Network Analysis of Disinformation Actors During COVID-19 Pandemics and Beyond

The Case of Czech Facebook

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Abstract

Disinformation has been on the rise in recent years. Especially Central and Eastern Europe felt this in the form of Russian hybrid campaigns aiming to destabilize democratic governments and whole societies. Despite the apparent threat, there is a considerable research gap regarding the disinformation scene in the Czech Republic, particularly during the COVID-19 pandemic and after the Russian invasion of Ukraine. This article aimed to cover this gap by conducting a social network analysis of the Czech disinformation scene on Facebook from the beginning of the pandemic on March 11, 2020, until August 2023. The final dataset contained more than 6,000 posts, resulting in a network of 3,822 actors and 7,255 interactions. The analysis showed a high interconnectedness of the analyzed network and confirmed the crucial role of politicians and other public figures in spreading disinformation in the Czech Republic. Furthermore, a “disinformation spillover” from Slovakia to Czechia was observed, pointing out the interconnected disinformation scene in the two countries.

Keywords

Social Network Analysis; Disinformation; Facebook; Covid-19.

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Introduction

Disinformation - which can be defined as "inaccurate information that the source intends to mislead the recipient" (Fallis 2015) - has been booming in recent years, mainly in conjunction with the rise of the Far-right (Bennett & Livingston 2020), events like the Russian annexation of Crimea in 2014 (Lanoszka 2019), and more recently with the COVID-19 pandemic. The 2022 Russian invasion of Ukraine saw a similar increase in disinformation surrounding the conflict, and a future without this phenomenon is hard to imagine. This is especially problematic for some societies - like those in Central and Eastern Europe (CEE) - which are generally more vulnerable to disinformation (Bokša 2019). This can be explained by cultural and historical realities that can be exploited by foreign actors, especially Russia (Bokša 2019). However, accentuating primarily foreign influence3 shifts focus from the fact that disinformation can be an issue of domestic policies (Gunitsky 2020) as well as individuals prone to distrust elites. This is especially important as such individuals can be used as proxy actors by a foreign power, indirectly influencing the target audience (see Eady et al. 2023), which necessitates differentiating between direct and indirect foreign influence, i.e., influence that comes directly and overtly from an adversary in the former case, or uses proxies including social media accounts in the latter.

There are two primary reasons for delving into the topic of disinformation in Czechia during the pandemic. First, this paper attempts to fill the gap of insufficient research on the issue, specifically in the Czech Republic, which has been a target of the Russian disinformation campaign for over a decade (GLOBSEC 2016). Second, there is an assumption that disinformation in the CEE region primarily results from a Russian hybrid warfare4 campaign aiming to destabilize the region (ibid.). However, it is feasible that there are internal disinformation actors with an agenda that might only intersect with the goals of foreign powers.

Researchers also point out the' snowball effect' of disinformation, which can be easily shared among social media users and help spread the narrative (Wanless & Berk 2017). Furthermore, Törnberg (2018) argues that so-called echo chambers contribute to the virality of disinformation on social media. Only a handful of actors might intentionally spread disinformation to achieve their political or other goals, while most participating social media users could contribute unknowingly. This creates an interesting situation where disinformation becomes misinformation – essentially unintentionally incorrect information – and helps hide the original malicious actor.

Facebook is the ideal starting point for analyzing the Czech disinformation scene, as it can be argued that most users consume and spread disinformation primarily on this platform (iRozhlas 2022).

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3 The concept of foreign influence is a fuzzy one and overlaps significantly with foreign interference. While some actors – like Australian government – distinguish the concepts, others – such as the European Union – use them interchangeably (Fridman 2024). Following Fridman’s (2024) definition, we understand foreign influence as “deployment of different sources of national power (diplomatic, information, military, economic, financial, religious, etc.) by one international actor to influence another in pursuit of a political goal.”

4 Defined by The European Centre of Excellence for Countering Hybrid Threats (n.d.) as “Coordinated and synchronized action that deliberately targets democratic states’ and institutions’ systemic vulnerabilities through a wide range of means.”
We used social network analysis (SNA) to map Czech Facebook's disinformation scene. The research question is as follows:

*How did disinformation spread on Czech disinformation Facebook groups since the COVID-19 pandemic?*

We also set several supporting questions that guided the analysis and helped answer the primary research question:

1. Which actors have played key roles in spreading disinformation since the COVID-19 pandemic in the Czech Republic?
2. Has foreign influence manifested in Czech Facebook groups since the COVID-19 pandemic? In case it did, how?
3. To what degree has the disinformation network in Czech Facebook groups been cohesive and interconnected since the COVID-19 pandemic?

