USC University of Southern California

2022 Russo-Ukrainian Crisis

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http://ec2-3-82-92-4.compute-1.amazonaws.com/
https://docs.google.com/document/d/1uYcLlgsyLe4gIAbIHsxKTvkrigzU2IFlu8I7g-UK0Ks/edit?usp=sharing

USC Annenberg
School for Communication and Journalism

Motivation / Background

- Social Movements
  - How can we amplify important conversation

- What conversations are going on Twitter?
- What topics encourage more engagement?
- What does audience sentiment look like?

Research Question & Hypothesis

- Initial RQ : Do high engagement tweets share a common sentiment compared to low engagement tweets? What topics do people care about?

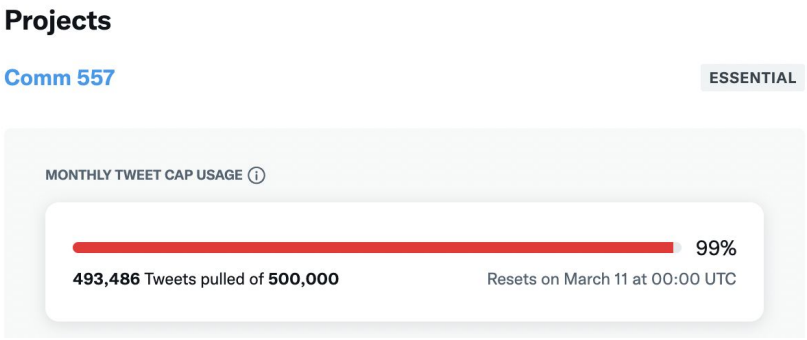
- H: There is a difference between sentiment expressed and topics discussed in high engagement tweets versus low engagement tweets.

Previously…

- Until Midterm, No Public Dataset
- Now, many useful public dataset on Kaggle, Github, etc…
  - https://github.com/echen102/ukraine-russia
    - Chen, E., & Ferrara, E. (2022). Tweets in Time of Conflict: A Public Dataset Tracking the Twitter Discourse on the War Between Ukraine and Russia. arXiv preprint arXiv:2203.07488.
- Public dataset can help the research community to further understand role of social media in information dissemination, and much more, during a time of conflict

Data Collection

- Scraped hashtag with #Ukraine* or #Russia*
- Start date : Feb 18, 2022, 00:00am
- End date : Apr 1, 2022, 11:59pm
- Total 2M+ Tweets Collected




```
220226_125912 : 1002 tweets in dataframe at 220302_234741
220226_125823 : 2009 tweets in dataframe at 220303_000011
220226_125736 : 3009 tweets in dataframe at 220303_001234
220226_125649 : 4000 tweets in dataframe at 220303_002458
220226_125559 : 5004 tweets in dataframe at 220303_003731
220226_125509 : 6004 tweets in dataframe at 220303_005007
220226_125415 : 7000 tweets in dataframe at 220303_010249
220226_125320 : 8003 tweets in dataframe at 220303_011549
220226_125225 : 9001 tweets in dataframe at 220303_012843
220226_125128 : 10007 tweets in dataframe at 220303_014133
./Tweets/ukraine_220226_125128.csv saved
./Tweets/names_220226_125128.csv saved
:: Time stamp 2022-02-26T12:51:28.000Z with 10007 tweets
```

Data Timeframe

- Data selection:

Scraping 24/7 tweets but without retweet text

Scraping 3-4 hours per day amount of tweets with retweet text

No Data

Resume scraping 24/7 tweets with retweet text

Feb 25, 2022

Mar 19, 2022

Mar 26, 2022

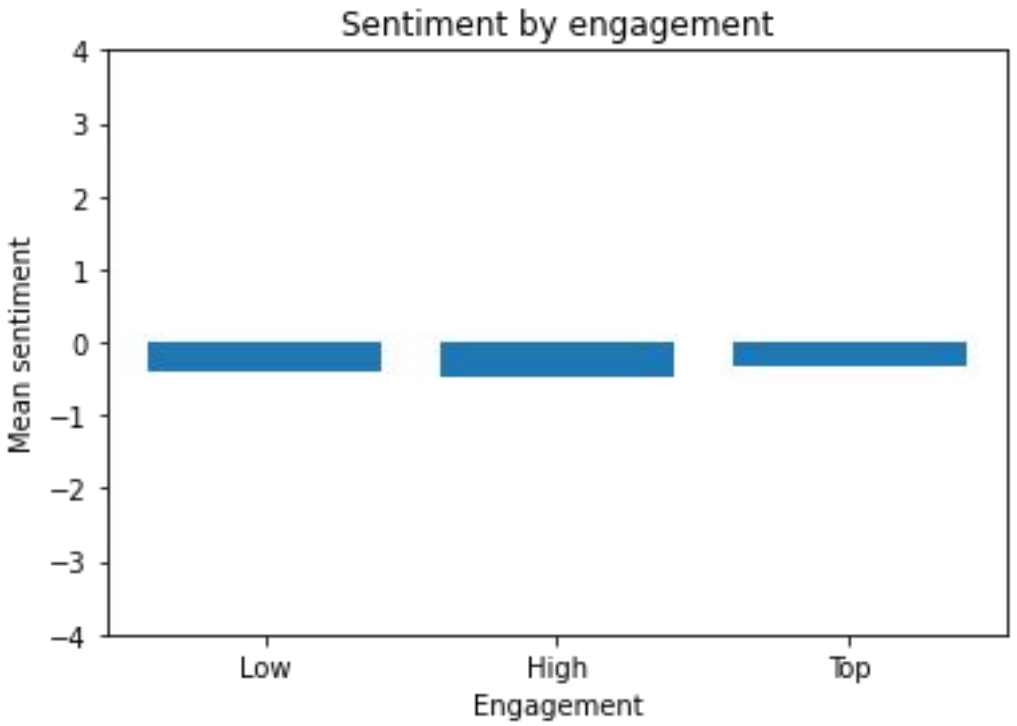
Sentiment Analysis

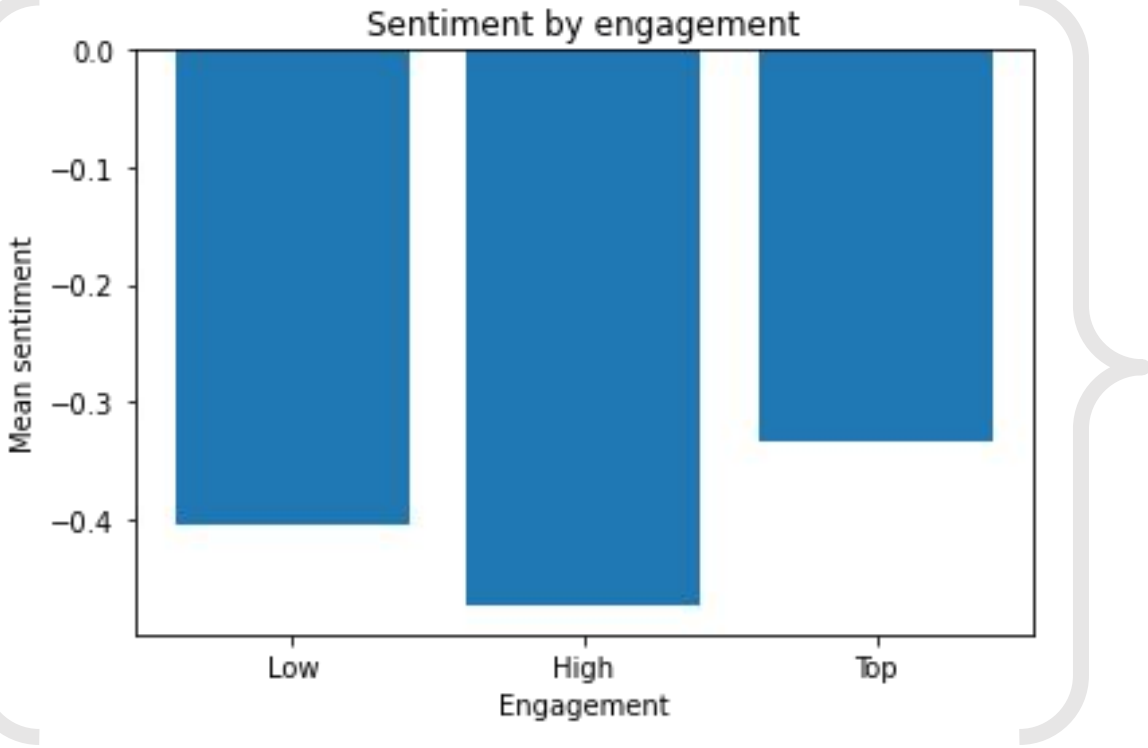
SentiStrength	Low engagement (≤40)	High engagement (40-10k)	Top (>10k)
-4	0%	0%	
-3	5%	5%	5%
-2	18%	20%	10%
-1	12%	12%	19%
0	49%	45%	48%
1	13%	14%	19%
2	4%	4%	
3	0%	0%	
4	0%	0%	

Sentiment Analysis

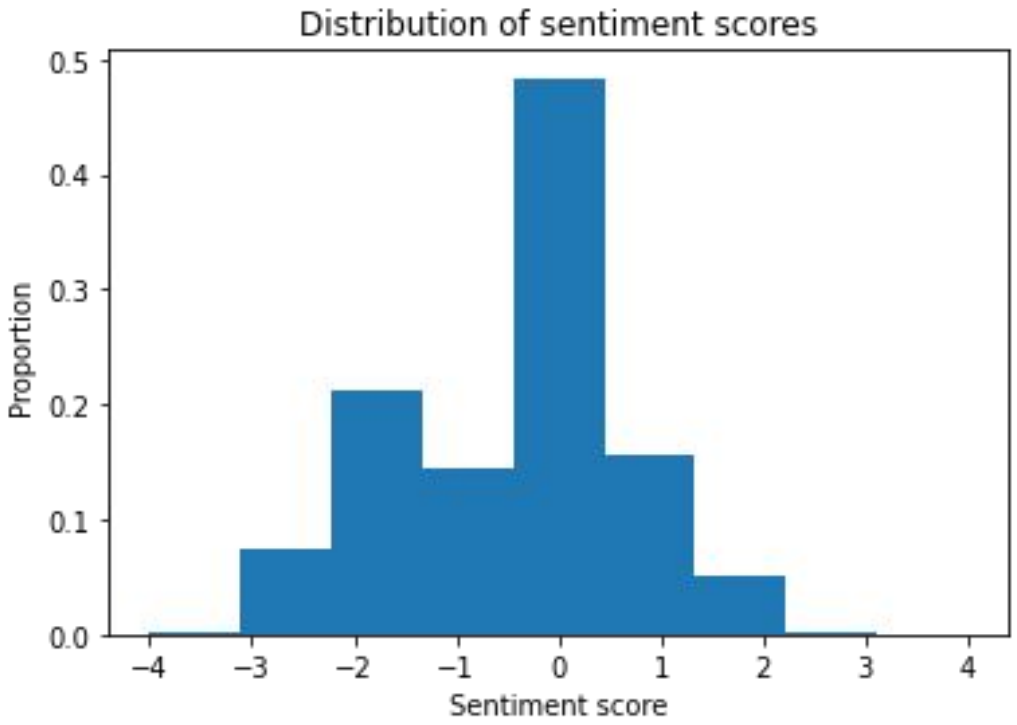
	Low engagement	High engagement	Top
Total tweets	497,718	441,656	55,908
Unique tweets	219,057	8,359	21
Sentiment: Mean	-0.406	-0.475	-0.333
Sentiment: STD	1.186	1.242	1.039

