

Final Project: An Analysis of Tweets Surrounding the Aftermath of the Midterm 2022 Election

By Adam Haney, Harishma Ashok, Shriram Sreedhar

Summary

Our report centers around the aftermath of the Midterm elections in the United States and analyzing the current state of the discourse surrounding the current political landscape using Twitter data to form a network of communities of interacting users. We aim to see what figures and issues are topics of discourse, as well as what accounts are gaining significant traction or influence, and whether communities of users related to different topics or political ideologies are interacting in any significant amount or whether echo chambers have been formed. Our findings indicate much disconnect between communities, with the broader discourse centering around the run-offs in Georgia, Kari Lake's fraud claims in the Arizona election, and criticism of the GOP for their underperformance in the midterms. While we did find a component of connected communities, many of these communities, especially the ones that revolve around conservative news outlets, are only connected by one or two users to other communities, showing that there are some echo chambers in the network and that users in these communities are not interacting with the wider discourse or the specific accounts of key figures such as Kari Lake or Herschel Walker. We also zoomed in on each major community and sampled tweets to understand what the general discourse was and which figures had gained the most interaction and thus the most good or bad controversy.

Data Source

Due to the lack of a license to use the Twitter API, NodeXL was used to gather tweets based on specific hashtags related to the midterm elections. This excel add-on gathers a set of 2,000 tweets at a time and provides them in a format that shows the poster, the tagged or mentioned account, the content of the tweet, and the type of relationship (reply, mention, etc.). The hashtags used were gathered from random sampling of midterm related tweets and are as follows:

#MidtermElections2022

#Midterms2022

#elections2022

#USMidtermElections

#Legislatives2022

#Vote

This garnered a total of 10,356 tweets prior to cleaning and data preparation, ranging from 11/14-11/24. Notably, as this necessitates a timeline after the November 8th election, this changed the original aim of our project from looking at discourse during the midterms to looking at the

immediate post-midterm result discourse.

Data Preparation

Data cleaning is the process of editing, correcting, and structuring data within a data set so that it's generally uniform and prepared for analysis. This includes removing corrupt or irrelevant data and formatting it into a language that computers can understand for optimal analysis.

The following are the data cleaning techniques employed in cleaning the extracted twitter data.

Step 1: Remove irrelevant data

- The empty columns are removed from the dataset.
- Columns available after cleaning : 'Vertex 1', 'Vertex 2', 'Relationship', 'Relationship Date (UTC)', 'Tweet', 'URLs in Tweet', 'Domains in Tweet', 'Hashtags in Tweet', 'Tweet Date (UTC)', 'Twitter Page for Tweet', 'Imported ID', 'In-Reply-To Tweet ID'

Step 2: Deduplicate the data

- Data deduplication is a process that eliminates excessive copies of data and significantly decreases storage capacity requirements.

Step 3: Fix structural errors

- Structural errors include things like misspellings, incongruent naming conventions, improper capitalization, incorrect word use, etc. These can affect analysis because, while they may be obvious to humans, most machine learning applications wouldn't recognize the mistakes and your analyses would be skewed.
- Stemming is a process that stems or removes last few characters from a word, often leading to incorrect meanings and spelling. Lemmatization considers the context and converts the word to its meaningful base form, which is called Lemma.
- Punctuations, and numbers are removed from the all the columns in the dataset except vertex1 and vertex2

Step 4: Deal with missing data

- The data is scanned to find the missing values in it.
- The missing values are dealt by filling it with NaN as it has no major impact on our analysis.

Step 6: Validate your data

- Data validation is the final data cleaning technique used to authenticate your data and confirm that it's high quality, consistent, and properly formatted for downstream processes.
- We decided to refine our dataset in such a way that it has only three columns.

Source : Vertex1, it is the source node which contains the username of the user

Target : Vertex2, it is the destination node which contains the user name of the user

Weights: The rest of all the columns expect source and target is merged into one column which acts as weights to the edges while plotting the graph.

Tools that we used to clean the data :

- Julia
- Excel
- Python

The Julia Model

In [1]:

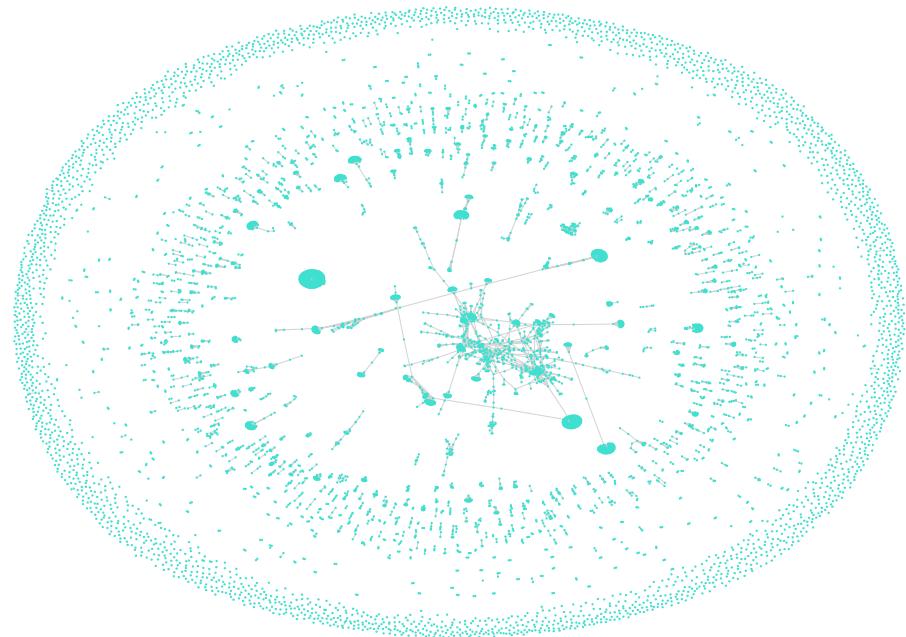
```

1  using CSV
2  using DataFrames
3
4  # for graph details
5  using Graphs
6  using SimpleWeightedGraphs
7
8  # for graphplots
9  using GraphPlot
10
11 import Pkg; Pkg.add("StringEncodings")
12 using StringEncodings
13
14 # reading the file
15 nodes_df = DataFrame(CSV.File(read("nodesInfo.csv", enc"ISO-8859-1")))
16 edges_df = DataFrame(CSV.File(read("edgesInfo.csv", enc"ISO-8859-1")))
17
18 # number of rows in df
19 nodes_df_row = nrow(nodes_df)
20 edges_df_row = nrow(edges_df)
21
22 # number of columns in df
23 nodes_df_col = ncol(nodes_df)
24 edges_df_col = ncol(edges_df)
25
26 # create the graph with required nodes
27 nodes_g = SimpleWeightedGraph(nodes_df_row)
28
29 # drawing edges
30 for node in eachrow(edges_df)
31     add_edge!(nodes_g, node.Source_ID, node.Target_ID)
32 end
33
34 # visualizing the graph
35 nodelabel = collect(1:nv(nodes_g))
36
37 # nodes size proportional to their degree
38 nodesize = [Graphs.outdegree(nodes_g, v) for v in Graphs.vertices(nodes_g)]
39
40 using Colors
41
42 # Generate n maximally distinguishable colors in LChab space.
43 nodefillc = distinguishable_colors(nv(nodes_g), colorant"orange")
44
45 # Control the node label size
46 nodelabelsize = nodesize
47
48 # basic plot
49 gplot(nodes_g, nodelabelsize=nodelabelsize)

```

Updating registry at `C:\Users\antch\.julia\registries\General.toml`
 Resolving package versions...
 No Changes to `C:\Users\antch\.julia\environments\v1.8\Project.toml`
 No Changes to `C:\Users\antch\.julia\environments\v1.8\Manifest.toml`

