

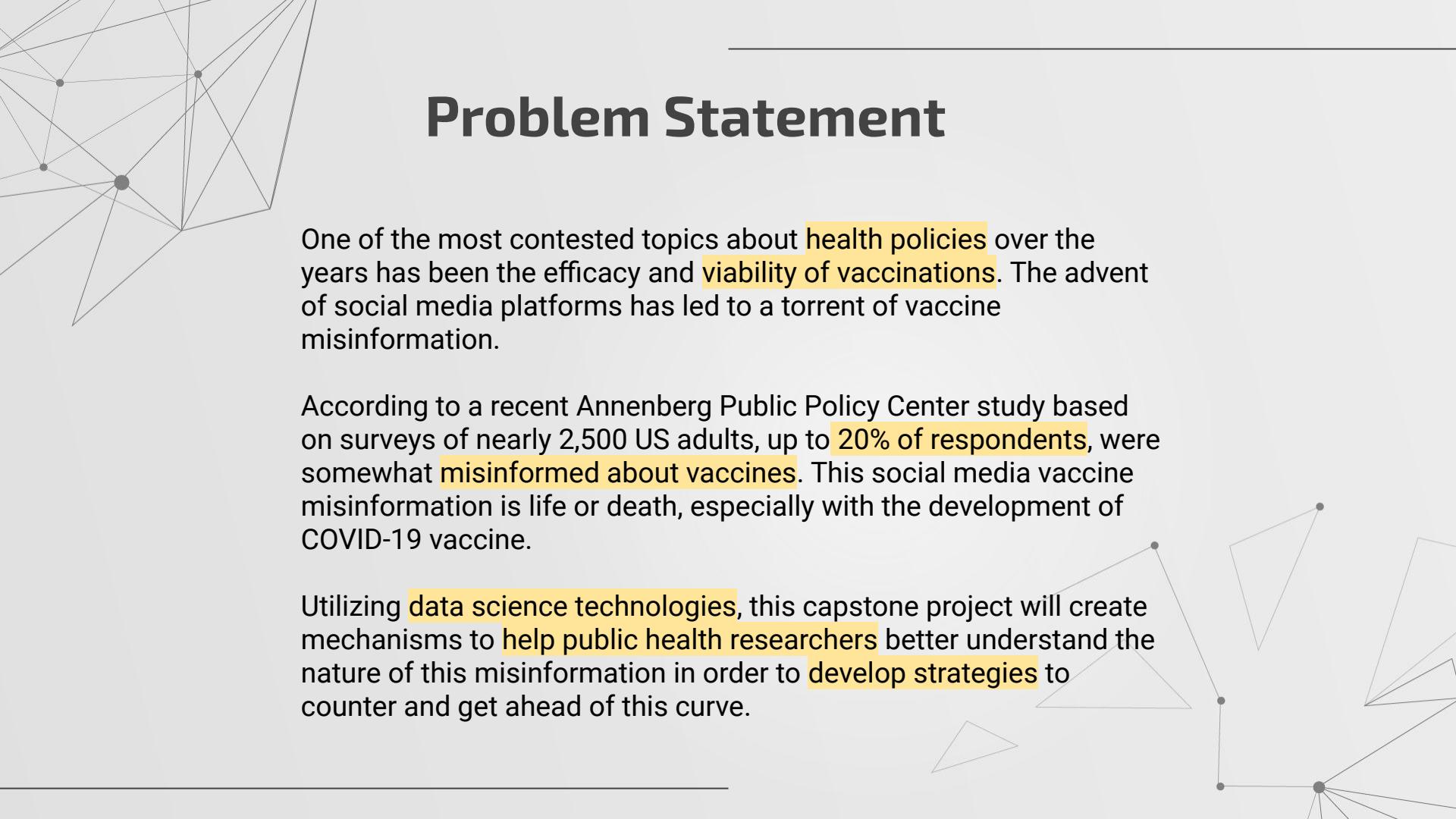
Tracking Vaccine Misinformation on Facebook

Adwoa Brako & Rashmi Menon

Problem Statement	01
Problem Elaboration and Background	02
Literature Review	03
Data Collection Pipeline	04
Data Description	05
Data Pre-Processing	06

TABLE OF CONTENTS

Data Visualization	07
Modeling Overview	08
Results & Analysis	09
Conclusion	10
Limitations & Future Work	11



Problem Statement

One of the most contested topics about **health policies** over the years has been the efficacy and **viability** of vaccinations. The advent of social media platforms has led to a torrent of vaccine misinformation.

According to a recent Annenberg Public Policy Center study based on surveys of nearly 2,500 US adults, up to **20% of respondents**, were somewhat **misinformed about vaccines**. This social media vaccine misinformation is life or death, especially with the development of COVID-19 vaccine.

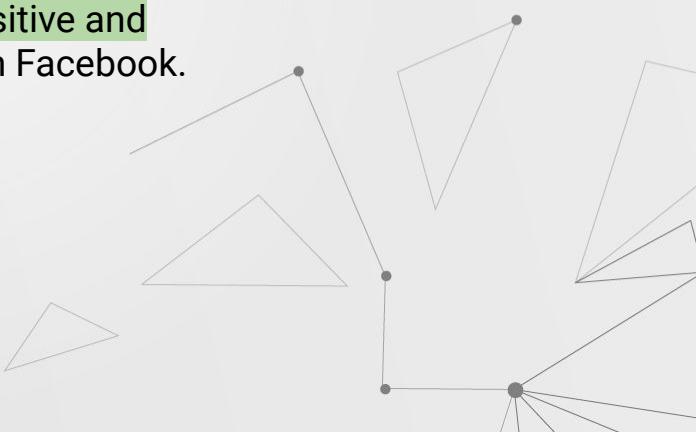
Utilizing **data science technologies**, this capstone project will create mechanisms to help public health researchers better understand the nature of this misinformation in order to **develop strategies** to counter and get ahead of this curve.



Problem Elaboration

The objective of mining this information is to identify the main topics reflected in both negative and positive content on Facebook. The safety and long-term side effects of vaccines have been questioned over the years, but with Health Organizations around the world speeding up vaccination trials on COVID-19, these concerns have been heightened .

A sentiment analysis would analyze both the positive and negative comments associated with vaccines on Facebook.



Literature Review

Title & Date: How the Anti-Vaccine Community Is Responding to Covid-19 [April 2020]

Description: How conspiratorial thinking and government mistrust affect stance on vaccination

Title & Date: Mandatory Vaccination: Why We Still Got To Get Folks To Take Their Shots [April 2016]

Description: How communicable diseases can be effectively eliminated by administering vaccines to sufficient levels of persons in the community

Title & Date: A Natural Language Processing Framework To Analyse The Opinions On HPV Vaccination Reflected On Twitter Over 10 Years (2008 - 2017). [June 2019]

Description: An NLP framework was developed to investigate opinions on HPV vaccination as discussed on Twitter

Title & Date: Studying Public Perception about Vaccination: A Sentiment Analysis of Tweets [May 2020]

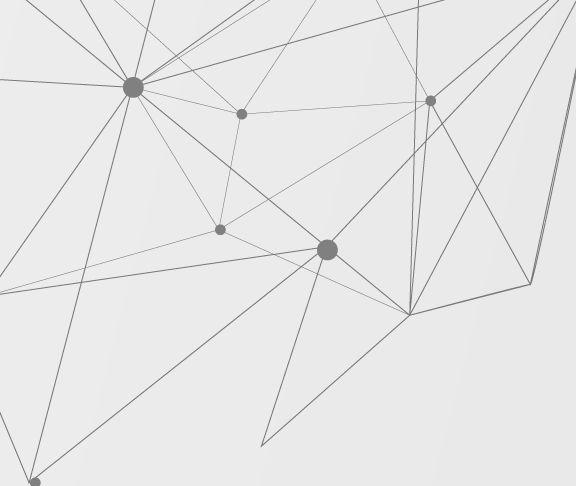
Description: Using text analysis to research attitudes towards vaccination



Methodology

Data Collection Pipeline





Data Description

Source	Facebook
Time Range	Feb '19 - Oct '20
Size of Dataset	91,026
No. of Distinct Pages	581

	pagename character varying	User Name character varying	Facebook Id bigint	Likes at Posting bigint	Created date	Type character varying	Likes integer	Comments integer	Shares integer	Haha integer	Sad integer	Angry integer	Care integer	Post Views integer	Total Views integer
1	No Jab No Pay No Way...	nojabnopaynoway	860651457306382	13635	2020-10-15	Photo	0	0	1	0	0	1	0	0	0
2	No Jab No Pay No Way...	nojabnopaynoway	860651457306382	13635	2020-10-15	Photo	2	0	1	0	0	0	0	0	0
3	International Revolutio...	internationalrevolutionf...	122901708305036	6430	2020-10-15	Link	0	0	0	0	0	0	0	0	0
4	Vaccination Decisions	vaccinationdecisions	530702127033360	5057	2020-10-15	Status	26	3	15	0	0	0	0	0	0

Total Views for All Crossposts integer	URL character varying	Message character varying	Link character varying	Final Link character varying	Image Text character varying	Link Text character varying	Description character varying	Overperforming Score double precision
0	https://www.facebook....	So the Major of Newca...	https://www.facebook....	[null]	Nuatali Nelmes- Lord ...	[null]	[null]	-0.82
0	https://www.facebook....	Well, today LNP showe...	https://www.facebook....	[null]	WARNING: LNP ARE P...	[null]	[null]	-0.73
0	https://www.facebook....	[null]	https://gbdeclaration.o...	[null]	[null]	This is a re-share of a p...	The Great Barrington D...	-32

The background features a complex network graph on the left side, composed of numerous small, light-gray triangles and a few larger, dark-gray nodes connected by thin gray lines. To the right of the text, there are several large, light-gray triangles of varying sizes scattered across the white space.

Data Cleaning & Pre-Processing

Data Cleaning & Pre- Processing

Dropped Irrelevant Columns

```
Index(['Page Name', 'User Name', 'Facebook Id', 'Likes at Posting', 'Created',  
       'Type', 'Likes', 'Comments', 'Shares', 'Love', 'Wow', 'Haha', 'Sad',  
       'Angry', 'Care', 'Video Share Status', 'Post Views', 'Total Views',  
       'Total Views For All Crossposts', 'Video Length', 'URL', 'Message',  
       'Link', 'Final Link', 'Image Text', 'Link Text', 'Description',  
       'Sponsor Id', 'Sponsor Name', 'Overperforming Score'],  
      dtype='object')  
  
Index(['Page Name', 'User Name', 'Facebook Id', 'Likes at Posting', 'Created',  
       'Likes', 'Comments', 'Shares', 'Post Views', 'Total Views',  
       'Total Views For All Crossposts', 'Message', 'Description',  
       'Overperforming Score', 'new_message'],  
      dtype='object')
```

Removed Punctuations

```
So the Major of Newcastle thinks she can ban a...  
Well, today LNP showed their cards the party d...  
NaN  
Proof of causality for COVID19 has not been pr...  
NaN  
...  
Shattered dreams in the wake of Gardasil. Anot...  
NaN  
So the Major of Newcastle thinks she can ban a...  
Well today LNP showed their cards the party de...  
nan  
Proof of causality for COVID19 has not been pr...  
nan  
...  
Shattered dreams in the wake of Gardasil Anoth...
```



Data Cleaning & Pre- Processing

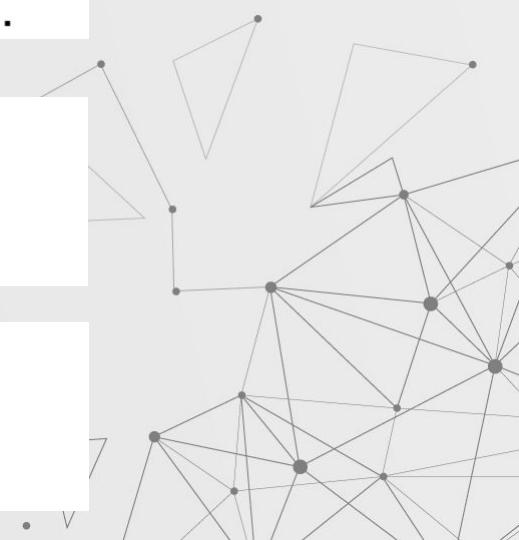
Removed Emojis

'The simple, poignant question: How could the ...
I couldn't help but notice something from this...
NaN
Vaccine mandates are created by the pharmaceut...
[USA flag emoji] The Volunteers of Mississippi Parents for...

The simple poignant question How could the ino...
I couldnt help but notice something from this ...
nan
Vaccine mandates are created by the pharmaceut...
The Volunteers of Mississippi Parents for Vac...

Tokenization
[Lowercase]

So the Major of Newcastle thinks she can ban a...
Well today LNP showed their cards the party de...
nan
Proof of causality for COVID19 has not been pr...
nan
...
Shattered dreams in the wake of [Gardasil] Anoth...
[so, the, major, of, newcastle, thinks, she, c...
[well, today, lnp, showed, their, cards, the, ...
[nan]
[proof, of, causality, for, covid19, has, not,...
[nan]
[get, your, tickets, today, the, online, confere...
[nan]



Data Cleaning & Pre- Processing

Removed
Stopwords

```
[proof, of, causality, for, covid19, has, not,...  
[get, your, tickets, today, the, online, confe...  
[fb, is, admittedly, censoring, our, reach, to...  
[watch, httpbitlyttavoct2020, httpsgothetrutha...  
[media, release, newcastle, council, bans, vac...  
[media, release, newcastle, council, bans, vac...  
are, you, over, the, age, of, 65, and, feelin...  
this, looks, like, it, will, be, quite, power...
```

```
[proof, causality, covid19, provided, crime, h...  
[get, tickets, today, online, conference, star...  
[fb, admittedly, censoring, reach, fraction, p...  
[watch, httpbitlyttavoct2020, httpsgothetrutha...  
[media, release, newcastle, council, bans, vac...  
[media, release, newcastle, council, bans, vac...  
[age, 65, feeling, pressure, get, flu, shot, r...
```



The background of the slide features a complex, abstract network graph composed of numerous small, semi-transparent grey dots connected by thin grey lines. This graph forms a dense web of triangles and larger polygons across the entire slide area.