**Disinformation, Misinformation, And Fake News**

Disinformation is nothing utterly new. Similar to other related concepts like propaganda or psychological warfare, it has been used throughout history (Fallis 2015). In the introduction, we mentioned a definition by Fallis (2015) as "inaccurate information that the source intends to mislead the recipient." Furthermore, the intention to cause harm to the target audience is widely considered to be one of the key conceptual constituents of disinformation (Hameleers 2023). This sets it apart from misinformation, which can be understood as any false or misleading information. Social media platforms often serve as "gatekeepers and amplifiers of disinformation" (Hameleers 2023: 2-3) because of their primary concern with profit (see Kim et al. 2018).

Another term is often used to convey a similar meaning to disinformation - fake news. Initially, fake news meant "satirical or parodic fictional news vehicles" (Tamul et al. 2020; see also Cosentino 2012, Holt 2009). The meaning has shifted since then, and many understandings and definitions of fake news currently exist. Tandoc Jr et al. (2018) came up with six broad categories: "(1) news satire, (2) news parody, (3) fabrication, (4) manipulation, (5) advertising, and (6) propaganda." However, the ambiguity itself is only one half of the problem. Donald Trump extensively used fake news as an accusatory term to delegitimize media and journalists (Tamul et al. 2020), and the term became primarily a buzzword (Tandoc et al. 2018). This is also true in the Czech Republic, as former Prime Minister Andrej Babiš - who has also been compared to Donald Trump - used the fake news label for media similarly to the former US president (Euronews 2018). Bennett & Livingston (2018) point out that the term fake news should be used with caution, as it frames the problem as an isolated incident. Furthermore, the polarisation of fake news in politics and media is high, and the term is used to label any inconvenient information as "fake" (Vosoughi et al. 2018).

The turning point of disinformation and fake news getting into the 'academic mainstream' and broader public discourse was the 2016 presidential elections in the USA (Persily & Tucker 2020).
However, disinformation has been a central topic in the CEE region since the Euromaidan protests in Ukraine and the Russian annexation of Crimea, and much has already been written about it (Shekhovtsov 2015). The Czech Republic is a prime example of a CEE country threatened by foreign hybrid warfare campaigns - namely from the side of the Russian Federation (Ministry of Interior 2016). Despite the security challenges posed by disinformation and other forms of hybrid threats to Czech democratic society, there is an apparent lack of academic work on the topic focusing specifically on the Czech Republic. Disinformation in Czechia is mainly researched through the prism of hybrid threats, for example, by Daniel & Eberle (2018). The authors of this article mapped the rise of Russian hybrid warfare from 2014 to 2016, which was a transformative period for the Czech security environment Daniel & Eberle (2018). However, disinformation is considered merely a part of a broader hybrid warfare strategy by the Czech strategic documents, including the Czech National Audit (see Ministry of Interior 2016; Daniel & Eberle 2018). One of the rare articles specifically focusing on disinformation was written by Gregor & Mlejnková (2021), who concluded that "disinformation campaigns are more about redirecting the blame onto others and lowering the level of trust in governments, elites, and established media within the general public."

Bennett & Livingston (2018) argue that disinformation, unlike ad hoc fake news, implies a systematic and strategic disruption attempt (Bennett & Livingston 2018). For the aforementioned reasons, we will be avoiding the term fake news throughout the article, similar to the approach of Vosoughi et al. (2018). Nevertheless, there is a possibility that Czech Facebook groups are primarily echo chambers\(^5\) for various societal groups and topics, and the spread of false news, as Vosoughi et al. (2018) would call it, is very much unsystematic. Filipec (2019) likens any disinformation and misinformation to viruses, which can occur both intentionally and naturally in the environment. It is practically impossible to assess the intent of Facebook users when spreading disinformation. Furthermore, various narratives that have been appearing on social media often present factually true information but omit important context. An interesting case is made by Simion (2023), who argues against the “orthodoxy” in disinformation conceptualization. She illustrates that a person reporting of a scientific disagreement on the safety of COVID-19 vaccination might spread disinformation by overrepresentation of the isolated cases of the experts opposing the majority – even without any intent to disinform (Ibid.).

With wide use of social media, another concept has been coined by Wanless and Berk 2017 - participatory propaganda. Contemporary forms of communication - and disinformation, for that matter - are essentially no more straightforward and linear. Propaganda moved from a "unidirectional' one-to-many' form of communication to a 'one-to-many-to-many more' form where each' target' of influence (an individual or group which is the object of persuasion) can in theory become the new' originator’” (Wanless & Berk 2017). One source can quickly generate a vast number of reactions, comments, and shares and influence a much larger group of people. This gives power to regular citizens, who do not have to invest much in terms of resources and time to influence others, which makes the threat of disinformation even more pressing. In line with Simion’s (2023) arguments

\(^5\) Can be defined as “environments in which the opinion, political leaning, or belief of users about a topic gets reinforced due to repeated interactions with peers or sources having similar tendencies and attitudes” (Cinelli et al. 2021).
on the conceptualization of the concept and the aforementioned emergence of *participatory propaganda*, we will – in the context of this paper – consider spreading false or propagandist narratives as *disinformation*, no matter the intentionality.

