Content analysis methods for estimating the dynamics of facebook groups

Rasa Kasperienė
Faculty of humanities
Vytautas Magnus univercity
Kaunas, Lithuania
rasa.kasperiene@gmail.com

Tomas Krilavičius
Faculty of informatics
Vytautas Magnus univercity
Kaunas, Lithuania
tomas.krilavičius@vdu.lt

Abstract— **The relationship between the content that is generated by the users of social networks and their dynamics has been analyzed by many scholars. However, due to favorable data policies, the majority studies have been carried out by analyzing Twitter data. In addition, such research on Facebook (FB) groups (esp. political) is usually qualitative. The present study analyses the dynamics as well as topic dynamics of radical right political groups on FB by employing a quantitative research methodology. The current paper draws on a large data set that is comprised of posts from FB groups. Overall, there are 79 728 posts which are made up of more than 2 million words and were generated within the timespan ranging from 2010 to 2018. The experimental set up compares the general dynamics and the dynamics of activity on four topics in two radical right FB groups (i.e., pro-Russian and other radical right) in Lithuania. The results show that the year 2014 was important for the radical right FB groups in Lithuania. Newly created pro-Russian FB groups started growing rapidly, whereas the posting activity in other radical right FB groups started to decrease. The topic word Lithuania is relevant for the whole activity time when it comes to all the radical right FB groups. Such topic words as Russia and land correlate with national and international political crisis.**

Keywords—Facebook groups, radical right, groups dynamics, timestamp.

I. INTRODUCTION

In recent years, the European Union has been witnessing the growth of radical political communities throughout Europe, including Lithuania. Many European countries are witnessing elections in which people vote for far-right and nationalist parties, even though they are at the opposite ends of a wide political spectrum. The migrant crisis accelerated a backlash against the recent political balance, but the wave of discontent also taps into long-standing fears about globalization and dilution of national identity. The increase in the percentage of radical wing voters substantially surpasses the percentage of immigration inflow [1].

The political radicals are more avid and enthusiastic to adopt new technology and have thus found the virtual space to be a uniquely useful place [2]. Through membership in groups, one can define and confirm his/her values and beliefs through incoming information or discussion. When members of such groups face uncertain situations, they can gain reassuring information about their problems and find security in companionship [3]. It is also important to highlight the fact that social media provides fertile ground for the dissemination of propaganda and disinformation as well as the manipulation of people's perceptions and beliefs [4].

Social networks can become a tool for manipulating the masses and fighting wars with little to no cost.

The present paper proposes a framework for carrying out research on posts from Facebook (further FB) groups as a means to reveal information dissemination and group behavior patterns in communication by information transmission dynamics in groups. In particular, the aim of this study is to analyze the establishment of radical right FB groups in relation to the political events of the time as well as the dynamics of the most prominent themes by using the data retrieved from FB groups and R toolset. This article investigates the launch of Lithuanian radical right FB groups in a wider political context. It is important to understand the dynamics and the reasons behind the activity of such groups. Another important issue is to pinpoint when the topics discussed in the aforementioned FB groups become relevant and no longer relevant. Finding the answers to these questions can provide a deeper insight into the social processes of radical right groups on FB.

Such social networks as FB and Twitter have become the most popular social networks in the world. In 2017, Twitter had more than 330 million active users, whereas FB had more than 2.13 billion monthly active users with a 14 per cent increase every year [5]. This giant flow of information has already shown to be useful for event detection [6], identifying public health issues [7], behavioral information propagation [1], community discovery [8], sentiment analysis [9], identification of communication roles [9], and recently as a means to aid political uprising [10] as well as a medium that can help to pinpoint and analyze the act of triggering an (upcoming) uprising [11].

II. DATA SET

FB groups are the place for small group communication and for people to share their common interests and express their opinion. Such groups allow people to come together around a common cause, issue or activity in order to mobilize, express their objectives, discuss issues, post photos and share related content [12]. All FB groups have a title and a group description that indicate the common cause of group activity. FB groups can be public or closed. In the first scenario, every FB user can access group content. In the latter, content can be accessed only with a permission given by the group administrator. To comply with the ethical aspects of doing research, the present study only reports on data that has been retrieved from public FB groups.