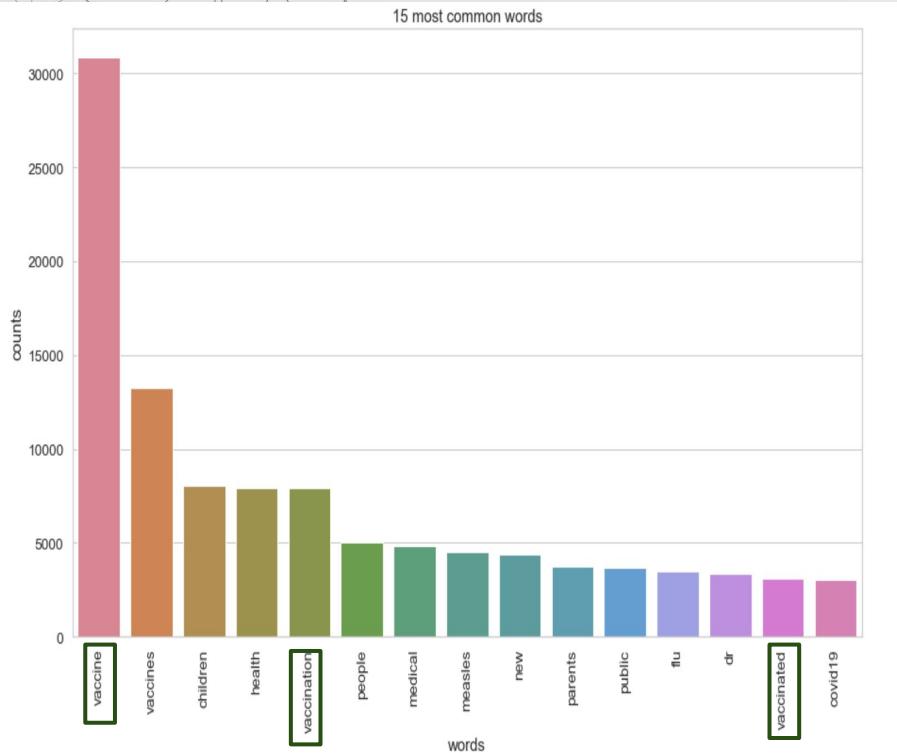
Exploratory Data Analysis

Word Cloud

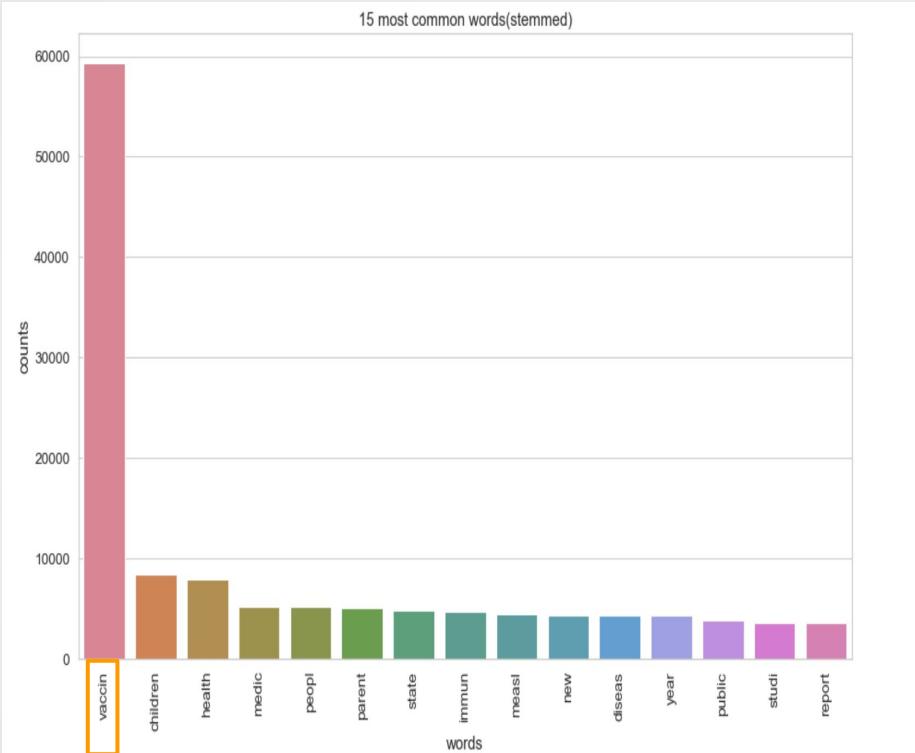


Word cloud representing text identified in the dataset

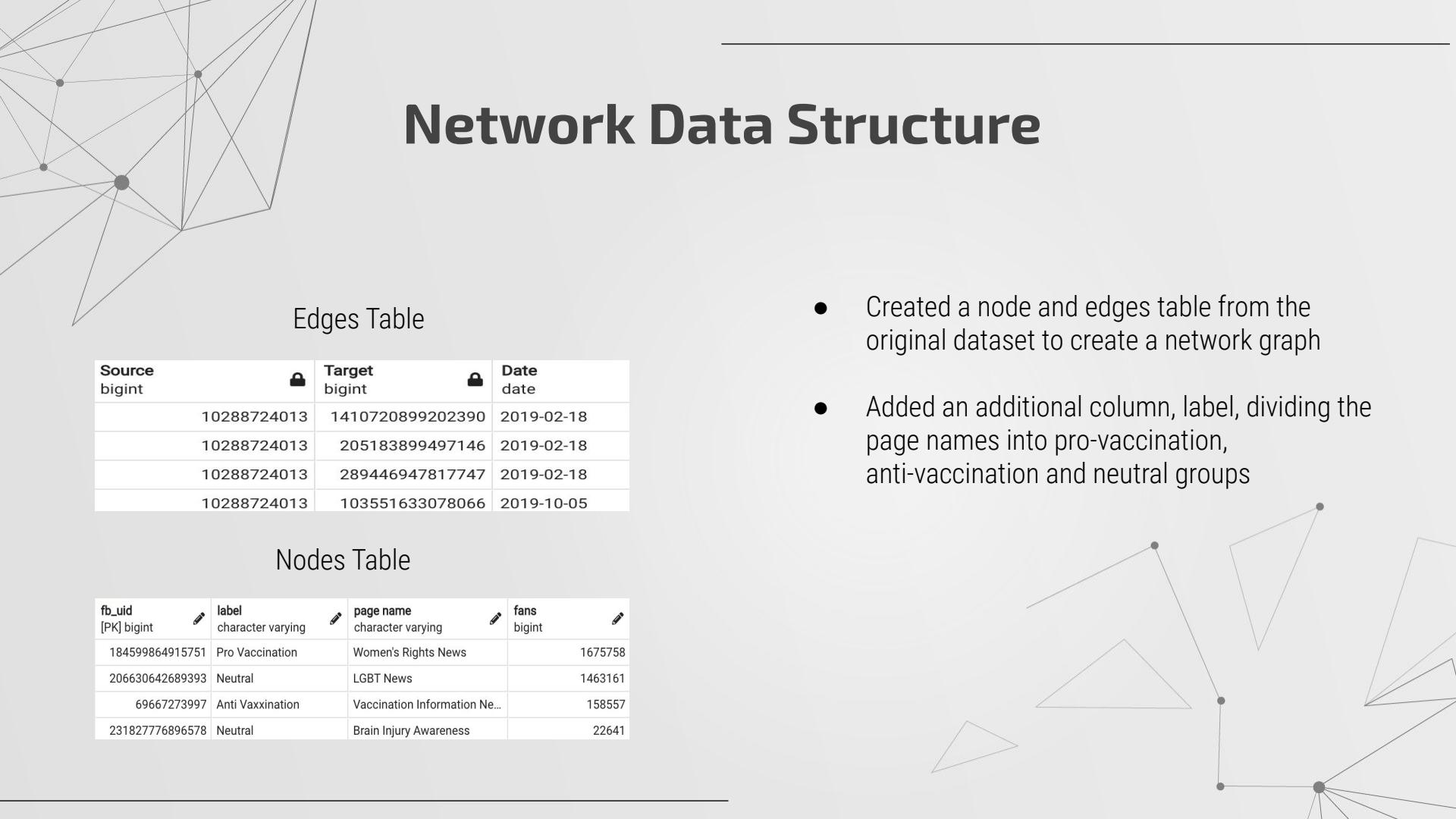
Stemming



Before



After



Network Data Structure

Edges Table

Source bigint	🔒	Target bigint	🔒	Date date
10288724013		1410720899202390		2019-02-18
10288724013		205183899497146		2019-02-18
10288724013		289446947817747		2019-02-18
10288724013		103551633078066		2019-10-05

Nodes Table

fb_uid [PK] bigint	📝	label character varying	📝	page name character varying	📝	fans bigint	📝
184599864915751		Pro Vaccination		Women's Rights News		1675758	
206630642689393		Neutral		LGBT News		1463161	
69667273997		Anti Vaxxination		Vaccination Information Ne...		158557	
231827776896578		Neutral		Brain Injury Awareness		22641	

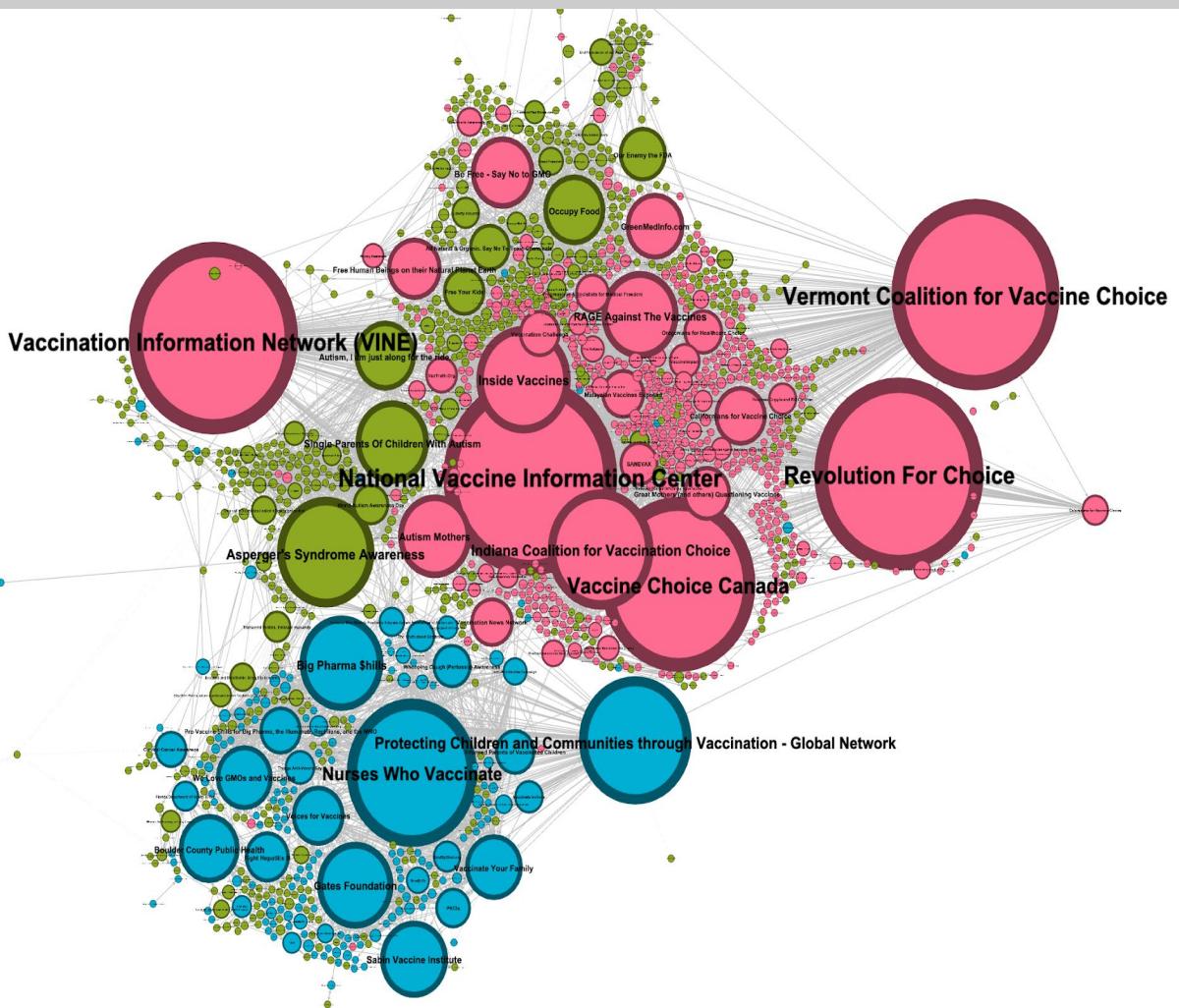
- Created a node and edges table from the original dataset to create a network graph
- Added an additional column, label, dividing the page names into pro-vaccination, anti-vaccination and neutral groups

Network

Red: Anti-Vaccination Groups

Blue : Pro-Vaccination Groups

Green: Neutral Groups



- The nodes represent the facebook pages
 - The edges represent the post “fanned” or liked by another facebook user
 - The node size is based on the betweenness centrality
 - (the most influential node in the network transmission)

Modeling





Overview



Modeling and validation methods

- TF-IDF vectorization model.
- Used an NMF model to identify any relevant topics in the data.
- Used a K-means model to produce clusters associated with each vaccine group (anti & pro).
- The K-means results are evaluated based on a silhouette score
- Each word belonging to a cluster is processed by VADER sentiment analyzer.