**COVID-19 Pandemic and Infodemic**

World Health Organization (WHO) officially characterized the outbreak of COVID-19 as a pandemic on March 11, 2020, and ended the global emergency more than three years later on May 5, 2023 (World Health Organization 2023). Gottlieb & Dyer (2020) informed in the early stages of the pandemic about the benefits of social media, such as faster times between research publication and its dissemination and application. Tsao et al. (2021) performed a scoping review and identified three key categories of social media use during the pandemic - namely, social media as contagion and vector, social media for surveillance and monitoring, and social media as disease control. Social media platforms like Facebook and YouTube were crucial for battling infodemics, spreading information concerning COVID-19 control, and even predicting COVID-19 case numbers (Tsao et al. 2021). Nevertheless, multiple studies have shown that disinformation boomed during the COVID-19 pandemic, to which the United Nations reacted by declaring an ‘infodemic’ (UNODC 2020; Cinelli et al. 2020; Mheidly & Fares 2020; Gehrke & Benetti 2021; Tagliabue et al. 2020). The geopolitical interests of key international actors like China and Russia have notably played a role in targeted global disinformation campaigns (Milewski 2022; Wilson & Wiysonge 2020). Furthermore, Das and Wasim (2022) used social network analysis to analyze Twitter groups and found connections between conspiracy theories surrounding 5G networks and the coronavirus. The COVID-19 sentiments were also connected to anti-corporate and anti-government motives (Ibid.).

The aforementioned lack of academic works on disinformation in the Czech Republic is ever more apparent regarding the COVID-19 pandemic. The Czech Republic was set as an exemplary best-in-COVID country, which managed the first wave of the pandemic in the Spring of 2020 well (Kaniok 2022). However, the subsequent waves were not handled well by Czechia, and Kaniok (2022) argues that this was caused by the politicization of the pandemic before the elections, as the populist government then ignored expert advice. Štětka et al. (2021) conclude that “the pandemic evinces some similarities with the ‘immigration threat,’ especially polarisation and radicalization of opinions, and a renewed popularity of disinformation sources, also stimulated by the apparent discord among “expert” opinions in the mainstream media, as well as by people’s uncertainty about the government’s handling of the crisis.” Furthermore, PSSI’s analysis showed that the most criticized institution was the EU (Syrovátková et al. 2020), which highlights the use of the COVID-19 pandemic for disinformation campaigns by Russia and China (see Vériter et al. 2020).

**Social Network Analysis**

Social networks are not inherently tied to social media and the internet - in fact, they are “as old as the human species” (Knoke & Yang 2019). However, with the ever-increasing number of users connected through social media platforms like Facebook, X (formerly Twitter), and many others, a new phenomenon arose - online social networks. With unprecedented internet penetration and usage of social media, much of the interhuman interaction happens in the online environment,
and researching phenomena like disinformation and fake news needs to address this. Internet penetration in Czechia, for example, was around 85% in 2022, based on the Czech Statistical Office (2022). The number of Facebook users was a staggering 7.18 million in July 2023 (Statista 2023), which is a staggering number in a country with less than 11 million inhabitants.

For this study, social network analysis was the most fitting method to answer the set research question, as we were specifically concerned with how disinformation spread during COVID-19 and beyond in the Czech Republic. Therefore, analyzing actors that post, share, and consume disinformation was necessary. In general, SNA is concerned with actors and their relationships, which form dyads, triads, subgroups, groups, and social networks (Wasserman & Faust 1994). Through these relationships, we can infer the network’s most important nodes and identify communities that might not necessarily be centred around the Facebook groups we scraped. Social network analysis can be particularly useful in research related to disinformation and misinformation. It is possible to identify the most influential individuals within the network and nodes that serve as “bridges” for the information flowing between other nodes. The information flow can also help identify key sources of disinformation within the network, potentially allowing early warning of disinformation campaigns (see Chatfield and Brajawidagda 2012).