The data were downloaded by using the FB graph API [13]. The Graph API is created to get data into and out of the FB platform. This FB platform uses low-level HTTP-based API access that can only be obtained by a user who is

registered as a FB developer. For API requests, it is necessary to have the access token (app id) together with its app password and the access token.

FB API requests return the following group data [13]: post author id (from_id) as numeric string, post author name (from_name) as string, post text (message) as string, post creation date (created_time) as string, post type (type) as string, link in the post (link) as string, post id (id) as numeric string, daily entry (story) as bool, likes count (likes_count) as number, comment counts (comments) as number, shares count (shares_count) as number.

To analyze the posts of FB groups as a means of information dissemination together with the patterns of group behavior in terms of communication by information transmission dynamics in groups, the following subset of data was used:

post text (message) as string, post creation date (created_time) as string, post id (id) as numeric string.

To handle the large dataset more efficiently, fingerprint of each FB group was created, and it contains the names and ids as well as the names of the dataset that come from the FB groups in focus.

The radical right groups on social network FB were identified through the Facebook search engine. The supporters of radical right diverge from other individuals though manifestation of nationalism, strong nation [14] and xenophobic ideology [15]. Nationalistic ideology relates to ethnocentrism and Euroscepticism. Xenophobic ideology relates to anti-immigration policy, hostility to ethnical minorities, and intolerance to sexual minorities. To identify radical FB groups by using the FB search engine, their most prominent characteristics were taken into consideration, and based on that, the following keyword list was compiled: *Lithuania, Lithuanians, land sale, European Union, NATO, refugees, refugee crisis, Muslims, Jewish restitution, Jew, Russian, Roma tabor, gay pride, gay mountaineering*. More than 20 most recent posts in each group that match the keywords were analyzed. After the analysis that aimed to pinpoint the FB groups which openly exhibit radical ideology, only 10 groups that proved to endorse radical ideology were chosen for a more in-depth analysis. The FB group selection criteria were the following: the presence of radical left ideological features on group titles, description and latest posts, the size of the group (more than 100 members), activity – the most recent post published at least 2 days prior to the analysis.

The data retrieved from FB groups were divided into two datasets, pro-Russian and other radical right groups. The analysis reveals that some radical right groups in addition to the nationalistic ideology manifest pro-Russian and pro-socialism ideology. Even though in some cases the titles and descriptions of the group's manifest nationalism and the idea of strong Lithuania, there was also support for Russian politics or a sense of nostalgia for the Soviet Union.

Each data set is comprised of five FB groups. As was previously indicated, to be able to handle such large amounts of data, the datasets were supplemented with additional records, i.e., the group and cluster ids. The dataset of pro-Russian FB groups consists of more than 70 150 posts. The second dataset, i.e. that of the other radical right groups, is comprised of 9 578 posts. The former dataset of groups has 13 940 members, whereas the latter has 6 126.

TABLE I.

Short data info	
Posts published period	4th of March 2010 – 1st of January 2018
Number of posts	79728
Download date	12th of February 2018
Max length of word	15 symbols
Min length of word	1 symbol

Lithuanian is a highly inflectional language, i.e. there are two grammatical genders for nouns and there are three genders for adjectives, numerals, participles, and pronouns. Every word must follow the gender and the number of the noun. All these features produce a substantial number of inflective forms of lemma. To avoid any loss of data, the lemmatization of the texts in FB posts was not used.

III. METHODS

To analyze the dynamics of the topics discussed in groups, the most frequent words were employed as features [16]–[18]. In addition, social networks post timestamp modelling was applied to analyze the behavior of online users [19], [20]. This paper proposes to study the posts from FB groups as a means of information dissemination and group behavior patterns in communication by information transmission dynamics in groups. The proposed approach is based on the following observation: the amount of information passed from one period to another in the social network may be quantified in different ways. For example, in the dataset of FB groups, the amount of information can be quantified by the time that passed from one post's appearance to other. The quantity of published group posts in a social network by looking at the time frame can show group behavior.