Sentiment Analysis





Sentiment Analysis



(Midterm: 995,282)

15,977,769

Total tweets

(Midterm: 227,437)

771,940

Unique tweets

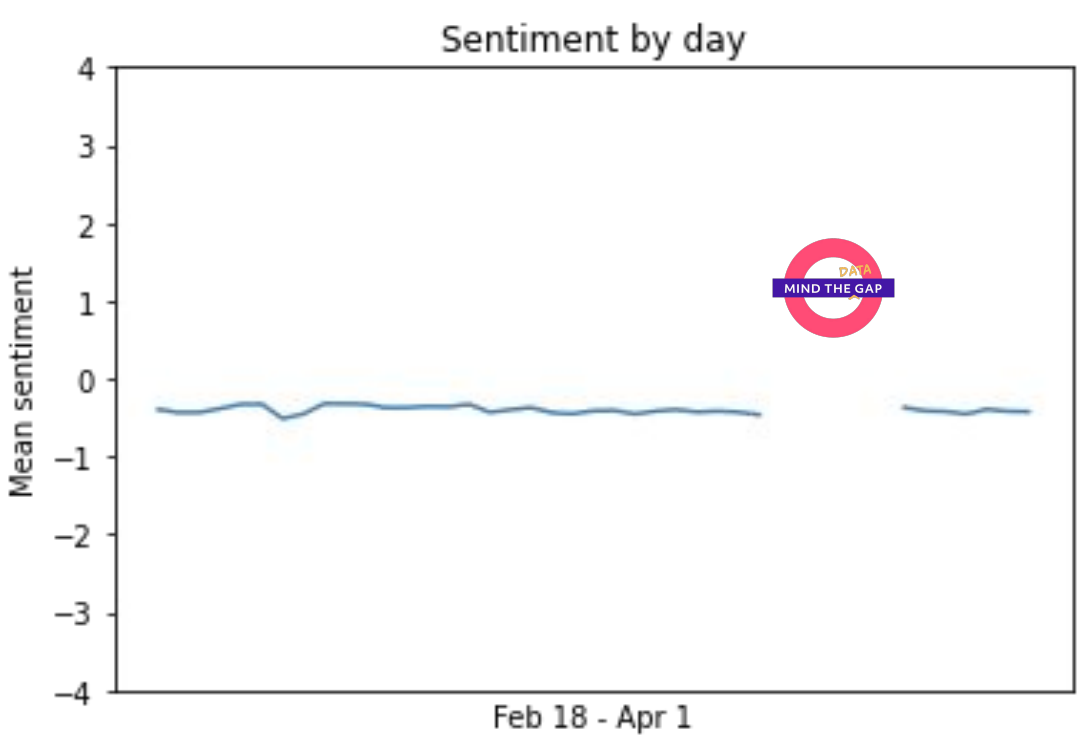
-0.477

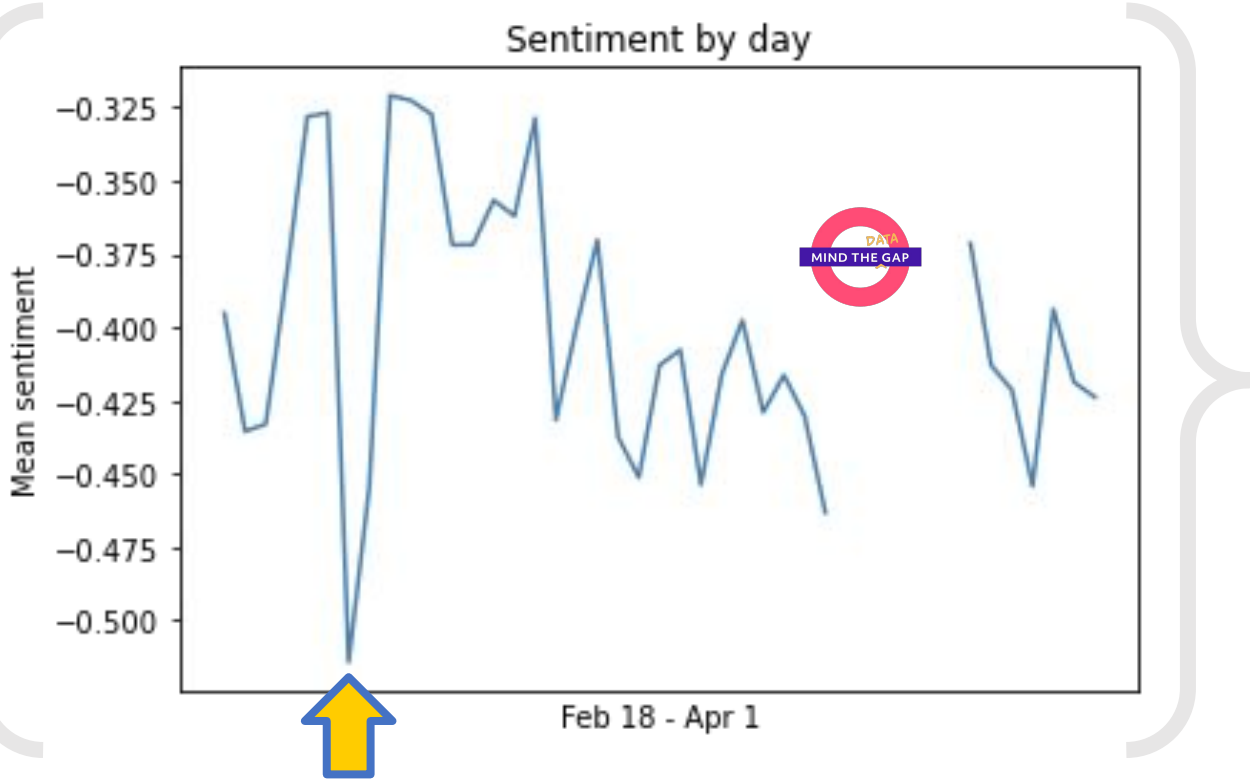
Mean sentiment

1.272

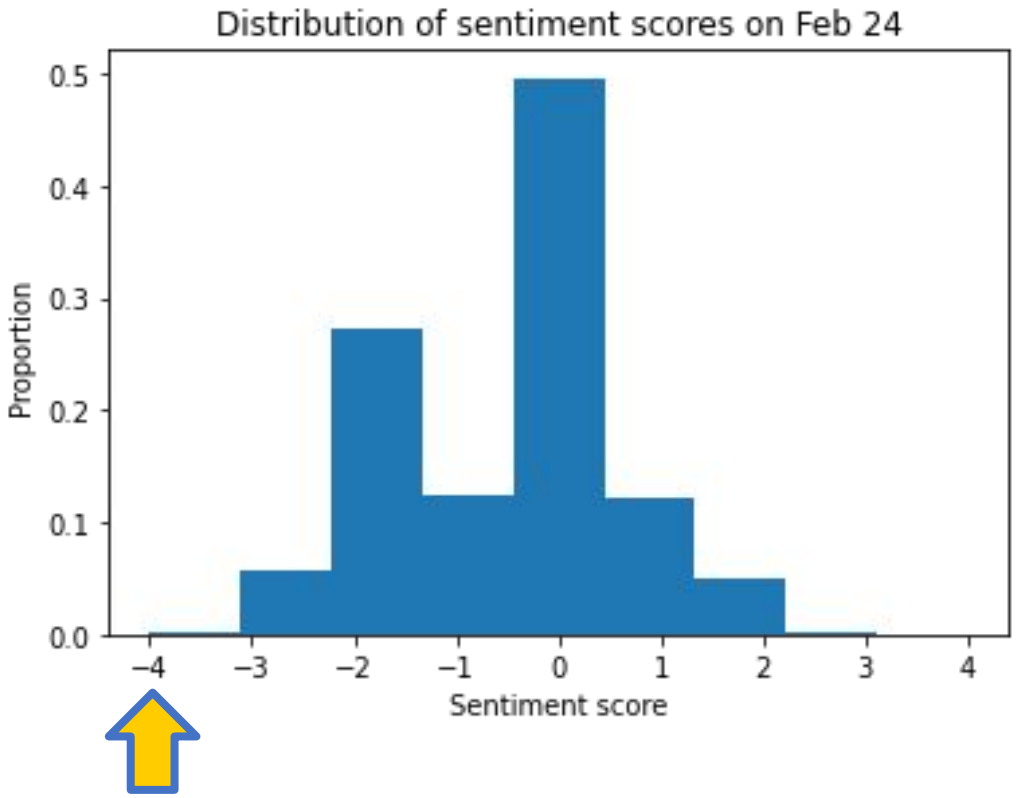
STD

Sentiment Analysis





Sentiment Analysis



Sirens sounding in Kyiv. Such a **sad sad day**. Putin is such an evil man.

#Putin is decimating Ukraine's military and non-military infrastructure by Land, Air and Sea. I'll be honest I **didn't see a full-scale invasion coming**. This is a really scary time for the people of #Ukraine who probably never asked to be a pawn in this superpower struggle.