Results & Analysis



NMF-Model

- For further feature reduction, the model uses the top 3000 words by term weight
- The model produced these topics discussed in 2019 with regards to Measles outbreak and vaccination

	Topic # 01	Topic # 02	Topic # 03	Topic # 04	Topic # 05	Topic # 06	Topic # 07	Topic # 08	Topic # 09	Topic # 10
0	michiganvaccinechoic	vaccin	facebook	watch	fan	thank	good	know	vax	measl
1	org	hpv	post	featur	sub	dr	news	fact	cdcwhistleblow	outbreak
2	michiganforvaccinechoic	injuri	video	share	submiss	share	read	truth	childrenshealthdefens	case
3	thevaccinereact	children	stori	desktop	found	jim	share	doctor		anti
4	video	mandat	fbid	app	anti	speak	question	need		truth
5	type	parent	php	video	sure	pleas	great	want		diseas
6	theater	flu	revolutionforchoic	fbclid	think	inform	pleas	read		immun
7	live	get	photo	iwar	sad	doctor	articl	one		refut
8	photo	health	group	pleas	happen	via	fight	better		viru
9	facebook	news	event	must	get	truth	greater	right		health
10	iwar	death	type	live	say	paul	keep	pleas	peopl	news





NMF-Model

- For further feature reduction, the model uses the top 3000 words by term frequency
- The model produced these topics that are discussed this year (2020) with regards to COVID-19 and vaccination

	Topic # 01	Topic # 02	Topic # 03	Topic # 04	Topic # 05	Topic # 06	Topic # 07	Topic # 08	Topic # 09	Topic # 10
0	vaxxeddownund	michiganvaccinechoic	vaccin	watch	facebook	thank	flu	injuri	interest	import
1	unvaccin	michiganforvaccinechoic	covid	featur	post	pic	know	gardasil	conflict	agre
2	healthi	org	need	egq	video	absolut	coronaviru	awar	studi	inform
3	injuri	childrenshealthdefens	mandat	sorri	highwiretalk	del	get	peoplestruth	thought	ever
4	dtap	thevaccinereact	mandatori	googl	photo	ted	say	vxd	theori	flu
5	investig	live	thevaccinereact	index	fbid	nvic	good	vaccin	live	show
6	stori	medicalfreedom	refus	continu	php	check	pleas	month	understand	appeal
7	pro	vaccineinjuri	thehighwir	must	comment	believ	covid	stori	call	miss
8	ex	learn	take	video	stori	number	mandatori	flu	time	placebo
9	flu	reaction	reaction	share	vax	interview	news	octob	alway	stay
10	vax	event	death	link	login	share	petit	compens	ago	awar

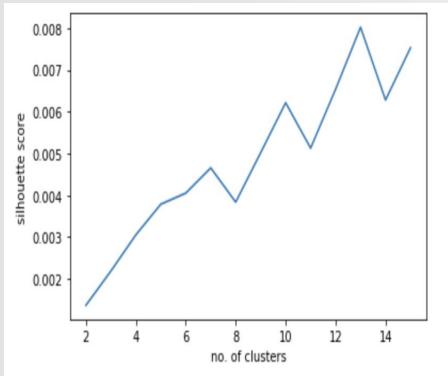




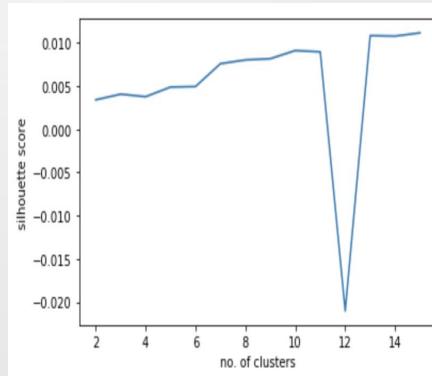
K-Means

- Created a specific numbers of cluster and designated each vector to a corresponding cluster
- Determined the optimal number of clusters based on the silhouette score to be the following:
 - Anti-vaccination - **13**
 - Pro-Vaccination - **8**

Anti-vaccination



Pro-vaccination





VADER sentiment Analysis- Anti-Vaccination

- Chose the top 200 words for each cluster to perform VADER sentiment analysis

```
{'neg': 0.173, 'neu': 0.654, 'pos': 0.173, 'compound': -0.4549}

{'neg': 0.106, 'neu': 0.699, 'pos': 0.194, 'compound': 0.936}

{'neg': 0.108, 'neu': 0.745, 'pos': 0.147, 'compound': 0.7449}

{'neg': 0.161, 'neu': 0.68, 'pos': 0.159, 'compound': -0.5277}

{'neg': 0.171, 'neu': 0.714, 'pos': 0.115, 'compound': -0.9492}

{'neg': 0.065, 'neu': 0.739, 'pos': 0.195, 'compound': 0.9769}

{'neg': 0.051, 'neu': 0.824, 'pos': 0.124, 'compound': 0.881}

{'neg': 0.172, 'neu': 0.691, 'pos': 0.137, 'compound': -0.891}

{'neg': 0.105, 'neu': 0.747, 'pos': 0.148, 'compound': 0.802}

{'neg': 0.211, 'neu': 0.64, 'pos': 0.149, 'compound': -0.9515}

{'neg': 0.191, 'neu': 0.695, 'pos': 0.113, 'compound': -0.9726}

{'neg': 0.204, 'neu': 0.639, 'pos': 0.156, 'compound': -0.9064}

{'neg': 0.062, 'neu': 0.923, 'pos': 0.014, 'compound': -0.8442}
```

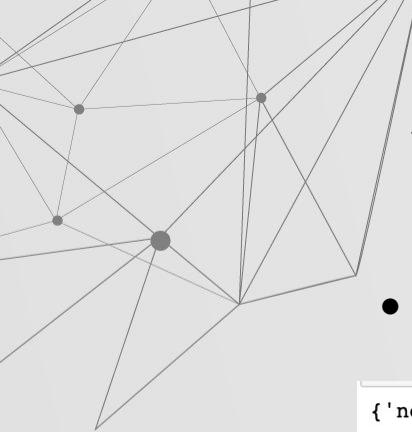
No. of Positive Clusters = 5

No. of Negative Clusters = 8



VADER sentiment Analysis- Anti-Vaccination

Topic	Frequent Keywords	Sentiment
Families harassed by doctors to vaccinate their children	harassment, bully, agonizing, struggle, catastrophe, bloody, lose, disagree	Negative
Vaccine safety claims made by Health officials	defence, safety, authority, consent, challenge, trustworthiness, support, responsible	Positive
A call to question the efficacy of vaccinations	share, truth, safety, well, safe, positive, protect, effective	Positive
Vaccinations as a risk for cancer	risk, harm, damage, death, dangerous, cancer	Negative
Failure of vaccines leading to “death”	died, death, die, sick, lost, cry, injured, cancer, severe	Negative
Expression of right to choose	free, consent, freedom, allow, support, friend, save, care, healthy	Positive
Growing opposition/Protests against Government mandates and vaccines	mandatory, exempt, bill, allow, support, care, legislative	Positive
Adverse effects of vaccinations associated with Hepatitis, Covid-19, Meningitis, Polio	flu, death, injury, disorder, failing, adverse, strain	Negative
False notions surrounding vaccine and development	ready, novel, effective, safe, immune, promising, hope, approval	Positive
Scandals surrounding Vaccine companies	fraudulent, lawsuit, exposed, risk, tragedy, suffering, fraud, harmed	Negative
Side-effects of the MMR vaccine	death, strain, emergency, fear, infected, rash, died, illness, worst, adverse	Negative
Lack of faith in vaccines	failure, shocking, lying, lack, doubt, forced, problem	Negative



VADER sentiment Analysis- Pro-Vaccination

- Chose the top 200 words for each cluster to perform VADER sentiment analysis

```
{'neg': 0.074, 'neu': 0.767, 'pos': 0.159, 'compound': 0.8991}
```

```
{'neg': 0.101, 'neu': 0.703, 'pos': 0.196, 'compound': 0.9274}
```

```
{'neg': 0.073, 'neu': 0.821, 'pos': 0.106, 'compound': 0.4019}
```

```
{'neg': 0.151, 'neu': 0.656, 'pos': 0.194, 'compound': 0.802}
```

```
{'neg': 0.153, 'neu': 0.658, 'pos': 0.189, 'compound': 0.5713}
```

```
{'neg': 0.196, 'neu': 0.737, 'pos': 0.068, 'compound': -0.975}
```

```
{'neg': 0.059, 'neu': 0.741, 'pos': 0.2, 'compound': 0.9633}
```

```
{'neg': 0.225, 'neu': 0.681, 'pos': 0.094, 'compound': -0.976}
```

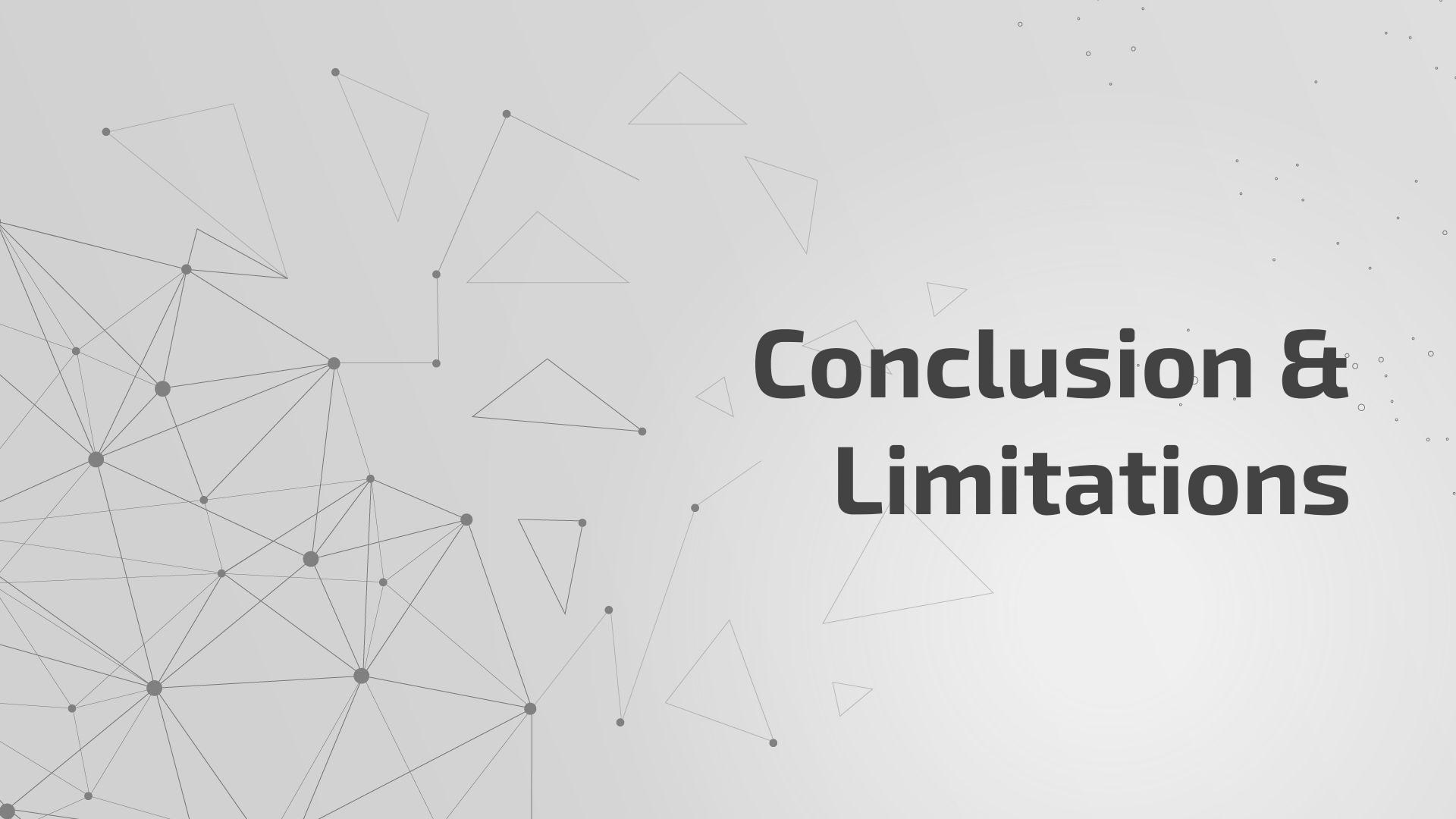
No. of Positive Clusters = 6

No. of Negative Clusters = 2



VADER sentiment Analysis- Pro-Vaccination

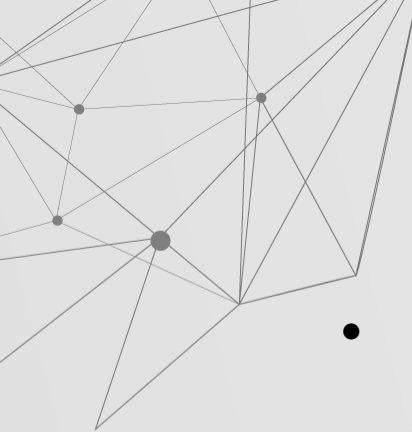
	Topic	Frequent Keywords	Sentiment
0	Improvement in numbers associated with Meningitis, HPC, Polio	safety, help, important, protect, well, support, safe, share	Positive
1	Benefits of Global Immunizations	interest, free, help, effective, passion, protect, approved, join, united	Positive
2	Making vaccinations mandatory	support, improve, allow, mandatory, care, bill, requirement, legislation, modernizing	Positive
3	Need for an Influenza vaccine to prevent a “twindemic”	important, protect, best, health, care, healthy, immune, community, hospitalization, seasonal	Positive
4	Importance of vaccinating children against chickenpox, polio and whooping cough	protect, prevent, recommended, help, save, study, control, immunization, preventable	Positive
5	Vaccine deception fuelling new outbreaks	contagious, hesitancy, misinformation, fear, blame, infected, death, emergency	Negative
6	Importance of HPV vaccines for women	benefit, recommended, safe, approved, effective, protect, prevents, effectiveness	Positive
7	Vaccine Pseudoscience	propaganda, fake, misinformation, harassment, ridiculous, crisis, attack	Negative



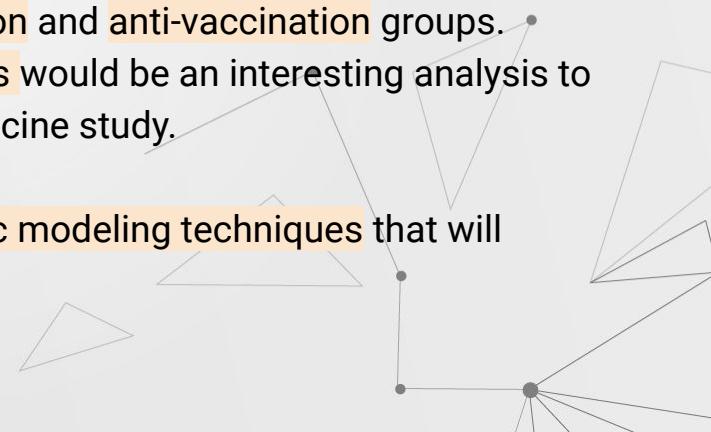
Conclusion & Limitations

Conclusion

- The results from the anti-vaccination community detail the side-effects of vaccines such as: autism, links to cancer, death and how the *freedom of choice* must be reinforced.
- This is spearheaded and backed by scientific studies and narratives.
- The results from the pro-vaccination community detail the importance of vaccines such as preventing outbreaks of polio, measles etc.
- The average Silhouette scores for anti-vaccinations is **0.008** and the average Silhouette scores for pro-vaccinations is **0.007** indicating the right fit of the data to its cluster.
- The sentiments of the anti-vaccination community were more negative in comparison to its pro-vaccination counterpart.
- The NMF models produced some topics that were relevant to vaccination discussions, as expected. Topics such as vaccine, injury, mandatory, measles, coronavirus, outbreak, death and health, among other topics were returned by the models.