To grasp the information transmission when it comes to the group dynamics, the datasets of FB groups were expanded by adding *fingerprints* entries. Let a pro-Russian FB groups dataset be denoted by D_1 and another radical right group dataset be denoted by D_2. W represents time window (W = 6 months). Denote each Facebook post as e_{ij}, where $i = 1$ represents that a post belongs to D_1 and $i=2$ represents that post belongs to D_2; $j = 1; n_i$ where n_i is the number of posts in group D_i. Each post e_{ij} consists of p_{ij}, t_{ij}, g_{ij}. Each post p_{ij}, consists of a set of words $p_{ij} = (w_{ij1}, w_{ij2} \ldots w_{ijk})$, where k is the number of words in p_{ij}.
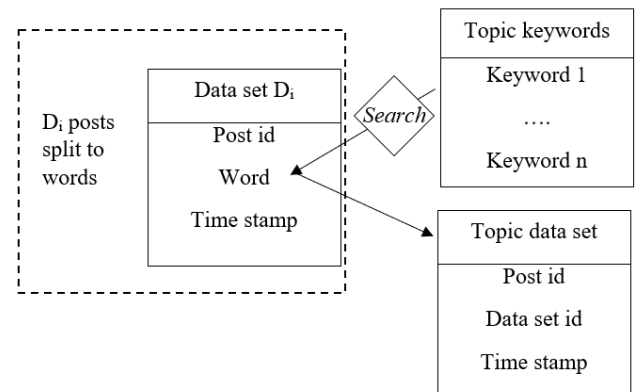

Fig. 1. Datasets of Facebook groups with expanded *fingerprints* entries

To compare the dynamics of the users in the two datasets, the transformed dates were stored from string to

POSIXct objects. To transform the dates, *Lubridate* [21] package for R was used. In order to visualize the distribution of groups' activities through time, *ggplot2* [22]] package for R was used. It helps to visualize the distribution of a single continuous variable by dividing the x-axis into bins and counting the number of observations in each bin. To make the text of the post tidy and the datasets lighter, *Tidytext* [23] and *Stringr* [24] packages for R were employed. By using these packages, English and Lithuanian stop words were removed. To estimate the dynamics of the topics in the collected posts, each entry (in form of sentences) was split into words. Once again, to keep track of data, every split word was supplemented with a post and dataset id, group name, and timestamp entries.

IV. EXPERIMENT

The preliminary analysis identified two types of radical right ideology in FB groups under investigation. The visualization in "Fig. 2" compares the dynamics of pro-Russian and other radical right groups' activity. It includes the posts (message) of both groups' members and post creation time (created_time). It also shows the peak activity periods that can be noticed in the datasets (within a time window of six months).
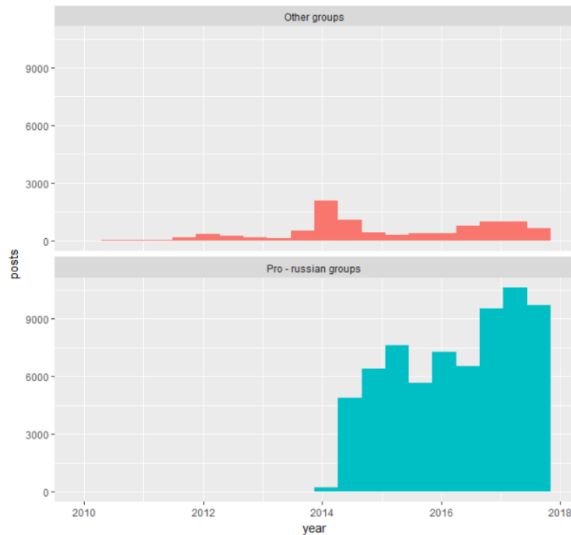