These UK diplomats and foreign pol experts saying oh we thought Putin was more sensible, we so fucking shocked, **biggest Pikachu face in the fucking world**. Putin has been
- destabilising Ukraine for 8 years
- consistently making irredentist, Pan Slavic, blood and soil statements

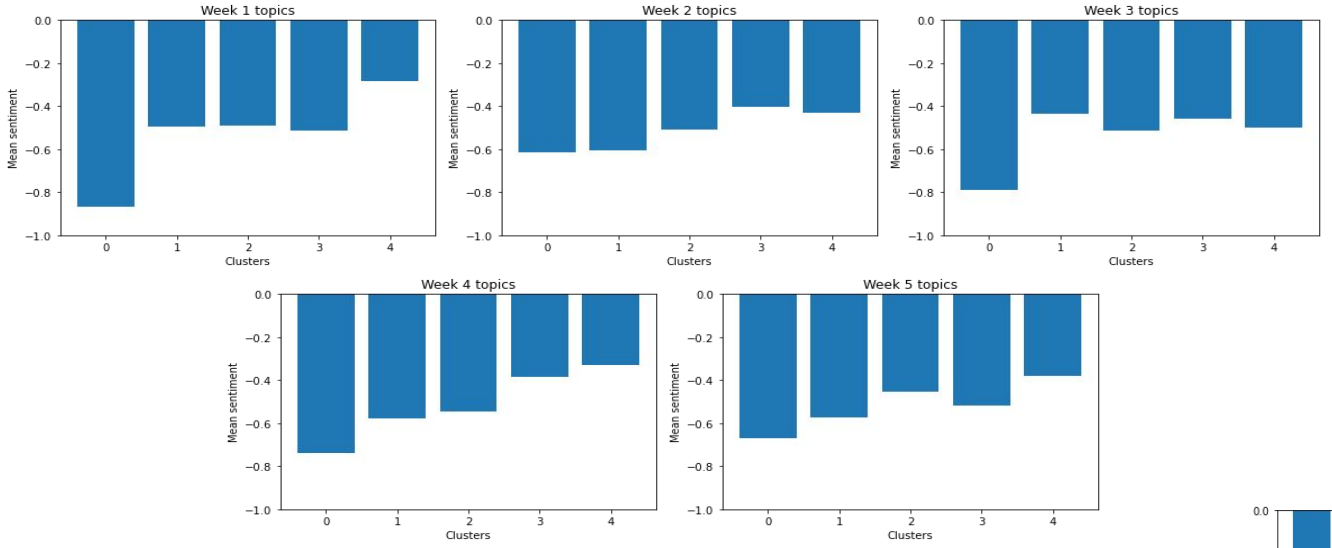
My professional take as a international relations expert on #Ukraine: fuck fuuuck, Jesus Christ..

Sad, sad day #ukraine

Sentiment Analysis + Topic Modeling Cross-analysis

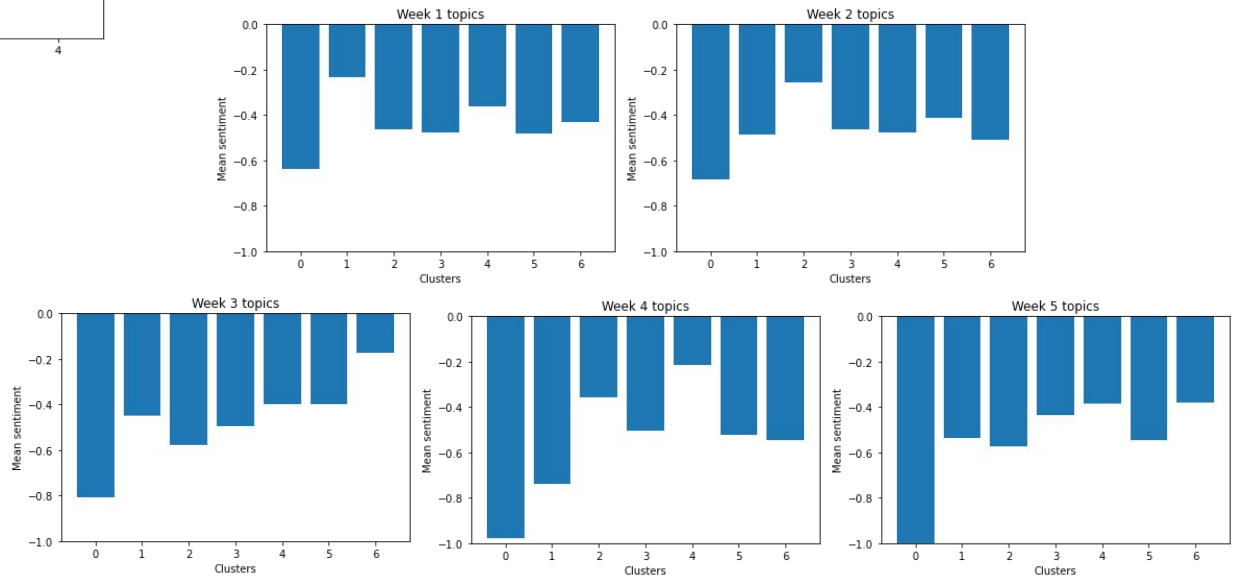
	week_cluster	importance	0	1	2	3	4	5	6	7	8	9	10
0	1_5	0.180902	russian	regions	donetsk	troops	eastern	ukraine	putin	forces	republics	luhansk	separatis
1	1_5	0.149232	sanctions	russia	ukraine	gas	crisis	tensions	foreign	security	minister	says	invasion
2	1_5	0.131858	putin	russia	ukraine	war	biden	invade	amp	world	just	like	presiden
3	1_5	0.104632	border	ukraine	video	state	military	new	air	emergency	state emergency	russian	live
4	1_5	0.076295	amp	today	good	time	years	russian	ukraine	russia	security	people	day
5	1_7	0.164149	troops	ukraine	russian	eastern	military	border	forces	russia	tensions	invasion	putin
6	1_7	0.163238	putin	ukraine	russia	regions	recognition	republics	president	independence	says	invade	nato
7	1_7	0.140893	biden	ukraine	putin	russia	president	crisis	sanctions	trump	joe	leave	speech

