

# Online Activity Traces Around a “Boston Bomber”

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**Abstract**—This paper describes traces of user activity around a alleged online social network profile of a Boston Marathon bombing suspect, after the tragedy occurred. The analyzed data, collected with the help of an automatic social media monitoring software, includes the perpetrator’s page saved at the time the bombing suspects’ names were made public, and the subsequently appearing comments left on that page by other users. The analyses suggest that a timely protection of online media records of a criminal could help prevent a large-scale public spread of communication exchange pertaining to the suspects/criminals’ ideas, messages, and connections.

**Keywords**—Boston Marathon; web crawling; terrorist networks; social media analysis

## I. INTRODUCTION

Nowadays, many people, especially young people, actively communicate online using social network resources of the Internet. Social media offers applications that build on the ideological and technological foundations of Web 2.0 and that allow the creation and exchange of user-generated content [1]. People share (upload to social media) various details of their personal lives. Using such data, social media monitoring can help assess and compare personalities of users, and anticipate planned activities, which is valuable since potential perpetrator’s criminals’ profiles are also present in such media. Semenov et al. [2] report that seven out of eleven major school shooters [3] in the recent past had active social media profiles, where they openly gave signals about their plans, and also suggest that some of them could have been prevented: consider the fact that Anders Behring Breivik who shot and killed 69 people in Norway, July 2011, uploaded his 1500 page manifesto to the Internet and put a similarly disturbing video to the popular social media site YouTube shortly before the massacre. Since then, the topic of analyzing weak online signals for detection of lone wolf terrorists has been brought to the public’s attention [4], and designing system architectures for automatic social media monitoring has become an important research direction [5].

Boston Marathon bombings took place on April 15, 2013, at 2:49PM EST, with three people killed, and 26449 injured. The crime suspects were soon announced: brothers Tamerlan and Dzhokhar Tsarnaev who had half Chechen and half Avar origin. Tamerlan was born in Kalmyk Autonomous Soviet Socialist Republic (USSR, Russia), and Dzhokhar was born in

Kyrgyzstan; they moved to the U.S. about ten years ago [6]. Shortly after their photographs were published by the police on April 18, and their names announced, the brothers were found to have been active in social media. Tamerlan Tsarnaev (the older brother) had a profile on YouTube, while Dzhokhar Tsarnaev had accounts on Twitter [7], as well as on the popular Russian social media site vk.com (former vkontakte.ru). The latter claims to have over 210M users [8].

The profile for Dzhokhar Tsarnaev at vk.com was saved on April 19, 2013, at 5:59AM EST, and has been monitored until May 14, 2013 by the authors. This paper reports on the analyses of this page as the social connection structure around it evolved during that period through May 14, 2013.

## II. QUALITATIVE AND QUANTITATIVE ANALYSES

The matching profile page allegedly belonging to Dzhokhar Tsarnaev on vk.com was found under name “Djohar Tsarnaev”, with “Cambridge Ringe & Latin School” mentioned in the profile as the user’s high school and “Boston” as the city of residence. The profile originally had 11 friends listed, and had 7 posts on the “wall”, where the first one was sent on February 22, 2012 and the latest sent on March 19, 2013. The profile and posts were all in Russian.

Vk.com displays the date and time of the most recent login of any user. In Dzhokhar Tsarnaev’s case, the last login was recorded as “today at 4:04”, or 4:04AM on 04.19.2013 GMT+2, or 8:04PM EST on April 18, 2013. Thus, the user last accessed the webpage after the bombing was carried out. The page displayed the user’s links to groups of some other Chechen users. Three videos were uploaded to the profile, two of which discussed Islam teachings. On May 14, these videos had between ca. 9000 and ca. 7000 views.