Fig. 2. The dynamics of radical right groups' activity on Facebook

The experiment shows that the activity of radical right FB groups starts in 2010, whereas pro-Russian groups emerge on FB four years later, in 2014. The pro-Russian groups that were created on the same year reached three times greater activity compared to other radical right groups on FB. From 2014 to 2017, the activity of pro-Russian groups has been increasingly growing. The activity has reached the maximum peak in 2017 with 23 413 posts per year "table 2". Until 2014, the radical right groups were witnessing the growth of posting activity every year, too. The year 2014 was important for the radical right FB groups as new ideology-following radical right groups started appearing and rapidly growing. After the appearance of pro-Russian groups on FB, the data spread in other radical right groups started decreasing, but the activity of pro-Russian groups on FB increased each year. This is evident because in 2015, the activity of pro-Russian groups on FB was 61 per cent greater than in previous year. Finally, in 2017, the posting activity in

pro-Russian FB groups is 44 per cent greater than it was initially in 2014.

TABLE II.

The dynamics of radical right Facebook groups activity								
Radical right groups	Year							
	2010	2011	2012	2013	2014	2015	2016	2017
Pro-Russian	0	0	0	0	10447	17033	19257	23413
Other	58	311	604	1164	2997	791	1914	1739
Total	58	311	604	1164	13444	17824	21171	25152

During the course of the Ukrainian crisis, the role of actual military interventions has remained low in comparison to different tools of asymmetric warfare (e.g., information warfare, economic measures, cyber war, and psychological war on all levels), often referred to as hybrid warfare [25]. This cyber war passed national or post-Soviet Union borders more widely and the spread of *fake news* reached the western world. The conflict in the Ukraine re-awakened Russian propaganda. For example, Twitter analyst Lawrence Alexander has identified an increase in bot registration coinciding with the start of the Euromaidan protests on 2013/2014 year in Ukraine and subsequent armed uprisings by pro-Russian militants in Eastern Ukraine in early spring of 2014 [26]. Lawrence's investigation corelates with rise of pro-Russian Facebook groups in 2014. Prior to 2014, on FB there were only radical right groups with low activity, but after 2014, the situation has changed. The activity of the newly created pro-Russian groups started rapidly growing. According to *NATO Strategic Communications Centre of Excellence*, some techniques, such as Russian propaganda techniques in particular, are used for achieving psychological influence and manipulation on social media [27]. One of such techniques is the mass-generated content which is used in order to spread manipulative messages and minimize alternative voices.

To analyze the dynamics of the most relevant topics in the groups, four keywords were chosen, namely, *Lithuania*, *Russia*, *land*, and *sky*. The words *Lithuania*, *land and Russia* were chosen for this experiment based on the previously defined most prominent characteristics of radical right groups. The word *Russia* also was chosen in order to assess and compare the dynamics of topics discussed by pro-Russian and other radical right in relation to the country. The neutral word *sky* was chosen to reveal whether there is any space for neutral topics in the datasets of radical right groups.

TABLE III.

The dynamics of the word *Lithuania* in the posts of radical right groups on Facebook								
Radical right groups	Year							
	2010	2011	2012	2013	2014	2015	2016	2017
Pro-Russian	0	0	0	0	2195	5173	4410	5302
Other	51	74	446	657	1890	520	740	857
Total	51	74	446	657	4085	5693	5150	6159

The topic word *Lithuania* is relevant for all the radical right groups "Fig. 3". This word in the posts of FB groups appears more than 22 300 times throughout the whole period of groups' activity "table 3". In 2014, the topics that mentioned the word *Lithuania* were mostly discussed by newly created pro-Russian groups rather than by other radical right groups. In 2017, both types of radical right FB groups mentioned *Lithuania* in the content of their posts the most frequently if compared to the previous years. *Lithuania* appears 5 302 times in pro-Russian groups and 857 times in radical right groups.
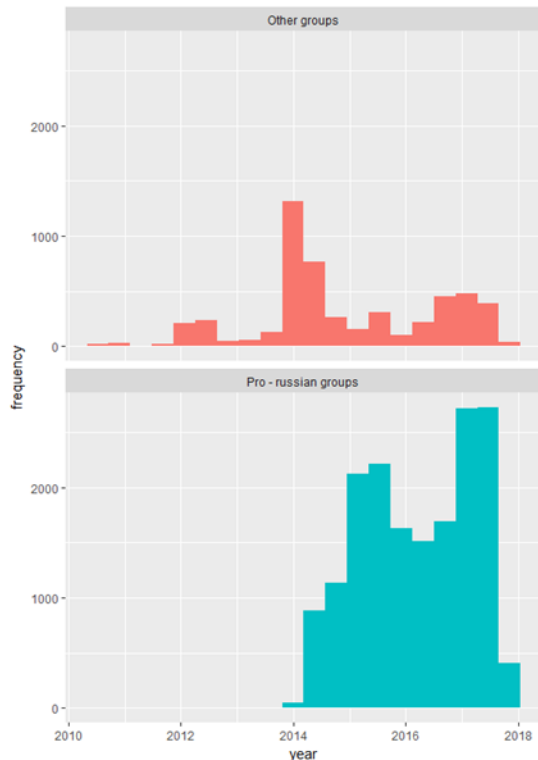

