent with coordinated campaigns that reinforced the presence of these hashtags on the platform.

A dataset contains hashtags which amplified pro-Palestinian narrative, after the war declared by Israel on October 7, 2023, in response to the Hamas invasion, which was the largest act of Palestinian terrorism in Israel's history (NYTimes 2023), with some 1,200 people killed and another 242 taken hostage.

A new study shows a connection between these two separate conflicts (TheConversation, 2023) as there is evidence that they share a common link in terms of propaganda.

The practical part section details the approach used in this study, which involved searching for accounts based on specific hashtags, collecting data, and then analysing and interpreting it.

A combination of descriptive statistics and test methods were used to extract meaningful patterns and relationships from the data and show their significance.

In the following, the limitations of this study will be discussed and recommendations for future research directions will be made. Moreover, this chapter serves to summarise the findings of the study within a broader picture of the role of social media in geopolitical narratives.

A notable characteristic of propaganda accounts who share pro-Russian narrative is their consistent lack of account verification. It is imperative to emphasize that all accounts within the scope of this study are, without exception, unverified.

Verified

User/Name	Verification Status
Emelia [REDACTED]	false
euroboma	false
Gabe	false
NoMoreNATO	false
Soror Inimicorum †	false
Springprincess #IStandW..	false
Tara Cleary	false
वेदीजा	false

Fig. 11: Account verification status
Source: Author's work, 2024

This pattern indicates the strategic promotion of a particular viewpoint rather than a collection of independent, self-motivated statements.

A comparative analysis was undertaken to determine whether there was a significant difference in the number of likes associated with pro-Russian hashtags such as #StandWithRussia and #StandWithPutin.

The study deployed various statistical tools to analyse the likes across the two periods. Despite initial assumptions of a potential increase post-conflict onset, the results supported the null hypothesis, that there is no significant difference in the number of likes on tweets with pro-Russian hashtags before and after the specified date.

These findings suggest that, contrary to expectations, the pro-Russian narrative did not gain more traction in terms of 'Likes' after the start of the war, indicating that the audience engagement with the content remained relatively unchanged. This could imply that the interaction with the narrative was established and did not significantly fluctuate due to the conflict's escalation.

In addition, several common roots were found with the pro-Palestinian way of publication, such as cross-support of both narratives in different accounts that certainly do not have any similarities in either the location or the causes of the conflict.

5.3 Limitations of the study

This thesis, despite its wide coverage and analysis, faces certain limitations. One such limitation is the inability to analyse all of Twitter due to the sheer volume of the social network. To address this problem, the study focused on a subset of accounts that were identified as potentially involved in propaganda activities based on hashtags. The natural limitations of this work lie in the analysed dataset.

The work focuses on textual data, because the dataset is formed from posts from specific accounts and checks the reach of a particular hashtag, while all posts with pictures or videos were removed from the dataset because they did not contain hashtags.

However, this approach is not perfect, as posts with videos or photos, even without captions can gather more reach.

Although the removal of multimedia content from the dataset is a serious limitation, it shows that methods should be found to translate pictures and videos into text for further analysis.

For future research, it makes sense to convert an image into text by using optical character recognition (OCR) software (TechTarget, 2019).

5.4 Recommendations for future research

When analysing Twitter (X) content in the area of propaganda detection, researchers have to navigate a rapidly changing landscape of social media, understanding how strategies change is critical for both research and countermeasure development.

To stay keep up to date in this field, the following strategies are recommended:

Use reliable, time-tested technologies as tools and platforms available today may not be available tomorrow. One should anticipate changes and adapt research methodologies accordingly. Diversify toolkit and remain flexible in approach to software and platforms. From this follows a second recommendation for using tools.

Use of new technologies, as the field of social media evolves and changes the rules, new tools may become more relevant to the topic. For future research it makes sense to find a way to convert an image into text by either using optical character recognition (OCR) software or by other services.

Diversify data sources, relying on a single account or narrow data set can skew results and be ineffective and show incorrect results. Twitter accounts that engage in propaganda may disappear or be banned. Therefore, it is recommended to collect a broad data set for analysis to ensure reliability.

Back up regularly, given the possible deletion of accounts, backing up data regularly is essential. This will allow maintaining access to valuable data that may otherwise be lost due to account suspension.

Perform pre-processing of the data, given that the scraper pulls all account data, a lot of it will be redundant and of no value to analyse. It makes sense to clean the dataset of unnecessary values.

Examine as much dataset as possible, a larger dataset will be more reliable to study than a smaller one. A small dataset can lead to wrong conclusions, while a large one will be much more reliable.

