

Using social media to measure foreign policy dynamics: An empirical analysis of the Iranian–Israeli confrontation (2012–13)

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Abstract

Does social media reflect meaningful political competition over foreign policy? If so, what relationships can it reveal, and what are the limitations of its usage as data for scholars? These questions are of interest to both scholars and policymakers alike, as social media, and the data derived from it, play an increasingly important role in politics. The current study uses social media data to examine how foreign policy discussions about Israel–Iran are structured across different languages (English, Farsi, and Arabic) – a particularly contentious foreign policy issue. We use follower relationships on Twitter to build a map of the different networks of foreign policy discussions around Iran and Israel, along with data from the Iranian and Arabic blogosphere. Using social network analysis, we show that some foreign policy networks (English and Farsi Twitter networks) accurately reflect policy positions and salient cleavages (online behavior maps onto offline behavior). Others (Hebrew Twitter network) do not. We also show that there are significant differences in salience across languages (Farsi and Arabic). Our analysis accomplishes two things. First, we show how scholars can use social media data and network analysis to make meaningful inferences about foreign policy issues. Second, and perhaps more importantly, we also outline pitfalls and incorrect inferences that may result if scholars are not careful in their application.

Keywords

foreign policy, networks, social media

Motivation

Increasingly social media is being recognized as an important arena for political competition and a source of political information (Kaplan & Haenlein, 2010; King, 2011). Scholars have started harnessing social media as an important source for political and conflict data (Van de Donk et al., 2004; Zeitzoff, 2011). Yet, important limitations on the analysis of social media remain (Aday et al., 2012), and the relevance of social media (and the Internet more broadly) in shaping public opinion and elite behavior remains underexplored theoretically and empirically. Too often, social media authors

(bloggers, Twitter accounts, Facebook pages, etc.) are discussed as though they represent a subset of the general public, when in fact weblog and social media networks contain many types of actors.¹ Furthermore, many

¹ There are millions of accounts under the control of organizations, firms, coordinated campaigns, covert initiatives, ‘bot’ armies, and political and professional elites doing their job (as opposed to citizens speaking their minds). See McMillan (2012).

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analyses treat the stream of messages as an undifferentiated ‘firehose’ of data, assumed to be universally visible and relevant, and not subject to selection bias (i.e. DiGrazia *et al.*, 2013). In fact, online messages move in structured networks, the shape of which determines the visibility and influence of any given voice or idea among diverse communities of interest and affiliation.

Our main research question is straightforward – can scholars of international relations and conflict use social media data to illuminate questions of foreign policy, and in particular do the structures on social media reflect offline behavior? This has important implications for two reasons. (1) Much of the previous literature on foreign policy agenda-setting has been limited to the US case (Mueller, 1973; Holsti, 1992; Gartner & Segura, 1998). Much less work has been done on mass opinion formation in contexts outside of the United States. Given the extant theoretical work (Keck & Sikkink, 1998; Thompson, 2006) that shows the importance of international public opinion and transnational networks for foreign policy decisionmaking, this is a large omission. (2) The Internet represents an important new medium for political communication (King, Pan & Roberts, 2013). Whether for gathering political information, fomenting collective action, or other forms of social engagement, the Internet is disrupting traditional communication structure (Howard, 2010; Howard *et al.*, 2011). Scholars have increasingly sought to use social media to construct conflict data (Zeitsoff, 2011), and possibly infer public opinion about ongoing crises (Elson *et al.*, 2012). There is also a growing body of research that has sought to make a causal argument of effect of social media on protests (Shirky, 2011), collective action (Seegerberg & Bennett, 2011), and conflict strategy (Zeitsoff, 2014). Yet such analyses are incomplete without a broader understanding of the underlying structure of social media communities, and differences across language and time. We attempt to fill this gap in the extant literature.

In the present article, we provide a template for exploring the dynamics of opinion networks by looking at the Israeli–Iranian confrontation over the Iranian nuclear program – an important foreign policy issue of contention. Using social media data gathered from Twitter and weblog sources in English, Farsi, Arabic, and Hebrew, we perform three complementary analyses that key off a timeline of issue engagement obtained from Google Trends. Using the Google data as a proxy for issue salience, we explore three key issues. (1) We map the Twitter networks active around the issue in English, comparing a network of ‘super-users’ who discuss the

issue at all periods of salience with those active only around individual periods. (2) We then compare this network in English language Twitter with the Hebrew and Farsi language Twitter network active around discussion of the Iran–Israel conflict and nuclear weapons. (3) Finally, we compare the Google Trends timeline of English language discussion about Iran and Israel with discussion of Iran, Israel, and nuclear weapons on Iranian (Farsi) and Arabic weblogs.

In this study, we use data from social media during periods of heightened media coverage on the Israeli–Iranian conflict over Iran’s nuclear program, to identify key communities of interest. Previous research on online social networks show that users tend to friend or follow other users who they either know or have some interest in (e.g. Aral, Muchnik & Sundararajan, 2009). However, online network formation should not be considered purely a disembodied process of individuated cyber actors pursuing their interests. These networks are also structured by ‘real world’ connections among influential offline actors, such as political leaders, journalists, policy specialists, advocacy organizations, partisans, etc. (Boshmaf *et al.*, 2011). To empirically explore this question, we show the difference in both profile and network configuration across languages, level of engagement (casual interest versus frequent users), and across platforms (Twitter and weblogs).

Three key findings emerge from our study. (1) Networks of consistently engaged actors (on Twitter) reflect meaningful policy differences – particularly for the English language networks. (2) Yet, we show that there are important limitations on making inference from social media data. Users who are active only during key events do not form a coherent network. Furthermore, important cultural and structural differences remain across the different language networks, preventing the direct comparison of meaningful policy differences across language networks. (3) Finally, the difference in salience and attention across the Arabic and Iranian blogosphere further suggest that local factors may explain more of the variation in foreign policy attention, rather than global trends.

Our findings and methodology also provide a template for future social science researchers to use social media and other ‘big data’ sources in their research (King, 2011). We are optimistic about the importance and ability for social scientists to use new data sources that provide a rich and complex picture of foreign policy and contentious politics. Yet, as we show, issues of representation and selection of users, separate platforms (blogs, Facebook, Twitter, etc.) which differ in their use

across different populations, and the need to analyze source data in multiple languages present new problems to researchers (compared with traditional social science datasets). Researchers must accept limitations on their inferences from such data and calibrate their research questions in light of these.

The structure of the article is as follows. First we provide a brief background on the dispute between Israel and Iran on the Iranian Nuclear Program. Then we discuss the use of social media data in previous research, issues with its use, and our data collection effort. We then present our Twitter network analysis in Farsi, English, and Hebrew, and show a complementary analysis looking at Arab and Farsi weblogs. Finally, we offer some conclusions and a plan for follow-up work. Additional methodological information is available in an online appendix.

Background on the Iranian nuclear program

The controversy surrounding Iran's nuclear program stretches back more than ten years (CNN Wire Service, 2012). In September 2002, Russian nuclear scientists began working on Iran's first nuclear reactor despite heavy objections from the USA, Israel, and other European countries (Al-Jazeera, 2013). From 2003 to 2005 Iran and the International Atomic Energy Agency (IAEA) sparred over whether or not Iran was in full compliance with the Nuclear Non-Proliferation Treaty and IAEA inspectors and not moving ahead with a nuclear weapons program. In January 2006, Iran broke the IAEA seals on its reactor in Natanz and in February 2006 again began enriching uranium at this reactor (Al-Jazeera, 2013). In reaction to the Iranian actions, the UN Security Council passed a resolution placing economic sanctions on Iran for failure to comply with the IAEA inspections in April 2006. Further broad-based sanctions by the USA were announced in October 2008, and tougher financial sanctions in December 2011 (CNN Wire Service, 2012). In January 2012, the European Union placed a ban on the importation of Iranian oil. Sanctions have tightened the economic noose on Iran, and negotiations between Iran, the UN, and the IAEA about bringing Iran into compliance with previous UN and IAEA demands had yielded little (by the end of January 2013). Yet, Iranian progress on its nuclear program has remained fairly constant (Shear & Sanger, 2013).