In 30 minutes, one of the 11 user’s online friends removed the user from their friend list; the friend count soon dropped to four. Since May 11, 2013, this count remained the same until May 14. At the time Tsarnaev’s page was first saved by the authors, only six comments were posted under the profile picture; however, by May 11, this number had grown to ca. 33000 (this observation is representative of other picture and posting comments on the page). The latest comment before the bombing was posted on March 25, 2012 at 11:40:11 PM EST; then next comment was posted on Friday, April 19, 2013 at 05:55:22 AM EST. Before the bombing, comments were quite

casual, e.g., expressing the liking for the picture in the profile. After the bombing, comments opened with critical/offensive messages for the perpetrator and various political/racial hate outbursts, and later grew into more of a general chat where terrorism and war related issues were primarily discussed. The majority of the posted comments was in Russian language; out of the first 100 comments after the bombing, 10 were written in English. Data from vk.com was collected using API interface of vk.com, which allows for collecting the comments under entities on the “wall”, and pictures and videos on a user’s page. Data on the users’ friends were collected using the same API. The API returns information in JSON format; the reported tasks were completed in compliance with the API usage regulations.

#### A. Time series analysis

Figure 1 depicts the dynamics of the number of comments per hour under the profile picture of Dzhokhar Tsarnaev. Altogether, 33098 comments were posted under the picture, of which only two appeared before April 19, 2013. The maximal comment entry rate reached 383 per hour. This was registered on April 19, 2013, between 1PM and 2PM EST. Figure 2 depicts the dynamics of comment counts under the postings on Dzhokhar Tsarnaev’s profile wall. The hourly comment entry rate reached 1218 on April 19, 2013, between 2AM and 3AM EST. After that, the rate steadily decreased. Note that the first comments appeared around 1AM EST on April 19, 2013. In total, 57101 comments were observed. Interestingly, ca. 57000 comments were posted by just 4103 people, with the top five contributors leaving 1782, 1479, 1366, 1195, and 1125 comments, respectively. Upon closer inspection, it was concluded that the comments were actually left by humans (chatting), not by automatic software.

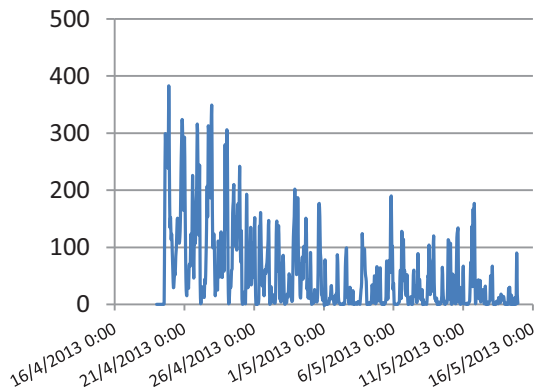


Fig. 1. The dynamics of picture comment counts on Tsarnaev’s page.

The distribution of the number of contributions by country on the logarithmic scale with base 10 is given in Figure 3. The largest number of comments has been posted by users having set Russia as their country; the second largest was posted by users with empty field “country”. The third largest was posted by users from the USA. Interestingly, users citing “Bolivia” as the native country in their profiles posted 187 comments; however, only three users contributed to this total. In average, ca 13 comments were posted by each user. The distribution of

the number of contributors by country on the logarithmic scale with base 10 is given in Figure 4.

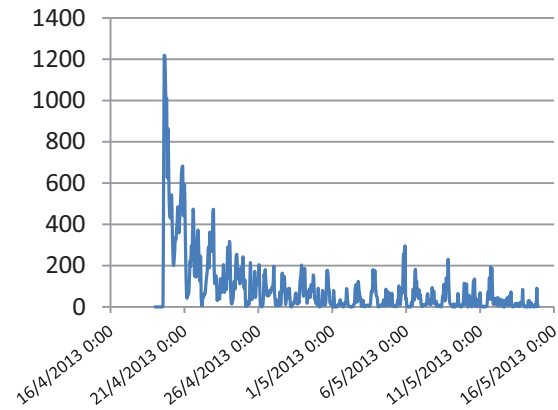


Fig. 2. The dynamics of “wall” comments counts on Tsarnaev’s page.

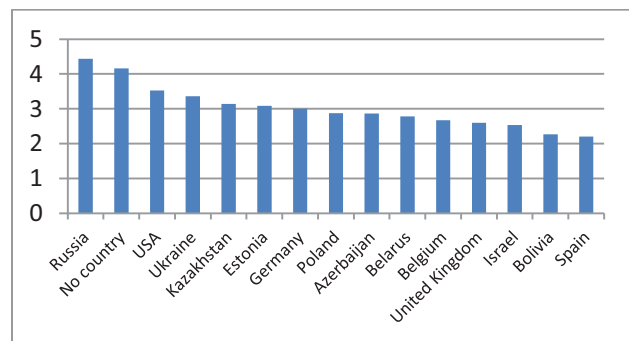


Fig. 3. The number of comments by country (ca. 57000 comments), on the logarithmic scale with base 10.