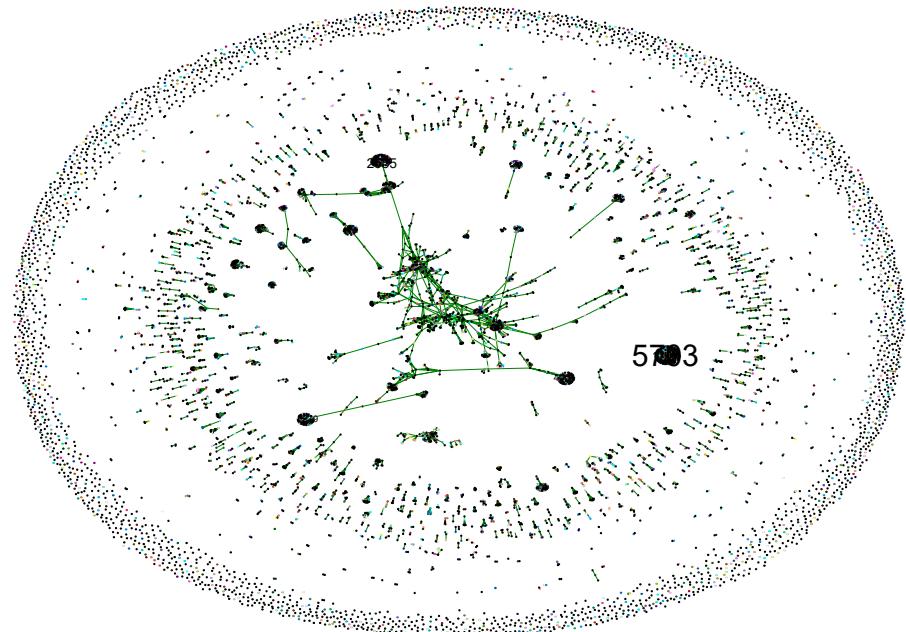
Out[1]:



In [2]:

```
1 #controlling node label size and adding colors to the nodes
2 gplot(nodes_g, nodelabelsize=nodelabelsize, nodelabel = nodelabel, nodef:
```

Out[2]:



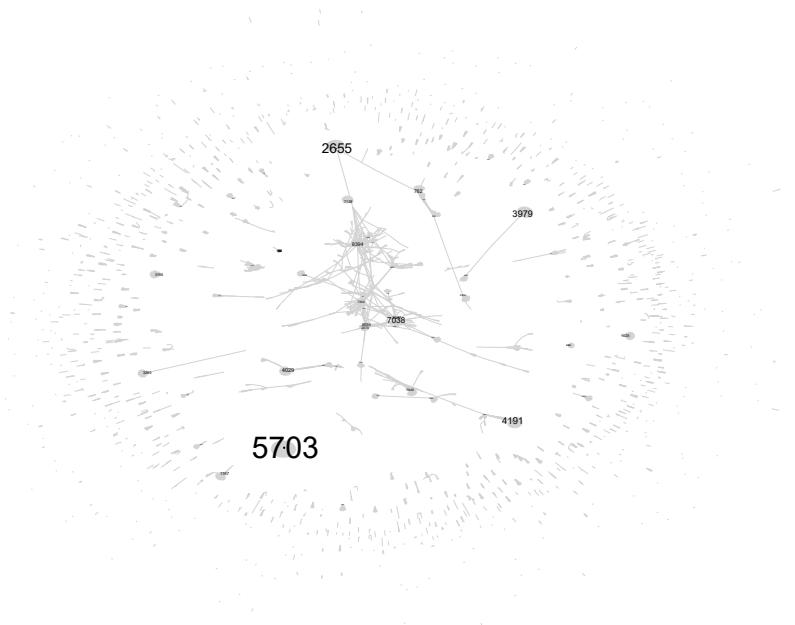
In [3]:

```

1 #controlling node and its label size, adding colors to the nodes, adding
2 gplot(nodes_g, nodelabelsize=nodelabelsize, nodelabel = nodelabel, nodef:

```

Out[3]:



Explanation of Julia Model

The model in julia is created using the julia package graphs.jl which is a versatile package for building and rendering graphs. The cleaned dataset was first loaded into a dataframe. The columns of interest are the columns vertex 1 and vertex 2. These columns are of string datatype. A unique numerical id was generated for each of the items in vertex 1 and vertex 2 columns to uniquely represent the twitter handle. The columns Source and Target was thus created. A pair of source and target in a row represent an edge in our graph and they represent the nodes and the edge between them in the graph. Therefore in a loop we add all the rows from our dataset as the edges of the graph using add_edge function. This builds a simple weighted graph which has all the nodes and the connections between them represented as edges. Using gplot this graph can be visualized, and we can visually spot the communities that have emerged. The way our variables work, Vertex 1 would be the posting user, whereas Vertex 2 is the user mentioned, replied to, or retweeted, with the edge weight being the amount of times these users interacted.

In [4]:

```
1 println("The number of edges in the graph are ", ne(nodes_g))
2 println("The number of vertices in the graphs are ", nv(nodes_g))
```

The number of edges in the graph are 8073
 The number of vertices in the graphs are 9107

Statistical Analysis

In [5]:

```
1 bc = betweenness_centrality(nodes_g)
2 sort!(bc,rev=true)
```

Out[5]: 9107-element Vector{Float64}:

```
0.01074703200448201
0.009307185985596694
0.008104124147940156
0.006704645723460122
0.005439296786683361
0.0043746163597725134
0.00424649322860434
0.004090525488260602
0.0034864568932894066
0.0029522738199424456
0.0026927469538402605
0.0025021616838694217
0.001996785688780861
:
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
0.0
```

In [6]:

```
1 global_clustering_coefficient(nodes_g)
```

Out[6]: 0.029479624173013842

In [7]:

```
1 tw_bridges = bridges(nodes_g)
2 num_edges = (length(tw_bridges))
3 ratio_bridges = length(tw_bridges) / ne(nodes_g)
4 println("Number of edges is : ", num_edges, " Percent of Edges is: ", rati
```

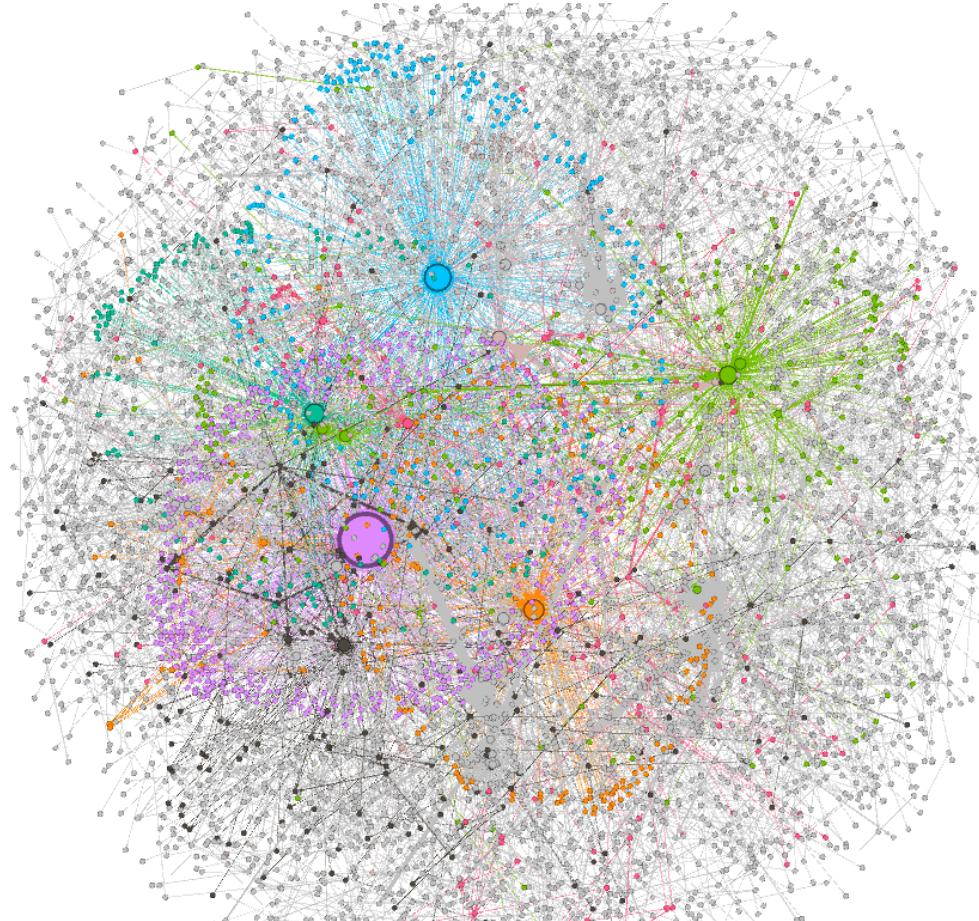
Number of edges is :4260 Percent of Edges is: 0.5276848755109624