The question of the Iranian nuclear program – whether Iran would pursue a nuclear weapon and what it would mean for the Middle East – continues to be hotly debated in diplomatic and foreign policy circles (see Kaye, Nader & Roshan, 2011). Israel, the lone

nuclear power in the Middle East, has argued that given Iran's stated opposition to Israel and threats made by ruling leaders towards Israel, its (Iran's) emergence as a nuclear superpower is unacceptable. Israel suggested that it would use military force to prevent this from happening.² While scholars and pundits are divided about the feasibility and strategic prudence of an Israeli air strike on Iranian nuclear reactors (Edelman, Krepinevich & Montgomery, 2011; Waltz, 2012), the specter of a possible Israel–Iran military confrontation has remained a salient geopolitical issue.

There has been considerable uncertainty about the perceived probability of an Israeli or joint US military strike on Iran. Intrade, a now defunct prediction market website, held a contract for a military strike on Iran that was trading as high as 60% in February of 2012, with prices mostly reflecting a 20–30% chance of a US or Israeli strike.³ Other commodity forecasts were more pessimistic about the likelihood of an Israeli strike in August 2012, laying the probability at 10–15% (Fenton & Hansen, 2012). The variation in the perceived probability of a military strike and salience of the Iran–Israel situation has also been amplified by speculative articles in the media about the likelihood or inevitability of an Israeli attack (i.e. Goldberg, 2010; Morris, 2012). Moreover, while Israel and Iran have not exchanged open military hostilities, numerous threats and details of proxy wars taking place between the two sides have also received considerable media coverage (Kulish & Rudoren, 2012).

There has been less focus, both academic and journalistic, on how changes in the salience of the issue are reflected in political behavior. Our article uses data from Israeli, US, and Iranian social media sources to map the dynamics of policy networks surrounding the possible confrontation between Iran and Israel. How are changes in salience of the confrontation and the perceived probability of an attack reflected in the different networks? Who are the central actors in these networks and do they change or remain constant?

Social media data

With the rising popularity of social media, there is a heightened interest in using it as data to better understand how social media networks form and coalesce and influence political behavior. Recent scholarly work has focused on analyzing the way information spreads and

² See Martinez (2012).

³ See graph of the Intrade prices in the online appendix.

Table I. Key events on heightened salience Israel–Iran (via Google Trends)

<i>Event type</i>	<i>Description</i>
Thai bombings and nuclear announcement	Thai police foil a plot by Iranian agents in Thailand directed at Israeli targets (14 February 2012). Iran announces new advancements in nuclear centrifuge technology (15 February 2012).
‘What if’ attack scenario	A series of news stories in US media emphasize the possibility of an Israeli air strike on Iran. The <i>Atlantic</i> releases its ‘Iran War Dial’, an expert survey of probability of war between Israel and Iran, to widespread media coverage (5 and 8 March 2012).
Netanyahu’s UN speech	Israeli Prime Minister Netanyahu gives a speech in front of the UN General Assembly imploring member countries to stop Iran from getting a bomb (27 September 2012).
2012 Gaza Conflict	Hostilities between Hamas and Israel that lasted from 14 November to 21 November 2012.

communities form online (Kumar, Novak & Tomkins, 2010). Social networks such as Twitter carry important signals, which can be used to gauge individual and collective responses to events. However, there is evidence that topics and opinions in social media data differ significantly from general opinion.⁴

While semantic analyses of text dominate, some recent studies have focused on network analytic and machine learning techniques to map and segment social media networks in a variety of international contexts (Kelly & Erling, 2008). Other approaches have looked at activity around local events, or engagement around international movements and event sequences encompassing numerous local contexts (Lotan et al., 2011). Barberá (forthcoming) uses shared follower networks of US politicians to extract meaningful ideal point estimations. DiGrazia et al. (2013) use data from Twitter to predict congressional vote shares during the 2010 US elections.

Yet, there are important shortcomings in much of the previous work that limits the type of inferences that can be made. With respect to traditional media sources, Baum & Zhukov (2015) show newspaper coverage of the Libyan Civil War is biased, reflecting the political context in which the newspapers operate. Given the self-selection of users on social media about political topics, this type of bias may be particularly strong when seeking to ‘crowdsource’ events using social media. Many extant studies only examine social media activity over a short time horizon (e.g. around a singular event like the 2009 Iranian election protests). This type of analysis does not differentiate between more permanent (and potentially important) actors, with more casual actors (Kaplan & Haenlein, 2010). Perhaps even more serious, many analyses

focus on a single language (typically English) or a single social media platform (e.g. Twitter), while ignoring important cross-language or cross-platform differences (Hughes et al., 2012).

To explore how foreign policy networks are structured surrounding the Israel–Iran nuclear confrontation, we take a multi-pronged approach. We construct three distinct datasets: an English language Twitter dataset, a complementary Hebrew and Farsi Twitter dataset, and an Arabic and Farsi blogosphere dataset. We first use the Google Trends interface to search for the terms ‘Israel’ and ‘Iran’ for the 2012–13 time period. We then gather points in time where there was a heightened salience around the Israeli–Iranian confrontation.⁵ Other researchers have used Google Trends to predict economic activity (Choi & Varian, 2012) and voting on US state ballot measures (Reilly, Richey & Taylor, 2012).

Using Google Trends, we identify four critical weekly time periods where user search queries about Israel and Iran peaked (see online appendix). Next, we use Google News searches around this time and date to extract the top news stories published during these peak time segments. After classifying the events covered by media during these points of peak attention, we identify the four main news stories shown in Table I.⁶

Given that discussion of key events may bleed over into the following days’ news cycle, we chose the two days that experienced highest traffic in a given week. To conduct the first analysis, for those two days we extract all publicly posted tweets that included the terms ‘Israel’ or ‘Iran’ within the tweet’s text field. Table II

⁴ See Pew Research Center (2013).

⁵ Google Trends is a public web facility of Google Incorporated, based on Google Search that shows how often a particular search-term is entered relative to the total search-volume across various regions of the world and in multiple languages (since 2004).

⁶ See CNN Wire Service (2012) and Al-Jazeera (2013) for a more in-depth look at events between Israel and Iran.

Table II. Key event dates, number of tweets, and users

<i>Event type</i>	<i>Dates</i>	<i>Number of tweets</i>	<i>Number of users</i>
Thai bombings and nuclear announcement	14, 15 February 2012	273,467	115,037
‘What if’ attack scenarios	5, 8 March 2012	255,816	121,798
Netanyahu’s UN speech	27, 28 September 2012	308,005	140,457
2012 Gaza conflict	19, 20 November 2012	1,604,912	615,086

Table III. Number of users active across different events

<i>Total number of users</i>	<i>Thai bombings and nuclear announcement</i>	<i>‘What if’ attack scenarios</i>	<i>Netanyahu’s UN speech</i>	<i>2012 Gaza Conflict</i>
2,209	X	X	X	
2,640	X		X	
3,091		X	X	
3,491	X		X	X
4,263		X	X	X
5,842	X	X		X
8,207	X	X	X	X
9,875	X			X
10,309	X	X		
11,729		X		X
29,080			X	X
72,464	X			
76,148		X		
87,476			X	
542,599				X

outlines the four observed event dates and dataset size in terms of tweets and use. Finally, in Table III we calculate the number of Twitter users active across the different events.

It is not surprising that major conflict events, principally the 2012 Gaza conflict, draw significantly higher levels of participation from Twitter users – for instance, 542,599 users only tweeted about the conflict, compared with 87,476 users who only tweeted about Netanyahu’s UN speech.

We compare user interest across different key events to make inferences on foreign policy networks. By identifying a set of users who are active across multiple events versus others who are only active during a single event, we are able to compare how highly engaged foreign policy actor networks compare to more ephemeral users. Given previous research that suggests that foreign policy is largely elite-driven (Holsti, 1992), this is an important distinction.

We compare two of the permutations. The first is a set of users who we label the ‘super-user’ set, consisting of those 8,207 users who tweeted during all four events. This includes journalists, news and media organizations,

and other close followers of politics in the Middle East. The second set consists of 542,599 users who tweeted only about the 2012 Gaza conflict and not about any of the other observed events. We label this second set of users as ‘ephemeral’⁷ in their interest around the Israel–Iran confrontation, as they do not participate in any of the other events.

Farsi and Hebrew Twitter networks

To investigate the difference between activity in English, which accounts for the vast majority of discussion of Iran and Israel in Twitter, and activity in the relevant vernacular languages, we collected all tweets using a set

⁷ We acknowledge that calling these individuals ‘ephemeral’ may be masking important differences among the actors that only tweeted during the 2012 Gaza conflict. They may simply be those most interested in the 2012 Gaza conflict and those following Palestinian/Hamas politics. While that may be true, we simply care whether or not they are attentive to the broader Israel–Iran debate on social media. And in that respect, they are ephemeral to the Israel–Iran social media debate.

of Hebrew and Farsi terms related to Iran, Israel, and nuclear weapons (see appendix for list of terms). For comparison purposes (to the English language dataset), we also collected tweets using English versions of the terms. These terms were used to query the Twitter streaming application programming interface (API) from 1 January 2012 through the end of January 2013.