Researchers must be vigilant to avoid bias that could affect the results of the analysis. A balanced and objective perspective is key to avoid over- or underestimating the prevalence and impact of propaganda. This implies consistently reviewing analytical frameworks to ensure that they reflect the current digital communications landscape and do not become outdated as social media platforms evolve.

Of course, it is important not only to have the tools, but also to use them correctly. The above measures will help to avoid unnecessary actions and focus on analyzing the results. And prove whether there is propaganda in a given amount of data or on the platform or not.

6 Conclusion

An examination of the data and graphs presented shows a presence of pro-Russian narratives on Twitter (X) before and once the full-scale invasion of Ukraine began on February 24, 2022. This might lead to conclude that propaganda works on the same level. In the theory part, the so-called Internet Research Agency (IRA) was mentioned, which hires people full-time to write pro-Russian posts on the Internet. Such vacancies on job market were called: "PC Operator", "Chat Operator" or simply - "Work on the Internet". Journalistic research (BBC, 2018) show that these workers were divided for work in different countries, those who know English well have written on American sites, particularly on Twitter (X).

The US media called the Russian "Troll factory" one of the main sources of threat to Facebook (The Guardian, 2022). Trolls create accounts and communities on Facebook, highlighting key issues in American society and thereby attempting to influence U.S. policy.

This information is important, especially near the US presidential election in 2024, where Russia is betting on the election of Donald Trump.

Particularly, hashtags with a pro-Russian connotation, such as #StandWithRussia and #StandWithPutin, maintain popularity, which speaks to the ongoing work of those who spread the propaganda.

Moreover, it is noteworthy that although criticism of the West and Ukraine had previously existed on Twitter, it assumed a more concrete form with hashtags like #WarCriminal, and more specific hashtags criticizing Zelenskyy, for instance #ZelenskyWarCriminal.

The data and graphs presented in this thesis demonstrate support for pro-Russian narratives on Twitter (X), even if it remains at the same level, as well as the connection between pro-Russian and pro-Palestinian actors.

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3 List of abbreviations

IRA – Internet research agency
PMC – Private military company
RT TV – Russia Today television
NATO – The North Atlantic Treaty Organization
OCR – Optical Character Recognition
VPN – Virtual Private Networks
IQR - Interquartile Range

Appendix

Result of the main hypothesis.

The TTEST Procedure

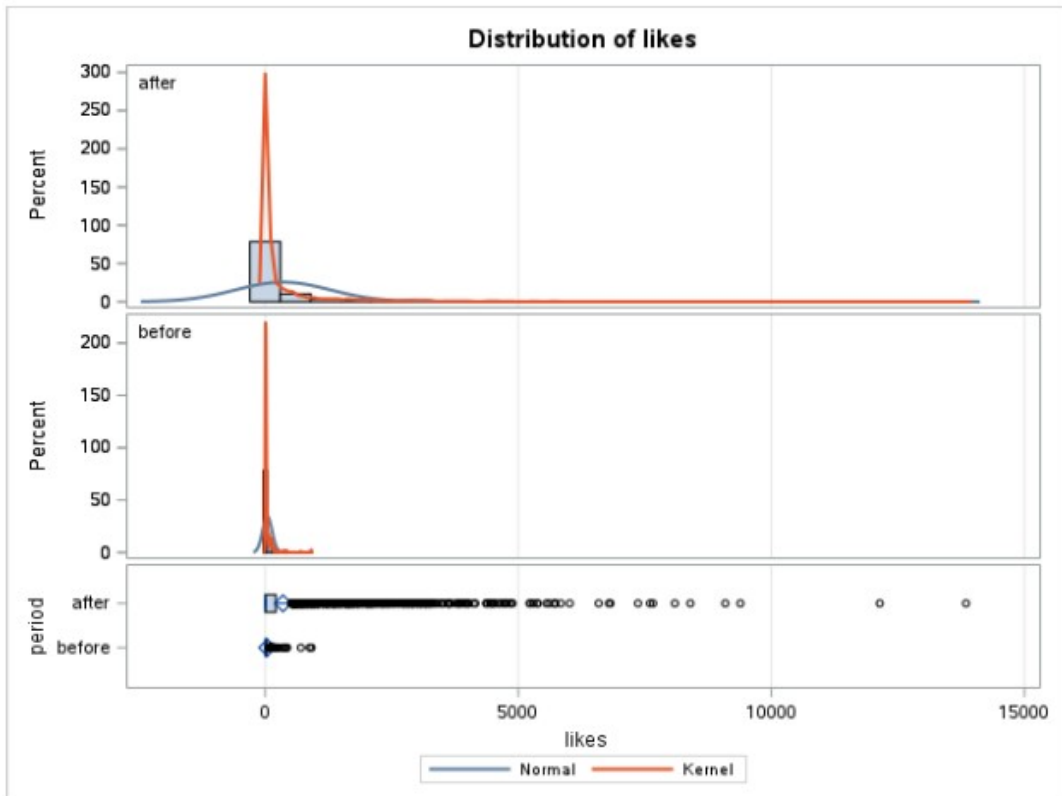
Variable: likes (likes)