**Dataset - Disinformation Actors on Czech Facebook**

After reviewing the existing theory and literature on disinformation in different contexts, the next step was constructing a dataset of Facebook groups active on Czech Facebook during COVID-19. Two primary options were available - (1) creating a new dataset using a combination of machine learning algorithms and traditional methods like snowballing or (2) reusing and modifying existing datasets made available by media, volunteer groups, and other researchers. We chose the latter and used a list of Facebook groups from www.investigace.cz, which includes 36 Facebook groups that shared posts from known disinformation and conspirational websites (Šlerka 2022b, see Šlerka 2022a for methodology). The server used data from CrowdTangle from May 15, 2022, to October 15, 2022. The Facebook groups have shown surprising stability in the number of members, with a notable exception of the quickly growing group named “We do not want a fascist government,” which saw a significant increase in its membership base. This particular group also changed its name to “People against Pavel and Fiala” later, referring directly to the newly elected Czech President Petr Pavel and the Czech Prime Minister Petr Fiala.

We consider spreading objectively false information and propaganda as disinformation, no matter the intent. The chosen Facebook groups actively participated in sharing posts from websites that spread conspiratorial content and disinformation regarding COVID-19, as well as the Russian invasion of Ukraine. Next to texts about the danger of COVID-19 vaccines, there are narratives about bio laboratories in Ukraine or alleged “Western propaganda centres” (see Šlerka 2022a). An analysis of the Czech Centre Against Terrorism and Hybrid Threats (n.d.) concludes that one of the key websites that share pro-Russian propaganda from Sputnik News, RIA Novosti, and TASS is AC24 News. Texts

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6 Such as konspiratori.sk, which is the approach chosen by Hacek & Virostková (2022)

7 “Nechceme fašistickou vládu . . . .” in Czech.
from this website were shared by at least some of the 36 Facebook groups chosen for network analysis in this paper. As the Czech Centre Against Terrorism and Hybrid Threats and the analysis of investigace.cz (Šlerka 2022a) are in line with their conclusions, we conclude that the validity of the dataset is satisfactory.

The list of actors was first cleaned of (1) actors with fewer than 10,000 followers and (2) groups with unavailable information on interactions. The cleaned list contained 23 Facebook pages that produce almost 1,500 posts per day based on the information from investigace.cz (Šlerka 2022b). This would result in around 1.5 million posts for analysis during the pandemic. Due to the technical constraints of software for network analysis, we narrowed down the final dataset in two ways. First, we chose only five groups with the highest number of members and five with the highest interaction rate, as stated by the investigace.cz portal. One of the groups fell into both categories, so the final list contained eight Facebook groups (see Table 1). Second, we sampled the data by incorporating a random jump to loop through the Facebook posts. This jump ranged between 1 and 19 steps, resulting in roughly 10% of posts between March 11, 2020, and the data gathering in August 2023.

**Data Gathering and Limitations**

Data was gathered using a Python library called facebook-scraper, which allows for collecting basic data for Facebook posts, but crucially also reactions and reactors. For SNA, gathering data on user connections through reactions is necessary. Otherwise, the only connections (edges) would be between the users and the Facebook groups where they post. However, due to technical limitations caused by Meta’s fight against data scraping, the dataset does not contain information on comments and commenting users, and often, the reacting users could not be extracted as well. Meta bans users who send large numbers of requests for data, which is necessary to get data from comments. This is, without a doubt, a limitation of this paper, but the amount of gathered data and interactions is high enough to mitigate it to a certain degree.

The initial dataset contained 9 Facebook groups. However, after cleaning the data, the group Českoslovenští vojáci v záloze / Československí vojáci v zálohe was omitted, as it contained only posts from the year 2020. This would potentially skew the analysis because the data from the other Facebook groups would have come from a largely different timeframe. A considerable part of the work with the extracted dataset was cleaning and transformation. First, we removed any:

1. Corrupted data;
2. Posts with unknown critical data (such as account name or date) were removed.

Second, we randomly selected only a subset of posts to match the differences in number of members among the groups. The smallest number matched the full set of extracted posts of the group with the lowest member base, Fórum vlastenců.cz, from which we managed to scrape 411 posts, while for the largest Facebook group, Češi, táhněme za jeden provaz, we included 1073 posts (see Table 1). The cleaned dataset of posts was then merged into the final dataset, which could then be used to create nodes and edges.
Table 1. Analysed Facebook groups and the final number of posts