The objective was to compare regular discussants in vernacular languages with regular discussants in English, and observe whether there is any direct connection between the Farsi language users and Hebrew language users (Farsi–Hebrew network). The Twitter Search API was used to grab social graph (friends and followers) for all Twitter accounts that used at least one of the terms in at least three different months (23,401 accounts). A network was built using the follower relationships among these vernacular accounts. The network was segmented using a clustering approach to highlight the most active, connected, and influential.⁸ While also using the Fruchterman & Reingold (1991) algorithm approach to draw the graph, the current approach slightly differs from the one used in the previous analysis, in that nodes are classified based on their connections to all other nodes in Twitter, rather than being limited to other members of the selected network. This serves to segment the network on the basis of regular, more ‘permanent’ relationships, rather than the issue-specific contextual relationships appropriate for the previous analysis (Gonçalves, Perra & Vespignani, 2011). For a more direct comparison, a version of the English network from the previous study was constructed using the same techniques as the Farsi–Hebrew network.

Farsi and Arabic blogosphere

Social media and the Internet are often credited with enabling a ‘global discussion’, but clear linguistic divides in the discussion network complicate this claim (Takhteyev, Gruzd & Wellman, 2012). It is possible that discussions in the *linguae francae* (English, French, Spanish, etc.) do enable significant cross-national information flow among publics, but there is good reason to suspect that (with the exception of viral high-concept ‘memes’) language barriers are a significant impediment to vernacular cross-discourse. Nevertheless, even if international actors are not speaking directly with one another about

topics of shared interest, they may nevertheless be speaking about those issues at the same time, prompted by agenda-setting elites or salient public events.

For our third analysis we investigate whether the salient peaks evident in Google Trends’ tracking of English language matched the dynamics of the Iranian and Arabic weblogs. Morningside Analytics maintains an active collection of Iranian (Farsi) and Arabic weblogs. The initial seeds for the blog were collected in 2008, and a larger corpus of blogs was then collected using a ‘snowball spidering’ process of blogs. This continually updated corpus of blogs has been the basis of several academic studies, which can be referenced for further study (Kelly & Etling, 2008; Etling et al., 2009).⁹

This corpus of weblog posts was searched for use of Farsi and Arabic versions of terms for ‘Israel’ (including ‘Zionist Entity’ and ‘Zionism’) and ‘nuclear’ (including ‘nuclear weapons’). The frequencies of posts containing these key search terms were plotted for the period from 1 January 2012 through 31 January 2013.

Twitter networks

In this section we examine how Twitter networks are structured around the Israel–Iran nuclear issue. We first examine English language Twitter networks, comparing users active across all major events (‘super-users’), identified via Google Trends, to those more ‘ephemeral users’. We then compare these networks to Hebrew and Farsi Twitter networks.

English language Twitter

We chose to focus on a set of users who were actively posting tweets during all of the four events from Table II. The group of users is made up of 8,207 users, which represents 0.8% of users across the whole dataset (992,378 Twitter users identified in total). We build a network graph where the 8,207 nodes represent all super-users, and the 415,444 directed edges represent follow relationships among these users. We hypothesize that these accounts would most likely include media, journalists, and news aggregators focusing on topics around Israel, Iran or the Middle East region.

In order to understand the structure of the super-users, we measured how many connections there are among actors in the networks out of the total possible number of connections (density), how tight-knit groups

⁸ As in the previous analysis, the algorithms clustered the groups, and then we determined based on their users what to call the networks. For information on the methods see Kelly & Etling (2008) and Etling et al. (2009).

⁹ Morningside Analytics also maintains a much smaller collection of Hebrew weblogs, which (unlike Farsi and Arabic) cannot be considered complete and thus will not be analyzed here.

Table IV. Calculations for both graphs using Gephi's built-in graph statistic modules

	<i>Super-user set</i>	<i>Ephemeral-user set</i>
Number of nodes	8,207	19,914
Number of edges	415,444	18,331
Graph density	0.006	~0.000
Avg. clustering coefficient	0.187	0.027
Avg. degree	50.621	0.921
Modularity	0.441	0.855
Number of communities	817	12,302

are within a network (average clustering coefficient), and the average number of connections each actor has (average degree). Additionally, to better understand how many distinct communities there are – groups of actors in the graph that are tightly interconnected – we use a community detection algorithm developed by Blondel et al. (2008).¹⁰ Calculation results are outlined in Table IV.

A key issue in presenting large network graphs is how to appropriately (and accurately) display the information. We run the OpenOrd (Martin et al., 2011) layout algorithm using the Gephi (Bastian, Heymann & Jacomy, 2009) software package to organize the graph in a way that highlights major regions of connectivity.¹¹ In the resulting graph (Figure 1), nodes that appear closer together are much more likely to be part of the same clusters, or communities, and hence have many attributes in common. We discover five dominant communities in the resulting graph and label them as:¹²

- (1) Mainstream news media (turquoise, 28.4%)
- (2) US liberals, progressives (dark blue, 16.91%)
- (3) US conservatives (red, 12.89%)
- (4) Israel supporters (green, 11.03%)
- (5) Israel critics (purple, 10.66%)

A list of the top 20 Twitter handles for each of the communities can be found in the online appendix.

¹⁰ The algorithm is based on modularity optimization. Modularity is the way of measuring how clustered groups are into 'modules', compared to purely by chance (Newman, 2006).

¹¹ OpenOrd is a force-directed algorithm originally based on Fruchterman & Reingold (1991). The algorithm is particularly suited for displaying large social graphs without sacrificing the local community structure; see the online appendix for a discussion of the Fruchterman & Reingold (1991) algorithm.

¹² It is important to point out that the OpenOrd algorithm reveals the clusters. However, we apply the labels to clusters.

Looking more closely at specific regions in Figure 1, we see the intricate relationships among the users within the identified communities. For example, the red cluster (see Figure 2) represents US conservatives – some self-identify as Republicans and others as Tea Party members – who tend to take a pro-Israeli approach. The largest node in this cluster represents the user with the highest 'degree' (highest number of connections with other nodes in the network) – @KatyInIndy, a blogger at Conservative News, usually takes the pro-Israeli and anti-Iranian point of view. For example, @KatyInIndy published the following tweet on 15 February – 'Obama wants to disarm USA; meanwhile Iran touts nuke breakthrough amid tensions #tweetcongress <http://t.co/YyqKDRZY> #tcot #gop #sgp #tlot' – in clear response to the heightened news about the continuation of the Iranian nuclear program.

The distance between the clusters also conveys information. The mainstream news media (turquoise) appears to bridge the Israel supporters (green)/US conservatives (red) section with the Israel critics (purple)/US liberals (blue) section. Another important observation is that the distance between US liberals and US conservatives is even greater than the distance between Israel critics and Israel supporters (within the Israel–Iran graph network). Surprisingly, this shows that US liberals and conservatives are more segmented in their communication networks (i.e. further apart) than Israel critics and supporters. Research by Barberá (forthcoming) further suggests that distance on social media reflects meaningful ideological distance – with a bigger gap between US conservatives and US liberals than between Israel critics and supporters.

As mentioned before, the ephemeral-user set consists of users who posted to Twitter only during the 2012 Gaza conflict. We take a random sample of 20,000 users from the ephemeral-user network and generate a graph (Figure 3) with the same method described in footnote 10. The resulting graph has significantly different network attributes (see Table IV).

There are substantially fewer connections (edges) in the graph in Figure 3, especially when compared to the super-user set, hinting at the lack of a coherent community in the ephemeral-user set. Conversely, the structure of the network of informed foreign policy followers (super-users) reflects meaningful policy differences. The coherence of the super-user network echoes research that finds that elites have more coherent views on policy (Converse, 1962). Some of the other calculated statistics further support this claim – graph density, average clustering coefficient, and the average degree are all significantly lower than in the super-user set.