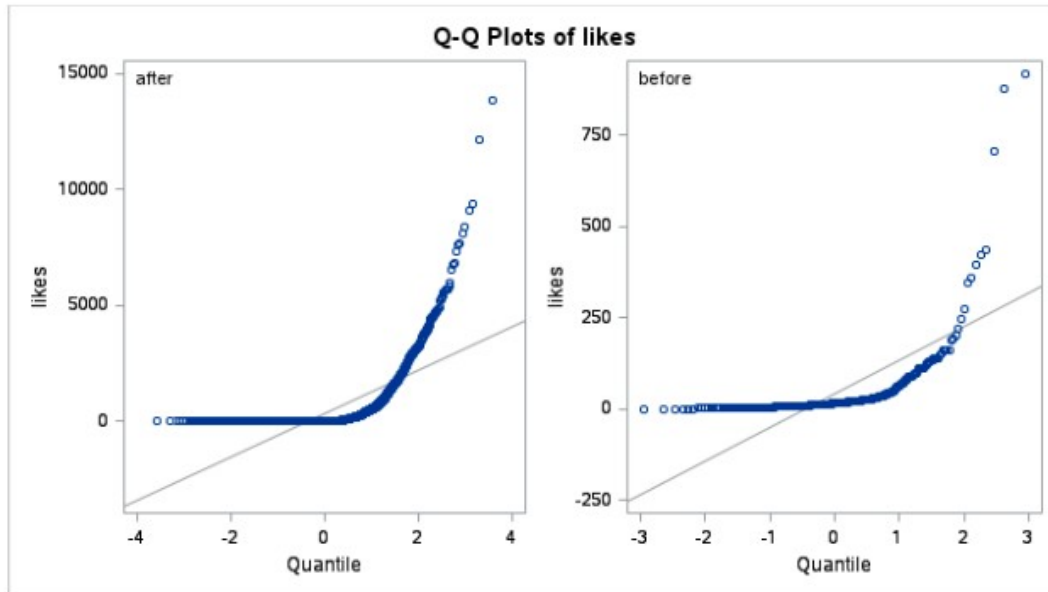
period	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
after		3399	352.4	936.3	16.0596	0	13846.0
before		379	41.8232	92.5359	4.7533	0	919.0
Diff (1-2)	Pooled		310.5	888.7	48.1258		
Diff (1-2)	Satterthwaite		310.5		16.7483		

period	Method	Mean	95% CL Mean	Std Dev	95% CL Std Dev
after		352.4	320.9 383.9	936.3	914.6 959.1
before		41.8232	32.4771 51.1693	92.5359	86.3838 99.6388
Diff (1-2)	Pooled	310.5	216.2 404.9	888.7	869.1 909.2
Diff (1-2)	Satterthwaite	310.5	277.7 343.4		

Method	Variances	DF	t Value	Pr > t
Pooled	Equal	3776	6.45	<.0001
Satterthwaite	Unequal	3760	18.54	<.0001