Cross-analysis

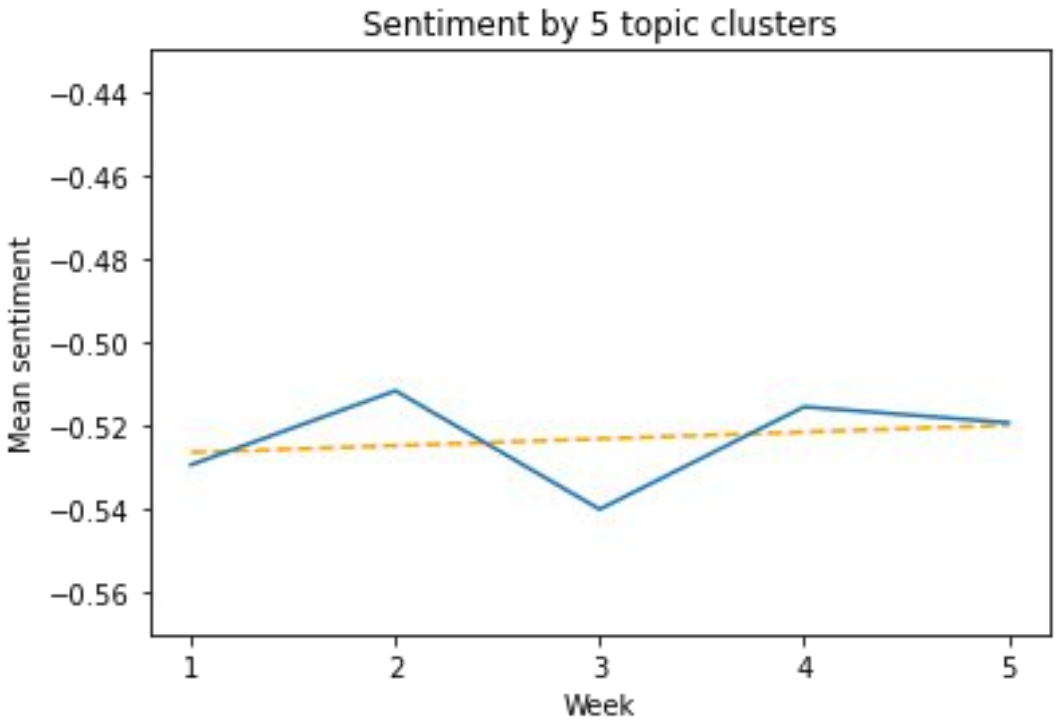


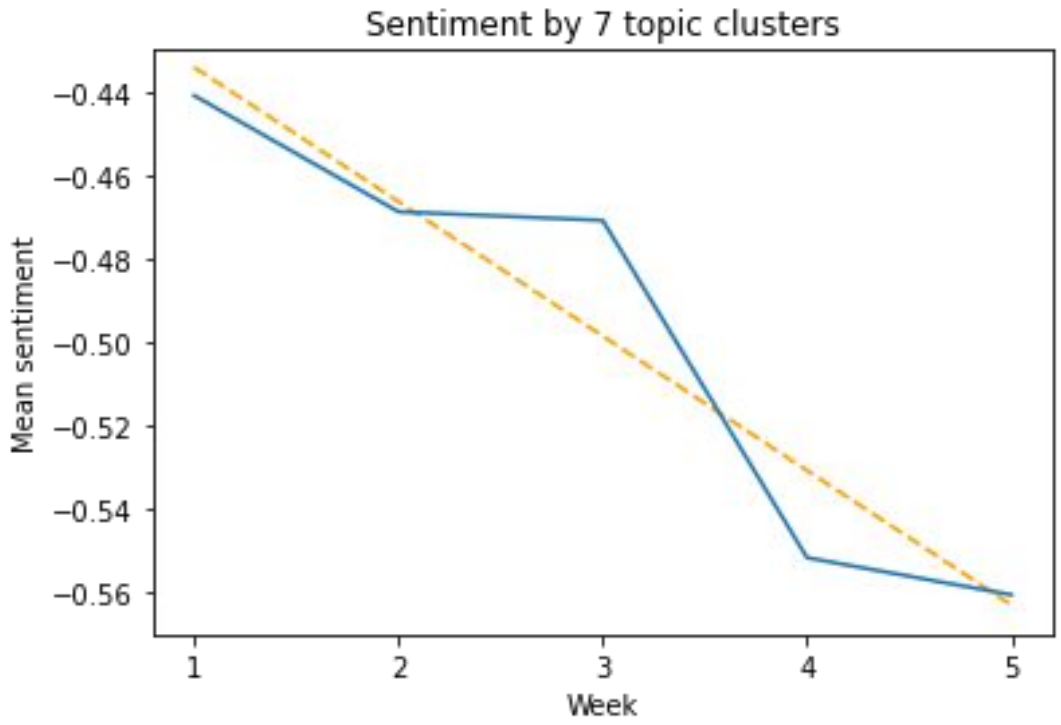
5 topic clusters

7 topic clusters

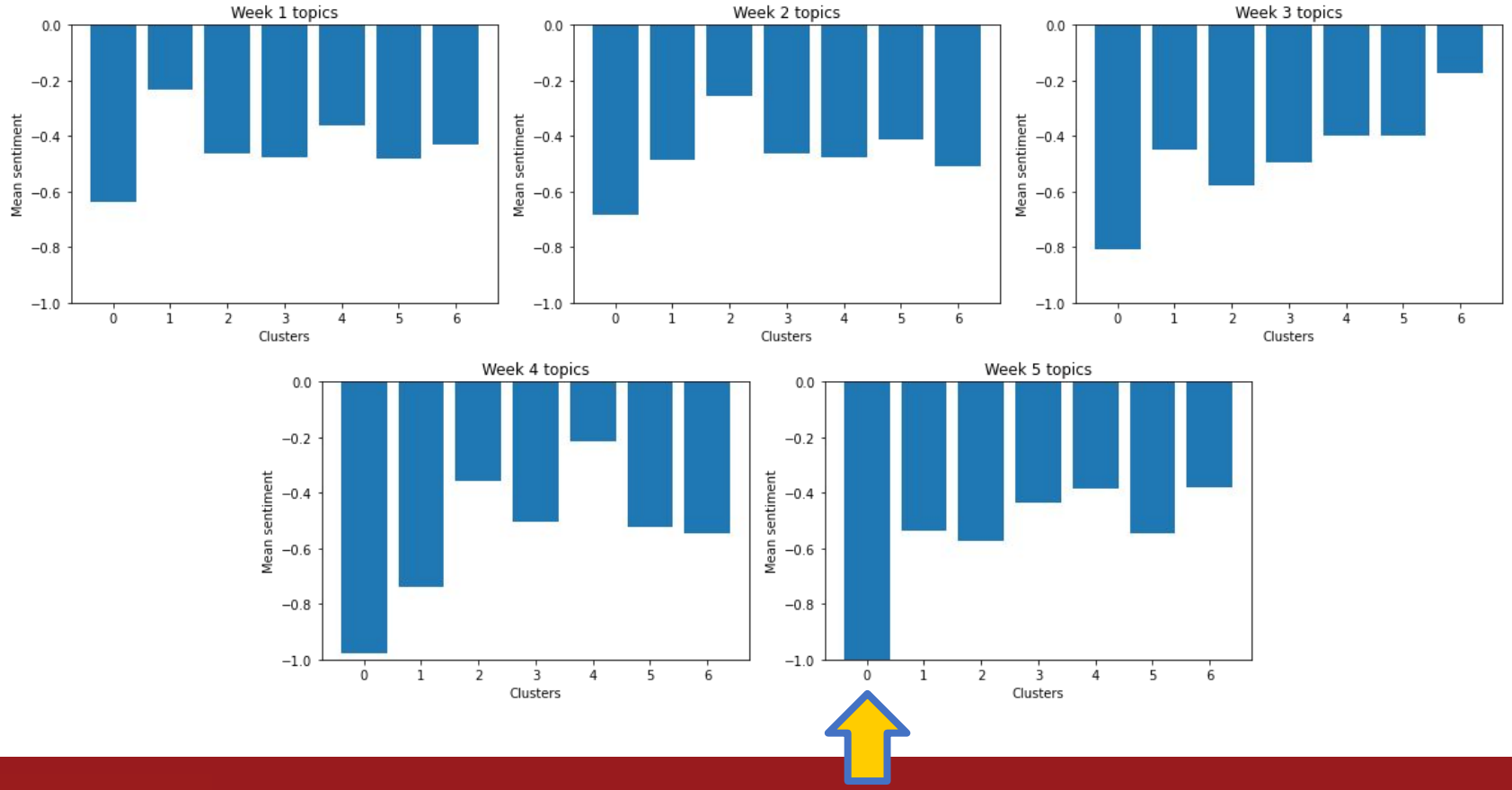


Cross-analysis

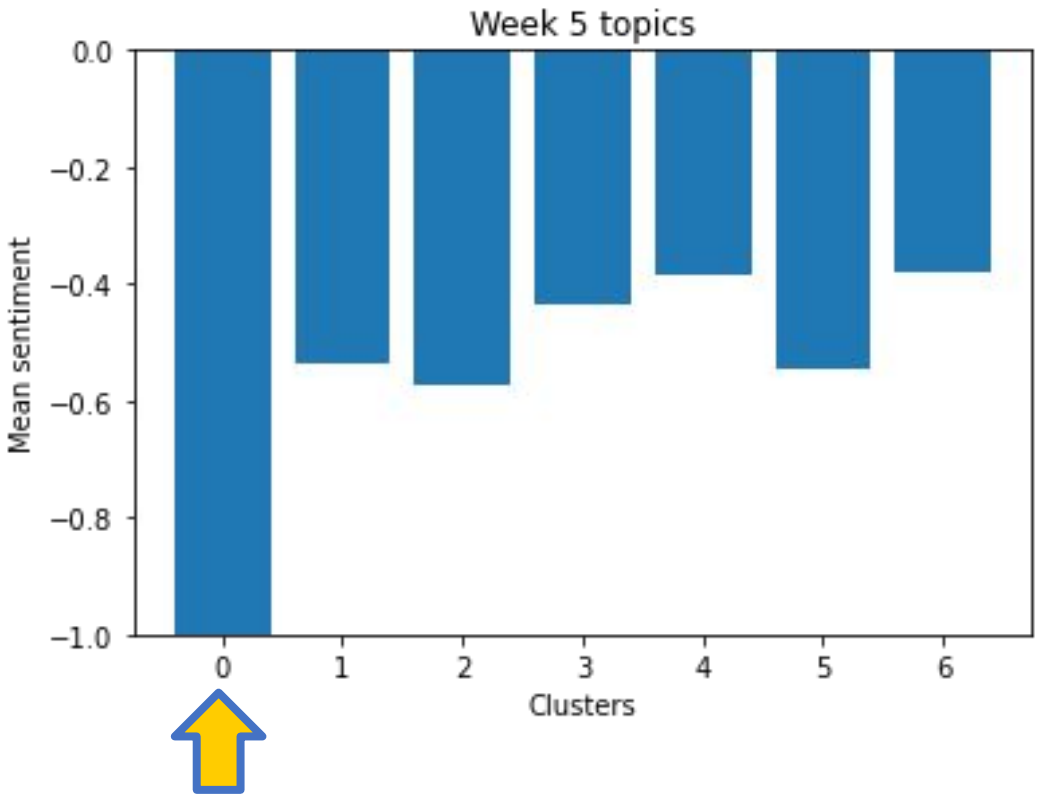




Cross-analysis



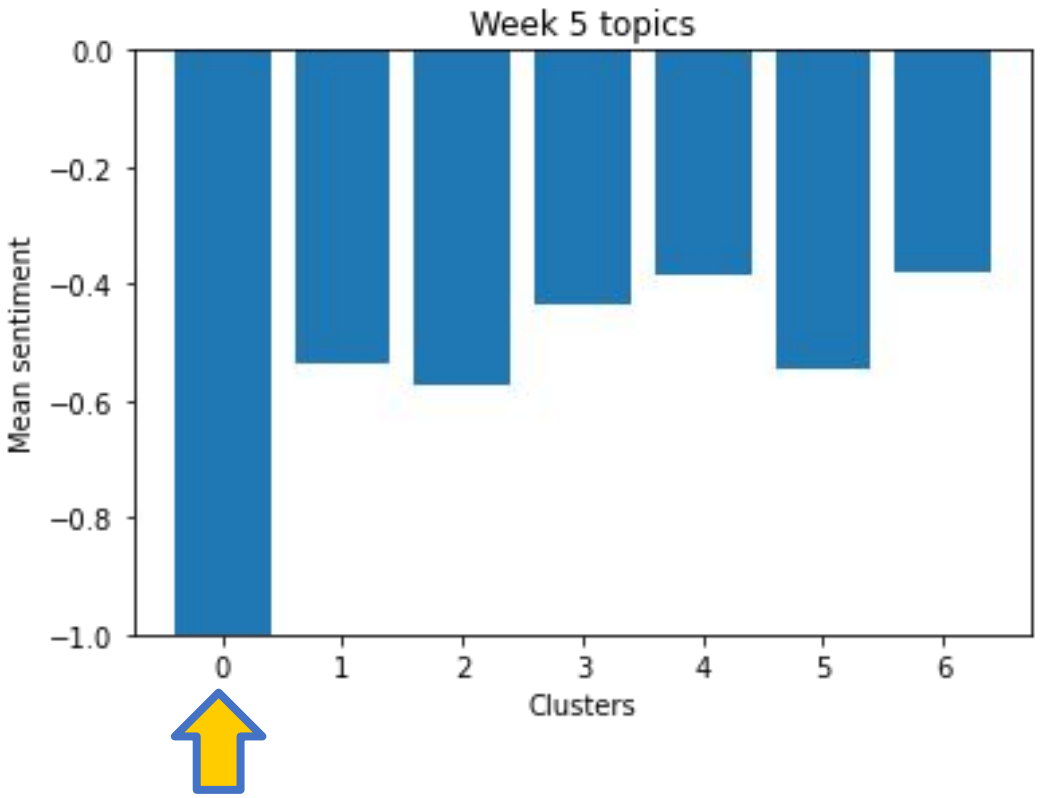
Cross-analysis



Sentiment = 4

As of Sunday night, the media says there's a massive Russian convoy headed toward **Kiev**. Putin actually thinks he's taking Ukraine. 😂 GOOD. FUCKING. LUCK. "I am not in danger. I am the danger" -- Kiev Citizen #Ukraine 🇺🇦💪 #StandWithUkraine

Cross-analysis



Sentiment = 0

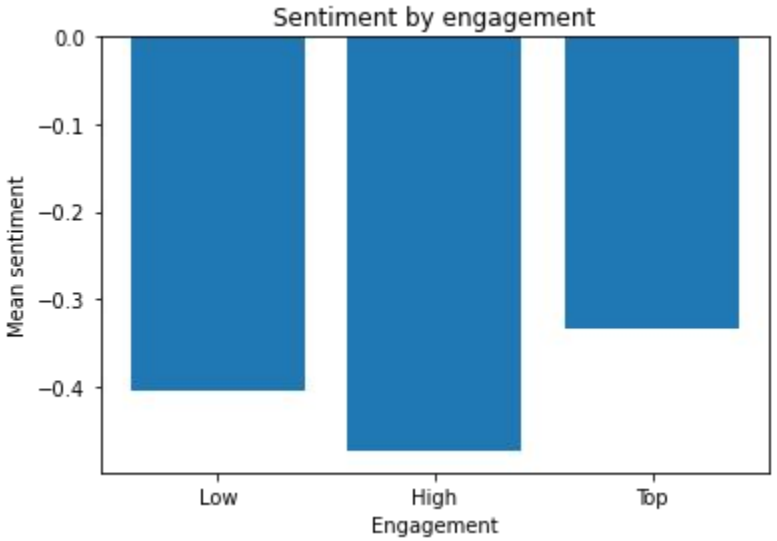
#**Kharkiv** saw at least 10 deaths and injuries in 35 people in rocket **strike**s by Russian forces on the centre of #Ukraine's second-largest city.