Explanation of Statistical Analysis

From our betweenness centrality scores, we can identify the node that is the most connected to other nodes in the network and that serves as a bridge between other nodes/communities in the network. We identify this node later in the project and go into detail of how it functions in the network. Our global clustering coefficient tells us that most nodes in the network do not form closed triangles (as our score is quite low). What this may indicate is that users are interacting with hub nodes and forming communities this way, but fail to close the triangle by interacting with each other within their community. We have a decent amount of edges that form bridges, meaning that many nodes likely are only connected to one or two nodes, and the removal of such bridges would cause more disconnection in the graph. We see this, particularly in some of our communities identified further down the graph, which are connected only by one or two users. Thus despite talking about the same broad topics (the Midterm Election and its aftermath), our communities and components are largely at risk of being disconnected given the removal of crucial bridges.

Gephi Visualization and Communities of Interest

Due to the number of communities and the need to view segments of the graph as individual pieces, the graph was exported and Gephi was used to visualize the graph and label communities more clearly so that filtering and singling out of major communities for analysis could be accomplished more easily. The initial Gephi image is shown below, with 970 communities found using Modularity:



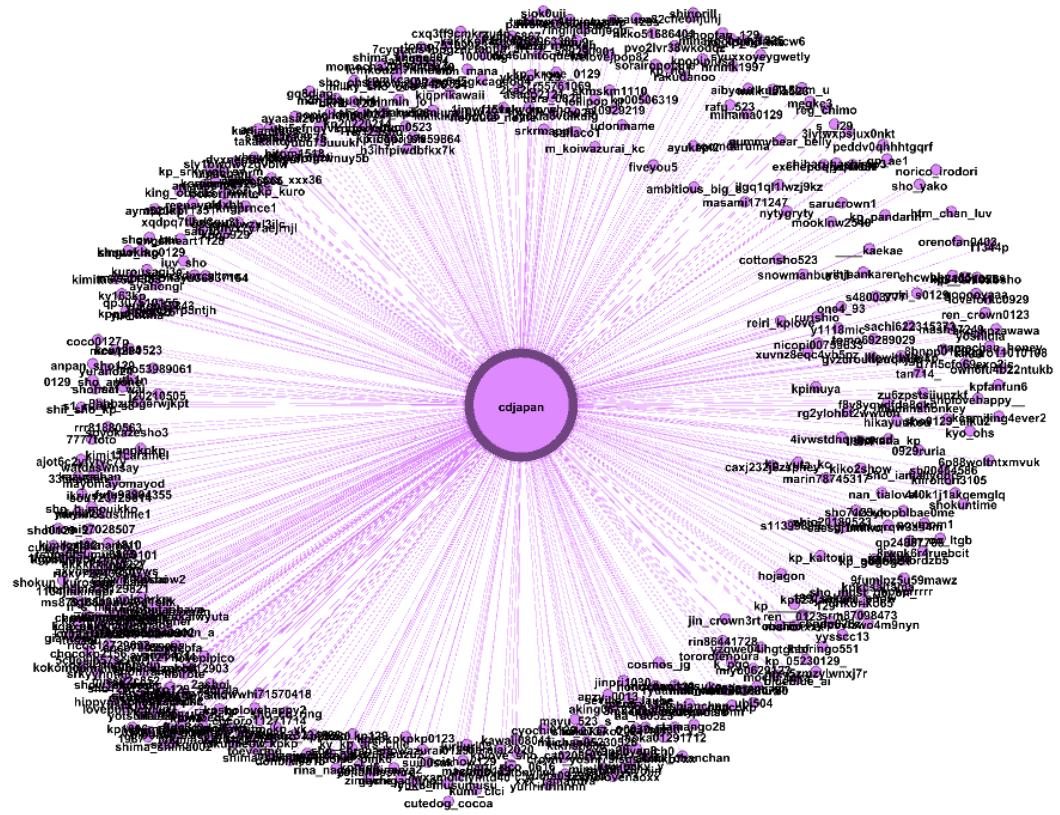
From this initial image, we can see several distinct communities that stand out from the others as major communities of interest. These will be the communities we focus on in our analysis to see what types of discourse were occurring and how this tied in to the overall environment of the 2022

Midterm election results. While this image is more muddled than what Julia had provided, using the Julia graph, we can identify visually the major component of the most connected and significant communities and single out this component in Gephi using a filter.