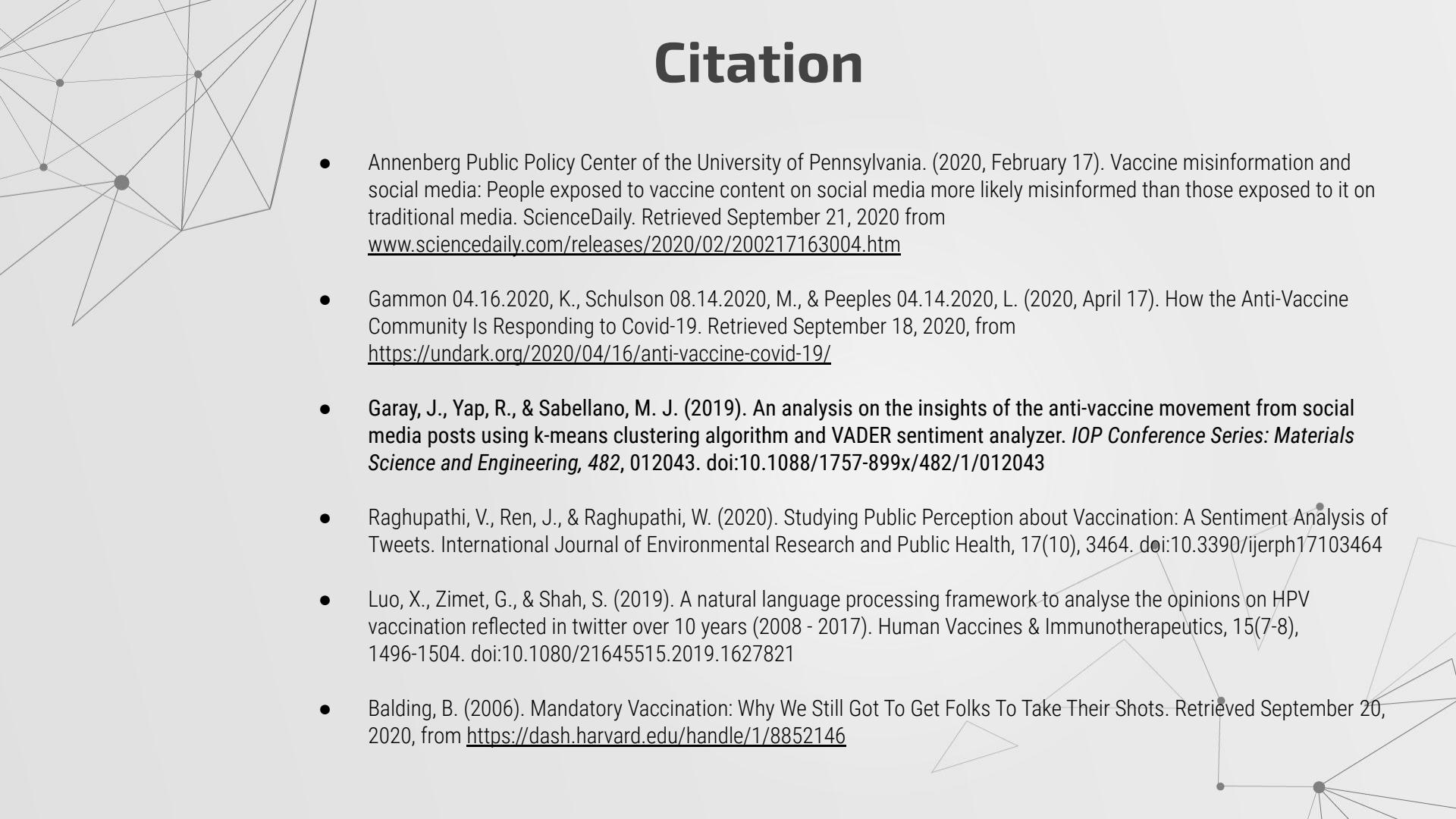


Limitations & Future Work



- Due to computational cost, our data is limited to a single social media platform, Facebook. Exploring other platforms where communities and groups are formed around similar ideologies would be interesting.
- Our analysis focuses on textual data and not on memes and images. Moving forward, we would like to extend our analysis to encompass all data.
- Our analysis is also limited to only pro-vaccination and anti-vaccination groups. Expanding our research to include neutral groups would be an interesting analysis to formulate a better understanding around the vaccine study.
- For future research, we would explore other topic modeling techniques that will improve on the topics generated.

References



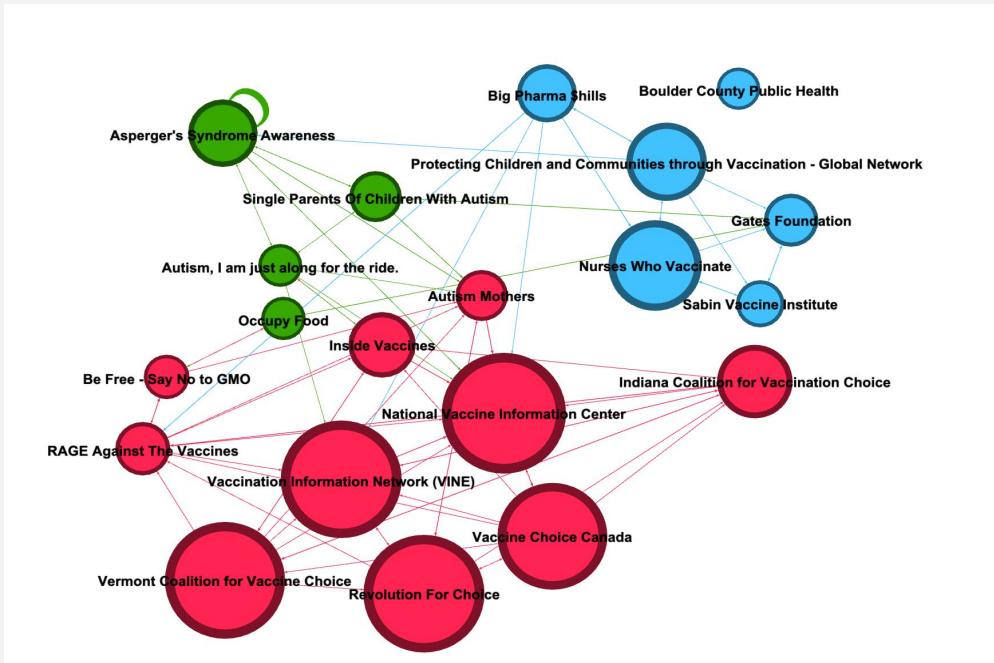
Citation

- Annenberg Public Policy Center of the University of Pennsylvania. (2020, February 17). Vaccine misinformation and social media: People exposed to vaccine content on social media more likely misinformed than those exposed to it on traditional media. ScienceDaily. Retrieved September 21, 2020 from www.sciencedaily.com/releases/2020/02/200217163004.htm
- Gammon 04.16.2020, K., Schulson 08.14.2020, M., & Peeples 04.14.2020, L. (2020, April 17). How the Anti-Vaccine Community Is Responding to Covid-19. Retrieved September 18, 2020, from <https://undark.org/2020/04/16/anti-vaccine-covid-19/>
- Garay, J., Yap, R., & Sabellano, M. J. (2019). An analysis on the insights of the anti-vaccine movement from social media posts using k-means clustering algorithm and VADER sentiment analyzer. *IOP Conference Series: Materials Science and Engineering*, 482, 012043. doi:10.1088/1757-899x/482/1/012043
- Raghupathi, V., Ren, J., & Raghupathi, W. (2020). Studying Public Perception about Vaccination: A Sentiment Analysis of Tweets. *International Journal of Environmental Research and Public Health*, 17(10), 3464. doi:10.3390/ijerph17103464
- Luo, X., Zimet, G., & Shah, S. (2019). A natural language processing framework to analyse the opinions on HPV vaccination reflected in twitter over 10 years (2008 - 2017). *Human Vaccines & Immunotherapeutics*, 15(7-8), 1496-1504. doi:10.1080/21645515.2019.1627821
- Balding, B. (2006). Mandatory Vaccination: Why We Still Got To Get Folks To Take Their Shots. Retrieved September 20, 2020, from <https://dash.harvard.edu/handle/1/8852146>

Appendix



Top 20 Pages based on Betweenness Centrality



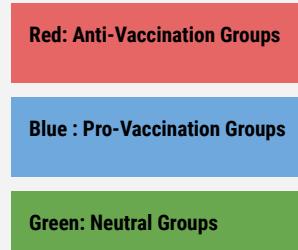
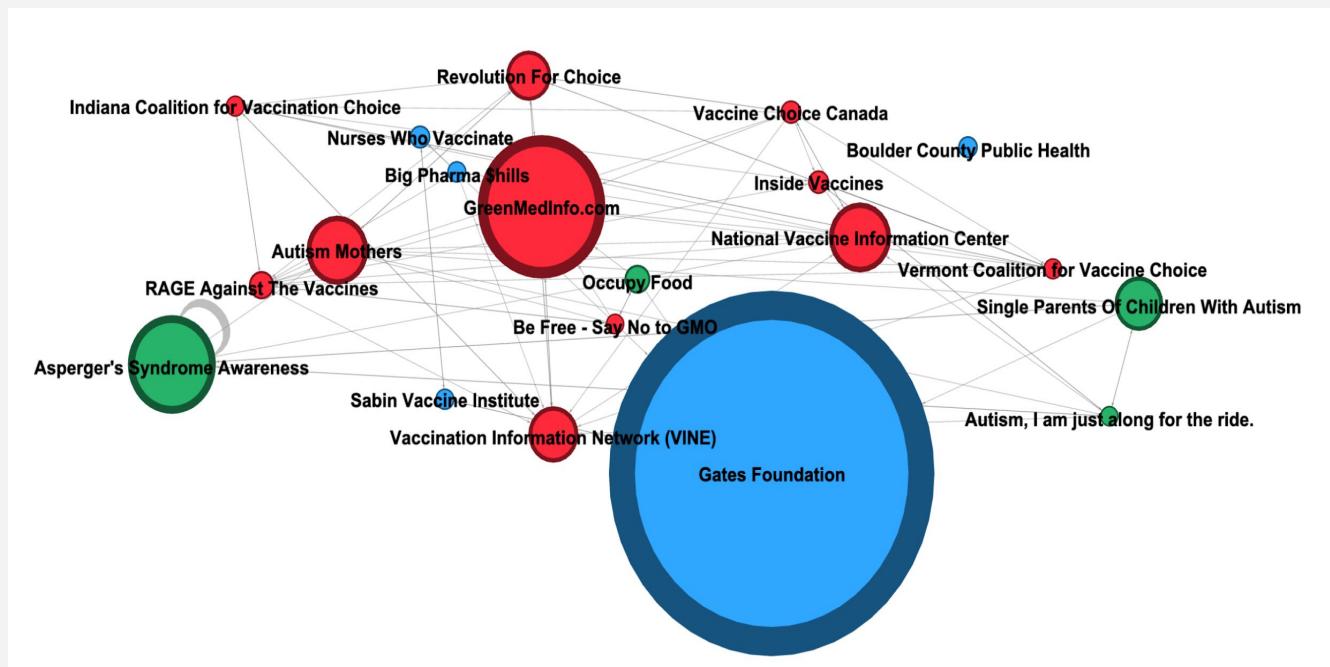
Red: Anti-Vaccination Groups

Blue : Pro-Vaccination Groups

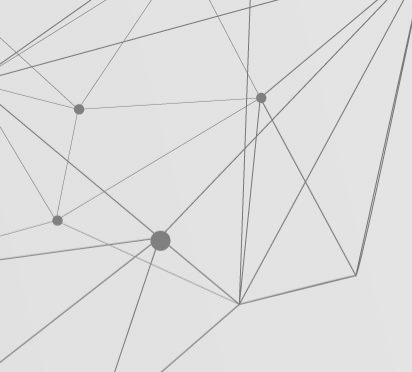
Green: Neutral Groups

Label	page name	fans	Label_Type	Betweenness Centrality	In-Degree	Out-Degree	Degree
Anti Vaxxination	Vaccination Infor...	158557	Anti Vaxxination	101959.004177	99	32	131
Anti Vaxxination	National Vaccine...	218340	Anti Vaxxination	104848.024808	151	12	163
Anti Vaxxination	Vaccine Choice ...	14419	Anti Vaxxination	92203.593018	21	139	160
Neutral	Asperger's Synd...	344890	Neutral	56835.309671	46	72	118

Top 20 Pages based on Fans



page name	fans
Gates Foundation	1520145
GreenMedInfo.com	541636
Asperger's Syndro...	344890
National Vaccine In....	218340



Network Randomization on Betweenness Centrality

Id	Label	Interval	In-Degree	Out-Degree	Degree	Betweenness Centrality
2050	2050		6	3	9	999.333333
2142	2142		3	5	8	928.0
1990	1990		4	3	7	829.5
2305	2305		6	4	10	805.583333
2490	2490		6	3	9	790.166667
2052	2052		3	4	7	770.416667
1830	1830		3	5	8	768.333333
2277	2277		4	4	8	766.5
1910	1910		3	3	6	763.666667
2007	2007		2	4	6	742.333333
2160	2160		7	5	12	704.083333



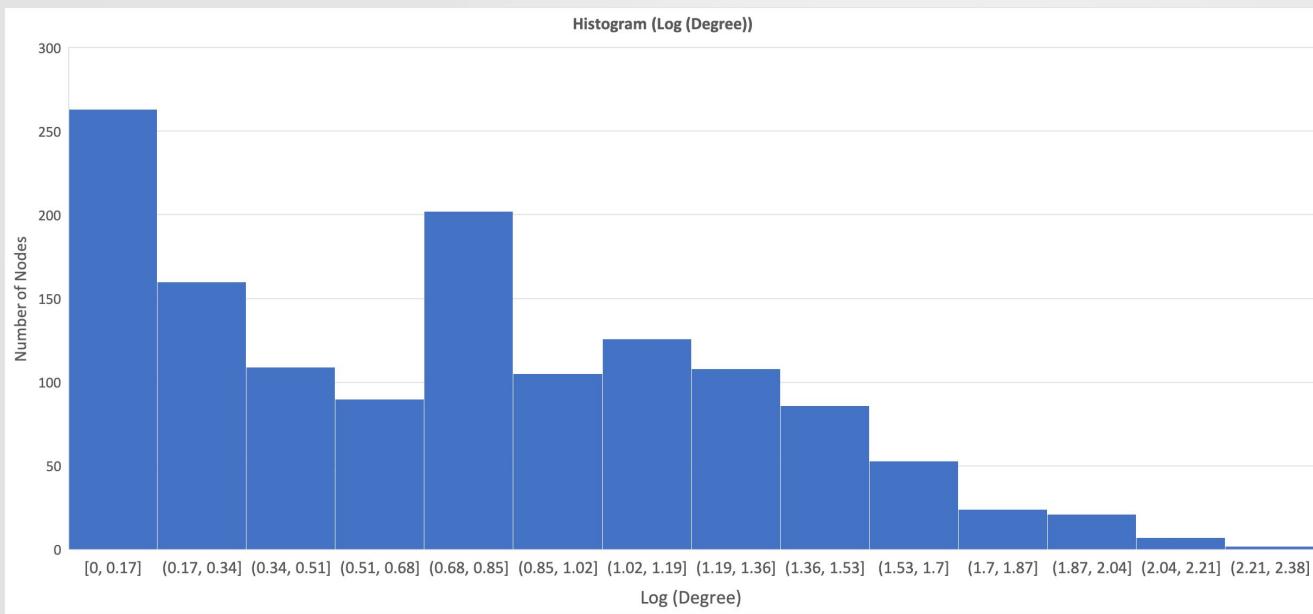
To calculate probability:

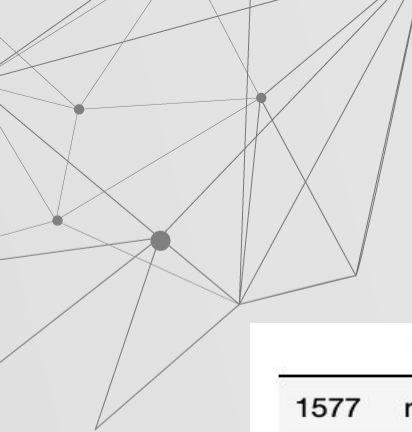
$P=n(n-1)/\text{Edges} = 0.004$

No of node=1356

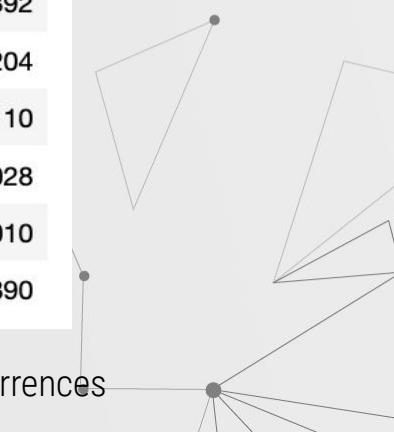
No of edges=8040

Network Randomization on Degree Distribution





TF-IDF

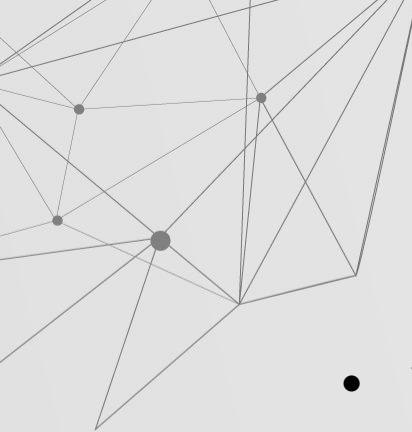


	term	weight
1577	measl	0.016171
988	flu	0.012711
584	covid	0.012393
1246	immun	0.012200
127	anti	0.010215
1525	ly	0.010085
1198	hpv	0.010060
1325	injuri	0.010032
2231	right	0.009908
1412	know	0.009837

Top 10 terms by average TF-IDF

	term	occurrences
1577	measl	13700
1246	immun	11969
2487	studi	9490
1443	le	9489
2070	public	9392
584	covid	9204
337	caus	9110
2196	report	9028
988	flu	9010
1308	inform	8890

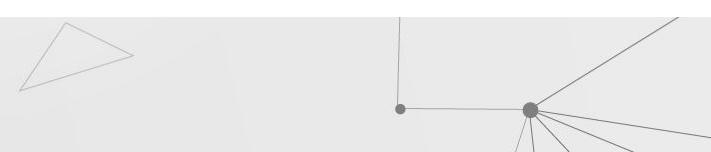
Top 10 terms by occurrences

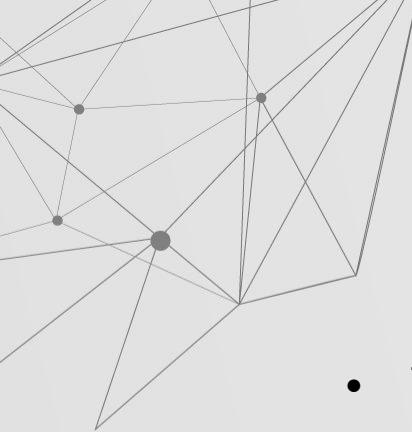


TextBlob (Anti-vaccination)

- Text Blob is used for sentiment analysis and returns a tuple value:
 - Polarity
 - Subjectivity
- Ran an SVM model to determine the accuracy(70% training, 30% training)

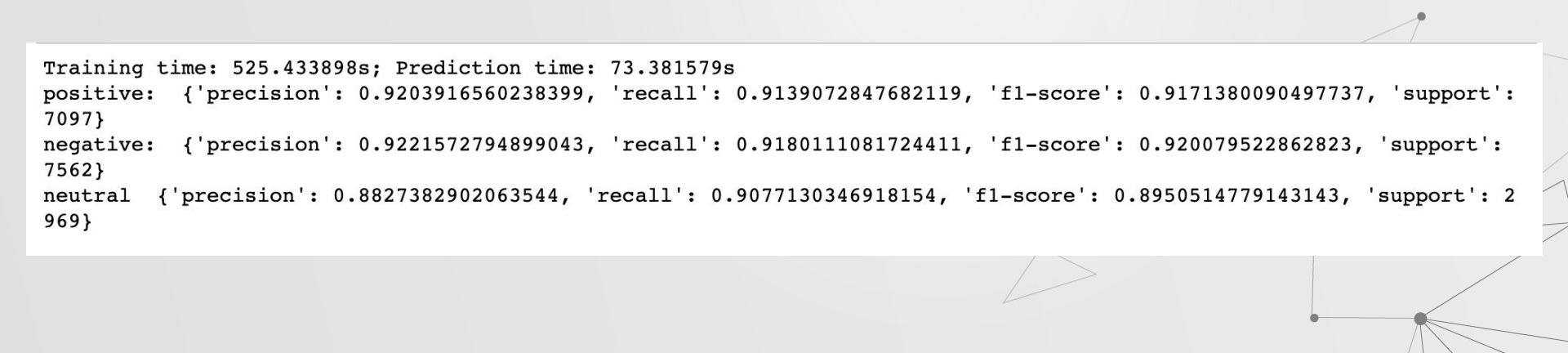
```
Training time: 648.208360s; Prediction time: 73.722004s
positive: {'precision': 0.9299460058147584, 'recall': 0.8983549551959342, 'f1-score': 0.9138775510204081, 'support': 7477}
negative: {'precision': 0.9067682653518602, 'recall': 0.7680334092634776, 'f1-score': 0.8316546762589928, 'support': 2634}
neutral {'precision': 0.8437729385857597, 'recall': 0.9175202873486763, 'f1-score': 0.879102670320566, 'support': 7517}
```





VADER(Anti-Vaccination)

- The analyzer returns a dictionary of scores with the following categories:
 - negative
 - neutral
 - positive
 - compound(computed by normalizing the top 3 categories)

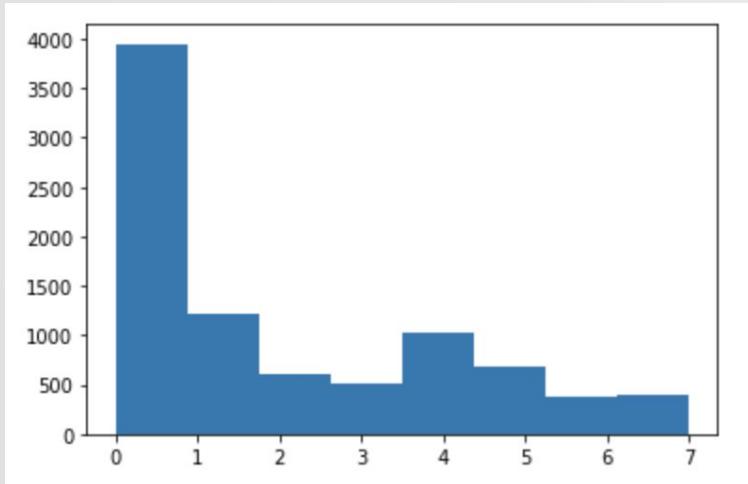


```
Training time: 525.433898s; Prediction time: 73.381579s
positive: {'precision': 0.9203916560238399, 'recall': 0.9139072847682119, 'f1-score': 0.9171380090497737, 'support': 7097}
negative: {'precision': 0.9221572794899043, 'recall': 0.9180111081724411, 'f1-score': 0.920079522862823, 'support': 7562}
neutral {'precision': 0.8827382902063544, 'recall': 0.9077130346918154, 'f1-score': 0.8950514779143143, 'support': 2969}
```

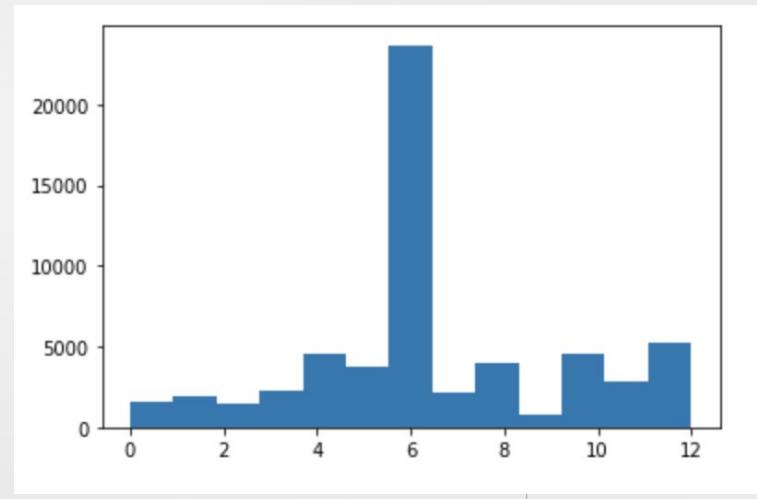


K-Means(Terms per Cluster)

Pro-vaccination



Anti-vaccination



Results - Anti-vaccination

Scores: {'neg': 0.173, 'neu': 0.654, 'pos': 0.173, 'compound': -0.4549}
Positive: ['share', 'truth', 'free', 'safety', 'please', 'help', 'mandator y', 'want', 'amazon', 'friend', 'trusted', 'encourages', 'gain', 'safe', 'credit', 'effective', 'brave']
Neutral: ['vaxxed', 'parent', 'watch', 'film', 'vaccine', 'ii', 'story', 'polly', 'child', 'bus', 'must', 'every', 'video', 'documentary', 'docuseries', 'tommey', 'dayayear', '365', 'vaccinate', 'question', 'emotionally', '247', 'endure', 'mentally', 'efficacy', 'physically', 'people', 'financia lly', 'interview', 'sara', 'often', 'team', 'mention', 'doctor', 'pediatrician', 'mother', 'interviewed', 'tour', 'producer', 'vaccination', 'episod e', 'policymakers', 'call', 'coverup', 'firmly', 'day', 'released', 'del', 'click', 'world', 'bigtree', 'vaccineinjured', 'nurse', 'know', 'industry', 'start', '9part', 'ama', 'around', 'family', 'mile', 'revealed', '180', 'level', 'cover', 'th', 'crew', 'son', 'vac', 'wound', 'happened', 'parent rights', 'costello', 'interviewing', 'beinformed', 'coronavirus', 'decide ', 'online', 'really', 'daughter', 'movie', 'dr', 'project', 'screening', 'government', 'get', 'highwire', 'ticket', 'visit', 'weve', 'event', 'oppose', 'explains', 'mirrored', 'travel', 'blow', 'see', 'recently', 'think', 'autistic', 'camera', 'health', 'mmr', 'usa', 'asked', 'series', 'epidemic ', 'mind', 'across', 'viewer', 'vaccinated', 'april', 'tell', '22', 'told', 'new', 'caused', 'dvd', 'show', 'nothing', 'medicalindustrial', 'link', '50000', 'dillon', 'everything', 'overstep', 'medium', 'viewing', 'year', 'dont', 'cdcwhistleblower', 'california', 'continues', 'need', 'australia', 'brisbane', 'tearful', 'theater', 'grandfather', 'far', 'cousin', 'strea ming', 'grandmother', 'araujo', 'egregious', 'jorge', 'woman', 'many', 'de serves', 'member', 'made', 'speak', 'message', 'filmmaker', 'wide', 'editi ng', 'brother', 'supervisor', 'old', 'outweigh', 'nov', 'action', 'page', 'discus', 'brill', 'vaxxed2', 'always', 'go']
Negative: ['harassment', 'bully', 'agonizing', 'injury', 'struggle', 'refuse', 'catastrophe', 'rejected', 'hide', 'bloody', 'misinformation', 'injur ed', 'lose', 'death', 'disagree']

Scores: {'neg': 0.106, 'neu': 0.699, 'pos': 0.194, 'compound': 0.936}
Positive: ['defense', 'freedom', 'care', 'safety', 'free', 'authority', 'consent', 'top', 'legal', 'challenge', 'interest', 'mandatory', 'united', 'truth', 'trustworthiness', 'support', 'protect', 'important', 'want', 'responsible', 'number']
Neutral: ['health', 'public', 'vaccine', 'world', 'official', 'childrens', 'organization', 'department', 'vaccination', 'child', 'parent', 'say', 'state', 'global', 'new', 'many', 'agency', 'right', 'people', 'school', 'government', 'human', '2019', 'measles', 'said', 'policy', 'medical', 'outbreak', 'service', 'one', 'national', 'immunization', 'informed', 'choice', 'would', 'county', 'mandate', 'program', 'committee', 'york', 'robert', 'jrx', 'country', 'respond', '300', 'cdc', 'city', 'kennedy', '100', 'year', 'level', 'secretary', 'dr', 'news', 'doctor', 'study', 'medium', 'article', 'case', 'may', 'bill', 'hearing', 'unvaccinated', 'hhs', 'individual', 'old', 'give', 'family', 'published', 'information', 'law', 'make', 'expert', 'control', 'vaccinated', 'team', 'report', 'take', 'minister', 'group', 'part', 'philippine', 'effort', 'organisation', 'research', 'declared', 'disease', 'get', 'could', 'gate', 'professional', 'list', 'governmental', 'million', 'time', 'pandemic', 'director', 'action', 'recently', 'federal', 'education', 'science', 'according', 'concern', 'board', 'exposure', 'dengue', 'order', 'event', 'scientist', 'international', 'chd', 'childhood', 'today', 'advocate', 'response', 'rise', 'institute', 'polio', 'fda', '10', 'issue', 'need', 'plan', 'student', 'statement', 'tuesday', 'given', 'decade', 'condition', 'first', 'social', 'ten', 'senate', '2018', 'infection', 'week', 'rate', 'current', 'patient', 'malaria', 'environmental', 'must', 'community', 'court', 'april', 'covid19', 'medicine', 'including', 'require', 'leading', 'product', 'virus', 'thousand', 'mmr', 'legislator', 'house', 'facility', 'coronavirus', 'across', 'parental', 'two', 'rockland', 'citizen', 'put', 'video', 'kid', 'force', 'washington']
Negative: ['threat', 'risk', 'emergency', 'conflict', 'hesitancy', 'problem', 'crisis', 'serious', 'shocking', 'fight']