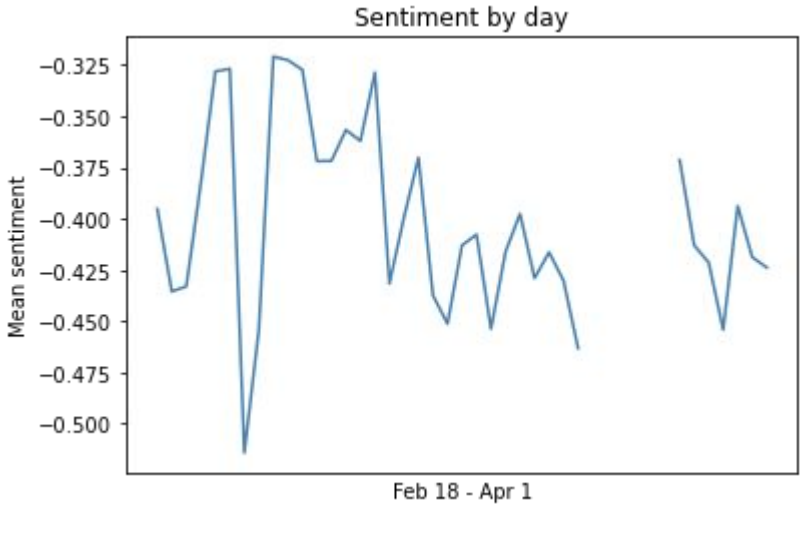
Heavy **shelling** in #**Kharkiv** continues in the night. #Russia #RussiaUkraine #WarCrimes #RussianUkrainianWar

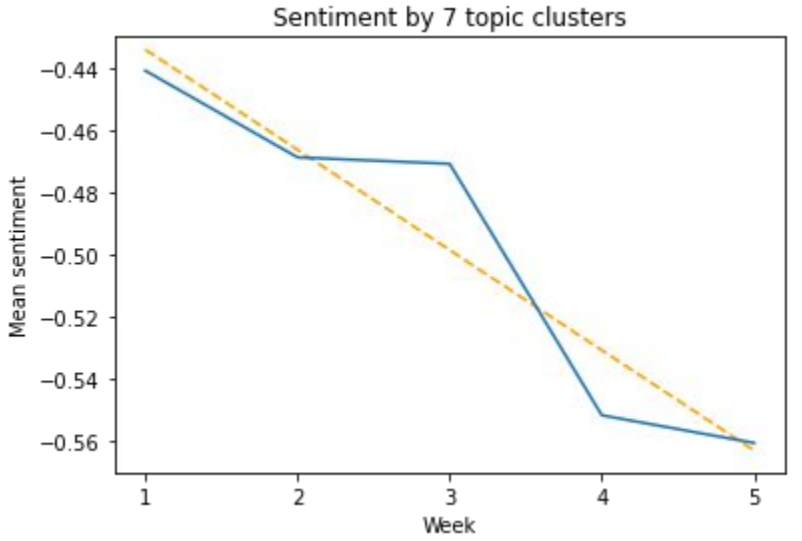
I hear #Russia is **shelling** kindergartens this morning, only a matter of time before they start bayoneting babies.

It appears they hit an **Oil Depot** and that is what is currently on fire. Unconfirmed. "Footage from Vasilkov where the **strike** was carried out, probably by a ballistic **missile**." #Ukraine #Vasilkov #**Kyiv**

Sentiment Analysis







Sentiment Analysis + Topic Modeling Cross-analysis

- Number of topics 7, using topics of Sentiment Score +4 texts

n_topics	importance	0	1	2	3	4	5	6	7	8	9	10
7	0.817292	fantastic	fucking fantastic	military	news	new	morning	pic military	military report	uav arrived	uav	morning update
7	0.663964	woman	brave woman	incredibly brave	brave	incredibly	fucking amazing	amazing	help	world	dark	country
7	0.599624	face	followers	fucking love	putins invasion	follow	putins	end	invasion	defiance putins	end week	face 10
7	0.570233	brave heroine	heroine	incredibly brave	brave	incredibly	solidarity	owned	stand	nato	nato solidarity	imperialist rivalry
7	0.474012	fucking hero	hero	fucking	man	hugely	popular	support	especially	money	need	respect
7	0.460527	absolutely	extremely	loved	people	loving	extremely brave	courage	work	beautiful	fuckin	raise
7	0.393198	brave people	people	amp	day	kyiv	really	incredibly	thrilled	hope	im	good

Cross-analysis

- Number of topics 4 → still similar topics exists

n_topics	importance	0	1	2	3	4	5	6	7	8	9	10	11
4	0.611651	brave	incredibly	incredibly brave	woman	brave woman	people	extremely	brave people	putin	world	help	good
4	0.599701	fucking	fucking hero	fantastic	news	hero	fucking fantastic	new	military	morning	armed	pic military	pic
4	0.367828	heroine	brave heroine	amp	amazing	loved	face	followers	fucking amazing	absolutely	thrilled	courage	friends
4	0.345122	day	hugely	people	fucking	love	fucking love	invasion	beautiful	office	awesome	fucking awesome	time

Cross-analysis and needs of visualization

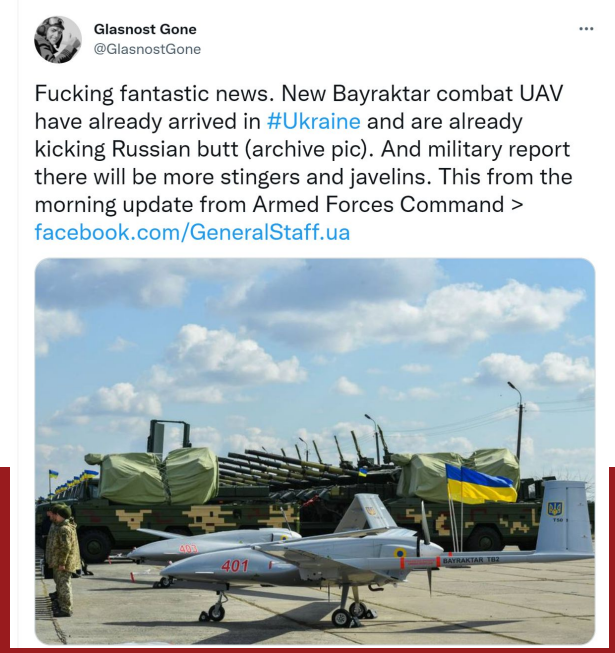
- Number of topics 3 → topics are converged

n_topics	importance	0	1	2	3	4	5	6	7	8	9	10
3	0.639273	fantastic	news	fucking fantastic	new	military	morning	news new	bayraktar combat	bayraktar	pic	pic military
3	0.567082	brave	incredibly	incredibly brave	woman	brave woman	people	amp	brave heroine	heroine	extremely	brave people
3	0.394298	hero	fucking	fucking hero	invasion	loved	protests	day	solidarity	owned	stand	thats

→ Bayraktar combat

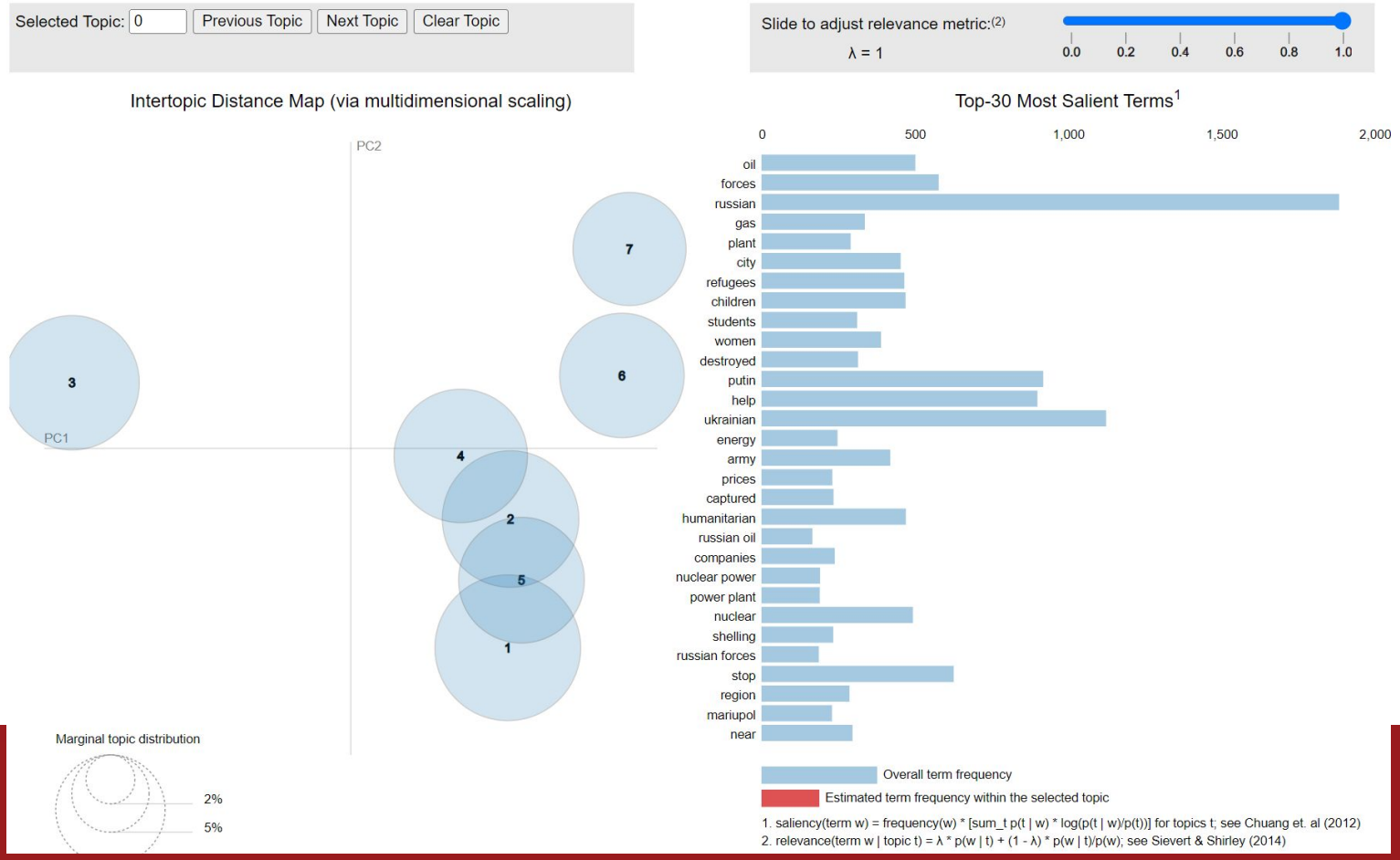
→ Brave protestants (Many cases)