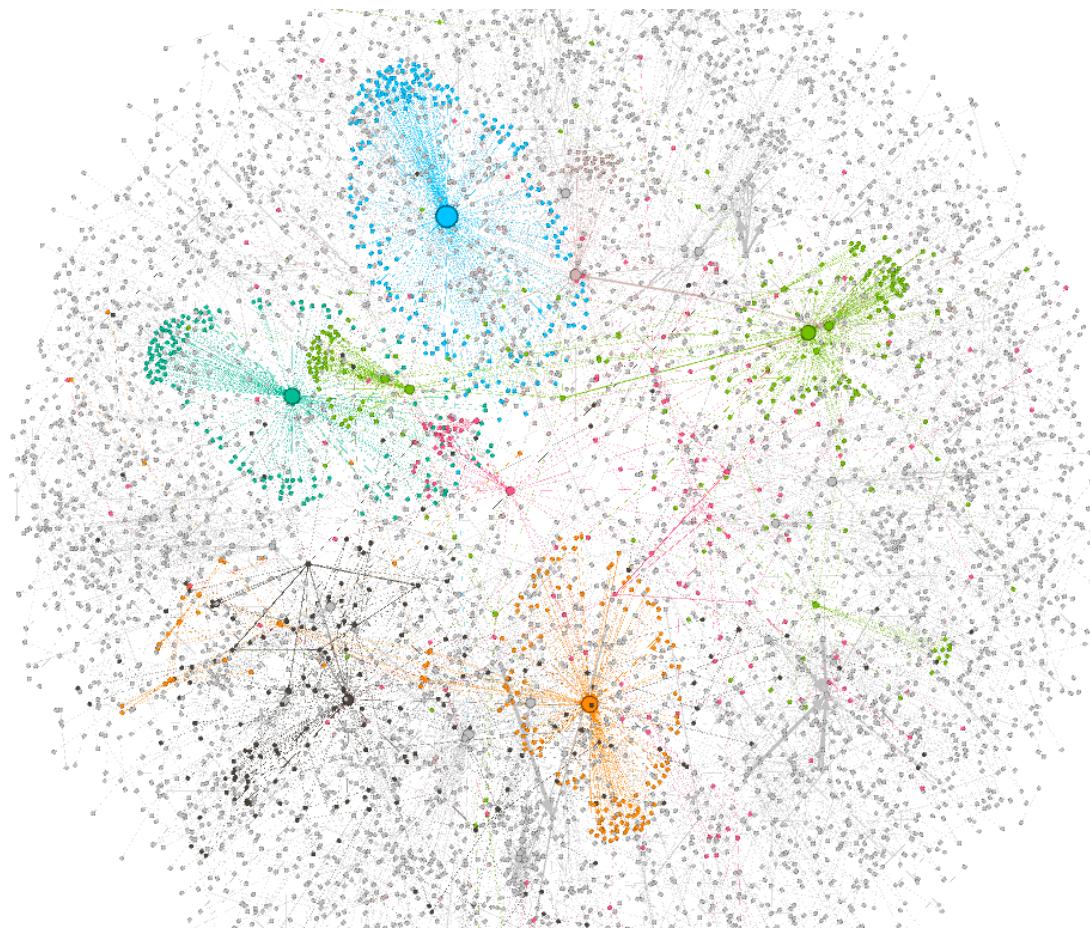
Findings

Filtering and Refinement to Find Communities of Note

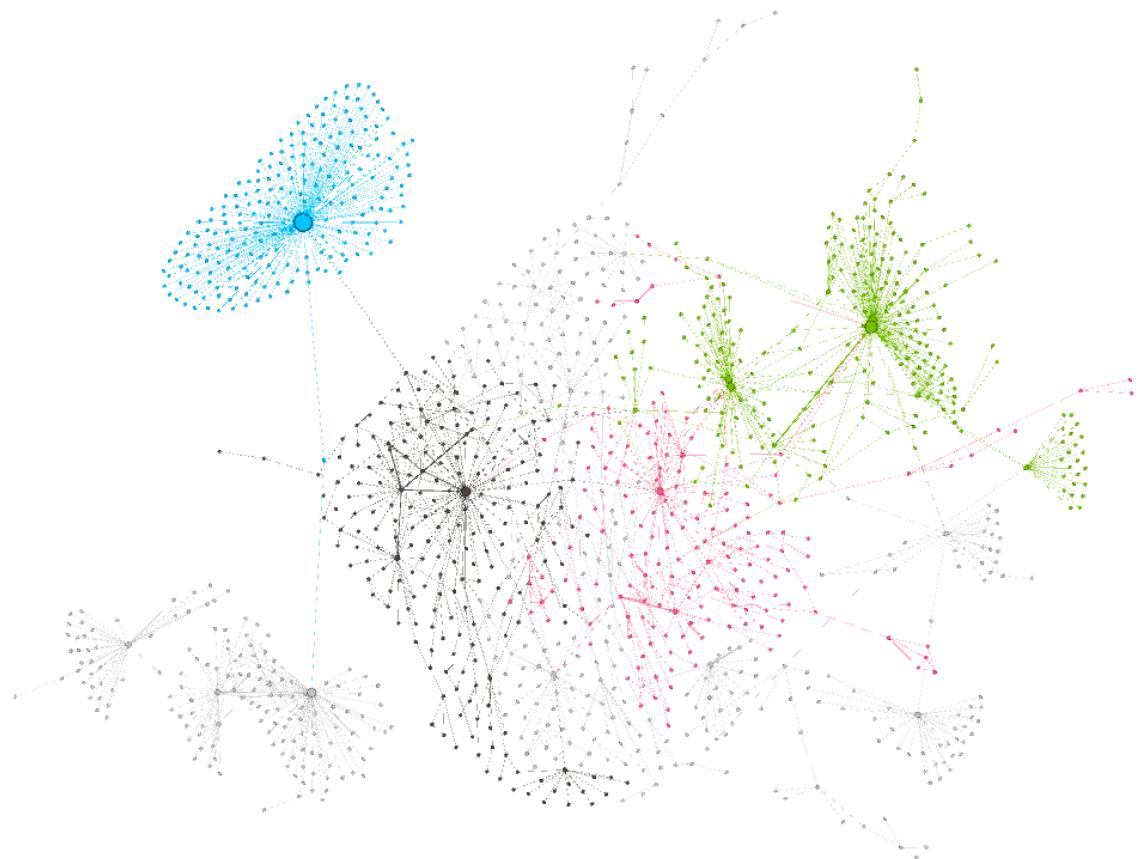
Following further inspection, our largest node and community surrounded a tweet by the account @CdJapan using the #Vote in regard to voting for an album to win a contest for their magazine. As this is irrelevant to the midterms, this network was filtered out.



Following the removal of this community, bar any nodes that were connected to any other nodes in the network, we are left with the network image below:



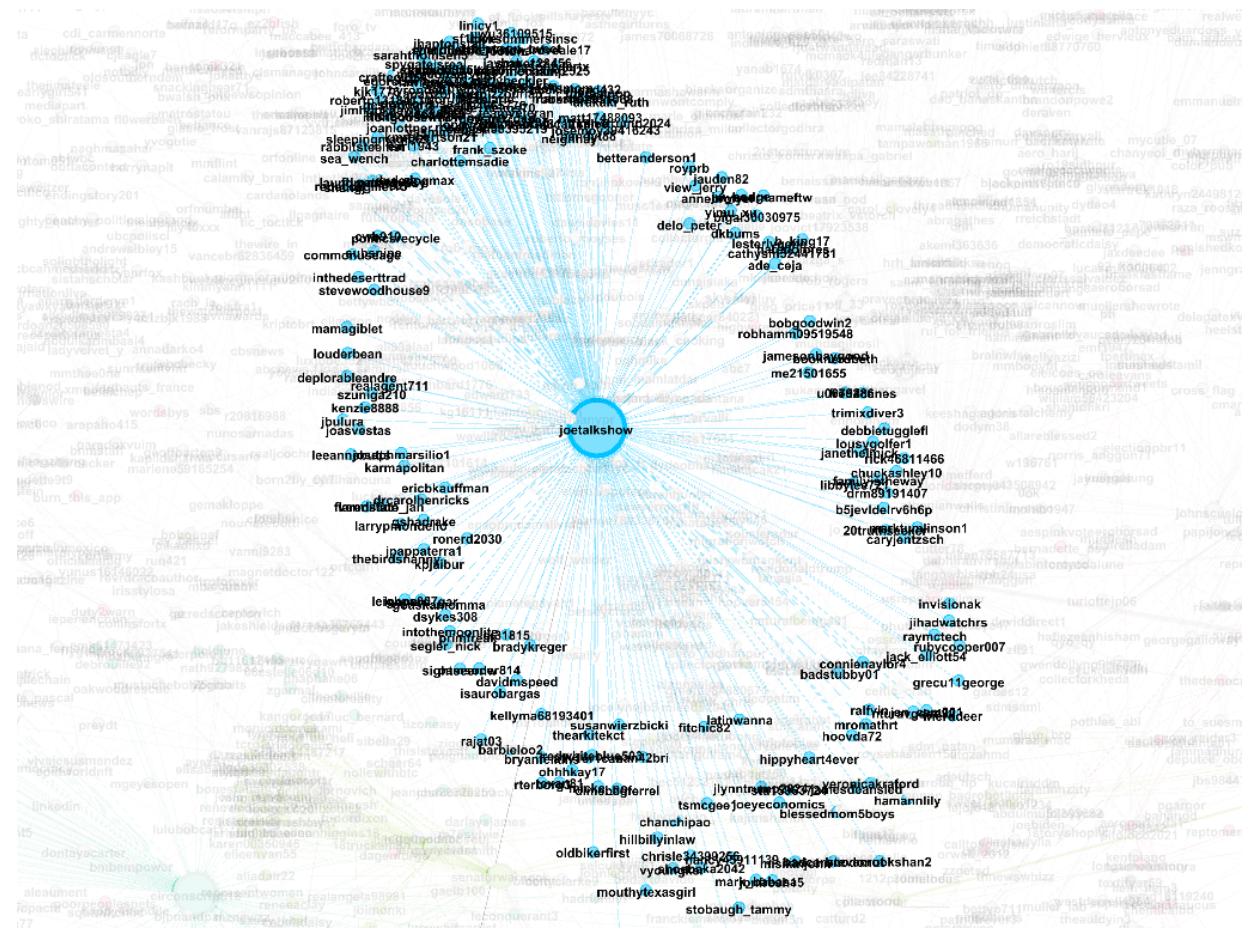
From our analysis, we can see that we have 957 components. As this is a large amount of components and unconnected networks, we add a filter to find our largest component, consisting of 1275 nodes and 1706 edges. The communities that make up this interconnected component will make up a majority of our further analysis. Running a Fuchtermann-Reingold algorithm on the filtered network, we are given the topology below:



Notably, in this filtered network, our Network diameter is reduced from 4 to 3, and our average path length is 1.102. This shows that this network is fairly interconnected, though as we can see, several key nodes serve as bridges, between communities such as the @JoeTalkShow Community in the blue, and the @epochopinion community in the grey.

Community 2: The Joe Talk Show

This left our node with the overall largest degree as @JoeTalkShow with a degree of 214, whose community is shown below



From sampling the tweets from our raw data, it appears that this community represents primarily retweets of and replies to videos by the host of this talk show regarding the midterms. Specifically, many of the tweets mention the Arizona election results and controversy surrounding the closeness of the election as well as other controversial election results such as the election in Pennsylvania. Below are a selection of some of the tweets that were commonly retweeted by the nodes in this network or replied to.

Joe Pags Pagliarulo @JoeTalkShow · Nov 16
caller gets owned. Not sure what he was thinking. rumble.com/v1useq0-caller... #Midterms2022

Joe Pags Pagliarulo @JoeTalkShow · Nov 15
okay #Republicans — you have the House. What are you going to do with it? btw, I should have mentioned @chiproytx in this as well. [@mattgaetz](#) [@RepMTG](#) [@Jim_Jordan](#) [@laurenboebert](#)

Joe Pags Pagliarulo @JoeTalkShow · Nov 15
Caller Tries To Fast Talk Pags — Not Smart
Caller from MN says he's an independent.. but Pags shows him he's not. Great content. www.joepags.com

Joe Pags Pagliarulo Retweeted
Joe Pags Pagliarulo @JoeTalkShow · Nov 15
#midterms #arizona #vote #KariLake

Joe Pags Pagliarulo @JoeTalkShow · Nov 15
And now the truth. youtube.com/shorts/OaD94tJ... #KatieHobbs #KariLake #Arizona

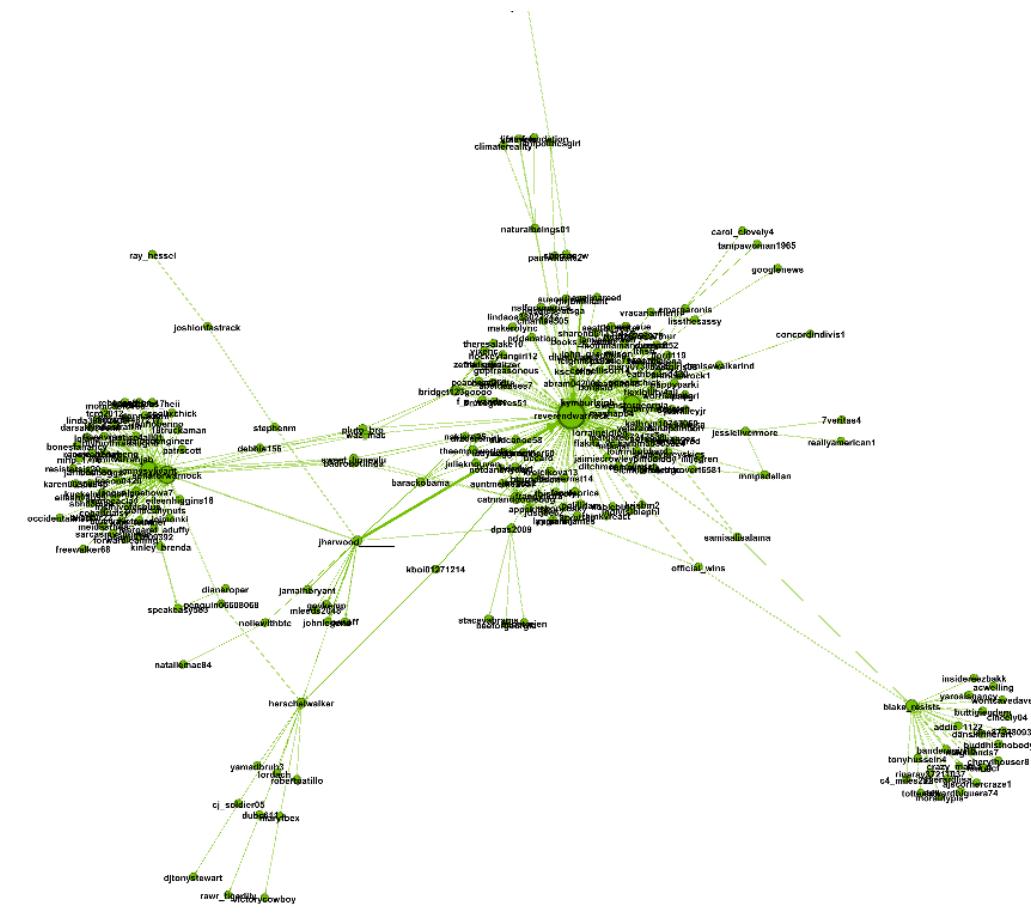
Joe Pags Pagliarulo @JoeTalkShow · Nov 15
Quality of candidate my ass.

Joe Pags Pagliarulo @JoeTalkShow · Nov 15
Don't fall for the "quality of candidate BS." Thanks #Fetterman #pennsylvania #midterms