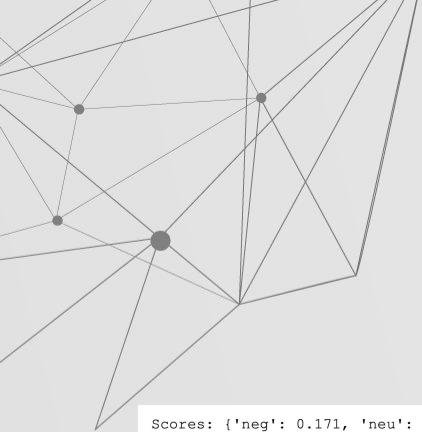


Results - Anti-vaccination

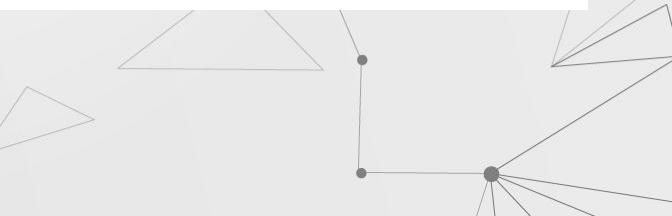
```
Scores: {'neg': 0.108, 'neu': 0.745, 'pos': 0.147, 'compound': 0.7449}
Positive: ['immune', 'truth', 'like', 'effective', 'protect', 'united', 'energy', 'strongly', 'safe', 'healthy', 'free', 'help', 'justice', 'natural']
Neutral: ['disease', 'vaccine', 'infectious', 'outbreak', 'center', 'vaccination', 'child', 'prevention', 'control', 'cdc', 'childhood', 'health', 'dr', 'vaccinated', 'federal', 'meeting', 'measles', 'pox', 'immunity', 'people', '2019', 'department', 'committee', 'population', 'government', 'study', 'one', 'accv', 'new', 'prevent', 'case', 'autoimmune', 'cause', 'advisory', 'concluded', 'human', 'chronic', 'rate', 'commission', 'whooping', 'year', 'american', 'cough', 'service', 'fever', 'state', 'many', 'system', 'virus', 'fully', 'infection', 'may', 'medical', 'preventable', 'time', 'diphtheria', 'first', 'research', 'vaccinepreventable', 'say', 'pension', 'chicken', 'scientist', 'herd', 'instigator', 'epidemic', 'labor', 'introduced', 'said', 'caused', 'immunized', 'rumps', 'immunization', 'occurred', 'march', 'country', 'body', 'highly', 'small', 'senate', 'polio', '2004', 'become', 'report', 'spread', 'include', 'suggests', 'even', 'get', 'mostly', 'history', 'william', 'allergy', 'education', 'thompson', 'antibody', 'could', 'know', 'opposes', 'make', 'agency', 'public', 'according', 'settled', 'life', 'doctor', 'would', 'mandate', 'data', 'aaps', '1950s', 'official', 'tuberculosis', 'world', 'common', 'quarterly', 'house', 'need', 'last', 'commerce', 'adult', 'also', 'parent', 'food', 'within', 'physician', 'syndrome', 'subcommittee', 'scarlet', 'unvaccinated', 'drug', 'surgeon', 'reported', 'feb', 'effect', 'shingle', 'made', 'mild', 'national', 'autism', 'far', 'doj', 'since', 'oversight', 'mortality', '26', 'expert', 'contracted', '8th', 'decade', 'medi', 'dying', 'deadly', 'investigation', 'two', 'kid', 'rarely', 'due', 'student', '6th', 'chickenpox', 'shot', 'senior', 'including', 'coronavirus', 'fauci', 'received', 'every', 'association', 'never', 'fact', 'science', 'researcher', 'today', 'claim', 'used', 'interference', 'school']
Negative: ['death', 'illness', 'serious', 'cancer', 'fear', 'risk', 'discomfort', 'contagious']
```

```
Scores: {'neg': 0.161, 'neu': 0.68, 'pos': 0.159, 'compound': -0.5277}
Positive: ['safety', 'safe', 'like', 'want', 'free', 'truth', 'consent', 'well', 'immune', 'effective', 'important', 'freedom', 'help', 'approved', 'protect', 'good', 'number']
Neutral: ['vaccine', 'child', 'cdc', 'study', 'aluminum', 'one', 'people', 'new', 'know', 'information', 'autism', 'dont', 'science', 'dr', 'cause', 'research', 'cell', 'medical', 'doctor', 'parent', 'vaccination', 'fda', 'time', 'many', 'government', 'get', 'question', 'human', 'mmr', 'ingredient', 'used', 'reaction', 'public', 'make', 'mandate', 'would', 'right', 'year', 'schedule', 'say', 'pharmaceutical', 'industry', 'virus', 'need', 'effect', 'fetal', 'scientist', 'dna', 'issue', 'first', 'health', 'insert', 'use', 'american', 'company', 'tested', 'medium', 'even', 'aborted', 'choice', 'informed', 'vaccinated', 'may', 'side', 'every', 'take', 'never', 'article', 'read', 'also', 'immunity', 'drug', 'product', 'see', 'world', 'adjuvant', 'line', 'fact', 'scientific', 'system', 'manufacturer', 'life', 'could', 'book', 'today', 'state', 'work', 'expert', 'given', 'follow', 'data', 'childhood', 'come', 'woman', 'show', 'think', 'made', 'evidence', 'link', 'pregnant', 'concern', 'ever', 'researcher', 'country', 'body', 'me rock', 'ir', 'infant', 'policy', 'brain', 'kid', 'story', 'hepatitis', 'including', 'response', 'report', 'two', 'mother', 'found', 'way', 'global', 'family', 'disease', 'debate', 'go', 'believe', 'vaccinate', 'going', 'muc h', 'yet', 'let', 'event', 'trial', 'law', 'said', '2019', 'injected', 'maker', 'twitter', 'full', 'another', 'pharma', 'baby', 'informedconsent', 'pertussis', 'letter', 'mom', 'list', 'adult', 'case', 'find', 'million', 'video', 'influenza', 'billion', 'big', 'dos', 'day', 'give', 'market', 'group', 'developed', 'told', 'patient', 'result', 'development', 'tell', 'live', 'administration', 'efficacy']
Negative: ['risk', 'injured', 'adverse', 'harm', 'misinformation', 'damage', 'lawsuit', 'death', 'problem', 'disorder', 'injury', 'dangerous', 'cancer']
```

Results - Anti-vaccination



```
Scores: {'neg': 0.171, 'neu': 0.714, 'pos': 0.115, 'compound': -0.9492}
Positive: ['healthy', 'like', 'number', 'well', 'want', 'help', 'please', 'care', 'friend', 'good', 'share']
Neutral: ['vaccine', 'polio', 'baby', 'day', 'child', 'month', 'infant', 'year', 'case', 'one', 'vaccination', 'doctor', 'never', 'old', 'two', 'life', 'would', 'virus', 'know', 'time', 'even', 'shot', 'receiving', 'first', 'hour', 'parent', 'get', 'within', 'oral', 'dy', 'received', 'sids', 'to ok', 'hospital', 'people', 'said', 'told', 'getting', 'still', 'boy', 'reaction', 'many', 'wild', 'caused', 'country', 'didnt', 'daughter', 'india', 'seizure', 'given', 'started', 'dont', 'health', 'brain', 'every', 'back', 'week', 'later', 'ive', 'say', 'got', 'son', 'medical', 'mother', 'im', 'story', 'dtap', 'could', 'cause', 'report', 'vaccinated', 'new', 'hepatitis', 'following', 'girl', 'family', 'kid', 'go', 'though', 'mmr', 'pentavale nt', 'see', 'six', 'went', 'pediatrician', 'dos', 'vaccinederived', 'eye', 'little', 'think', 'hep', 'make', 'away', 'take', 'last', 'give', 'disease', 'world', 'came', 'going', 'study', 'way', 'thing', 'reported', 'also', 'nurse', 'fever', 'system', 'ever', 'three', 'another', 'right', 'tell', 'found', 'known', 'called', 'autopsy', 'cdc', 'age', '12', 'much', 'live', 'something', 'since', 'show', 'due', 'born', 'developed', 'today', '10', 'million', 'paralyzed', 'nothing', 'home', 'done', 'african', 'sleep', 'need', 'made', 'meningitis', 'body', 'research', 'around', 'nicholas', 'far', 'visit', 'infection', 'result', 'believe', 'government', 'cant', 'may', 'birth', 'matter', 'come', 'almost', 'autism', 'long', 'dpt', 'normal', 'look', 'night', 'always', 'paralysis', 'four', 'high', 'wasnt', 'side', 'happened', 'syria', 'causing', 'knew', 'schedule', '20', 'really'}
Negative: ['died', 'death', 'die', 'damage', 'sick', 'risk', 'injury', 'lost', 'cry', 'cancer', 'injured', 'pain', 'delayed', 'severe']
```



```
Scores: {'neg': 0.065, 'neu': 0.739, 'pos': 0.195, 'compound': 0.9769}
Positive: ['mandatory', 'freedom', 'please', 'support', 'like', 'want', 'help', 'free', 'share', 'good', 'well', 'truth', 'consent', 'healthy', 'friend', 'thank', 'join', 'protect', 'number']
Neutral: ['vaccination', 'vaccine', 'child', 'dr', 'new', 'one', 'parent', 'people', 'medical', 'right', '2019', 'government', 'year', 'vaccinated', 'say', 'vaxxeddownunder', 'state', 'get', 'school', 'medium', 'said', 'time', 'doctor', 'facebook', 'article', 'video', 'autism', 'family', 'case', 'news', 'research', 'day', 'today', 'group', 'law', 'may', 'see', 'bill', 'antivaccine', 'study', 'know', 'post', 'event', 'make', 'two', 'need', 'ould', 'report', '2020', 'information', 'many', 'could', 'take', 'big', 'antivaccination', 'public', 'read', 'first', 'social', 'unvaccinated', 'story', 'way', 'back', 'company', 'world', 'dont', 'pharma', 'go', 'science', 'kid', 'life', 'choice', 'question', 'virus', 'show', 'cdc', 'last', 'link', 'movement', 'country', 'page', 'vaccinate', 'drug', 'kennedy', 'week', 'di', 'month', 'court', 'comment', 'jr', 'rate', 'also', 'following', 'attorney', 'merck', 'robert', 'immunization', 'come', 'california', 'order', 'adult', 'community', 'member', 'fact', 'medicine', 'american', 'find', 'ever', 'gate', 'book', 'mother', 'interview', 'informed', 'york', 'patient', 'going', 'immunity', 'pharmaceutical', 'made', 'mmr', 'del', 'censorship', 'live', 'action', 'national', 'think', 'letter', 'call', 'million', 'debate', 'official', 'mandate', 'student', 'issue', 'county', 'president', 'recent', 'response', 'content', 'human', 'outbreak', 'even', 'son', 'work', 'found', 'test', 'much', 'baby', 'program', 'without', 'email', 'health', 'former', 'published', 'home', 'told', 'expert', 'industry', 'cause', 'recently', 'march', 'end', 'let', 'give', 'full', 'still', 'measles', 'scientific', 'part', 'claim', 'next', 'believe', 'city', 'website', 'since']
Negative: ['risk', 'stop', 'death', 'misinformation', 'forced', 'protest']
```

Results - Anti-vaccination

Scores: {'neg': 0.051, 'neu': 0.824, 'pos': 0.124, 'compound': 0.881}
Positive: ['freedom', 'support', 'consent', 'mandatory', 'please', 'allow', 'want', 'protect', 'care', 'exempt', 'thank', 'like', 'number']
Neutral: ['exemption', 'bill', 'state', 'religious', 'vaccine', 'child', 'school', 'medical', 'would', 'new', 'vaccination', 'law', 'california', 'right', 'parent', 'senate', 'york', 'house', 'senator', 'maine', 'remove', 'public', 'health', 'philosophical', 'doctor', 'family', 'committee', 'passed', 'hearing', 'legislation', 'requirement', 'vote', 'sb', 'lawmaker', '276', 'colorado', 'legislature', 'student', 'get', 'legislator', 'repeal', 'parental', 'mandate', '2019', 'capitol', 'attend', 'introduced', 'make', 'personal', 'ny', 'governor', 'one', 'end', 'assembly', 'immunization', 'nonmedical', 'albany', 'sb276', 'decision', 'proposed', 'belief', 'id', 'education', 'year', 'require', 'say', 'arizona', 'action', 'eliminate', 'need', 'measles', 'time', 'legislative', 'government', 'call', 'voted', 'informed', 'oregon', 'people', 'take', 'opposition', 'hb', 'day', '798', 'may', 'choice', 'also', 'physician', 'thursday', 'kid', 'pan', 'jersey', 'reas', 'on', 'go', 'vaccinated', 'required', 'many', 'department', 'robert', 'information', 'board', 'wednesday', 'today', 'last', 'oppose', 'federal', 'representative', 'know', 'email', 'newsom', 'private', 'believe', 'without', 'ohio', 'sen', 'daycare', 'washington', 'signed', 'june', 'must', 'first', 'monday', 'outbreak', 'group', 'effort', 'week', 'back', 'even', 'republican', 'connecticut', 'made', 'district', 'removing', 'nvic', 'said', 'dakota', 'minor', 'session', 'policy', 'dont', 'kennedy', 'filed', 'democrat', 'away', 'childhood', 'gov', 'office', 'way', 'come', 'written', 'attorney', 'member', 'hpv', 'vaccinate', 'every', 'force', 'gavin', 'official', 'give', 'amendment', 'florida', 'across', 'could', 'opt', 'hundred', 'let', 'dr', 'receive', 'case', 'south', 'rally', 'issue', 'service', 'pas', 'sacramento', 'show', 'opponent', 'sign', 'human', 'news', 'citizen', 'act', 'mandated']
Negative: ['protest', 'restrict', 'fight', 'ban']