→ Zelensky and soldiers



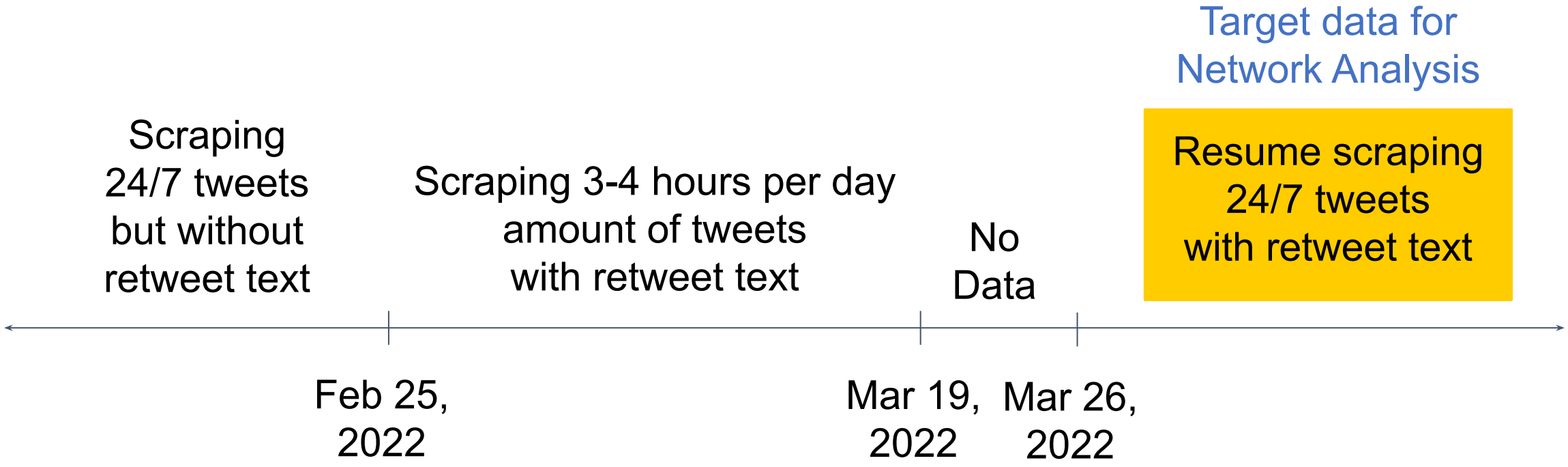
Topic modeling and visualization

- By using visualization, we can guess optimal number of clusters



Network Analysis - retweets

- Data selection:



Network Analysis - retweets

- Selected 100 top retweeted texts in the target period

→ 9 distinct texts

→ Filtered to 5 authors with self-identified location

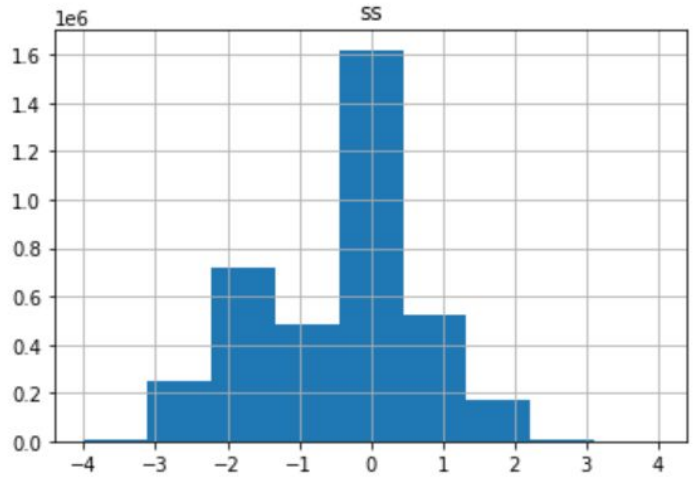
to_username	to_location	to_lat	to_long
HannaLiubakova	Belarus	53.425061	27.697136
nexta_tv	Belarus	53.425061	27.697136
lesiavasylenko	Kyiv	50.450034	30.524136
GHS	NY/Delhi/Rio/Beijing/Nairobi/Joburg/London	16.117451	19.899738
UAWeapons	UK	54.702354	-3.276575

→ latitude and longitude of the center of 7 cities

Network Analysis - retweet sentiment score

Whole corpus

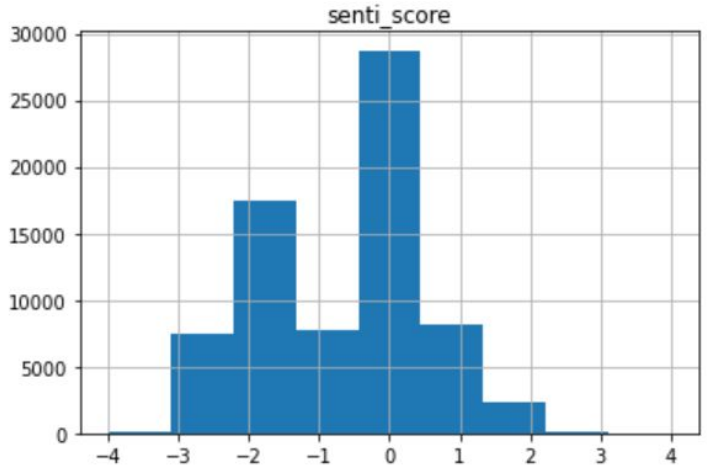
mean: -0.48
standard deviation: 1.27



Target retweet data

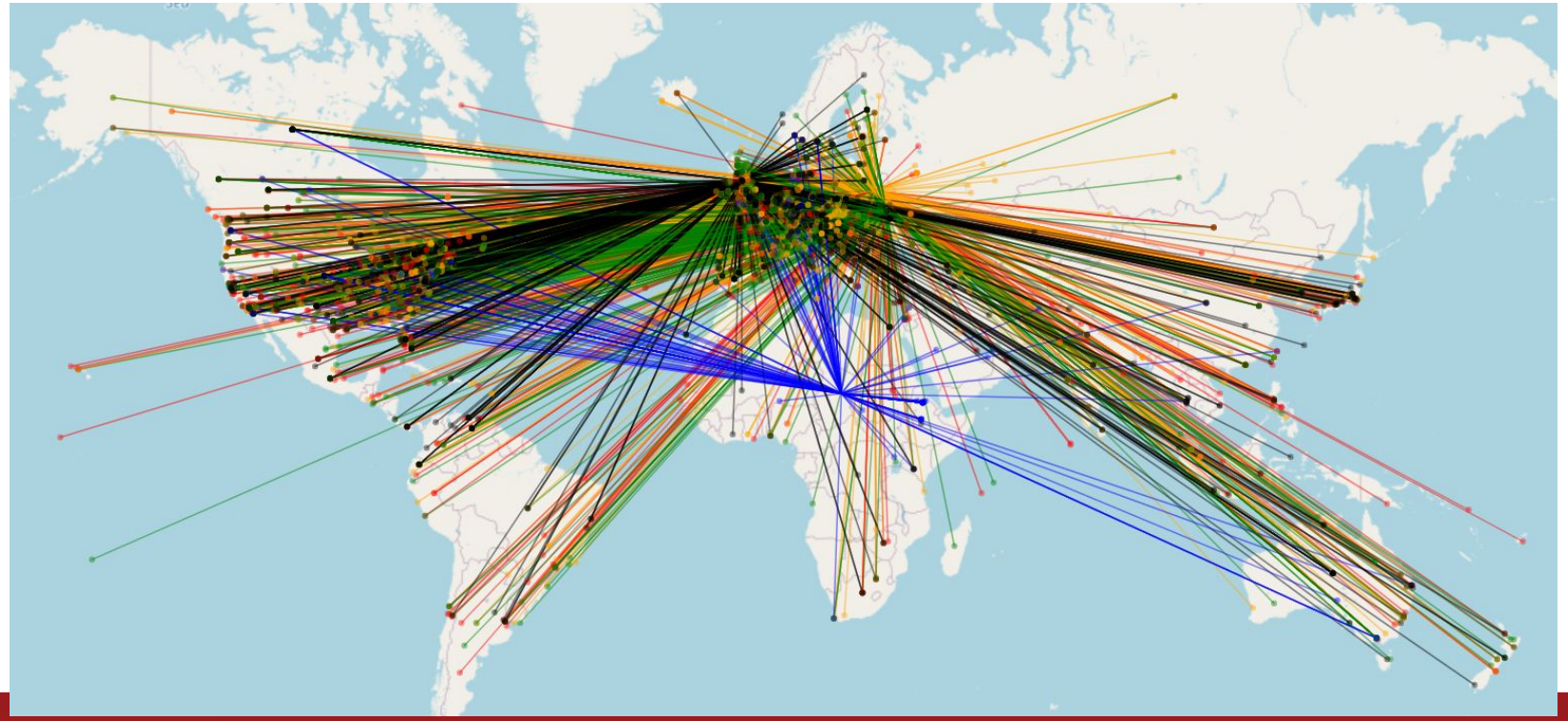
mean: -0.72
standard deviation: 1.33

→ more negative
→ more diverse



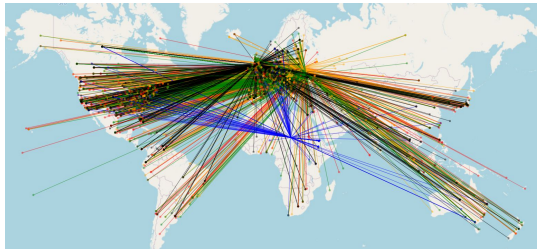
Network Analysis Visualization

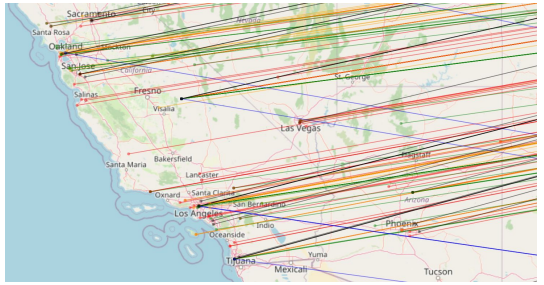
- Drew a map with depth 1

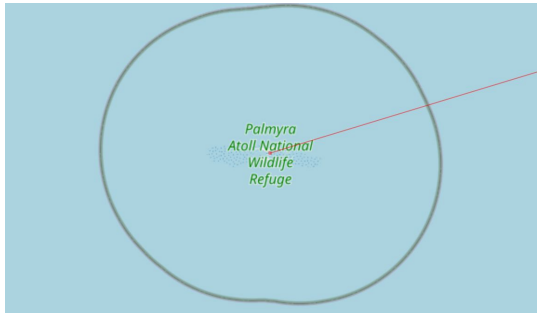


Network Analysis

- This is the power of only five tweets
- Retweeters retweet not only once
- A tweet goes literally everywhere