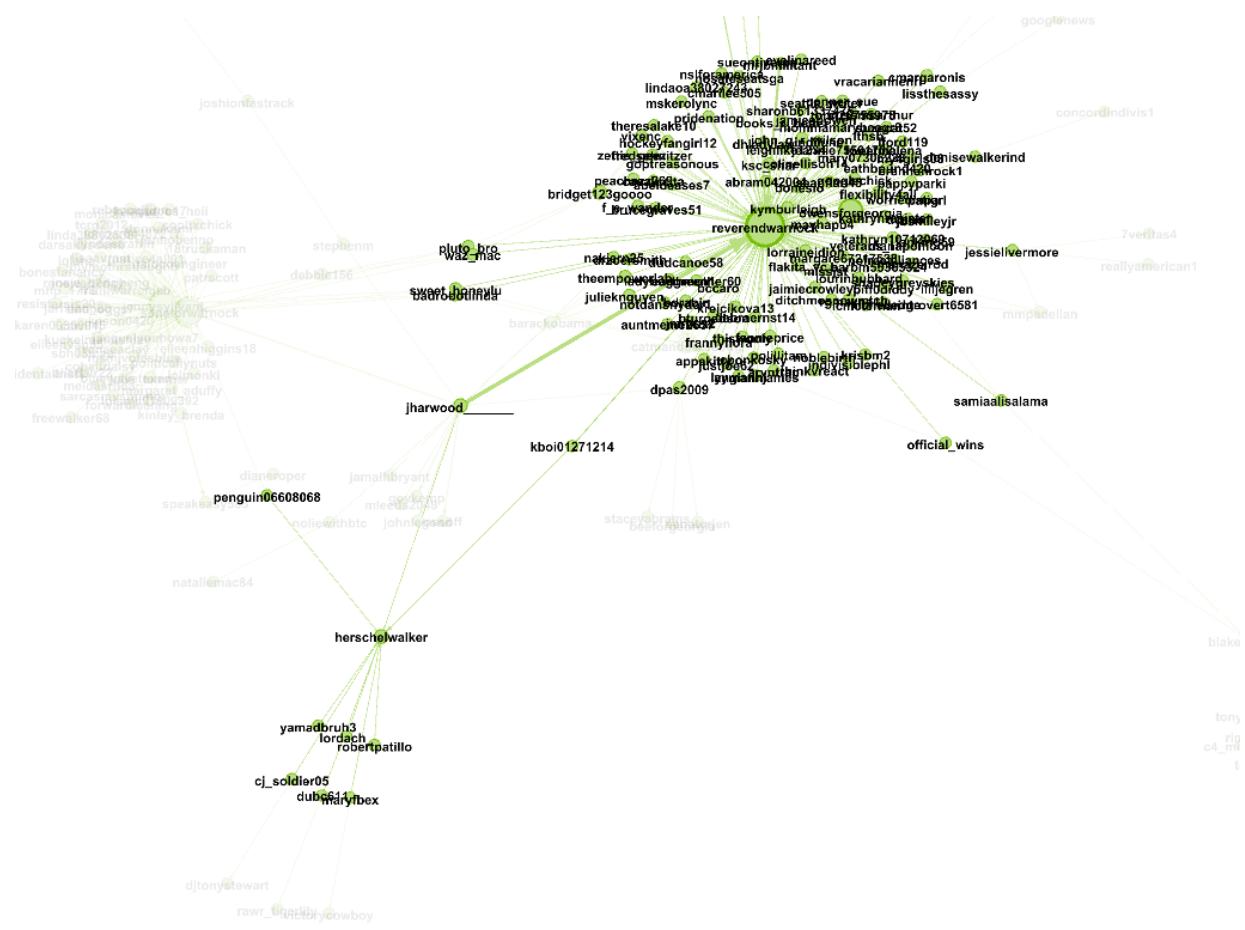
Notably, when looking at our raw dataset, almost all of the responses involving this account are Mentions/Retweets rather than replies, showing overall agreement of the people in this community with the ideas being echoed. The host is a conservative commentator so this community can be fairly assumed to be a right-leaning community as a whole, versus a community of nodes discussing an issue with accounts from the other side of the aisle. Thus as a fairly unanimous community, we can assume this is an echo chamber of sorts, and, when looking at our network, the nodes in this community appear to be fairly separate from other communities. In fact, this community is its own component, and is disconnected from other components/communities in the network.

Community 3: Georgia

Our third community of note appears to concern the Georgia midterms, a close race that has yet to be called as a run-off will occur in December. notably, two of our large hubs are different accounts for the incumbent candidate Reverend Warnock: @reverendwarnock and @senatorwarnock.



Other hubs of note here are an account called @Blake_Resists, a left-leaning account that was tweeting in support of Reverend Warnock, and the account of opposition candidate Hershel Walker. Notably, Herschel Walker's network is much smaller than Warnock's, and, when sampling tweets, we see that many of the tweets mentioning Walker are in opposition to him, while many of the Warnock tweets are in support of the incumbent candidate. Interestingly enough, the two bridges between the two candidates are a tweet by a now-deleted account @JHarwood_____ in support of Warnock, and a tweet by kboi1271214 in support of Walker, demonstrating that many of the tweets that mention one candidate or the other do not mention both candidates' accounts in the same tweet as there are only two bridges linking them to eachother.



Below are a selection of tweets related to this community and its hubs:

 **Blake**
@Blake_RESISTS

#Vote 
#VoteBlue 
#VoteBlueToSaveDemocracy 
#VoteForReverendRaphaelWarnock

#Dems4Rights        !! !!

RT @jHarwood_____ : @NoLieWithBTC @jamalhbryant @HerschelWalker
We don't need a Walker...
@ReverendWarnock us 
HONESTY. INTEGRITY. SERV...

 **Lordach**
@Lordach_

@HerschelWalker campaign motto should be, “Don’t make no sense.” #GeorgiaRunoff #GeorgiaBlue #MidtermElections2022

10:46 AM · Nov 15, 2022

 **Reverend Raphael Warnock**  @ReverendWarnock · Nov 22
US Senate candidate, GA
"This election, like the last one, is going to depend on you."
These voters have a message for you about Early Voting!



0:54 21.2K views

1:03 PM · Nov 22, 2022

 **RobertPatillo ~ Civil Rights Attorney ~ Radio Host**
@RobertPatillo
Replies to @GOP
@HerschelWalker beat the living shit out of a Pregnant woman and threw down a flight of stairs...and the #GOP STILL supported him knowing that from the before he ever got in the race. This is the definition of being morally bankrupt. The #MidtermElections2022 were KARMA

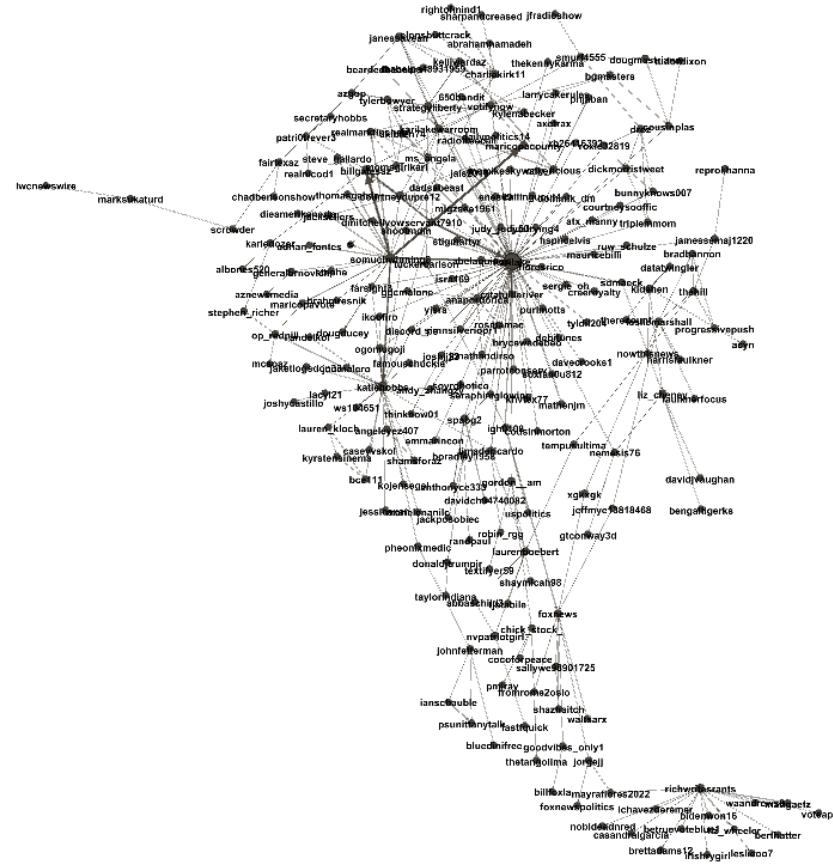
 #VoteWarnock4GA  
@Catmandoodlebug

GA #Vote #WarnockForGeorgia U.S. Senate

#DemVoice1
@ReverendWarnock

Community 4: Arizona

The fourth community of note concerns the Arizona election, another close election that required extra days to determine the outcome. Notably, our nodes with the two highest degrees in this network are @karilake and @katiehobbs, the two opponents in this midterm. Compared particularly with the Georgia network above, the nodes in this network are more evenly split between the two candidates, though Kari Lake still has a significantly higher degree, and both candidates are tied together by several bridges, meaning they are often spoken about in the same tweet compared to Warnock and Walker who were hardly linked.