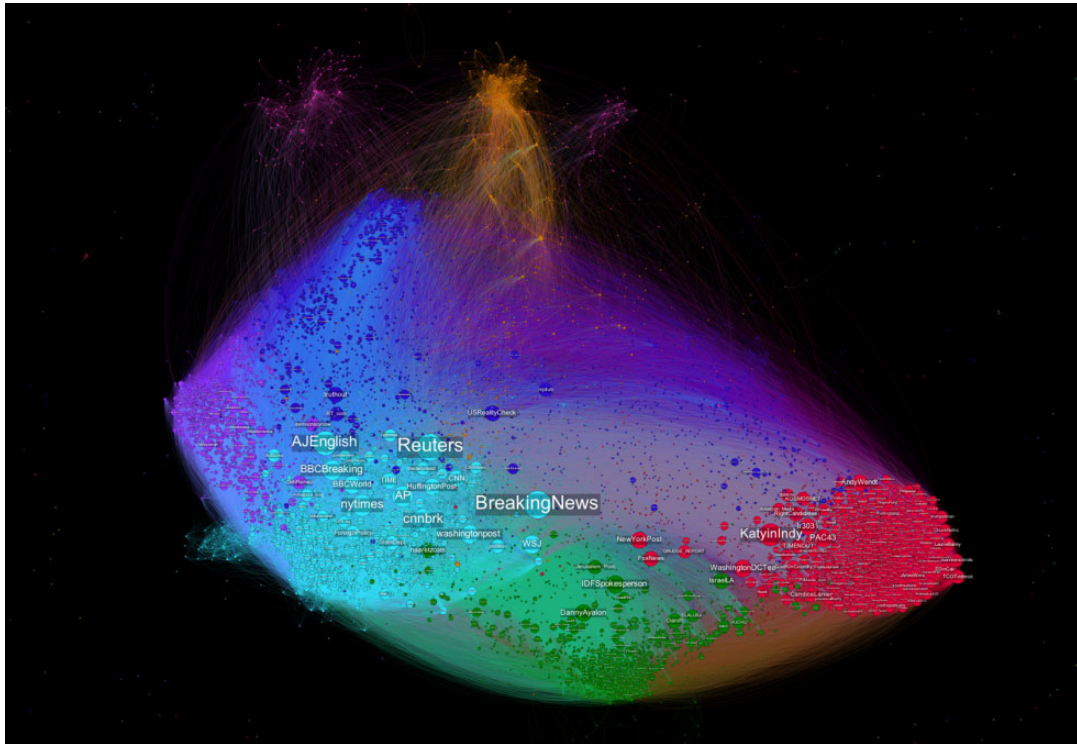


Figure 1. Network graph representation of the 8,207 Twitter super-user set
Node size represents degree. Regions of the graph are colored by clusters (via modularity).

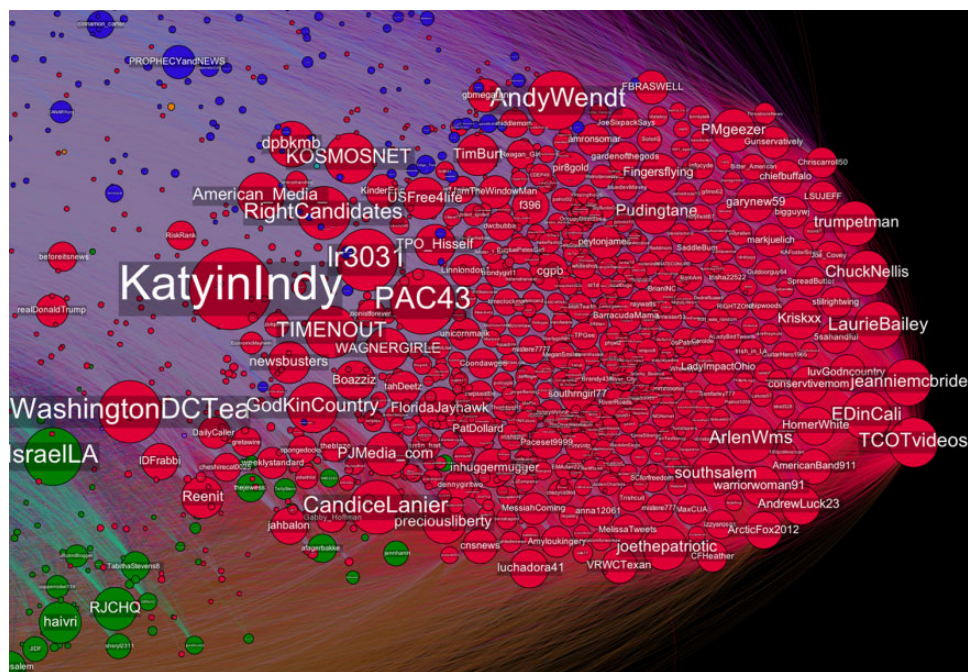


Figure 2. Closer look at the US Conservative cluster
These are users responding to events around Israel and Iran from Figure 1.

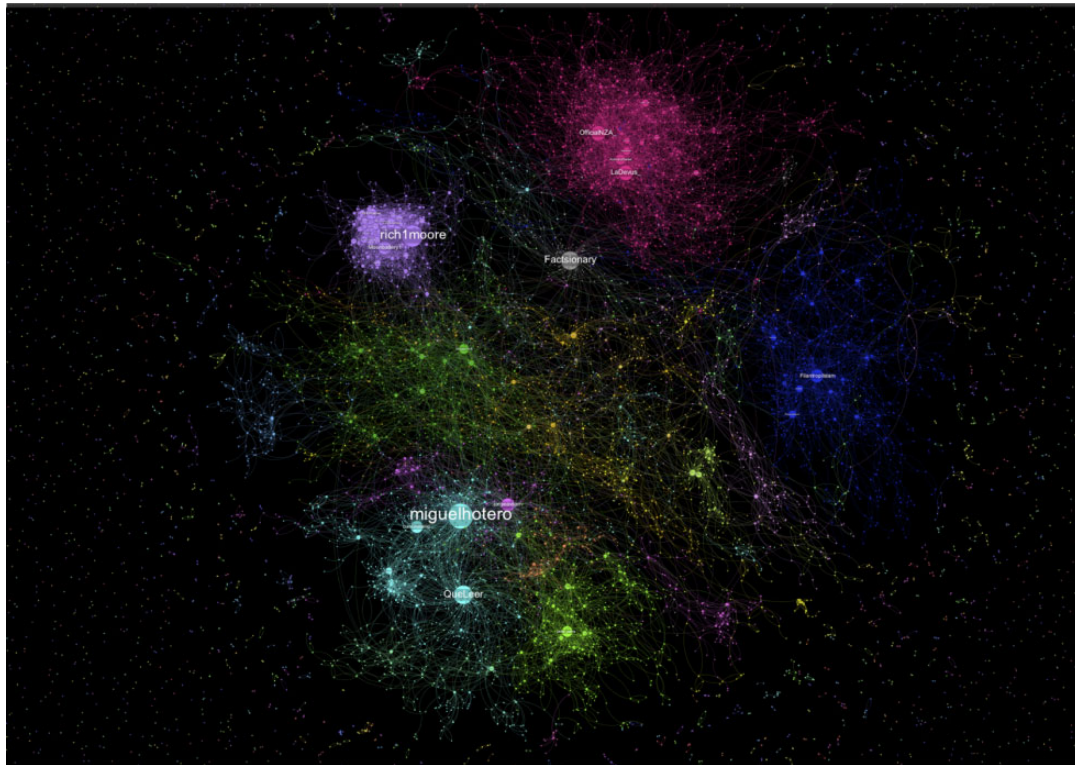


Figure 3. A random sample from the ephemeral user network

These are users who were actively tweeting about Israel or Iran during the 2012 Gaza Conflict, but did not tweet during any of the other observed events.

When we run the same algorithm as we did in the super-user analysis (i.e. Figure 1), we identify a number of small clusters. One of them (purple) represents US conservatives, frequently using hashtags such as #tcot (Top Conservatives on Twitter), #nra, #proIsrael, #anti-Obama, and #teaparty. Other identified clusters include a group of users in Indonesia (dark blue) and another group of users in Venezuela (light blue). Even though this is a sample of a much larger graph,¹³ we see clear evidence that this group of users are less coherent and lack a topical or geographic focus, especially when compared with the super-user set.