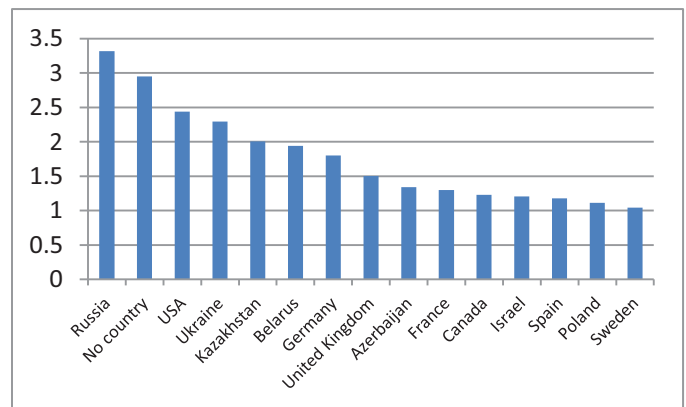


Fig. 4. The number of contributing users by country (4103 users), on the logarithmic scale with base 10.

#### B. Social network analysis

A social network around the alleged profile of Dzhokhar Tsarnaev was also collected and analyzed (with the friends, friends of friends, and friends of friends of friends of the ego). A total of 1208892 nodes were included in the network. The size of the second circle of friendship of the ego was 5909. On average, the first circle friends of the ego had 591 friends each. The other first circle friends of the profile had around 50-200

friends each, which is more typical for regular online users. In the second circle, there were 5821 nodes; the average clustering coefficient of this social network was equal to 0.508.

Among the first-circle friends of Tsarnaev, the one with the highest degree had ca. 4500 friends. The profile of this “hub” user contains many pictures and materials, related to Islam, such as Islamic news, citations from the Quran, and reposts from other Islamic pages. The average degree for the friends of this user is equal to 473.6; the maximal degree among these friends is equal to 9992. Moreover, 70 of them have a number of friends greater than 5000. The full degree distribution is given in Figure 5. The average clustering coefficient of this social network is found to be 0.5; the standard deviation is equal to 0,347. These metric values are unlike those typically observed in excerpts from an online social network, which indicates that these high degree user profiles might have been created with purposes beyond simple socializing.

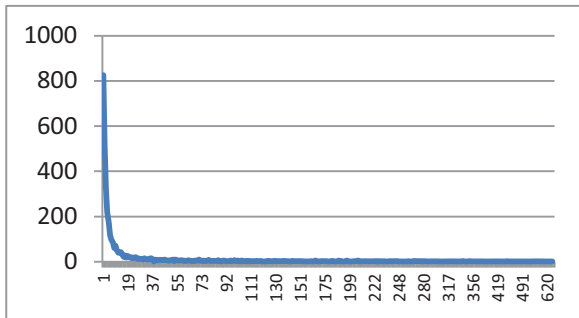


Fig. 5. The degree distribution in a social network around the “hub” user.

The distribution of the number of friends within the three circles of friendship from D. Tsarnaev by country on the logarithmic scale with base 10 is given in Figure 6.

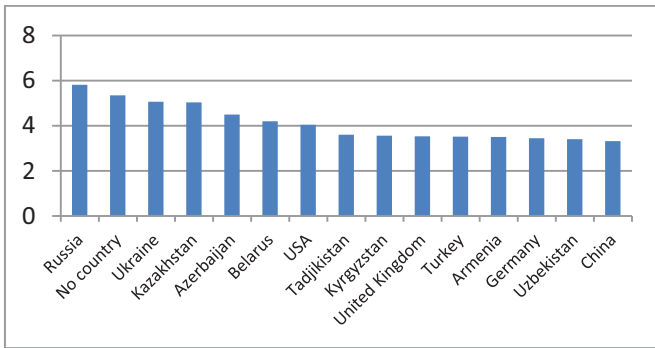


Fig. 6. The number of friends by country, on the logarithmic scale with base 10 (ca. 1,208,892 around profile “Djokhar”, within 3 circles of friendship).