Scores: {'neg': 0.172, 'neu': 0.691, 'pos': 0.137, 'compound': -0.891}
Positive: ['free', 'effective', 'friend', 'like', 'top', 'immune', 'number', 'want', 'well', 'increase', 'protect', 'safety', 'care', 'share']
Neutral: ['shot', 'vaccine', 'season', 'influenza', 'get', 'swine', 'year', 'people', 'vaccination', 'got', 'study', 'woman', 'received', 'cdc', 'say', 'child', 'virus', 'health', 'receiving', 'getting', 'pregnant', 'sterling', 'might', 'pandemic', 'annual', 'elderly', 'new', 'vaccinated', 'munt', 'doctor', 'infection', 'one', 'million', 'spanish', 'nurse', 'time', 'last', 'even', 'fact', 'thats', 'work', 'senior', 'according', 'found', 'may', 'cause', 'effectiveness', 'hospitalization', 'narcolepsy', 'dr', 'department', 'jab', 'would', 'also', 'cough', '1976', 'reaction', 'claim', 'hooping', 'day', 'coronavirus', 'percent', 'student', 'early', 'evan', 'half', 'family', 'every', 'hospital', 'news', 'state', 'seasonal', 'made', 'actually', 'hln1', 'wh', 'bug', 'showed', 'case', 'show', 'medical', 'researcher', '2009', 'syndrome', 'developed', 'report', 'dont', 'result', 'data', 'disease', 'story', 'mandate', 'system', 'mercury', 'recent', 'compensated', 'article', 'think', 'know', 'miscarriage', 'receive', 'kentucky', 'wkrc', 'citizen', 'grew', 'friday', 'way', 'court', 'many', 'three', 'given', '50100', 'two', 'guillainbarre', 'ky', 'popped', 'bc', 'healthier', 'including', 'week', 'mankato', '100', 'said', 'son', 'told', 'still', 'program', 'read', '191819', 'everyone', 'night', 'make', 'need', 'preventing', 'research', 'body', 'school', 'estimated', 'respiratory', 'government', 'shedding', 'caused', 'covid19', 'location', 'expert', 'started', 'meet', 'vaxxeddownunder', 'instead', 'record', 'rate', 'official', 'science', 'high', '10', 'jama', 'among', 'uc', 'hepatitis', '2019', 'cbs', 'month', 'isnt', 'question', 'university', 'insert', 'young', 'documentary', 'could', 'first', 'worked', 'another']
Negative: ['flu', 'death', 'strain', 'risk', 'injury', 'killed', 'died', 'disorder', 'failing', 'infected', 'miserably', 'adverse', 'alarm', 'bad']

Results - Anti-vaccination

Scores: {'neg': 0.105, 'neu': 0.747, 'pos': 0.148, 'compound': 0.802}
Positive: ['ready', 'novel', 'effective', 'safety', 'mandatory', 'want', 'safe', 'united', 'like', 'immune', 'promising', 'challenge', 'hope', 'appoval']
Neutral: ['covid19', 'coronavirus', 'vaccine', 'trial', 'clinical', 'people', 'gate', 'pandemic', 'said', 'could', 'company', 'may', 'virus', 'say', 'new', 'moderna', 'testing', 'astrazeneca', 'experimental', 'scientist', 'government', 'available', 'human', 'get', 'first', 'test', 'oxford', 'volunteer', 'fauci', 'study', 'american', 'world', 'one', 'development', 'potential', 'would', 'university', 'developed', 'develop', 'dr', 'take', 'johnson', 'million', 'drug', 'phase', 'expert', 'bill', 'health', 'year', 'researcher', 'participant', '2020', 'candidate', 'billion', 'race', 'trump', 'result', 'part', 'africa', 'vaccination', 'infection', 'state', 'animal', 'news', 'developing', 'response', 'public', 'immunity', 'china', 'poll', 'modernas', 'month', 'antibody', 'two', 'anthony', 'make', 'country', 'global', 'medical', 'treatment', 'become', 'announced', 'shot', 'effect', 'even', 'covid', 'speed', 'according', 'tested', 'around', 'federal', 'concern', 'president', 'uk', 'begin', 'likely', 'vaccinated', 'biotech', 'need', 'australian', 'week', 'time', 'institute', 'early', 'told', 'already', 'spread', 'fda', 'pharmaceutical', 'wednesday', 'end', 'outbreak', 'many', 'patient', 'dos', 'next', 'rushing', 'disease', 'plan', 'influenza', 'work', 'claim', 'event', 'soon', 'population', 'foundation', 'jab', 'use', 'sarscov2', 'report', 'whether', 'case', 'becomes', 'research', 'fasttracked', 'prevent', 'getting', 'reaction', 'child', 'possible', 'executive', 'given', 'full', 'effort', 'medium', 'history', '18', 'melinda', 'group', 'therapeutic', 'working', 'life', 'key', 'without', 'go', 'reuters', 'data', 'sars', 'canada', 'compulsory', 'also', 'rush', 'return', 'much', 'question', 'action', 'morrison', 'administration', 'pfizer', 'received', 'show', 'used', 'find', 'national', 'future', 'technology']
Negative: ['risk', 'adverse', 'serious', 'warning', 'illness', 'death', 'severe', 'problem', 'liability', 'emergency']

Scores: {'neg': 0.211, 'neu': 0.64, 'pos': 0.149, 'compound': -0.9515}
Positive: ['approved', 'safety', 'approval', 'healthy', 'popular', 'protected', 'giving', 'consent', 'truth', 'safe', 'recommended', 'help', 'active', 'share', 'hope']
Neutral: ['hpv', 'gardasil', 'vaccine', 'cervical', 'papillomavirus', 'girly', 'human', 'merck', 'vaccination', 'young', 'woman', 'reaction', 'health', 'trial', 'reported', 'year', 'mercks', 'case', 'receiving', 'study', 'new', 'age', 'effect', 'rate', 'sexually', 'child', 'cause', 'school', 'dr', 'event', 'side', 'boy', 'following', 'around', 'given', 'doctor', '2006', 'found', 'one', 'according', '2018', 'fda', 'court', 'world', 'efficacy', 'daughter', 'never', 'mother', 'published', 'research', 'family', 'without', 'prevent', 'life', 'since', 'report', 'science', 'many', 'first', 'transmitted', 'thousand', 'introduced', 'group', 'received', 'virus', 'papiloma', 'article', 'public', 'state', 'cervarix', 'may', 'get', 'also', 'researcher', 'presentation', 'two', 'link', 'fact', 'clinical', '2019', 'day', 'globe', 'know', 'evidence', 'data', 'said', 'teen', 'medical', 'say', 'analysis', 'mandate', 'receive', 'parent', 'tarstell', 'end', 'jennifer', 'country', 'infection', 'australia', 'video', 'jab', 'teenager', '25', 'ovarian', 'robi', 'cdc', 'government', 'caused', 'japan', 'shortly', 'shot', 'people', 'several', 'would', '2008', 'information', 'syndrome', 'kaiser', 'autoimmune', 'scientist', 'use', 'administration', 'january', 'second', 'disease', 'twitter', 'read', 'angeles', 'injection', 'los', 'time', 'whether', 'ministry', 'developed', 'could', 'schoolgirl', 'result', 'hold', 'database', 'jr', 'getting', 'make', 'manufacturer', 'permanente', 'million', 'three', 'discovering', 'news', 'already', '9th', 'son', 'august', 'symptom', 'june', 'includes', 'conceive', '13', 'diagnosed', 'maryland', 'screening', 'gardasilrelated', '100000', 'virgin', 'sacrificial', 'manufactured', 'genevieve', 'sterilized']
Negative: ['cancer', 'adverse', 'death', 'serious', 'injury', 'suffering', 'lawsuit', 'risk', 'fraud', 'dangerous', 'died', 'severe', 'scandal', 'paid', 'harmed', 'problem', 'suffered', 'damage']



Results - Anti-vaccination

```
Scores: {'neg': 0.191, 'neu': 0.695, 'pos': 0.113, 'compound': -0.9726}
Positive: ['united', 'number', 'like', 'natural', 'vitamin', 'effective',
'want', 'well', 'mandatory', 'important', 'immune', 'help']
Neutral: ['measles', 'vaccine', 'outbreak', 'mme', 'child', 'case', 'vacci
nated', 'vaccination', 'mumps', 'autism', 'year', 'immunity', 'rubella', 'ne
w', 'study', 'medium', 'disease', 'one', 'two', 'cdc', 'fact', 'reported',
'seizure', 'infection', 'samoa', 'cause', 'public', 'dr', 'article', 'may',
'know', 'adult', 'get', 'school', 'county', 'medical', 'reaction', 'york',
'doctor', 'report', 'time', 'say', 'response', 'many', 'population', 'n
ews', 'link', 'dos', 'even', 'caused', 'dont', 'found', 'evidence', 'also',
'recent', 'age', 'since', 'informedconsent', 'country', 'city', 'would',
'yet', 'mortality', 'day', '2019', 'fully', 'today', 'high', 'last', 'wash
ington', 'herd', 'following', 'merck', 'confirmed', 'picphysicians', 'high
ly', 'baby', 'become', 'law', 'government', 'million', 'physiciansinforme
dconsent', 'official', 'need', 'according', 'research', 'kid', 'month', '1
963', 'make', 'physician', 'among', 'result', 'individual', 'symptom', 'st
udent', 'developed', 'received', 'question', 'spread', 'due', 'brain', 'co
mmunity', 'antibody', 'live', 'exemption', 'brooklyn', 'receiving', 'order
', 'likely', 'decade', 'right', 'effect', 'percent', 'said', 'infant', 'va
ccinate', 'around', 'occurred', 'every', 'first', 'still', 'higher', '2015
', 'claimed', 'see', 'encephalitis', 'several', 'least', 'claim', 'world',
'mainstream', 'pic', 'scientific', 'debate', 'american', 'rockland', 'jewi
sh', 'california', 'given', 'week', 'epidemic', 'fever', 'dose', 'mandate'
, 'despite', 'show', '2018', 'blasio', 'compared', 'current', 'campaign',
'three', 'read', 'science', 'investigation', 'others', 'could', 'declared',
'informed', 'childhood', 'without', 'reporting', 'distinguish']
Negative: ['death', 'risk', 'failure', 'strain', 'emergency', 'fear', 'inf
ected', 'blamed', 'rash', 'died', 'cancer', 'disorder', 'illness', 'avoid'
, 'worst', 'low', 'adverse']
```

```
Scores: {'neg': 0.204, 'neu': 0.639, 'pos': 0.156, 'compound': -0.9064}
Positive: ['shared', 'safety', 'consent', 'save', 'legal', 'safe', 'specia
l', 'care', 'win', 'dedicated', 'please', 'charitable', 'significant', 'nu
mber', 'freedom', 'join', 'share', 'united', 'mandatory']
Neutral: ['vaccine', 'national', 'compensation', 'act', 'program', 'childh
ood', '1986', 'paid', 'vaxxeddownunder', 'child', 'awareness', 'story', 'f
ederal', 'billion', 'compilation', '14th', 'court', 'parent', 'event', 'br
ain', 'time', 'investigate', '2016', 'february', 'report', 'potus', 'faceb
ook', 'vaccination', 'many', 'one', 'people', 'ncvia', 'post', 'today', 'm
edical', 'group', 'little', 'information', 'year', 'vaers', 'drug', 'manuf
acturer', 'congress', 'vie', 'informed', 'day', 'life', 'nonprofit', 'reac
tion', 'biggest', 'petition', 'controversy', 'government', 'including', 'm
uch', 'public', 'health', 'regression', 'injure', 'reported', '180', 'rare
ly', '2019', 'establish', 'there', 'th', 'washingtont', 'vaccinate', 'make'
, 'dc', 'since', 'even', 'cause', 'never', 'law', 'case', 'lcdds', 'admini
stration', '2the', 'family', 'nvic', 'reason', 'monitor', 'mrr', 'commissi
on', 'system', 'reporting', 'claim', 'implementation', 'center', 'va', 'au
tism', 'president', 'hold', 'vicp', 'month', 'concluding', 'right', 'maker
', 'request', 'new', 'know', 'get', 'schedule', 'ba', 'pharmaceutical', 'd
octor', 'rare', 'product', 'dr', 'epidemic', 'prnewswire', 'given', 'austi
n', 'unable', 'following', 'revealed', 'may', 'thousand', 'disclosure', 'u
nit', 'live', 'company', 'licensed', 'intensive', 'fda', 'research', 'lay'
, 'million', 'attorney', 'action', 'state', 'preventing', 'ican', 'first',
'reagan', 'diagnosis', 'cdc', 'paying', 'fact', 'network', 'texas', 'carry
, 'call', 'caused', 'medicine', 'question', 'attention', 'education', 'va
ccinerelated', 'sand', 'industry', 'measles', 'dont', 'food', 'defending',
'permanent', 'nvicp', 'date', '30', 'wake', 'here', 'dollar', 'bring', 'im
munity']
Negative: ['injury', 'death', 'damage', 'injured', 'liability', 'adverse',
'dispute', 'risk', 'failure', 'kill', 'severe', 'limited', 'victim', 'suff
ering', 'lawsuit', 'harm']
```

Results -Pro-vaccination

Scores: {'neg': 0.074, 'neu': 0.767, 'pos': 0.159, 'compound': 0.8991}
Positive: ['like', 'safety', 'help', 'important', 'effective', 'safe', 'share', 'protect', 'well', 'support']
Neutral: ['vaccine', 'health', 'vaccination', 'new', 'people', 'coronavirus', 'one', 'year', 'antivaccination', 'say', 'get', 'world', 'public', 'immunization', 'science', 'dr', 'facebook', 'time', 'antivaxxers', 'study', 'could', 'group', 'day', 'make', 'expert', 'trial', 'would', 'global', 'research', 'disease', 'scientist', 'virus', 'parent', 'take', 'hiv', 'information', 'read', 'month', 'work', 'medium', 'video', 'social', 'may', 'influenza', 'community', 'medical', 'national', 'even', 'need', 'mother', 'two', 'state', 'antivax', 'show', 'story', 'post', 'said', 'spread', 'meningitis', 'movement', 'vaccinated', 'autism', 'comment', 'country', 'family', 'doctor', 'question', 'first', '2019', 'american', 'case', 'also', 'claim', 'many', 'human', 'effort', 'researcher', 'life', 'outbreak', 'antivaxxer', 'news', 'development', 'company', 'way', 'cdc', 'know', 'dont', 'rate', 'use', 'million', 'university', 'article', 'see', 'platform', 'cause', 'come', 'go', 'nurse', 'made', 'baby', 'found', 'online', 'getting', 'kid', 'program', 'medicine', 'still', 'advocate', 'report', 'school', 'organization', 'pandemic', 'antivaccine', 'hepatitis', 'patient', 'polio', 'page', 'last', 'recent', 'think', 'issue', 'talk', 'government', 'today', 'campaign', 'child', 'back', 'develop', 'three', 'much', 'end', 'ebola', 'center', 'find', 'used']
Negative: ['misinformation', 'death', 'dangerous', 'conspiracy', 'threat']