We further explore how networks of users are engaged in discussion on Israel and Iran across languages. We gathered data using a complementary

method to that employed in the previous analysis. To examine more permanent network relationships in Hebrew, Farsi, and English, we look at individuals who tweeted terms related to Israel and Iran at least three times over a 12-month period. We then built a network of users in Farsi, Hebrew, and English Twitter networks looking at shared follower relationships using a similar clustering algorithm.¹⁴

The English (Figure 4) and the Hebrew–Farsi (Figure 5) networks show very different network structures and levels of interconnectivity. The English network (Figure 4) reflects the same policy differentials as in the previous analysis (Figure 1). Strongly pro-Israel accounts, including Israel-based authors and their conservative US allies, dominate one side of the network. Pro-Palestinian activists and their supporters anchor the other side, and in between are clusters focused on foreign policy and global news. Additionally, there is a small cluster of accounts associated with

¹³ There are issues when taking a sample from a larger graph, since a random sample from a network graph may be inefficient and may not fully reflect the underlying graph (Muow & Verdery, 2012). However, our sample includes approximately 4% of the users, similar to other research sampling from large graphs (Mislove et al., 2007), suggesting that our underlying interpretation is influenced by the sampling procedure.

¹⁴ See the online appendix for more information.

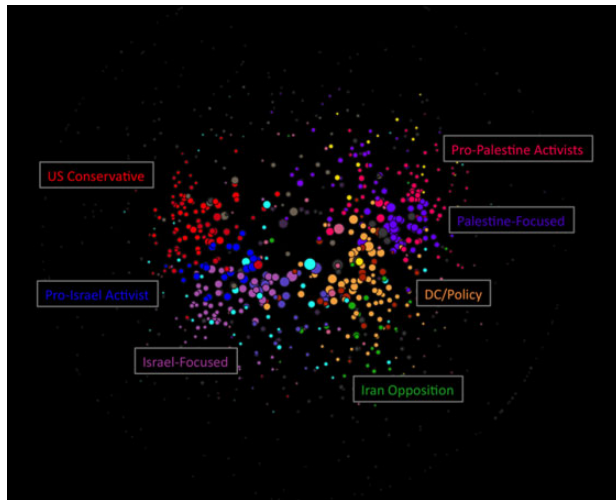


Figure 4. Mapping of English Twitter networks

the Iranian opposition (expatriate activists and Green Movement).¹⁵ While each of these clusters is distinct, they are significantly interconnected and show a dense level of interaction.

In contrast, the Hebrew and Farsi network shows a strong bifurcation by language (see Figure 5 and Table V). A few nodes connect the two languages, mainly intentional bridges such as the Twitter users *@dudi_cohen* and *@MeirJa*. There are also significant differences between the types of groups, and structure of networks in Hebrew and those in Farsi. The Farsi clusters are mainly associated with specific parts of the Iranian political spectrum. These include opposition accounts, including those associated with domestic opposition to the Iranian government (like the Green Movement) and accounts belonging to expatriate activists. There is a distinct and densely connected cluster associated with the People's Mujahedin of Iran (MEK), a controversial opposition group based in Iraq. Unexpectedly, there is a pro-government cluster as well.¹⁶ The only non-political cluster is associated with Iran's software development community.

The Hebrew side of the network features very different kinds of participants. Whereas highly politicized groups dominate the Farsi discussion, the Hebrew discussion features clusters of less politicized users who mainly tweet about their personal lives or about entertainment and pop culture topics. There are Hebrew clusters focused on news and current affairs in general,

and a left-leaning cluster focused on human rights, but key parts of Israel's political spectrum are not in evidence here (notably religious and right-wing Israelis). This is an important point. Scholars must be cautious when interpreting social media data streams from different countries (and in different languages). The kind of actors that are engaged on social media differ based on geography and language, preventing straightforward comparisons across countries and language.

Issue salience across languages

In Table I, we used Google Trends to identify salient peaks of activity around the Israel–Iran issue. The Google Trends data identified five key peaks occurring in mid/late February (corresponding with the Thai bombings), early March (Netanyahu's visit to the United States, 'What-If' articles), late September (Netanyahu's UN speech), and mid/late November (Gaza hostilities). There were additional, secondary peaks evident in early February 2012 and mid-August 2012.¹⁷ Yet, the Google Trends data only identified peaks in English-language search activity. A key question is does issue salience in English match the salience of discussion happening Farsi and Arabic? To answer this question we turn to the corpus of Iranian (Farsi) and Arabic weblogs regularly updated by Morningside Analytics. We plot frequencies of weblog posts containing key search terms in Farsi (Figure 6) and Arabic (Figure 7) related to the Israeli–Iranian nuclear issue from 1 January 2012 through 31 January 2013.

The first thing to notice (Figure 6) in the frequency of Iranian weblog posts using our key terms is that discussion of Israel (إسرائيل), nuclear (اتمی), and nuclear weapons (سلاح هسته‌ای جنگ‌افزار) generally track together. This would support the idea that Iranians are discussing the issue as we have framed it in this article, with Israeli relations tied to the Iranian nuclear program. The second thing to notice is that some peaks in the Iranian discussion correspond to the Google Trends peaks, but others do not. There appears to be some modest increase in salience early in 2012, initially preceding but then overlapping with the early peaks in the Google Trends data. But then there are three large peaks (late April and early May, early June, and early to mid-July) with no analog in the Google Trends English

¹⁵ See Tafesh (2012).

¹⁶ See the *Guardian* (2012).

¹⁷ Unfortunately, there is currently no single corpus of the Hebrew blogosphere. We hypothesize that given the strong ties between the United States and Israel, the salience of the Iran–Israel nuclear confrontation would in Hebrew largely match those of the English-language Google Trends in Table II.