<table>
<thead>
<tr>
<th>Group</th>
<th>Group ID</th>
<th>Members September 2023</th>
<th>Posts in the final dataset</th>
</tr>
</thead>
<tbody>
<tr>
<td>Češi, táhněme za jeden provaz</td>
<td>1678005795706610</td>
<td>34200</td>
<td>1073</td>
</tr>
<tr>
<td>LID PROTI PAVLOVI A FIALOVI...</td>
<td>366208380198441</td>
<td>32800</td>
<td>1029</td>
</tr>
<tr>
<td>Chceme obecné referendum bez omezení tématu referenda</td>
<td>1584252448554681</td>
<td>29600</td>
<td>929</td>
</tr>
<tr>
<td>NEOČKOVANÍ CZ, SK pro MÍR ! NE VÁLCE !</td>
<td>131915778646395</td>
<td>24800</td>
<td>778</td>
</tr>
<tr>
<td>Podporujeme premiéra Babiše před podlými útoky na rodinu a snahou o puč!</td>
<td>370618123684724</td>
<td>24400</td>
<td>766</td>
</tr>
<tr>
<td>SVOBODA je stav VĚDOMÍ</td>
<td>196756315572788</td>
<td>18100</td>
<td>568</td>
</tr>
<tr>
<td>Spojujeme český národ</td>
<td>1224109594789021</td>
<td>14400</td>
<td>452</td>
</tr>
<tr>
<td>Fórum vlastenců.cz</td>
<td>881350348647773</td>
<td>13100</td>
<td>411</td>
</tr>
</tbody>
</table>

Wasserman & Faust (1994) list two fundamental concepts for SNA - actors and relations ties, which constitute any network and must be used to create one in specialized software. We use more technical terms “nodes” and “edges” as they are also widely used in the software used for the analysis. The next step of the data preparation was creating files containing all the nodes and edges. The nodes had all Facebook users who published at least one post in the final dataset or users whose posts were shared by any of the initially scraped actors. All edges or relations between the actors - had to be created manually by creating a file with directed relationships, i.e., coming from a source to a target. As Facebook groups constitute important platforms for sharing disinformation, we considered each post as an edge towards the group where it was posted. All reactions were considered as edges towards the actor who created the post. With information flow in mind, we considered sharing a post as an edge where the source (sender) was the user whose posts were shared, while the target (receiver) was the user who shared the post. Last, data was loaded into Gephi software to calculate quantitative metrics and create a graphical representation of the social network. The resulting network contained 3,822 unique nodes and 7,255 edges.

This study is limited by the fact that the data were collected in 2023, already after the COVID-19 pandemic. Some users are no longer active, and gathering data for dynamic analysis is impossible. However, the post-pandemic data gathering also leads to an advantage of monitoring stable Facebook groups that might still be relevant in future research. One of the crucial limitations is tied to Meta’s policies on automated data scraping. Gathering all posts in the chosen Facebook groups would be technically feasible, and the number of groups would not necessarily have to be lowered. However, Facebook made attempts to scrape higher numbers of posts with all necessary information - such as reactions and reactors - impossible. We advise any researcher interested in Facebook data to gather data over a longer period, both due to constraints set by Meta and to enable dynamic network analysis.
Network Analysis

After uploading the cleaned and transformed data sampled from the Czech disinformation-spreading Facebook groups into Gephi software, we let the program calculate important metrics for nodes in the network. We worked concretely with betweenness centrality and outdegree, which are the most beneficial for understanding the landscape of disinformation groups on Czech Facebook. Betweenness centrality is essentially a quantification of node centrality within a network that is based on how many times it is on the shortest path between other nodes (Ruhnau 2000). We expect nodes with higher betweenness centrality to play an important central role within the analyzed network, pointing out a potentially high impact on Czech society. The resulting shape of the analyzed network with nodes scaled based on betweenness centrality can be seen in Figure 1. The other metric we used to scale the nodes was outdegree, which essentially indicates the number of connections a node has towards other nodes or receives from them (Wasserman & Faust 1994). Similar to Wu & Huberman (2004), we think of a node with high outdegree as the information flow originator. Therefore, we also scaled the nodes with outdegree to see the primary originators of disinformation spread in our network (see Figure 3). The core nodes differ significantly in the two figures.

Figure 1. Sample of Czech disinformation network on Facebook. Node sizes and label sizes scale with weighted degree.

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8 SVOBODA je stav VĚDOMÍ – FREEDOM is a state of CONSCIOUSNESS; Fórum vlastenců.cz – Forum of patriots.cz; NEOČKOVANÍ CZ, SK pro MÍR ! NE VÁLCE – UNVACCINATED CZ, SK for PEACE ! NO TO WAR !; Chceme obecné referendum bez omezení tématu referenda – We want a general referendum without limitation of its topic; ; LID PROTI PAVLOVI A FIALOVI – PEOPLE AGAINST PAVEL AND FIALA; Spojujeme český národ – We bring together the Czech nation; Podporujeme premiéra Babíše před podílní útoky na rodinu a sňahou o puč! – We support the Prime Minister Babiš against vile attacks on his family and attempts of coup; Češi, táhněme za jeden provaz – Czechs, pull on the same rope.
Core Network Metrics