Id	Label	Interval	In-Degree	Out-Degree	Degree
@karilake	@karilake		79	0	79
@katiehobbs	@katiehobbs		25	0	25
somuchwinning8	somuchwinning8		1	17	18
richwritersrants	richwritersrants		0	15	15
anapordorica	anapordorica		9	1	10
karilakewarroom	karilakewarroom		10	0	10
courtneydpr...	courtneydpr...		0	9	9
strategyliberty	strategyliberty		1	8	9
foxnews	foxnews		9	0	9

Sampling through the tweets in this network, it appears that many of the @KatieHobbs tweets were negative towards the candidate, who won the election by a narrow lead that prompted Kari Lake and her supporters to decry fraud in the Midterm election. However, the tweets @KariLake appear to be split between support and mockery of her claims of fraud, as shown below:

 **Dads A Beast**  @Dadsabeast

Replying to @KariLake

A message to All Arizonians DO NOT ALLOW THIS TO HAPPEN AGAIN! I DID NOT REALIZE THERE WERE SO MANY "SHEEP" IN YOUR STATE. DEMAND A RE-ELECTION. #MidtermElections2022 #arizonaelections #ArizonaElections2022 #ArizonaMidterms #arizonagovernor

12:33 AM · Nov 15, 2022

 **KELVIN_The_Great**  @khvtex77

Replying to @KariLake

The fact that this woman was close to becoming a US governor is truly frightening. She sounds like a senior leader at Qanon. God help us. #Midterms2022 #Election2022

3:19 PM · Nov 21, 2022

 **DO BETTER MARICOPA CO.**  @SoMuchWinning8

Replying to @maricopacounty and @billgatesaz

Next comes the indictment of @maricopacounty BOS, @katiehobbs & their co-conspirators for treason. Stay tuned! @billgatesaz @stephen_richer @Adrian_Fontes #Arizona #Midterms2022 #MaricopaCounty

...  SmIppIAgstBigGov  @SPABG2

Where do losers go to hide? 😞 Asking for a friend. 😊

3:25 PM · Nov 15, 2022

...  Republi... Democra... Peased off

Replies to @KariLake

Obviously, the most popular candidate “won”...
Down is up.
War is Peace.
Truth is Treason.
In The Empire of Lies.

#DemocracyWins #GOP #GOPLosers #Independent #RedWaveComing #RedWaveTrainWreck #MidtermElections2022

Community 5: GOP

Our final community of note from our large interconnected component is the one with the @GOP node as the hub. Other nodes of note in this network are @gopleader and @isellmpls.



Notably, a majority of tweets in this network appear to be critical of @Gop, either prominent conservative accounts and candidates blaming the GOP and supporting Trump as reasons for the Midterm results that were less than what Republicans had hoped for, or being critical of the GOP overall from left-leaning accounts, as shown below:

 Maverick 
@Isellmpls

Trump has the Midas touch in reverse these midterms.

The @GOP have completely supported him throughout every unethical and illegal act and now they want to quit him? That won't happen anytime soon, he's all yours, enjoy.

#FreshResists #MidtermElections2022

 TrumanDem 
@TrumanDem

@GOPLeader & other @HouseGOP members have been let it be known what hearings they are planning focusing on except for the ONE thing they screamed about before the #midterms2022: #inflation. Its all about revenge...

 Jake Hunsaker 
@JakeHunsaker

Donald Trump isn't a winner. He has no place as the leader of the @GOP moving forward.

@MickMulvaney @GBNEWS @mrmarkdolan #utpol
#DonaldTrump #MidtermElections2022 #GOP

 John Antony Negron 
@JohnNegron1

cc: @GOP @SenateGOP @SenateGOP
@LeaderMcConnell @GOPLeader @LindseyGrahamSC
@GOPChairwoman @SenTedCruz @SenRickScott et al
#Election2022 🗳️
#MidtermElections2022 📁 #GOP 🗳️

 Lindsey Graham 
@LindseyGrahamSC · May 3, 2016
If we nominate Trump, we will get destroyed.....and we will deserve it.

Highest Betweenness Centrality

Our node with the highest Betweenness Centrality was @epochtimes. Looking through our sample tweets, we can see that the tweets consist mainly of retweets of right-leaning headlines, as shown below:

The Epoch Times @EpochTimes Official

"What we've shown in Florida is... you can fight the woke elite, and you can win," said DeSantis.

Gov. @RonDeSantisFL, a potential presidential hopeful in 2024, said the #Midterms2022 show that #Florida presents a "blueprint for success" for the GOP.

theepochtimes.com

Florida Offers 'Blueprint for Success': DeSantis Says at Major GOP Gathering i...
Florida Gov. Ron DeSantis, a potential presidential hopeful in 2024, said during the weekend that the midterm results ...

1:55 PM · Nov 21, 2022

The Epoch Times @EpochTimes Official

A 2nd #Arizona county delayed certifying its #Midterms2022 results until the Nov. 28 deadline in a show of solidarity with #MaricopaCounty.

The delay comes after GOP gubernatorial candidate @KariLake said that "whistleblowers are coming forward."

The Epoch Times @EpochTimes Official

An analysis found that 86% of Trump-backed GOP candidates won their elections in the #Midterms2022.

theepochtimes.com

Trump Makes MASSIVE Update on 2024 Election; Analysis Shows 86% Win Ra...
After announcing his intention to run for President again in 2024, former President Trump also mentioned that the ...