Topic Modeling - LDA

- Top Vectors (Feb 18th) by 5 clusters
  - Topics: Evacuation, Invasion, Gas explosion, Video, Nuclear

top_20	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0.076836	evacuation	donetsk	shelling	civilians	eastern	separatists	region	ukraine	forces	separatist	ukrainian	dpr	republic	russia	russian	children	donbass	evacuate	residents	luhansk
0.071517	ukraine	invade	russia	war	putin	biden	president	says	russian	just	invasion	attack	crisis	convinced	world	amp	days	false	invade ukraine	going
0.056428	explosion	amp	ukraine	russian	border	security	media	military	pipeline	gas	russia	minister	donetsk	foreign	says	news	gas pipeline	reports	powerful	ukrainian
0.053425	video	watched	latest	watched latest	latest video	ukraine	russia	like	biden	amp	invasion	putin	crisis	time	lets	war	russian	thank	watch	right
0.049866	project	ukraine	russia	drills	russian	2022	amp	forces	attack	nuclear	defense	feb	analysis	18	day	february	results	ministry	missiles	strategic

Topic Modeling - LDA

- Top Vectors (Feb 25th) by 5 clusters
  - Topics: War, Shelters, India China vote, Zelensky, Invasion

top_20	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0.083687	war	people	ukraine	world	stop	peace	pray	like	god	putin	amp	support	heart	stop war	love	russia	know	help	just	lets
0.080910	russian	forces	ukrainian	kyiv	sky	shelter	ukraine	capital	air	kiev	near	military	troops	people	close	city	destroyed	russian forces	close sky	shot
0.067676	ukraine	help	support	war	people	russia	resolution	council	need	invasion	security	security council	russian	amp	india	today	china	vote	time	solidarity
0.066395	ukraine	president	russia	ukrainian	people	stand	russian	zelensky	war	amp	nato	country	help	right	kyiv	fight	putin	dont	invasion	want
0.061190	russian	ukraine	invasion	russia	amp	putin	war	ukrainian	military	tank	russias	indian	video	kyiv	car	minister	students	army	new	foreign

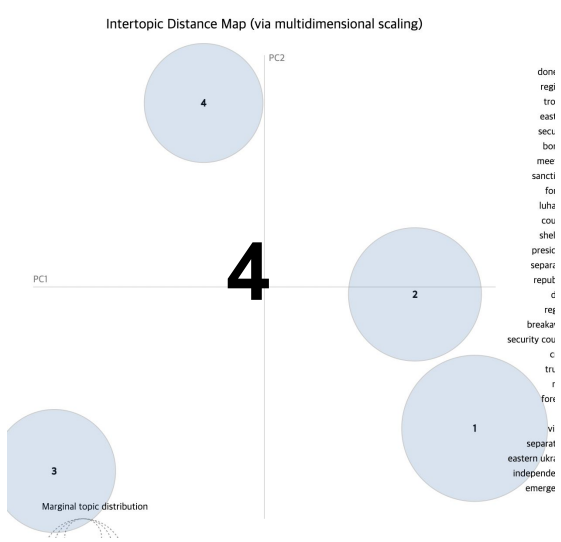
Topic Modeling - LDA

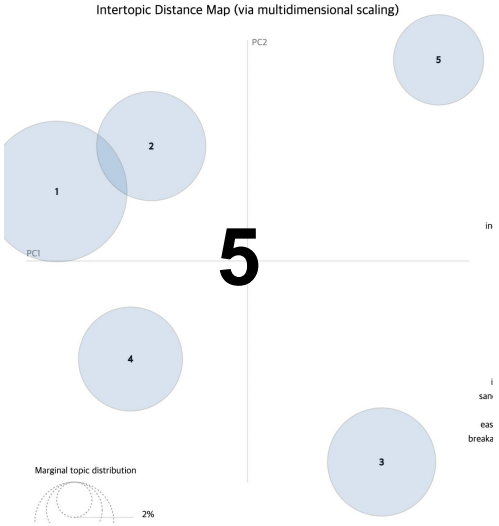
- Tweets (Feb 18-25)

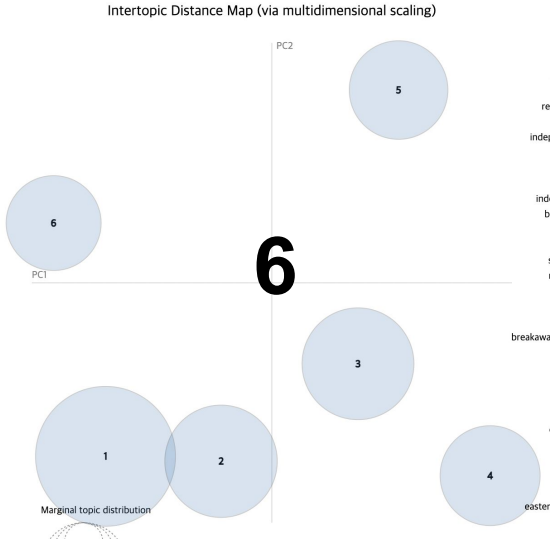
18	19	20	21	22	23	24	25
Biden says the U.S. believes Putin has decided to **invade** Ukraine. 'A whistling sound, then an **explosion'**: Shelling hits a kindergarten in Ukraine.	President Vladimir Putin held a test of its **nuclear** readiness that included launching three missiles.	Shelling intensifies in eastern Ukraine and thousands of civilians board buses to **evacuate**.	The Kremlin said Russia would recognize two areas in Ukraine held by Moscow-backed separatists, setting the stage for a potential **invasion**.	President Biden is speaking. He is expected to announce new **sanctions** against Russia, joining E.U. leaders condemning Vladimir Putin. Germany halted a key Russian natural **gas pipeline**, the West's strongest move yet to punish Moscow for recognizing separatist regions in Ukraine.	Russia's **invasion** of Ukraine has begun, the Ukrainian interior ministry said. **Explosions** were reported in Kyiv and other parts of the country.	Russia **declares war** over Ukraine Ukraine's government vowed an "all-out **defense**" as Russia attacked more than a dozen cities and towns across the country **from land, air and sea.**	At the Polish Border, Tens of Thousands of Ukrainian **Refugees** It's not just **China**: **India** is tiptoeing around Russia's invasion of Ukraine too.

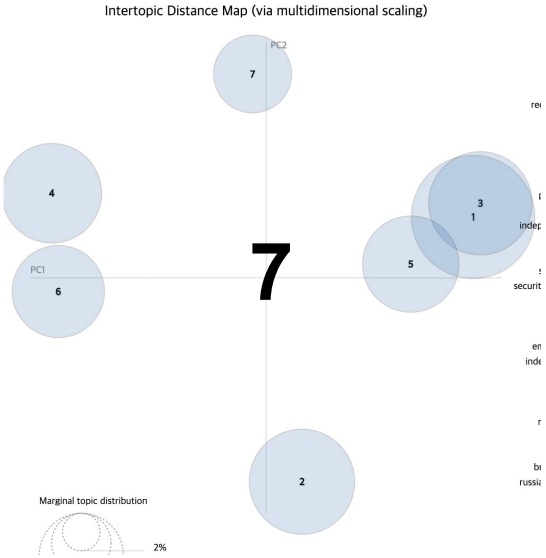
Connection with Real World

- Tried LDA topic modeling with 4, 5, 6, 7 clusters
- 4 clusters had no overlap between the clusters

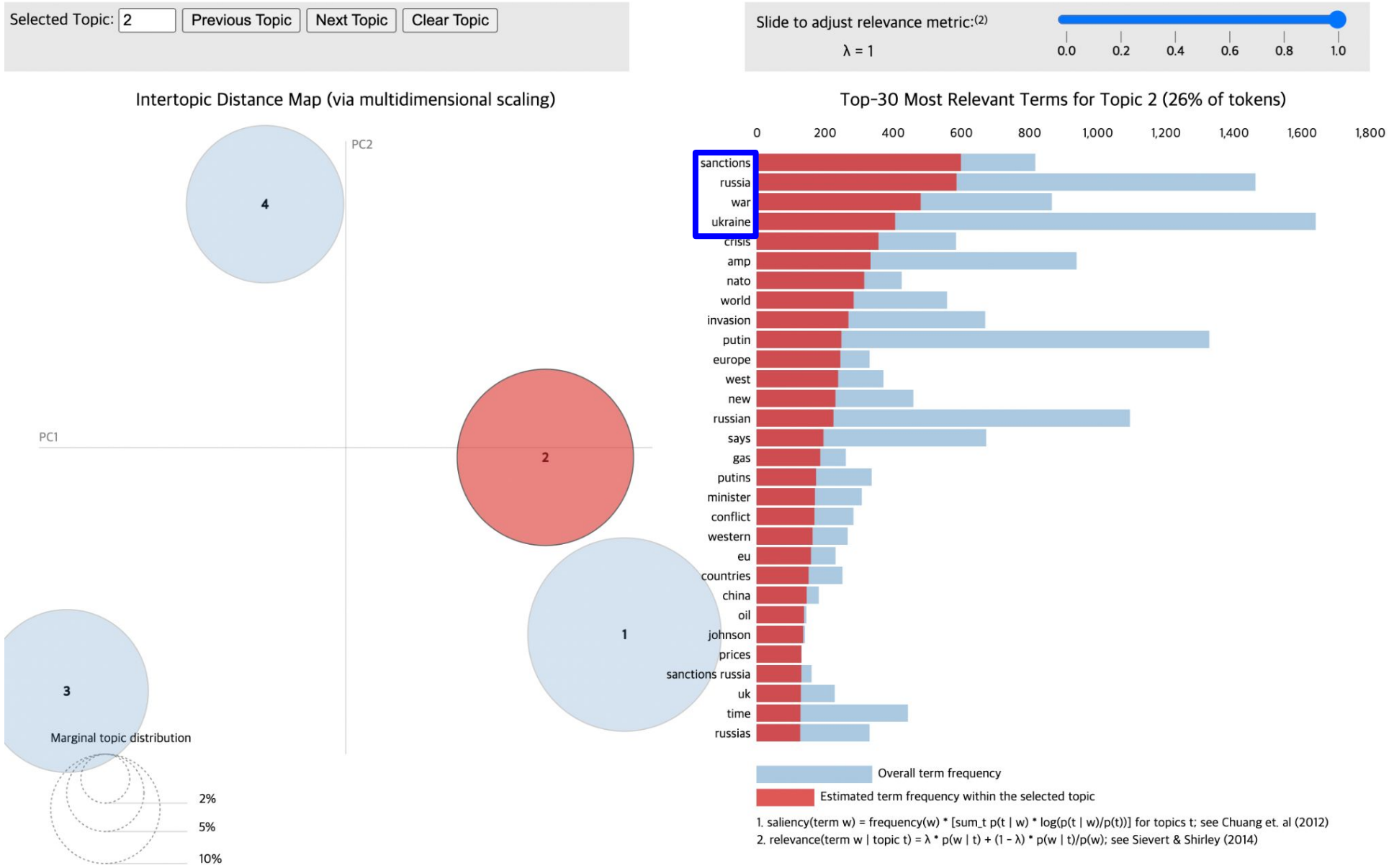








Week 1
(2/18 - 2/23)