To assess the network structure, we calculated its modularity using the Louvain method for fast uncovering communities in large networks, which is available in Gephi (Blondel et al. 2008). Ji et al. (2015) describe modularity as a measure of the strength of a network’s division, where “networks with high modularity have dense connections between the nodes within modules but sparse connections between nodes in different modules” (Ibid.). Modularity can range between -1 and 1, with values closer to 1 indicating a stronger community structure (Newman & Girvan 2004). The resulting modularity was 0.588, and 4 communities were recognized. Both the modularity score and the visualization point out quite a strong community structure in the analyzed network. The actors in the network are often connected to other actors and Facebook groups, with the notable exception of several Facebook users and one of the analyzed groups, Fórum vlastenců.cz. Most posts in this group are from only one person, who is not well connected within the broader network of disinformation consumers and other Facebook groups. However, based on the data from investigate.cz, the posts in this group enjoyed a relatively high interaction rate of 2.62% in 2022 (Šlerka 2022b). We also calculated an average path length within the network with an in-built algorithm (Brandes 2001), which essentially shows the average of shortest paths between all nodes within the network. In practical terms, the shorter the path, the easier and faster the information flow is among the actors. In the case of our network, the average path length is 4.438 - hence transfer of information is relatively easy. The path length can be compared with path lengths observed that average path lengths on social media popular in the late 2000s ranged between 4.25 on the most popular platform, Orkut, to 5.88 on LiveJournal (Mislove et al. 2007), while Matsumura et al. (2017) calculated average path lengths in four social media datasets that ranged between 4.299 and 6.782. Consequentially, with the size of the network analyzed in our paper being 7255 edges and 3822 unique nodes, we consider the average path length of 4.438 to be short and the network strongly intertwined.

What do all of the aforementioned metrics mean in practical terms? The sampled network of disinformation groups on Facebook shows a remarkable interconnectedness and a quite low number of outliers that are not connected to many other nodes within the network. This is in line with the findings of Štětka et al. (2021), who concluded that social media play a key role in disinformation spreading, but the production of disinformation content “often takes place within a variegated “alternative” news ecosystem, increasingly dominated by hyperpartisan, anti-system and conspiracy news websites, both stemming from and further exacerbating political polarization in many countries around the world.”

Central Actors and Communities

Naturally, the network is centralized around the Facebook groups when the weighted degree is calculated, which is not very telling (see Figure 1). However, changing the node size based on betweenness centrality (see Figure 2) essentially highlights important nodes playing a specific role in the network. Based on Zhang & Luo (2017), “betweenness centrality is to measure one node undertaking ‘mediation’ role,” which means that the nodes are located in the only way between other nodes and serve as “bridges” between otherwise not connected nodes (Nooteboom 2003). Around ten Facebook accounts have a relatively high degree (number of connections) and very high
betweenness centrality (see Figure 2), which revolve primarily around the group Češi, táhněme za jeden provaz. Some nodes also have a very high degree compared to other nodes in the analyzed network and represent “central figures” that are key to the information flow and information keeping in the network. Independent media in Czechia informed of one of the persons that are among these mediators - Aleš Svoboda - as a “known disinformator” in the context of COVID-19 and Russian invasion-related disinformation (Krupka 2023). Therefore, it seems that the findings of our analysis are very much in line with the known information.

Figure 2. Sample of Czech disinformation network on Facebook. Node sizes and label sizes scale with betweenness centrality

Modularity calculation (Blondel et al. 2008; Lambiotte et al. 2008) identified four core communities within the network, which are colored differently in Figures 1, 2, and 3. We achieved the best results with a higher resolution of 4.0, resulting in fewer communities. The identified communities inherently have much in common and deal with common topics centered around the War in Ukraine,
anti-Westernism, and vaccinations against COVID-19. The largest part of the network, consisting of four Facebook groups, is mainly concerned with the criticism of Prime Minister Fiala’s government and President Pavel. The second largest community is a combination of opposition to vaccines and “esoteric” posts, but anti-government and anti-Ukrainian content is not missing as well. The group with the most members - Češi, tâhnême za jeden provaz is, quite paradoxically considering the name, the least connected to the other communities. Posts in this group primarily deal with the international situation, with strong opposition to Ukraine and the EU. Most accounts with the highest betweenness centrality are tied to this community, and few of them were created shortly after the beginning of the COVID-19 pandemic. The last community based on the modularity report belongs to Fórum vlastenců.cz - a group tied to Freedom and Direct Democracy (SPD) party that can be considered Far-right and nationalist, which in turn translates to the content of the posts in the group.