Fig. 3 The dynamics of the word *Lithuania* in the posts of the radical right groups on Facebook.

As was previously mentioned, the increased instances of mentioning *Lithuania* were the most prominent in pro-Russian groups. *NATO Strategic Communication Centre of Excellence* claims that in the period ranging from 1 November 2017 to 31 January 2018, the proportion of bot activity in Twitter was relatively high, with 62 per cent of all tweets mentioning NATO and Lithuania [31]. In other radical right FB groups, Lithuania is mentioned less often as opposed to the pro-Russian groups. The data in the NATO report correlate with the experimental results. The Russian hybrid troll or bot activity campaign has reached the users of social networks in Lithuania, and the experiment shows that this campaign is still being successfully implemented. According to NATO Hybrid trolls (as we have labelled hired, pro-Russian trolls), communicate a particular ideology and, most importantly, operate under the direction and orders of a particular state or state institution. In the context of the Ukraine crisis, the aim of hybrid trolls has been to promote the Kremlin's interests and portray Russia as a positive force against the 'rotten West' and the US hegemony[28].

Russia-related topics seem to be more important to pro-Russian groups than other radical right FB groups (Fig. 4). The word analysis of the FB groups' posts that were split to

words shows that from the beginning to the end of 2018, the words *Russia* appeared 16 times more than in other radical right groups. The word count indicates that the word appeared 2 864 times in pro-Russian and 178 times in other radical right groups "table 4".
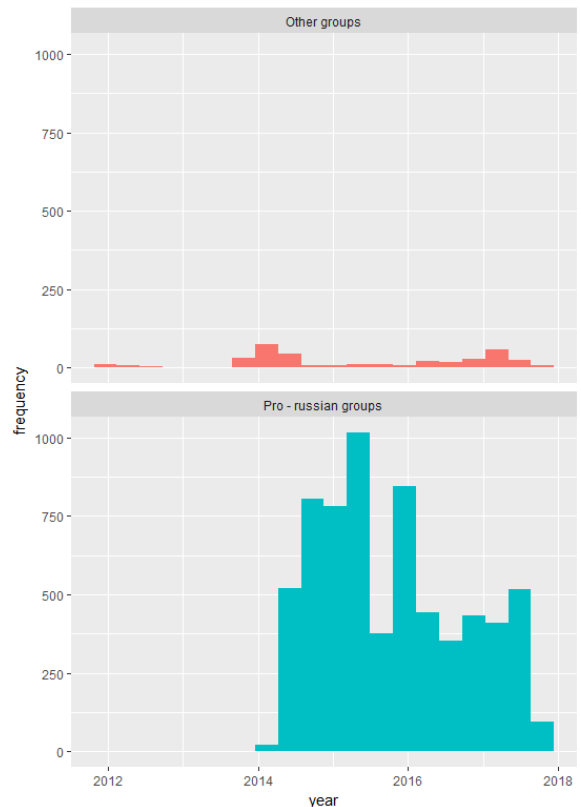

Fig. 4 The dynamics of the word *Russia* in the posts of the radical right groups on Facebook.