Scores: {'neg': 0.101, 'neu': 0.703, 'pos': 0.196, 'compound': 0.9274}
Positive: ['interest', 'free', 'like', 'prevent', 'reached', 'help', 'effective', 'safety', 'safe', 'passion', 'protect', 'approved', 'join', 'united']
Neutral: ['covid19', 'vaccine', 'coronavirus', 'trial', 'pandemic', 'development', 'research', 'health', 'world', 'collection', 'find', 'clinical', 'new', 'develop', 'people', 'expert', 'article', 'take', 'first', 'available', 'pediatrics', 'one', 'human', 'get', 'news', 'public', 'dr', 'race', 'latest', 'global', 'researcher', 'potential', 'even', 'disease', 'may', 'say', 'updated', 'effort', 'scientist', 'already', 'american', 'early', 'pediatric', 'official', 'candidate', 'vaccination', 'view', 'related', 'virus', 'university', 'make', 'discus', 'trump', 'state', 'look', 'around', 'question', 'cause', 'use', 'year', 'drug', '2020', 'regularly', 'month', 'registered', 'president', 'child', 'time', 'need', 'said', 'result', 'resource', 'testing', 'dont', 'ongoing', 'outbreak', 'leader', 'speed', 'group', 'recognizes', 'currently', 'also', 'country', 'ap', 'volunteer', 'published', 'government', 'long', 'gate', 'influenza', 'fasttracking', 'track', 'maryland', 'politics', 'working', 'could', 'participant', 'work', 'future', 'response', 'developed', 'know', 'effect', 'fda', 'process', 'treatment', 'claim', 'sarscov2', 'today', 'antivaccine', 'would', 'read', 'publishing', 'quickly', 'social', 'massive', 'there', 'here', 'phase', '2019', 'college', 'access', 'science', 'company', 'uk', 'administration', 'keeping', 'list', 'report', 'grad']
Negative: ['fight', 'racism', 'conspiracy', 'misinformation', 'risk', 'crisis']

Results -Pro-vaccination

Scores: {'neg': 0.073, 'neu': 0.821, 'pos': 0.106, 'compound': 0.4019}
Positive: ['support', 'improve', 'ability', 'allow', 'increase', 'mandatory', 'challenge', 'care']
Neutral: ['exemption', 'school', 'state', 'vaccination', 'bill', 'law', 'medical', 'california', 'religious', 'vaccine', 'new', 'rate', 'child', 'immunization', 'nonmedical', 'requirement', 'parent', 'york', 'would', 'public', 'health', 'personal', 'student', 'colorado', 'mandate', 'newsom', 'kidd', 'governor', 'gavin', 'opt', 'belief', 'doctor', 'signed', 'senate', 'sab', 'maine', 'official', '276', 'lawmaker', 'legislature', 'family', 'reas on', 'measles', 'district', 'sb276', 'outbreak', 'board', 'philosophical', 'passed', 'get', 'say', 'seattle', 'make', 'legislator', 'attend', 'year', 'community', 'gov', 'legislation', 'required', 'vote', 'eliminate', 'bogus', '2019', 'activist', 'vaccinated', 'eliminating', 'writing', 'vaccinating', 'washington', 'tightening', 'several', 'committee', 'arizona', 'hb', 'june', 'monday', 'provaccine', 'amid', 'skip', '13', 'voter', 'tuesday', 'dr', 'effect', 'right', 'diego', 'people', 'robert', 'san', 'shot', 'entry', 'end', 'jr', 'remove', 'kennedy', 'record', 'modernizing', 'vaccinate', 'house', 'capitol', '191312', 'need', 'proposed', 'pacific', 'oregon', 'joined', 'lax', 'pan', 'oversight', 'northwest', 'require', 'considering', 'revised', 'trend', 'across', 'childhood', 'exempting', 'catholic', 'last', 'three', 'show', 'veto', 'bar', 'loophole', 'making', 'jersey', 'one', 'ended', 'office', 'unvaccinated', 'harder', 'fifth', 'zandvliet', 'week', 'hearing', 'go', 'oppose']
Negative: ['rejected', 'accused', 'critical', 'catastrophe']

Scores: {'neg': 0.151, 'neu': 0.656, 'pos': 0.194, 'compound': 0.802}
Positive: ['protect', 'best', 'help', 'care', 'effective', 'important', 'good', 'prevent', 'healthy', 'immune', 'like', 'well', 'importance', 'free']
Neutral: ['season', 'shot', 'get', 'vaccine', 'year', 'influenza', 'health', 'getting', 'vaccination', 'family', 'people', 'virus', 'child', 'annual', 'cdc', 'time', 'seasonal', 'one', 'new', 'say', 'vaccinated', 'covid19', 'fall', 'official', 'pandemic', 'could', 'story', 'read', 'everyone', 'complication', 'still', 'know', 'disease', 'way', 'two', 'even', 'month', 'last', 'around', 'center', 'adult', 'week', 'many', 'according', 'may', 'universal', 'also', 'system', 'state', 'late', 'information', 'appeared', 'first', 'end', 'found', 'protection', 'report', 'said', 'full', 'cause', 'patient', 'hospital', 'community', 'every', 'make', 'need', 'million', 'expert', 'pregnant', 'researcher', 'likely', 'find', 'case', 'take', 'prevention', 'flurrelated', 'latest', 'ever', 'american', 'symptom', 'winter', 'including', 'doctor', 'three', 'dont', 'older', 'hospitalization', 'clinic', 'working', 'kid', 'early', 'least', 'control', 'far', 'mean', 'life', 'thats', 'got', 'parent', 'rate', 'give', 'october', 'day', 'learn', 'department', 'dr', 'pregnancy', 'circulating', 'national', 'urging', 'fact', 'article', 'study', 'target', 'second', 'start', 'pharmacy', '20192020', 'would', 'effectiveness', 'young', 'see', 'part', 'infection', 'le']
Negative: ['flu', 'strain', 'illness', 'death', 'died', 'sick', 'serious', 'severe', 'risk', 'lost', 'attack']

Results -Pro-vaccination

Scores: {'neg': 0.153, 'neu': 0.658, 'pos': 0.189, 'compound': 0.5713}
Positive: ['protect', 'help', 'important', 'like', 'sure', 'prevent', 'well', 'save', 'healthy', 'best', 'effective', 'want', 'protected', 'recommended']
Neutral: ['child', 'disease', 'vaccine', 'parent', 'vaccination', 'vaccine preventable', 'learn', 'need', 'people', 'year', 'one', 'vaccinate', 'million', 'preventable', 'life', 'many', 'baby', 'vaccinated', 'immunization', 'health', 'age', 'two', 'make', 'kid', 'deadly', 'get', 'family', 'infectious', 'outbreak', 'immunity', 'rotavirus', 'country', 'measles', 'cough', 'study', 'polio', 'community', 'whooping', 'spread', 'time', 'new', 'first', 'know', 'still', 'adult', 'see', 'even', 'world', 'shingle', 'chickenpox', 'effect', 'person', 'today', 'public', 'way', 'state', 'put', 'mother', 'doctor', 'vaccinating', 'work', 'fact', 'diabetes', 'every', 'alzheimer', 'infection', 'cause', 'protecting', 'would', 'schedule', 'seen', 'autism', 'young', 'influenza', 'lead', 'eventually', 'dont', 'show', 'living', 'rate', 'virus', 'herd', '58', 'childhood', 'case', 'month', 'also', 'sixth largest', 'available', 'memory', 'week', 'take', 'getting', 'personality', 'control', 'among', 'story', 'thousand', 'keep', 'potentially', 'putting', 'currently', 'say', 'talk', 'three', 'evidence', 'unvaccinated', '14', 'woman', 'count', 'within', 'day', 'school', 'access', 'according', 'recent', 'visit', 'despite', 'side', 'hepatitis', 'protection', 'could', 'lifetaker', 'research']
Negative: ['risk', 'serious', 'dangerous', 'stop', 'vulnerable', 'losing', 'death', 'robs', 'horrible', 'battle', 'illness', 'hard']

Scores: {'neg': 0.196, 'neu': 0.737, 'pos': 0.068, 'compound': -0.975}
Positive: ['united', 'number', 'increase', 'immune', 'prevent', 'played']
Neutral: ['measles', 'outbreak', 'case', 'health', 'year', 'state', 'disease', 'vaccine', 'vaccination', 'child', 'official', 'confirmed', 'reported', 'new', 'country', 'county', 'people', '2019', 'mumps', 'since', 'mmr', 'one', 'world', 'public', 'unvaccinated', 'epidemic', 'across', 'virus', '20', 'cdc', 'many', 'spread', 'rubella', 'samoa', 'according', 'say', 'control', 'vaccinated', 'center', 'york', 'last', 'city', '30', 'decade', 'rate', 'washington', 'said', 'amid', 'declared', 'individual', 'may', 'week', 'parent', 'prevention', 'infection', 'eliminated', 'time', '10', 'clark', '2018', 'first', 'organization', 'month', 'area', 'europe', 'around', '2000', 'big', 'antivaccine', 'two', 'polio', 'vaccinepreventable', 'article', 'highly', 'doctor', 'viral', 'need', 'rise', 'get', 'least', 'read', 'early', 'part', 'recent', 'department', 'complication', 'percent', 'movement', 'current', 'cause', 'eradicated', 'central', 'amnesia', 'system', 'expert', 'deadly', 'global', 'highest', 'recently', 'study', 'contributing', 'spreading', 'school', 'bernard', 'selz', 'making', 'ongoing', 'due', 'contracted', 'could', 'factor', 'texas', 'government', 'person', 'america', 'five', 'dos', 'another', 'news', 'lisa', 'california', 'region', 'even', 'medium', 'hospital', 'result', 'donor', 'wednesday', 'know', 'student', 'wash', 'show']
Negative: ['worst', 'contagious', 'hesitancy', 'misinformation', 'death', 'emergency', 'risk', 'threat', 'fear', 'infected', 'died', 'blame']

Results -Pro-vaccination

Scores: {'neg': 0.059, 'neu': 0.741, 'pos': 0.2, 'compound': 0.9633}
Positive: ['prevent', 'prevents', 'important', 'recommended', 'safe', 'safety', 'certain', 'approved', 'united', 'protect', 'effective', 'help', 'sh are', 'protects', 'benefit']
Neutral: ['hpv', 'vaccine', 'cervical', 'study', 'woman', 'human', 'papill omavirus', 'year', 'evidence', 'gardasil', 'new', 'vaccination', 'virus', 'age', 'girl', 'nearly', 'could', '45', 'infection', 'effectiveness', 'bre nnan', 'question', 'type', 'caused', 'published', 'men', 'one', 'get', 'yo ung', 'laura', 'researcher', 'say', 'several', 'prevention', 'decade', 'pa rent', 'article', 'cause', 'two', 'hpvrelated', 'provides', 'adult', 'dise ase', 'written', 'wiped', 'according', 'screening', 'myth', 'optional', 'w ithin', 'american', 'fda', 'dose', 'video', 'teen', 'genital', 'people', 'v accinated', 'adolescent', 'answer', 'world', 'know', 'uptake', 'show', 'r elated', 'boy', 'need', 'life', 'case', 'despite', 'rate', 'state', 'recen t', 'health', 'cdc', 'million', 'series', 'many', 'old', 'immunisation', 'pre venting', 'link', 'papilloma', 'campaign', 'ireland', 'linked', '27', 'dos', '2006', 'fall', 'awareness', 'use', 'anal', 'way', 'efficacy', 'prev alence', 'sudden', 'oral', 'large', 'learn', 'reducing', 'experience', 'cl aim', 'country', 'may', 'introduction', 'make', 'still', 'lead', 'child', 'story', 'antivaccine', 'doctor', 'thats', 'newly', 'common', 'diagnosed', 'significantly', 'autonomic', 'nine', 'fact', '2015', 'throat', 'find', 'i mp', 'three', 'involved', 'recommendation', 'every', 'receive', 'society', 'also']
Negative: ['cancer', 'risk', 'dysfunction']

Scores: {'neg': 0.225, 'neu': 0.681, 'pos': 0.094, 'compound': -0.976}
Positive: ['convince', 'growing', 'like', 'important', 'prominent', 'legal ', 'increase']
Neutral: ['antivaccine', 'dorit', 'reiss', 'rubinstein', 'professor', 'art icle', 'meme', 'law', 'written', 'refutation', 'vaccine', 'california', 'a ctivist', 'university', 'facebook', 'religion', 'movement', 'hastings', 't rope', 'group', 'published', 'claim', 'advocate', 'another', 'one', 'socia l', 'used', 'doctor', 'medium', 'parent', 'science', '2019', 'provaccine', 'health', 'recently', 'ican', 'college', 'foia', 'baby', 'autism', 'lie', 'called', 'blog', 'page', 'robert', 'public', 'unexpectedly', 'website', 'commenters', 'frequent', 'contributor', 'post', 'folk', 'recent', 'acip', 'bill', 'study', 'try', 'question', 'made', 'go', 'measles', 'whose', 'te med', 'myth', '2020', 'kennedy', 'time', 'get', 'world', 'scientist', 'yeh uda', 'protester', 'online', 'pseudoscientific', 'course', 'paper', 'pharm a', 'story', 'many', 'child', 'right', 'old', 'pushed', 'wakefield', 'acti on', 'practice', 'andrew', 'organization', 'immunization', 'conference', 'film', 'meeting', 'find', 'mmr', 'lydia', 'woman', 'telling', 'belief', 's ay', 'staple', 'posted', 'dont', 'two', 'modern', 'behind', 'cause', 'make ', 'economic', 'james', 'believe', 'flood', 'kid', 'former', 'wrote', 'feb ruary', 'link', 'look', 'retracted', 'jr', 'connected', 'reality', 'physician', '1986', 'hear', 'spread', 'coordinated']
Negative: ['fake', 'propaganda', 'attack', 'lawsuit', 'misinformation', 'blame', 'harassment', 'risk', 'died', 'flu', 'ridiculous', 'crisis', 'press ure', 'whore', 'pseudoscience', 'killer']