The network’s top and middle parts consist almost entirely of actors known well in the Czech disinformation scene. Notable names mentioned, for example, in PSSI’s report on disinformation actors (see Tkáčová et al. 2023) include, in no particular order, Zuzana Majerová, Jana Zvyrtek Hamplová, Tomio Okamura, and Jindřich Rajchl. These accounts have the largest outdegree (see Figure 3), which means a large amount of information flows from them in the network. On the other hand, the bottom part of the network is characterized by a group of seemingly regular citizens’ accounts with high betweenness centrality. According to Nobre et al. (2022), “[t]he users, groups and communities more often engaged in misinformation tend to have higher centrality in the network.” This would imply that some of the most engaged accounts do not belong to highly visible public figures but regular individuals or fake disinformation accounts.

**Disinformation Sources**

Maybe even more important in the case of our network are actors with a high outdegree, which can be considered the primary disinformation sources, as most information in the network flows from them. Unsurprisingly, the node with the highest outdegree belongs to Jindřich Rajchl, a Czech political activist who organized anti-government demonstrations and is one of the most well-known figures of the Czech disinformation scene. In 2022, he founded a new political party Právo, Respekt, Odbornost (PRO). Another political figure that serves as a disinformation source in the analyzed network is Tomio Okamura - the founder and chairman of Freedom and Direct Democracy (SPD), which attracts the masses and far-right in Czechia (Kubát & Hartliński 2019). Many known figures of the Czech disinformation scene are also present, such as Zuzana Majerová, Ladislav Vrábel, and others. Despite the focus on Czech disinformation groups on Facebook, one of the nodes with the highest outdegree belongs to Slovak pro-Russian politician Tomáš Špaček, who actively translates and shares speeches of Vladimir Putin (Šnídl 2023). The similarity in Czech and Slovak languages creates a unique situation with a “disinformation spillover” - in this concrete example from Slovakia – itself under the Russian disinformation campaign (see GLOBSEC 2016), getting into the Czech Republic.

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9 The name could be translated as “Czechs, let us pull on the same rope.”

10 Law, Respect, Expertise.
Discussion

Many inferences can be drawn from the conducted network analysis. We will first answer the supporting questions briefly before elaborating on the core research question of the article.

1. What actors have played key roles in spreading disinformation since the COVID-19 pandemic in the Czech Republic?

Based on the conducted analysis, several types of actors exist in the Czech disinformation scene on Facebook. First, there are the disinformation sources - usually individuals and politicians whose posts are shared on the walls of disinformation groups on Facebook by their members.

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11 Alliance národních sil – Alliance of national powers; Aby bylo jasno – Just so it is clear.
Furthermore, alternative media articles and videos are often shared similarly. Second, there are gatekeepers or mediators. A significant amount of information flows through these accounts, and their removal might fragment the network (Home Office Science 2016). Third, there are foreign accounts that could be considered disinformation sources but ultimately constitute an external threat with certain specifics. The key people and organizations spreading disinformation are mostly well-known and documented (see Tkáčová et al. 2023; Czech Centre Against Terrorism and Hybrid Threats n.d.; Šlerka 2022a). However, there is a significant group of accounts that seem to belong to publicly unknown individuals. These might be individuals who believe in disinformation, but there is a possibility that they are part of a coordinated disinformation effort by pro-Russian actors.

2. Has foreign influence manifested in Czech Facebook groups since the COVID-19 pandemic? In case it did, how?

The available data and analysis of several influential nodes in the network show foreign influence manifests through Slovak disinformator Tomáš Špaček, but indirect influence from Russia is apparent as well. Alternative media critical to the West and inclined to Russia - such as KTV Live or Raptor-TV - are important nodes in the network. Several nodes with the highest betweenness centrality also seem to be specifically disinformation-spreading accounts. It is hard to assess whether these are legitimate accounts or not. However, using fake accounts to spread disinformation is a known Russian strategy that was utilized, among others, before the US elections in 2016 (Shane 2017). It is hard to assess the degree of Russian influence in the Czech disinformation scene. Still, from a strictly practical point of view, the pro-Russian narratives are shared - whether Russia contributes to it directly or indirectly.

3. To what degree has the disinformation network in Czech Facebook groups been cohesive and interconnected since the COVID-19 pandemic?

The analyzed network is highly coherent and interconnected. The Czech disinformation scene on Facebook is seemingly scattered into many smaller groups, but the actors are often active members of multiple disinformation sites. This assembly might work as a huge echo chamber, contributing to consolidating anti-systemic, anti-government, and pro-Russian narratives, among others. The revealed communities within the network had slightly different primary interests, but there is considerable overlap among all the analyzed groups.

How did disinformation spread on Czech disinformation Facebook groups since the COVID-19 pandemic?