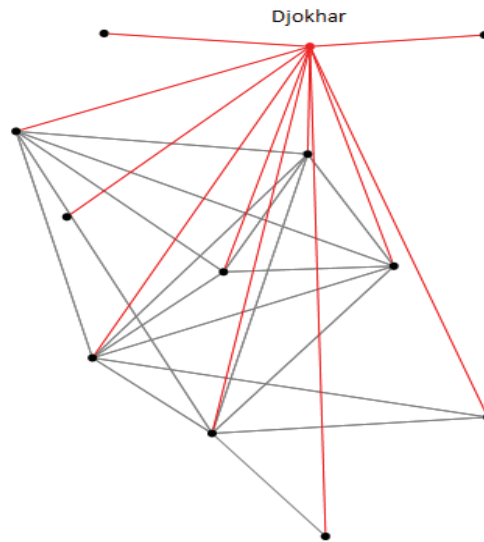


Fig. 7. Social network around D. Tsarnaev

Figure 7 depicts the social network around the perpetrator at the moment of the first collection of the data. The nodes in the graph are vk.com user profiles, while the edges are “friend” relationships, according to the site.

Figure 8 depicts the same network, with most of the first circle friends gone and only four left. Note that the last edge connecting the perpetrator’s profile to a community of 6 users is with the user who last accessed vk.com on April 14, i.e., before the bombing; thus, they did not have an opportunity to disconnect after the event. This user is the hub user mentioned and discussed above in this section.

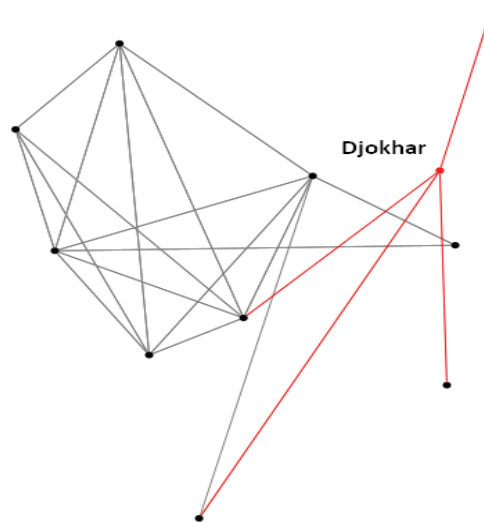


Fig. 8. The social network around D. Tsarnaev with removed “friend” edges on May 14, 2013.

Interestingly, one of the second circle friends of the ego was observed to use the same name as the perpetrator; that user has uploaded pictures and videos of the real D. Tsarnaev and proclaimed the real Tsarnaev to be innocent: see Figure 9. The

picture shows that the handle of the backpack with explosives was different from the one the perpetrator was carrying, and also, that Tsarnaev's backpack was white, instead of black.



Fig. 9. A picture found on Tsarnaev's friend-of-friend page.

### III. CONCLUSIONS

This paper focuses on analyzing the online behavior pertaining to a social network website profile allegedly belonging to Boston Marathon bombing suspect Dzhokhar Tsarnaev. Using the matching profile page on vk.com, this paper reports on the traces of activity of the users within three circles of friendship from this alleged Tsarnaev's profile as well as some metrics computed for the social network around the page.

It was discovered that neither the individual behind the profile nor his friends were particularly active; however, after the suspect name was announced in the public media, the first-circle friends promptly disconnected from the profile. At the same time, many people visited the profile page and posted comments. Also, some supporters of the perpetrator appeared in the network around the page. The number of observed comments indicates that a criminal's page can momentarily become popular at the time the news breaks.

The observations suggest a conclusion: if online media records of suspects/criminals are not removed from the Internet

in a timely fashion (e.g., by website administration), this may lead to a large-scale public spread of communication exchange pertaining to the suspects/criminals' ideas, messages, and connections. Additionally, the analysis of online social network surroundings of suspects/criminals' profiles may help uncover connection structures not typical for most socializing users, thus deserving more close studies.

As an additional direction for future research, one might be interested in quantifying the patterns of communication and other social media users' behavior at different points in time (e.g., before and after an event of interest). Longitudinal data collection and analysis methodologies appear to be fitting tools for such investigations.

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