The word *Russia* in the topics of pro-Russian groups was most frequently used in 2014 and 2015. This data correlate with Russia's policy and international political crises of 2013 and 2015 – after Russian military intervention to Ukraine, various sanctions were imposed on Russia by the United States, the European Union (EU) and other countries as well as international organizations. In 2015, Russia intervened to Syrian civil war (30 September 2015 – February 2016) and this event correlates with the dynamics of the topics on Russia in pro-Russian FB groups Russian. The members of other radical right groups show no attention to this international crisis, the Russian topic in their FB posts is irrelevant.

TABLE IV.

The dynamics of the word *Russia* in the posts of radical right groups on Facebook								
Radical right groups	Year							
	2010	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Pro-Russian	0	0	0	0	768	1032	659	405
Other	0	3	6	18	57	16	31	47
Total	0	3	6	18	825	1048	690	452

Creating 'noise' or 'informational fog' around a topic is a strategy used to distract attention from more strategically important events. An important example of this has been the

case of the downing of Malaysian air flight MH17. Russian media channels and social media distributed a large volume of messages offering numerous explanations for why the plane crashed. Another bot campaign was launched to distract the public by offering an *alternative explanation* of the murder of the Russian politician Boris Nemtsov, claiming that he was killed by jealous Ukrainians. Such 'news' were published just a few hours after the attack [1]. The experiment shows that the word *Russia* in the pro-Russian groups became more actively used during the turmoil caused by Russia's policy. This could have affected the results of the trending topics in order to make 'noise' or 'informational fog' around any given topic.

The themes related to *land* are more relevant to the members of both groups. The word count estimations show that from 2010 to 2017, the word *land* appeared 110 times in pro-Russian groups and 141 times in other radical groups "table 5". The assessment of the thematic dynamics of the groups indicate that in 2014, the word *land* was more popular in the posts of other radical right groups than in what was posted by pro-Russian users (Fig. 5).

TABLE V.

The dynamics of the word *land* in the posts of radical right groups on Facebook								
Radical right groups	Year							
	2010	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Pro-Russian	0	0	0	0	46	15	32	17
Other	0	0	3	41	94	1	1	1
Total	0	0	3	41	140	16	33	18

The word correlates with the Lithuanian land-related political crisis related to the restrictions imposed on foreigners who want to purchase land for agricultural purposes in Lithuania. The referendum by the Republic of Lithuania held on 2014 July was related to the abovementioned restrictions. Prior to the referendum, there were many protests and a rally against land purchase restrictions. These events also ignited debates in the virtual space and affected the topics that were generated in the radical right FB groups.
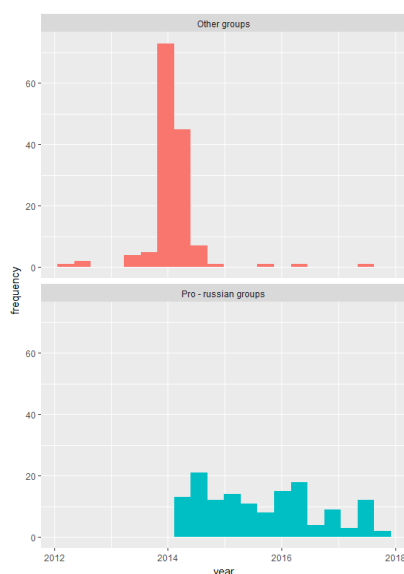

Fig. 5 The dynamics of the word *land* in the posts of the radical right groups on Facebook

In order to compare the content of the posts in radical right FB groups, a neutral keyword *sky* was chosen. The assessment of dynamics show that the word *sky* did not appear in the content produced by the radical right FB groups

TABLE VI.