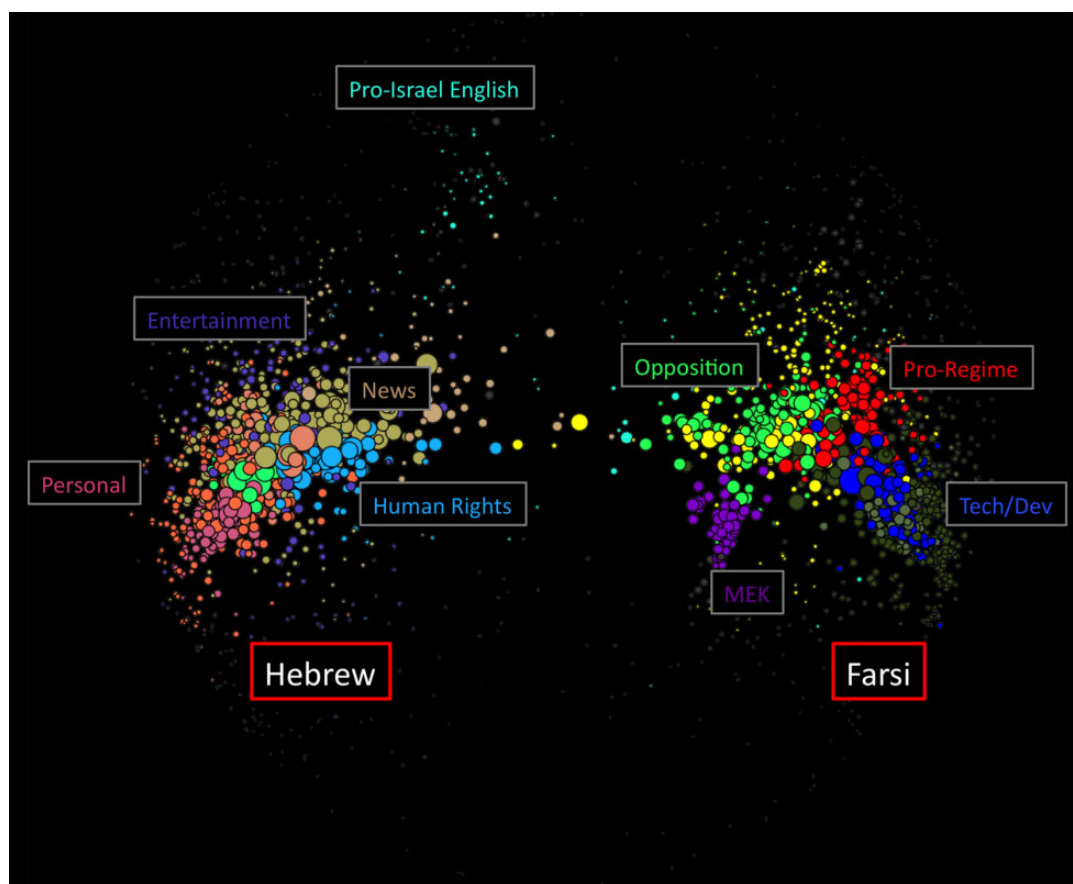


Figure 5. Mapping of Hebrew and Farsi Twitter networks

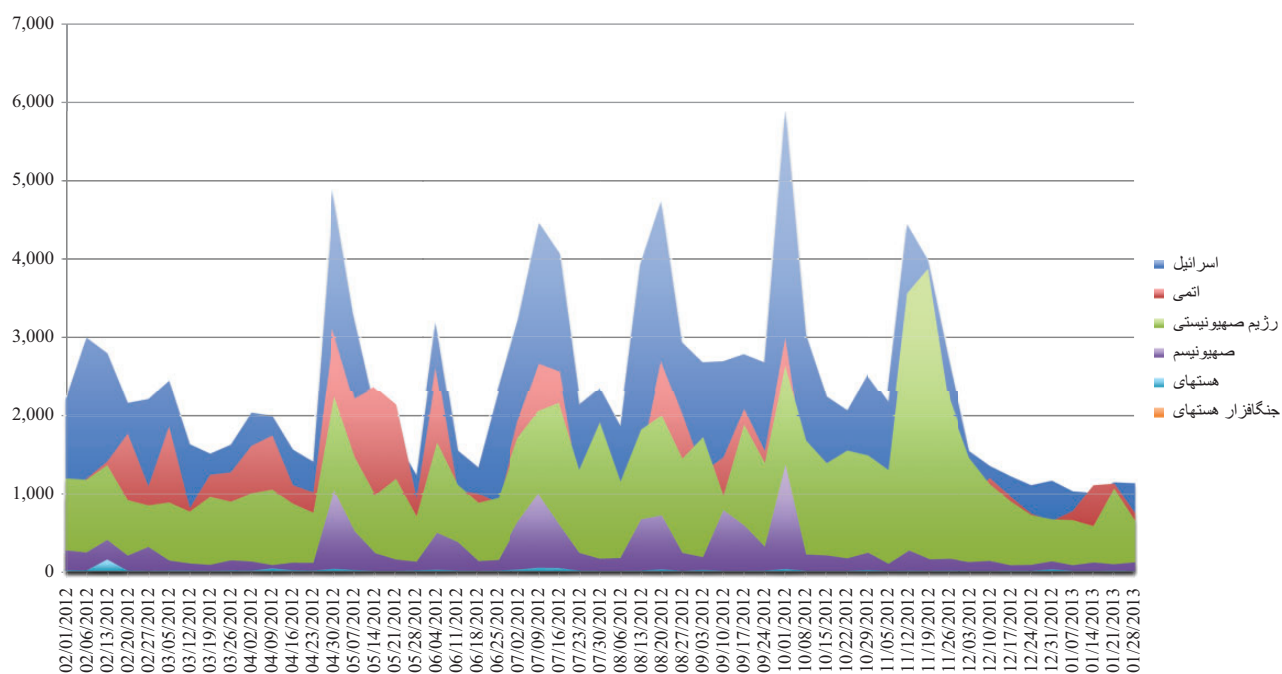


Figure 6. Farsi term frequency in Iranian weblogs

Please refer to the appendix for the translation of the legend.

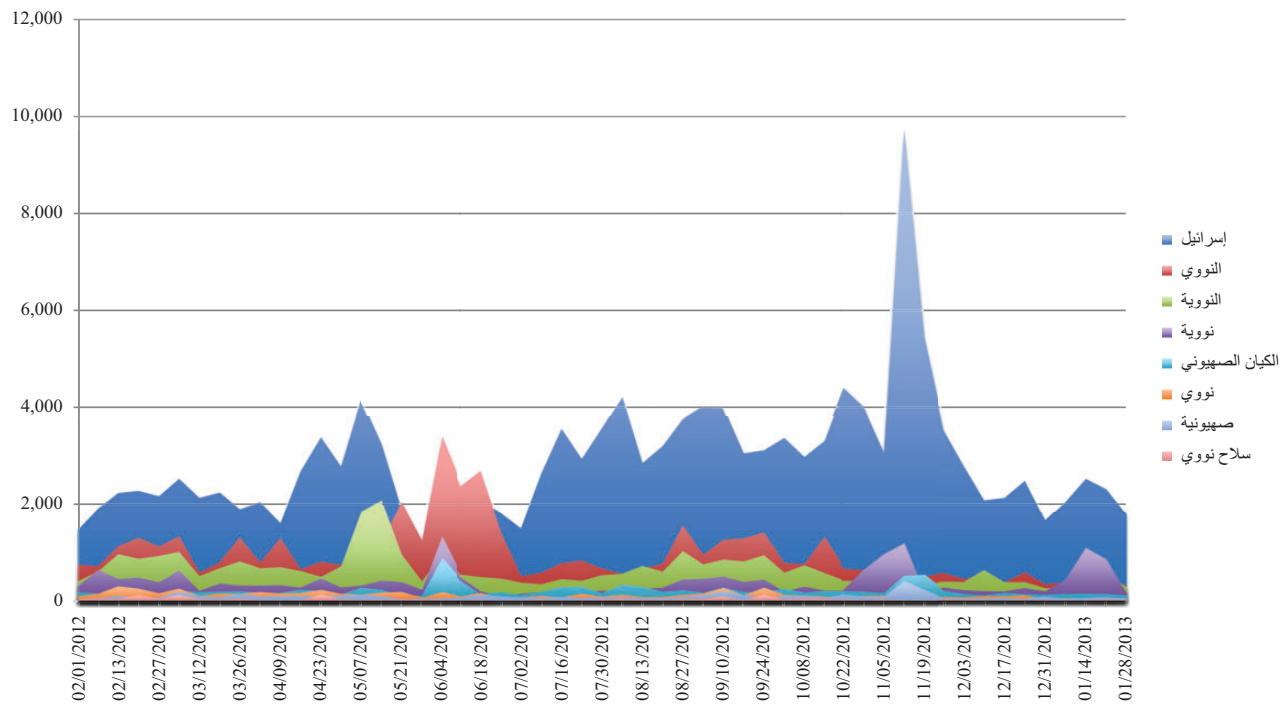


Figure 7. Arab term frequency in Arab weblogs

Please refer to the appendix for the translation of the legend.

Table V. Network calculations from Hebrew and Farsi Twitter networks

<i>Hebrew–Farsi Twitter network</i>	
Number of nodes	4,692
Number of edges	659,822
Graph density	0.029
Avg. clustering coefficient	0.102
Avg. degree	137.692
Modularity	0.441
Number of communities	3

data. Finally, the three final peaks in Iranian weblogs correspond to the three later peaks in Google Trends.

We cannot causally identify the drivers of salience of the Iranian–Israeli nuclear issues on the Farsi blogosphere. Yet, we can provide (what we believe) is a likely answer. The events early in 2012 were either US-based (e.g. US media editorials) or embarrassing to the Iranian government (e.g. failed Thai bombings). These seemed to have little echo in the Iranian blogosphere. The final three peaks were related to regional events (e.g. Israeli Defense Minister speaking and 2012 Gaza Conflict) or high-profile global events (Iranian President Mahmoud Ahmadinejad also spoke at the UN). We expect that issues that actively involve Iran or Middle East foreign relations would garner

greater attention in Iran. The interesting question is what drove the other three large peaks in the Iranian conversation. Why did that have no echo outside Iran?

The term frequencies in Arab weblogs (Figure 7) paint a very different picture. First, discussion of Israel (إسرائيل) and nuclear (النووي) issues appear completely decoupled. There are many more peaks associated with discussion of Israel, and just a small burst around nuclear issues (with no corresponding bump in Israel mentions). The only peak that evidently corresponds to the Google Trends data is the one associated with the 2012 Gaza Conflict, which has no relationship to a discussion about nuclear issues.

The Arabic and Farsi weblogs further reinforce the idea that social media is not creating a ‘global conversation’. Rather, distinct languages reflect geographic and political differences of attention to foreign policy issues. This is an important point for scholars hoping to harness these data to answer questions related to social media’s effect on politics, or its ability to serve as a barometer of public sentiment.

Interpretation and future work

We began with a very simple research question: can scholars of international relations and conflict use social media data to illuminate questions of foreign policy? Our answer is a cautious ‘yes’. By analyzing Twitter networks

in English, Farsi, and Hebrew and weblogs in Farsi and Arabic surrounding the Israel–Iran nuclear confrontation, we show that communication networks online (particularly in English) reflect offline policy differences. Yet, we also show that any differences between political actors are swamped by language differences. We further show that the salience of the confrontation was not uniform across different languages (e.g. English-language Google Trends compared to the Farsi and Arabic weblogs). Rather, the variation likely reflects domestic differences in the salience of the Iranian nuclear issue.