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	3398	378	102.38	<.0001





The NPAR1WAY Procedure

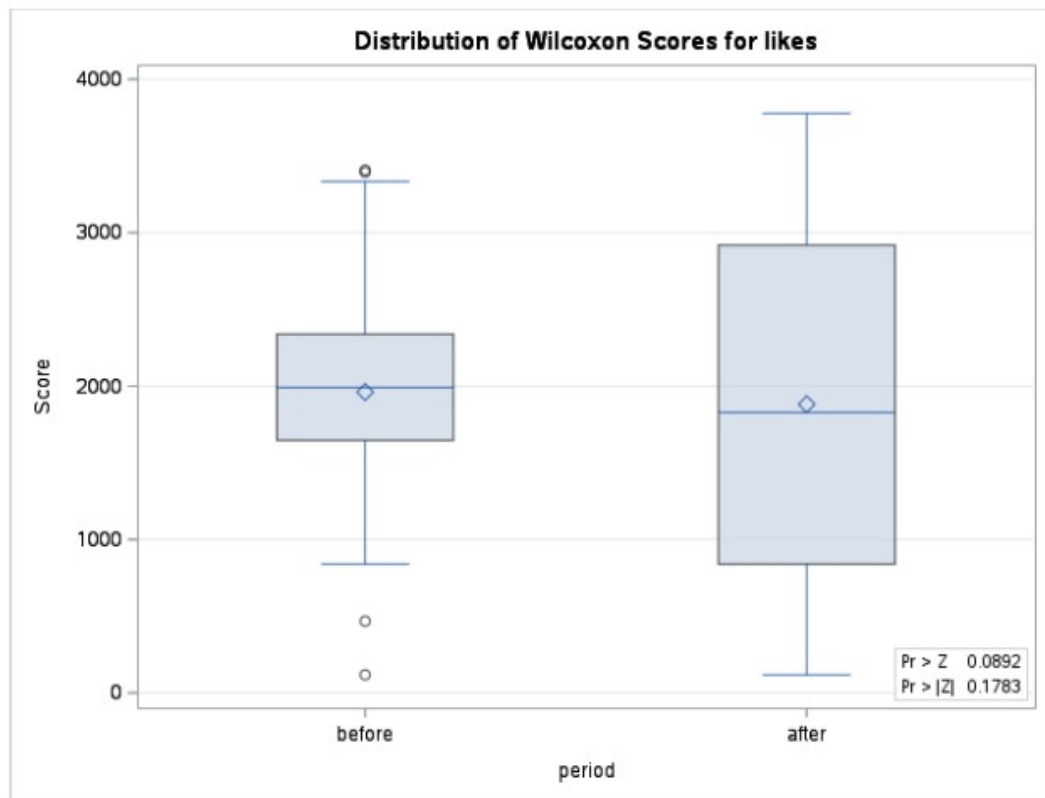
Wilcoxon Scores (Rank Sums) for Variable likes Classified by Variable period					
period	N	Sum of Scores	Expected Under H0	Std Dev Under H0	Mean Score
before	379	743191.0	716120.50	20113.6266	1960.92612
after	3399	6395340.0	6422410.50	20113.6266	1881.53575

Average scores were used for ties.

Wilcoxon Two-Sample Test					
Statistic	Z	Pr > Z	Pr > Z	t Approximation	
				Pr > Z	Pr > Z
743191.0	1.3459	0.0892	0.1783	0.0892	0.1784

Z includes a continuity correction of 0.5.

Kruskal-Wallis Test		
Chi-Square	DF	Pr > ChiSq
1.8114	1	0.1783



Result of the specific hypothesis.

Analysis Variable : likes likes							
supportsRussia	supportsPalestine	N Obs	N	Mean	Std Dev	Minimum	Maximum
0	0	8330	8330	371.2714286	1980.30	0	65016.00
	1	2558	2558	663.3373729	3663.46	0	130056.00
1	0	3273	3273	357.9544760	943.7332605	0	13846.00
	1	505	505	83.1267327	366.6416439	0	4120.00

Obs	supportsRussia	supportsPalestine	_TYPE_	_FREQ_	average_likes
1	0	0	3	8330	371.27142857
2	0	1	3	2558	663.33737295
3	1	0	3	3273	357.95447602
4	1	1	3	505	83.126732673

Frequency Expected Percent Row Pct Col Pct	Table of supportsRussia by supportsPalestine			
	supportsRussia(supportsRussia)	supportsPalestine(supportsPalestine)		
		0	1	Total
0	8330	2558	10888	
	86.14	22.74		
	56.80	17.44	74.24	
	76.51	23.49		
	71.79	83.51		
1	3273	505	3778	
	29.89	7.89	0.04	
	22.32	3.44	25.76	
	86.63	13.37		
	28.21	16.49		
Total	11603	3063	14666	
	79.11	20.89	100.00	

Statistics for Table of supportsRussia by supportsPalestine

Statistic	DF	Value	Prob
Chi-Square	1	174.0832	< .0001
Likelihood Ratio Chi-Square	1	187.0893	< .0001
Continuity Adj. Chi-Square	1	173.4709	< .0001
Mantel-Haenszel Chi-Square	1	174.0714	< .0001
Phi Coefficient		-0.1089	
Contingency Coefficient		0.1083	
Cramer's V		-0.1089	

Fisher's Exact Test	
Cell (1,1) Frequency (F)	8330
Left-sided Pr <= F	< .0001
Right-sided Pr >= F	1.0000
Table Probability (P)	< .0001
Two-sided Pr <= P	< .0001

Sample Size = 14666