The dynamics of the word *sky* in the posts of radical right groups on Facebook								
Radical right groups	Year							
	2010	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Pro-Russian	0	0	0	0	1	5	4	13
Other	0	0	0	0	0	0	0	1
Total	0	0	0	0	1	5	4	14

This indicates that the content generated by the members of the radical right groups is similar to the political background. As Veronika Solovian, the administrator of the popular Finnish-Russian website russia.fi, admits, the trolls are commenting on political topics. They are able to attract other participants into arguments, and other users do not necessarily immediately identify them as trolls [29]. The experiment reveals that political topics are indeed relevant for radical right-wing political groups on Facebook. The largest part of the generated political content could be generated by trolls or bots. Therefore, social media provides fertile ground for the dissemination of propaganda and disinformation. The latter indicates that social media can be an effective tool to manipulate people's mind and influence their decisions. Ease of Use

V. CONCLUSIONS AND FUTURE WORK

Facebook developer acc with API requests and R tools set (*Lubridate, Tidytext, ggplot2*) can help to analyze radical right FB groups establishment and themes dynamics. For social and political scientists, the most important result is that in Lithuania radical right groups on Facebook posts together with nationalism, strong nation and xenophobic ideology also appears topics related to the support for the Russian policy and former communist ideology. The analysis reveals that some radical right groups in addition to the nationalistic ideology manifest pro-Russian and pro-socialism ideology.

Radical right groups on Facebook started to appear in 2010, but the year 2014 was important for the radical right FB groups as new ideology-following radical right groups appeared and was rapidly growing each year. Experiment data correlates with the awakening of Russian propaganda on social media.

The topic word *Lithuania* is relevant for all the radical right groups. This word in the posts of FB groups appears more than 22 300 times throughout the whole period of groups' activity. The increased instances of mentioning *Lithuania* were the most prominent in pro-Russian groups. Russia-related topics seem to be more important to pro-Russian groups than other radical right FB groups and land-related topics is more important to other radical right groups. These topics activity correlates with national or international political crisis: the land-related topics activity reaches its maximum before referendum related to the restrictions imposed on foreigners who want to purchase land for agricultural purposes in Lithuania, the word *Russia* in the topics of pro-Russian groups was most frequently used in 2014 and 2015 while after Russian military intervention to

Ukraine, various sanctions were imposed on Russia by the United States, the European Union (EU) and other countries as well as international organizations. The assessment of dynamics show that the word *sky* did not appear in the content produced by the radical right FB groups. This indicates that the content generated by the members of the radical right groups is similar to the political background.

Future plans are to make different kind of radical right groups generated content most frequency words estimations and analyze it dynamics. Future work is also to analyze dynamics of FB groups incoming information and the posting dynamics of most active groups' members.

VI. References

[1] B. Podobnik, M. Jusup, D. Kovac, and H. E. Stanley, "Predicting the Rise of EU Right-Wing Populism in Response to Unbalanced Immigration," *Complexity*, vol. 2017, pp. 1–12, Aug. 2017.

[2] J. Bartlett, "From hope to hate: how the early internet fed the far right | World news | The Guardian," 2017. [Online]. Available: https://www.theguardian.com/world/2017/aug/31/far-right-alt-right-white-supremacists-rise-online. [Accessed: 03-Mar-2019].

[3] D. R. Forsyth and D. R. Forsyth, *Group dynamics*, 2nd ed. Pacific Grove Calif.: Brooks/Cole Pub. Co, 1990.

[4] NATO strategic communications centre of excellence, "Robotrolling 2018/1 | StratCom," *2018*. [Online]. Available: https://www.stratcomcoe.org/robotrolling-20181. [Accessed: 03-Mar-2019].

[5] "Top 20 Facebook Statistics - Updated March 2019." [Online]. Available: https://zephoria.com/top-15-valuable-facebook-statistics/. [Accessed: 03-Mar-2019].

[6] J. Weng, Y. Yao, E. Leonardi, and F. Lee, "Event Detection in Twitter," 2011.

[7] M. J. Paul and M. Dredze, "You Are What You Tweet: Analyzing Twitter for Public Health."

[8] A. Java, X. Song, T. Finin, and B. Tseng, "Why We Twitter: Understanding Microblogging Usage and Communities," 2007.

[9] A. Ortigosa, J. M. Martín, and R. M. Carro, "Sentiment analysis in Facebook and its application to e-learning," *Comput. Human Behav.*, 2014.

[10] J. Park, W. L.-P. of the fifth international A. conference, and undefined 2011, "Revolution 2.0 in Tunisia and Egypt: Reactions and sentiments in the online world," *icwsm.org*.