The approaches taken here are intended to show how social media can be used to measure networks of foreign policy issues and, more importantly, its limitations or misuses. We identify three major limitations or areas with potential for misuse: (1) analysis of message content without regard to network structure, (2) using social media as perfect substitute for traditional public opinion, and (3) having a simple conception of the Internet as comprising a ‘global conversation’, without sufficient attention to global vs. local contexts, and the relationship between languages and cross-national information flow.

Part of the challenge of using social media data effectively is linking available analytic methods to extant theoretical models. The natural instinct of researchers is to view social media activity as the output of some subset of the public, however skewed, and thus an interesting if problematic proxy for the *vox populi*. Then, as long as bloggers and tweeters can be thought of in the same way as citizens, social media data can be leveraged against any number of older questions/models that accept individuals and their opinions as inputs. But as we argue, caution should be exercised when attempting to draw a direct relationship to social media and public opinion. Social media, and the Internet more broadly, represent a field of communicative engagement among diverse sets of actors, only some of which are subsets of ‘the public’. Straightforward attempts to use social media as an opinion poll will miss these important dynamics and may draw incorrect inferences.

We also believe that social media data can be leveraged against constructs besides those individual-level survey data. By clustering networks and segmenting the data stream, a wider variety of actors (individual and collective) can come into view. The role of firms, parties, movements, organizations, and politicians can be compared to more ‘average’ citizens in a common communication space. Measuring how these networked communities are structured begins with the social network analytic methods we used.

For example, the first analysis showed how the most consistently engaged sets of actors in English language Twitter represented a combination of opposed partisan

communities mediated by accounts (many professional) generally attuned to news and policy. Once discovered, these communities seem quite intuitive. The second analysis showed how the discussion networks in Hebrew and Farsi differed not just from English, but also from each other. The Farsi discussion mainly engaged highly politicized sets of actors associated with different sides of Iran’s contentious political landscape, including a specific group (MEK) evidently engaged in a social media campaign. Since Iran routinely blocks the Twitter service, it is very interesting to observe that these contentious groups are active nonetheless. In Hebrew, routinely politicized actors are evident from only one side of the political spectrum (liberal, human rights oriented). But unlike Farsi, Hebrew Twitter features a large number of accounts mainly focused on personal life and Israeli entertainment getting engaged in the conversation about Iran and nuclear weapons. Finally, the third analysis demonstrated that engagement with global issues sometimes has global drivers and sometimes local drivers, and that social media reflects both of these.

The prominent role of social media in the Syrian Civil War (Lynch, Freelon & Aday, 2014) and Israel– Hamas hostilities (Zeitsoff, 2014) has shown that it (social media) is growing in importance as a tool for understanding conflict (i.e. as data), and a strategic platform for actors to shape the conflict. Yet, it also presents researchers with difficulties. Social media data and actors are not disembodied from the conflict which they are connected to, but rather increasingly become an integral part of it.

Future research could delve deeper on a similar foreign policy issue. An analysis of salient peaks could be leveraged across key clusters in each network, revealing whether particular subgroups engage more or less at key points, or tend to drive the discussion of other clusters. Analysis of semantic activity within key clusters can shed light on the opinions, framing, and influence strategies of key constituencies. Furthermore, when different networks are not in sync, what explains this variation? For instance, why are there three large peaks in the Iranian weblog discussion of Israel and nuclear weapons?

We end with a note of caution. The present research represents a first step in unpacking the complicated dynamics in analyzing the networks surrounding foreign policy conflicts. Yet as we have shown, the increasing quantity of data available from social media sources does not necessarily mean increased quality. Researchers must be cognizant of traditional social science data problems (selection bias of users) and new problems (difficulty in estimating network structures across time) that make drawing straightforward inferences and conclusions from social media data difficult to support.

Replication data

Scripts for extracting the data from Twitter using Python, and graphing the data visualizations in Gephi, along with the online appendix, can be found at <http://www.prio.no/jpr/datasets>.

References

- Aday, Sean; Henry Farrell, Marc Lynch, John Sides & Deen Freelon (2012) *New Media and Conflict after the Arab Spring*. Washington, DC: United States Institute of Peace (<http://www.usip.org/sites/default/files/PW80.pdf>).
- Al-Jazeera (2013) Timeline of Iran's nuclear programme: Major events in Iran's development of nuclear power since 2002. 24 November (<http://www.aljazeera.com/indepth/features/2012/04/201241410645752218.html>).
- Aral, Sinan; Lev Muchnik & Arun Sundararajan (2009) Distinguishing influence-based contagion from homophily-driven diffusion in dynamic networks. *Proceedings of the National Academy of Sciences* 106(51): 21544–21549.
- Barberá, Pablo (forthcoming) Birds of the same feather tweet together: Bayesian ideal point estimation using Twitter data. *Political Analysis*. DOI: 10.1093/pan/mpu011.
- Bastian, Mathieu; Sebastien Heymann & Mathieu Jacomy (2009) Gephi: An open source software for exploring and manipulating networks. Proceedings of the Third International AAAI Conference on Weblogs and Social Media (ICWSM), San Jose, CA, 17–20 May: 361–362 (<http://aaai.org/ocs/index.php/ICWSM/09/paper/view/154>).
- Baum, Matthew A & Yuri Zhukov (2015) Filtering revolution: Reporting bias in international newspaper coverage of the Libyan civil war. *Journal of Peace Research* 52(3): 352–368.
- Blondel, Vincent D; Jean-Loup Guillaume, Renaud Lambiotte & Etienne Lefebvre (2008) Fast unfolding of communities in large networks. *Journal of Statistical Mechanics: Theory and Experiment* 10: 10008–10020.
- Boshmaf, Yazan; Ildar Muslukhov, Konstantin Beznosov & Matei Ripeanu (2011) The socialbot network: When bots socialize for fame and money. Proceedings of the 27th Annual Computer Security Applications Conference, Orlando, FL, 5 December: 93–102 (<http://lrsse-dl.ece.ubc.ca/record/264/files/264.pdf>).
- Choi, Hyunyoung & Hal Varian (2012) Predicting the present with Google Trends. *Economic Record* 88(s1): 2–9.
- CNN Wire Service (2012) Timeline of Iran's controversial nuclear program. 6 March (<http://edition.cnn.com/2012/03/06/world/meast/iran-timeline>).
- Converse, Philip E (1962) *The Nature of Belief Systems in Mass Publics*. Ann Arbor, MI: University of Michigan Press.
- DiGrazia, Joseph; Karissa McKelvey, Johan Bollen & Fabio Rojas (2013) More tweets, more votes: Social media as a quantitative indicator of political behavior. *PloS One* 8(11): e79449.
- Edelman, Eric S; Andrew F Krepinevich & Evan Braden Montgomery (2011) The dangers of a nuclear Iran: The limits of containment. *Foreign Affairs* 90(1): 69–81.
- Elson, Sara Beth; Douglas Yeung, Parisa Roshan, Susan R Bohandy & Alireza Nader (2012) *Using Social Media to Gauge Iranian Public Opinion and Mood after the 2009 Election*. Santa Monica, CA: Rand National Security Research Division (http://www.rand.org/pubs/technical_reports/TR1161.html).
- Etling, Bruce; John Kelly, Robert Faris & John Palfrey (2009) *Mapping the Arabic Blogosphere: Politics, Culture, and Dissent*. Cambridge, MA: Berkman Center Research (https://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Mapping_the_Arabic_Blogosphere_0.pdf).
- Fenton, Colin P & Megan V Hansen (2012) Commodity market outlooks and strategy: The guns of August. *JP Morgan Global Commodities Research* 31 August (<https://mm.jpmorgan.com/EmailPubServlet?h=4sde5pr4&doc=GPS-933345-0.pdf>).
- Fruchterman, Thomas MJ & Edward M Reingold (1991) Graph drawing by force-directed placement. *Software: Practice and Experience* 21(11): 1129–1164.
- Gartner, Scott S & Gary Segura (1998) War, casualties, and public opinion. *Journal of Conflict Resolution* 42(3): 278–300.
- Goldberg, Jeffrey (2010) The point of no return. *Atlantic* 11 August (<http://www.theatlantic.com/magazine/archive/2010/09/the-point-of-no-return/308186/>).
- Gonçalves, Bruno; Nicola Perra & Alessandro Vespignani (2011) Modeling users' activity on Twitter networks: Validation of Dunbar's number. *PloS One* 6(8): e22656.
- Guardian (2012) MEK supporters push for recognition by US as official Iranian opposition. 28 September (<http://www.theguardian.com/world/2012/sep/28/mek-supporters-us-iranian-opposition>).
- Holsti, Ole R (1992) Public opinion and foreign policy: Challenges to the Almond-Lippmann Consensus Mershon series: Research programs and debates. *International Studies Quarterly* 36(4): 439–466.
- Howard, Philip N (2010) *The Digital Origins of Dictatorship and Democracy: Information Technology and Political Islam*. Oxford: Oxford University Press.
- Howard, Philip N; Aiden Duffy, Deen Freelon, Muzammil Hussain, Will Mari & Marwa Mazaid (2011) Opening closed regimes: What was the role of social media during the Arab spring? Working paper 2011.1. Project on Information Technology & Political Islam (PITPI) (<http://pitpi.org/index.php/2011/09/11/opening-closed-regimes-what-was-the-role-of-social-media-during-the-arab-spring/>).
- Hughes, David John; Moss Rowe, Mark Batey & Andrew Lee (2012) A tale of two sites: Twitter vs. Facebook and the personality predictors of social media usage. *Computers in Human Behavior* 28(2): 561–569.
- Kaplan, Andreas M & Michael Haenlein (2010) Users of the world, unite! The challenges and opportunities of social media. *Business Horizons* 53(1): 59–68.
- Kaye, Dalia D; Alireza Nader & Parisa Roshan (2011) *Israel and Iran: A Dangerous Rivalry*. Santa Monica, CA: RAND National