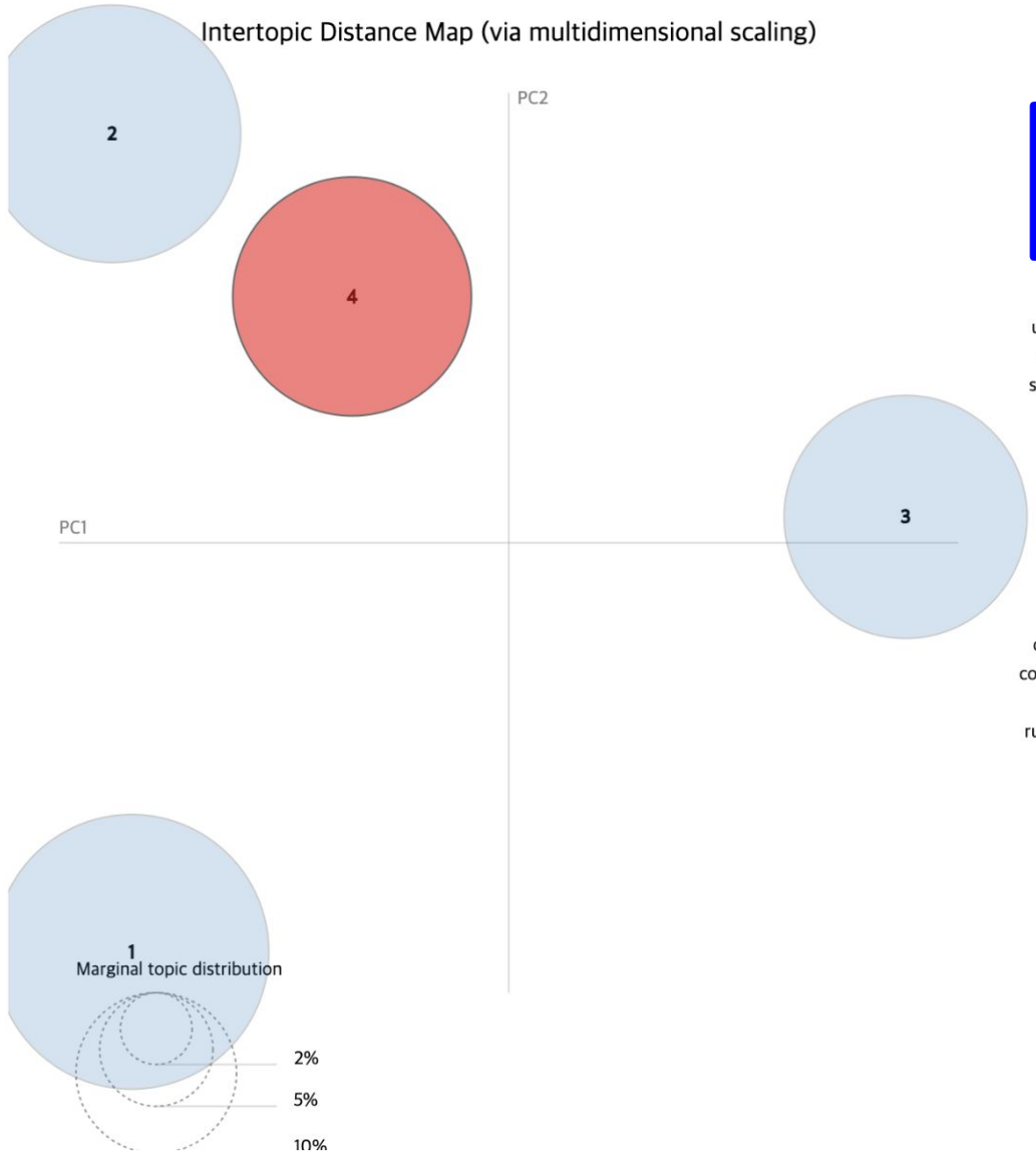
NATIONAL SECURITY

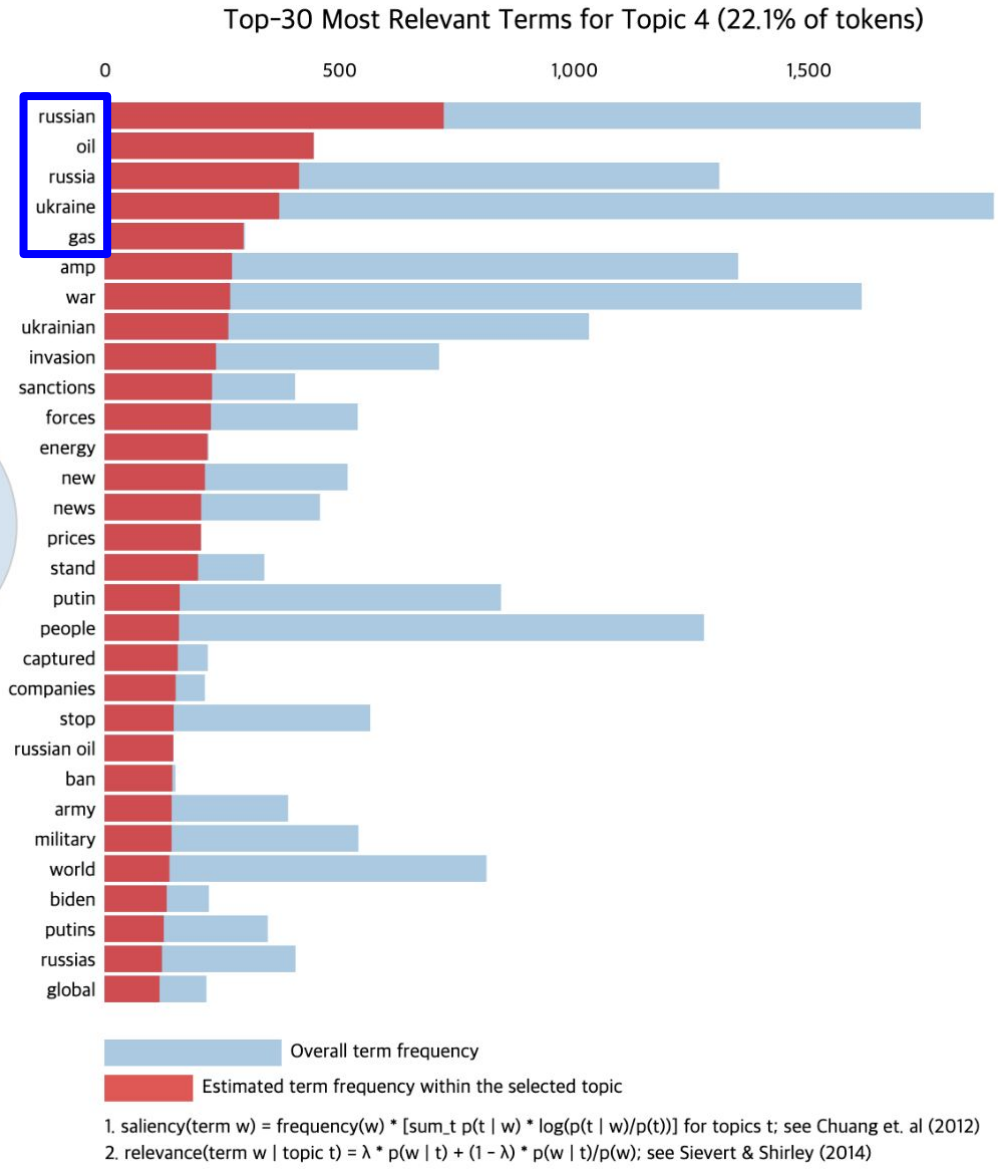
U.S., European allies announce first wave of sanctions after Russian troops enter eastern Ukraine

By Shane Harris, Ellen Nakashima and Michael Birnbaum

February 22, 2022 at 7:58 p.m. EST

Week 3
(3/3 - 3/10)


Intertopic Distance Map (via multidimensional scaling)
PC2
PC1
2
4
3
1
Marginal topic distribution
2%
5%
10%


Top-30 Most Relevant Terms for Topic 4 (22.1% of tokens)
0
500
1,000
1,500
russian
oil
russia
ukraine
gas
amp
war
ukrainian
invasion
sanctions
forces
energy
new
news
prices
stand
putin
people
captured
companies
stop
russian oil
ban
army
military
world
biden
putins
russias
global
Overall term frequency
Estimated term frequency within the selected topic
1. saliency(term w) = frequency(w) * [sum_t p(t | w) * log(p(t | w)/p(t))] for topics t; see Chuang et. al (2012)
2. relevance(term w | topic t) = λ * p(w | t) + (1 - λ) * p(w | t)/p(w); see Sievert & Shirley (2014)

BBC Sign in

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Ukraine conflict: Petrol at fresh record as oil and gas prices soar

7 March | Comments

Russia-Ukraine war

Challenges, Limitations & Future Directions

- Interpreting results requires human labor
- Choosing meaningful subset of data to analyze
- Only tweets in English
  - Results could be different if including other languages
- Handling duplicates in Sentiment Analysis and Topic Modeling
  - Removing duplicate contents or author ids affects the results
- Impact of social media content moderation policies

What we have learned

- Sentiment did not have huge variations, but splitting the data into different subsets revealed different insights
- The power of a single tweet: it is multiplied and reaches everywhere in the world
- The conversations that were going on Twitter were similar to actual News

PRAY
for
UKRAINE