[11] K. Alaimo, "How the Facebook Arabic Page 'We Are All Khaled Said' Helped Promote the Egyptian Revolution," *Soc. Media + Soc.*, vol. 1, no. 2, p. 205630511560485, Sep. 2015.

[12] Matt Hicks, "(18) Facebook Tips: What's the Difference between a Facebook Page and Group? | Facebook," 2010. [Online]. Available: https://www.facebook.com/notes/facebook/facebook-tips-whats-the-difference-between-a-facebook-page-and-group/324706977130/. [Accessed: 03-Mar-2019].

[13] "Graph API." [Online]. Available: https://developers.facebook.com/docs/graph-api. [Accessed: 03-Mar-2019].

[14] K. Arzheimer, "Electoral Sociology: Who Votes for the Extreme Right and why-and when?"

[15] C. Mudde, *The ideology of the extreme right*. 2018.

[16] J. B.-L. and L. Computing and undefined 1992, "Not unles you ask nicely: The interpretative nexus between analysis and information," *academic.oup.com*.

[17] D. H.-L. and L. Computing and U. 2004, "Delta prime?," *academic.oup.com*.

[18] M. Eder, J. R.-L. and L. Computing, and undefined 2012, "Do birds of a feather really flock together, or how to choose training samples for authorship attribution," *academic.oup.com*.

[19] R. Perera, … S. A.-2010-M. 2010, and undefined 2010, "Twitter analytics: Architecture, tools and analysis," *ieeexplore.ieee.org*.

[20] Q. Zhao, Y. Tian, Q. He, N. Oliver, … R. J.-P. of the 19th, and undefined 2010, "Communication motifs: a tool to characterize social communications," *dl.acm.org*.

[21] G. Grolemund, H. W.-J. of S. Software, and undefined 2011, "Dates and times made easy with lubridate," *academia.edu*.

[22] L. Wilkinson, "ggplot2: Elegant Graphics for Data Analysis by WICKHAM, H.," *Biometrics*, vol. 67, no. 2, pp. 678–679, Jun. 2011.

[23] J. Silge, D. R.-T. J. of O. S. Software, and undefined 2016, "tidytext: Text mining and analysis using tidy data principles in r," *theoj.org*.

[24] H. Wickham, "Simple, Consistent Wrappers for Common String Operations [R package stringr version 1.4.0]."

[25] V. Sazonov, H. Molder, and Muur Kristiina, "COMBINED ANALYSIS PREPARED BY THE NATO STRATEGIC COMMUNICATIONS CENTRE OF EXCELLENCE RUSSIAN INFORMATION CAMPAIGN AGAINST THE UKRAINIAN STATE AND DEFENCE FORCES," 2015.

[26] A. Lawrence, "Social Network Analysis Reveals Full Scale of Kremlin's Twitter Bot Campaign · Global Voices," 2015. [Online]. Available: https://globalvoices.org/2015/04/02/analyzing-kremlin-twitter-bots/. [Accessed: 03-Mar-2019].

[27] Svetoka Sanda, "Social Media as a Tool of Hybrid Warfare | StratCom," 2016. [Online]. Available: https://www.stratcomcoe.org/social-media-tool-hybrid-warfare. [Accessed: 03-Mar-2019].

[28] NATO, "Internet Trolling as a hybrid warfare tool: the case of Latvia | StratCom," 2016. [Online]. Available: https://www.stratcomcoe.org/internet-trolling-hybrid-warfare-tool-case-latvia-0. [Accessed: 03-Mar-2019].

[29] J. Aro and Y. Kioski, "This is How Pro-Russia Trolls Manipulate Finns Online – Check the List of Forums Favored by Propagandists," 2015. [Online]. Available: https://www.stopfake.org/en/this-is-how-pro-russia-trolls-manipulate-finns-online-check-the-list-of-forums-favored-by-propagandists/. [Accessed: 03-Mar-2019].

[30] Wozniak, M., Polap, D., Borowik, G., & Napoli, C. (2015, July). A first attempt to cloud-based user verification in distributed system. In 2015 Asia-Pacific Conference on Computer Aided System Engineering (pp. 226-231). IEEE.