- Defense Research Institute (http://www.rand.org/content/dam/rand/pubs/monographs/2011/RAND_MG1143.pdf).
- Keck, Margaret E & Kathryn Sikkink (1998) *Activists Beyond Borders: Advocacy Networks in International Politics*. Ithaca, NY: Cornell University Press.
- Kelly, John & Bruce Etling (2008) *Mapping Iran's Online Public: Politics and Culture in the Persian Blogosphere*. Cambridge, MA: Berkman Center Research (http://cyber.law.harvard.edu/sites/cyber.law.harvard.edu/files/Kelly%20Etling_Mapping_Irans_Online_Public_2008.pdf).
- King, Gary (2011) Ensuring the data-rich future of the social sciences. *Science* 331(6018): 719–721.
- King, Gary; Jennifer Pan & Margaret E Roberts (2013) How censorship in China allows government criticism but silences collective expression. *American Political Science Review* 107(2): 326–343.
- Kulish, Nicholas & Jodi Rudoren (2012) Plots are tied to shadow war of Israel and Iran. *New York Times* 8 August (http://www.nytimes.com/2012/08/09/world/middleeast/murky-plots-and-attacks-tied-to-shadow-war-of-iran-and-israel.html?pagewanted=all&_r=0).
- Kumar, Ravi; Jasmine Novak & Andrew Tomkins (2010) Structure and evolution of online social networks. In: Philip S Yu, Jiawei Han & Christos Faloutsos (eds) *Link Mining: Models, Algorithms, and Applications*. New York: Springer, 337–357.
- Lotan, Gilad; Erhardt Graeff, Mike Ananny, Devin Gaffney & Ian Pearce (2011) The Arab Spring: The revolutions were tweeted: Information flows during the 2011 Tunisian and Egyptian revolutions. *International Journal of Communication* 5: 1375–1405.
- Lynch, Marc; Deen Freelon & Sean Aday (2014) *Syria's Socially Mediated Civil War*. Washington, DC: United States Institute of Peace (<http://www.usip.org/publications/syria-socially-mediated-civil-war>).
- Martin, Shawn W; Michael Brown, Richard Klavans & Kevin W Boyack (2011) OpenOrd: An open-source toolbox for large graph layout. Proceedings of Society of Photo-Optical Instrumentation Engineers (SPIE) 7868, Visualization and Data Analysis: 786806–786816 (<http://spie.org/Publications/Proceedings/Paper/10.1117/12.871402>).
- Martinez, Michael (2012) Netanyahu asks UN to draw 'red line' on Iran's nuclear plans. *CNN* September 28 (<http://www.cnn.com/2012/09/27/world/new-york-unga/>).
- McMillan, Robert (2012) A Twitter bot so convincing that people sympathise with 'her'. *Wired* 26 June (<http://www.wired.co.uk/news/archive/2012-06/26/twitter-bot-people-like>).
- Mislove, Alan; Massimiliano Marcon, Krishna P Gummadi, Peter Druschel & Bobby Bhattacharjee (2007) Measurement and analysis of online social networks. Proceedings of the 7th ACM SIGCOMM conference on Internet measurement, San Diego, CA, 24–26 October (<http://www.mpi-sws.org/~gummadi/papers/imc2007-mislove.pdf>).
- Morris, Benny (2012) Obama's last chance before Israel bombs Iran. *Daily Beast* 16 August (<http://www.thedailybeast.com/articles/2012/08/16/obama-s-last-chance-before-israel-bombs-iran.html>).
- Mouw, Ted & Ashton M Verdery (2012) Network sampling with memory: A proposal for more efficient sampling from social networks. *Sociological Methodology* 42(1): 206–256.
- Mueller, John E (1973) *War, Presidents, and Public Opinion*. New York: Wiley.
- Newman, Mark EJ (2006) Modularity and community structure in networks. *Proceedings of the National Academy of Sciences* 103(23): 8577–8582.
- Pew Research Center (2013) State of the Union 2013 and Twitter. 13 February (<http://www.pewresearch.org/2013/02/13/state-of-the-union-2013-and-twitter/>).
- Reilly, Shauna; Sean Richey & J Benjamin Taylor (2012) Using Google search data for state politics research: An empirical validity test using roll-off data. *State Politics & Policy Quarterly* 12(2): 146–159.
- Segerberg, Alexandra & W Lance Bennett (2011) Social media and the organization of collective action: Using Twitter to explore the ecologies of two climate change protests. *Communication Review* 14(3): 197–215.
- Shear, Michael & David E Sanger (2013) Iran nuclear weapon to take year or more, Obama says. *New York Times* 14 March (http://www.nytimes.com/2013/03/15/world/middleeast/iran-nuclear-weapon-to-take-year-or-more-obama-says.html?_r=0).
- Shirky, Clay (2011) The political power of social media: Technology, the public sphere, and political change. *Foreign Affairs* 14 October (<http://www.foreignaffairs.com/articles/67038/clay-shirky/the-political-power-of-social-media>).
- Tafesh, Abdul Q (2012) Iran's green movement: Reality and aspirations. *Al Jazeera Center for Studies* 5 November (<http://studies.aljazeera.net/en/reports/2012/11/20121159103533337.htm>).
- Takhteyev, Yuri; Anatoliy Gruzd & Barry Wellman (2012) Geography of Twitter networks. *Social Networks* 34(1): 73–81.
- Thompson, Alexander (2006) Coercion through IOs: The Security Council and the logic of information transmission. *International Organization* 60(1): 1–34.
- Van De Donk, Wim; Brian D Loader, Paul G Nixon & Dieter Rucht (eds) (2004) *Cyberprotest: New Media, Citizens and Social Movements*. London: Routledge.
- Waltz, Kenneth N (2012) Why Iran should get the bomb: Nuclear balancing would mean stability. *Foreign Affairs* 14 October (<http://www.foreignaffairs.com/articles/137731/kenneth-n-waltz/why-iran-should-get-the-bomb>).
- Zeitsoff, Thomas (2011) Using social media to measure conflict dynamics. *Journal of Conflict Resolution* 55(6): 938–969.
- Zeitsoff, Thomas (2014) Does social media influence conflict? Evidence from the 2012 Gaza Conflict. Working paper (http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2407804).

Appendix

Table A1. List of terms used in Farsi, Hebrew, and Arabic components

Term	Language	Translation
إسرائيل	ar	Israel
الكيان الصهيوني	ar	Zionist entity
النووي	ar	Nuclear
النوية	ar	Nuclear
نوي سلاح	ar	Nuclear weapon
صهيونية	ar	Zionism
نوي	ar	Nuclear
نوية	ar	Nuclear
إيران	ar	Iran
ایتم	fa	Nuclear
یل اسرائل	fa	Israel
ی هستها جنگ افزار	fa	Nuclear weapons
یونیستیه یمرژ	fa	Government
یونیسم صه	fa	Zionism
ی هستها	fa	Nuclear
איראן	he	Iran
גרעיני	he	Nuclear
ישראל	he	Israel
גרעיני נשק	he	Nuclear weapons

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