The network analysis shows that disinformation spreads from two primary types of sources in the analyzed Facebook groups. First, a considerable group of politicians and public figures - primarily in the anti-government and anti-vaccination communities - are sources of the information flow within the analyzed network. Members of parties from the populist ANO 2011, Euro-skeptic Tricolour Citizens’ Movement, far-right Freedom and Direct Democracy, and the Communist Party are among the nodes with the highest outdegree in the network - i.e., the most important sources. Gregor & Mlejnková (2021) argue that the goal of disinformation is to lower trust in the government,
traditional media, and elites in general, which is apparent within the analyzed network. Primary information sources are politicians from the opposition or alternative media linked to them.

We also observed a “disinformation spillover” from Slovakia - primarily through a known pro-Putin politician, Tomáš Špaček. Next to political and other public figures, there are internet media traceable to pro-Russian trolls - such as Raptor-TV, owned by Zarko Jovanović (see Golis 2019), or Aby bylo jasno linked to Jana Bobošíková who is herself tied to political parties known to spread disinformation. It is worth mentioning that the Czech Security Information Service informed in September 2023 that they identified a “Russian influence agent” tasked to spread pro-Russian narratives in Czechia using public figures, among others (Czech Security Information Service 2023). The person is unknown, but attempts by the Russian government to influence public figures have been confirmed in the Czech Republic.

The second type of disinformation sources we identified consists of seemingly normal Facebook accounts combined with accounts created only after the COVID-19 pandemic began. We cannot state with certainty that the accounts in our dataset are, in fact, Russian trolls. However, McCombie et al. (2020) argued that The Russian Internet Research Agency’s troll campaign “sought to disrupt the social and political processes rather than galvanize an alternative, convenient political movement.” This would be consistent with what we observed in our dataset, as several accounts have high betweenness centrality, with several created only during the COVID-19 pandemic and dealing exclusively with sharing and interacting with disinformation. Nevertheless, disinformation can also spread naturally - similar to viruses Filipec (2019). Primarily in several accounts within the community around Češi, těhněme za jeden provaz, we observed high values of betweenness centrality, but also weighted degree and outdegree. A closer look revealed that the users are likely ordinary citizens, which might be an indicator of working participatory propaganda, where the initial targets become new sources of disinformation. Törnberg (2018) also points out that disinformation can become viral thanks to the echo-chamber effect, which is likely the case of the community around Češi, těhněme za jeden provaz.

Disinformation is comparatively less successful in the Czech Republic when compared to its closest neighbour – Slovakia, potentially due to the “more lenient” approach of the latter towards Russia (Rechtik and Mareš 2021). Of the countries of Central Europe, Poland and Hungary are considerably less focused on dealing with and discussing disinformation in public discourse (Syrovátka 2021). However, our analysis demonstrates that there is a thriving disinformation network on Facebook in the Czech Republic. Furthermore, it is not unilaterally and solely driven by politicians and media. Instead, we observed that actors with the highest betweenness centralities – pointing towards their high engagement (Nobre et al. 2022) – are seemingly regular citizens.

The role of individuals in spreading disinformation, no matter the true reason for their engagement, is often overshadowed by the focus on public figures and media. Nonetheless, in the era of social media, individuals can reach large audiences and get disinformation shared further. Buchanan and Vladlena (2019) concluded that a level of trust in the source plays a significant role in disinformation and fake news propagation. We argue that focusing on external sources of disinformation, public figures, alternative media, and large bot farms overshadows the role of regular individuals in disinformation networks. While they might not be the initial sources of disinformation, they can facilitate its spread
and increase its trustworthiness, ultimately leading to higher “organic reach” (see Buchanan and Vladlena 2019).

**Conclusion**

While we managed to answer the research questions, there are still knowledge gaps, specifically in the Czech context. Furthermore, looking at disinformation only through the prism of hybrid warfare – an external threat – is an often-made mistake not only in Czechia. Filipec (2019) brings the likening of disinformation to viruses in the debate, which can be helpful in tackling the “hybridization” of threats to national security. Ultimately, however, disinformation might be a concept much closer to warfare in general, with interstate conflicts as well as civil wars and guerilla warfare. Even without Russian influence, anti-government, anti-Western, and even Far-right parties can take advantage of using disinformation for their own political gains, resulting in the erosion of democracy. Despite the relative success of tackling disinformation in the Czech Republic (see Rechtik and Mareš 2021; Syrovátka 2021), much work must be done to increase Czech society’s resilience. The results of our analysis also suggest that future research should continue beyond focusing on publicly known figures and foreign adversaries. While the role of politicians and the hybrid warfare of Russia and China must not be underestimated, individuals’ belief in disinformation might be facilitated by increased trust in people close to them (Buchanan 2020).
References


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