The Epoch Times @EpochTimes Official

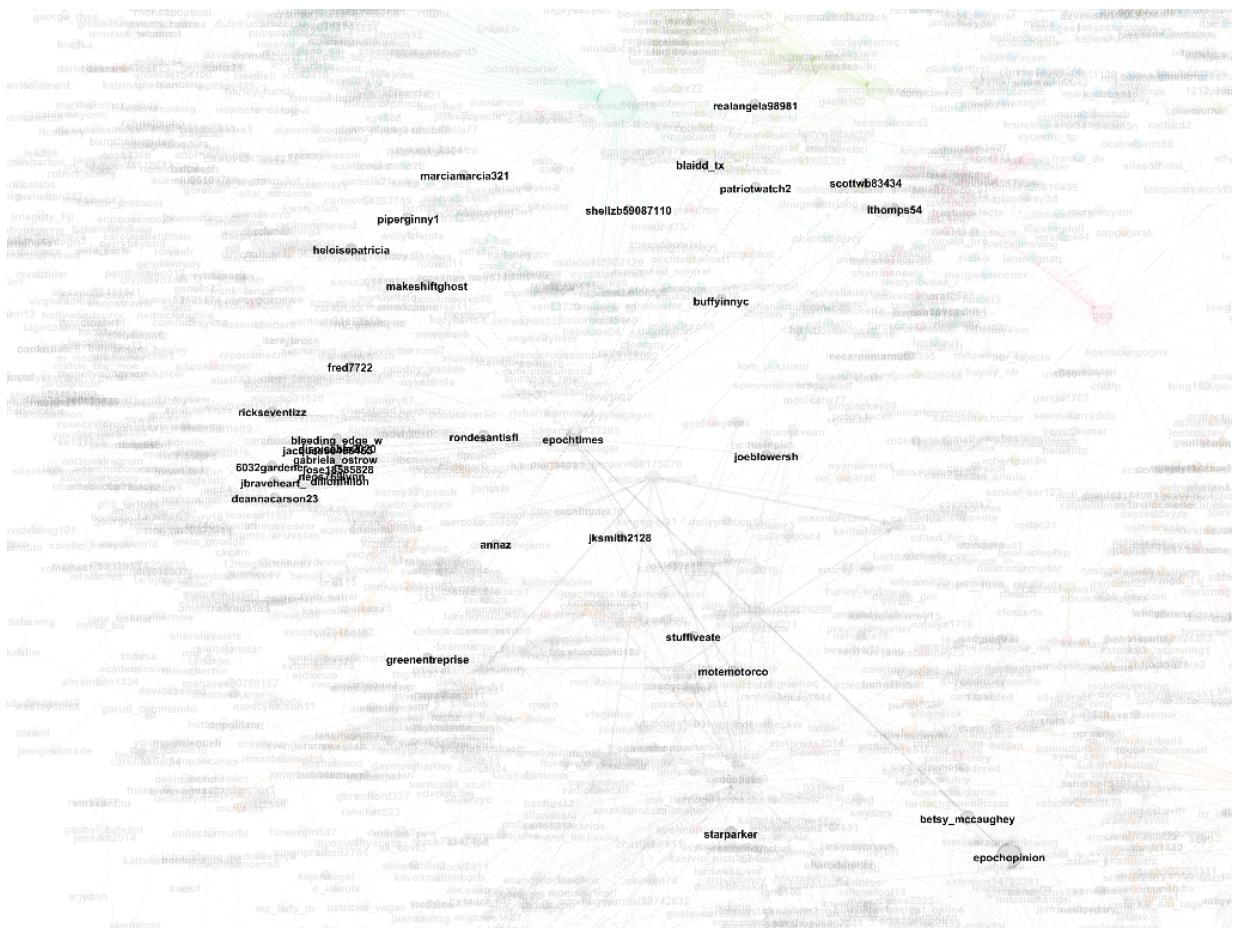
"We secured... the most Republicans we have ever had in Florida's history."

Gov. @RonDeSantisFL contested the "underwhelming performances" by Republicans in the #Midterms2022 with a "true Republican landslide" in #Florida.

theepochtimes.com

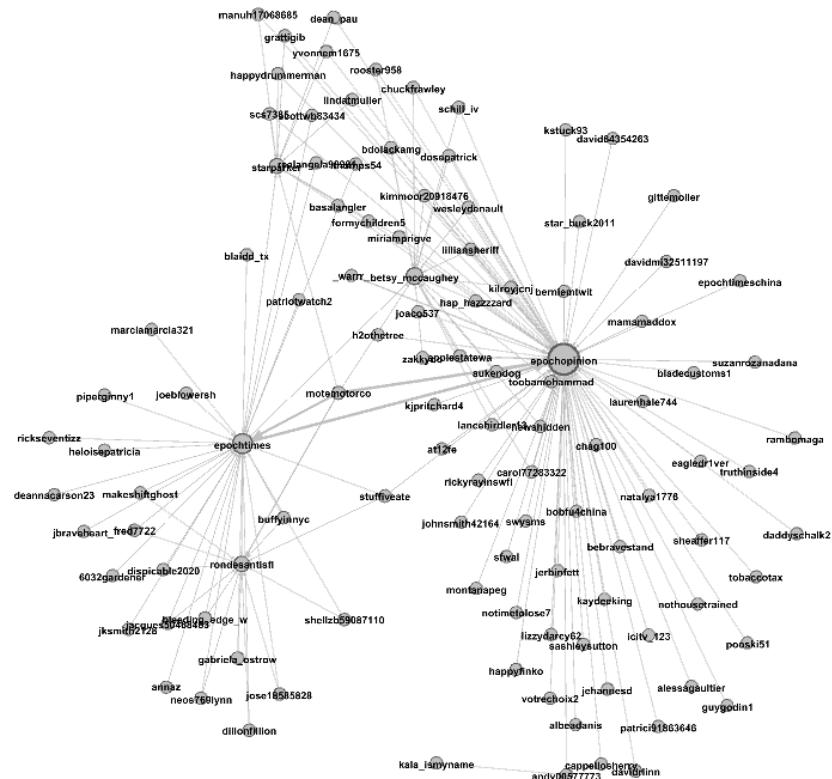
DeSantis Credits Florida's Red Wave to Leadership Against 'Woke Mind Virus'
Florida Gov. Ron DeSantis on Nov. 19 acknowledged "underwhelming performances" by Republicans in the midterm elections and contrasted the ...

This account thus having the highest betweenness centrality and with tweets from our sample tending to favor conservative headlines, we can infer that it serves as a key bridge between one or more of our communities in this network, and that were this node (which is a news outlet) to be removed, the component of connected communities would be significantly impacted and several communities, such as the one surrounding the Epoch Times and Epoch Opinion, would ultimately be disconnected into their own components. Thus we can see that users of these communities are connected to the broader discourse only through their connection to the Epoch Times news outlet that they receive their information from. With these nodes being disconnected from other communities, this forms an echo chamber of sorts with regard to where these users are getting their information from and whom they are interacting with. Below is an image of the nodes connected to the Epoch times by at least one mention or retweet.



This node is of the community of the @epochopinion hub shown below, which is the opinion account of the Epoch Times, and has a notably higher degree, meaning tweets from this opinion account are interacted with more than headlines from the Epoch Times itself:

Id	Label	Interval	In-Degree	Out-Degree	Degree
epochopinion	epochopinion		80	0	80
epochtimes	epochtimes		29	4	33



This community is notably separate from other communities in the network, connected by only one or two bridge nodes. This shows that this community serves as somewhat of an echo chamber of conservative opinions. Some prominent tweets found in the raw data are sampled below:

Opinion by Stu Cvrk

The media narratives during the #Midterms2022 are a classic example of media warfare of which the #CCP would be proud.

The Democrat-media complex playbook was right out of the Three Warfares strategy.

Opinion by @StarParker

Can it possibly be accidental timing that Biden reached out to tens of millions with #StudentDebt—offering to wipe these loans out—just prior to the #Midterms2022 when the outlook for his party was not looking encouraging?

Opinion by @Betsy_McCaughey

How serious could the so-called threat of 'right-wing domestic extremism' have been if, now that the #Midterms2022 are over, the #Jan6Committee puts aside concerns about it?

It was a lie all along.

Conclusions

From our findings on the network graph and the communities that make up our network we can come to some interesting conclusions regarding post-midterm debate topics and the organization

of political communities and discourse on the Twitter platform.

While a large amount of tweets formed small communities of one or two nodes, using filtering techniques, we were able to find our largest component, with the communities remaining all being linked by at least one tweet.

Firstly, many of the communities surrounded conservative figures, we see this in the communities with a hub of Kari Lake, GOP, JoeTalkShow, and EpochOpinion. While this may indicate a more strong right-wing presence on Twitter, it is important to note that, in the cases of Kari Lake and the GOP communities, many of the tweets connected to these accounts are criticism of them, either by users on the left, or in the case of the GOP, from members of their own political alignment criticizing their midterm performance.

In addition to this, we see that the Epoch Opinion and JoeTalkShow communities are mostly separated from the other communities in the network component, linked by only one or two tweets. This is in comparison to the KariLake, GOP, and Warnock communities which are more closely connected. What this may indicate is that users who are tweeting at or about these conservative outlets are not interacting with the wider network and topics, and in addition, these outlets themselves are not interacting with accounts tied to these topics (though as we see above, JoeTalkShow did talk about Kari Lake, yet he did not tag Kari Lake's account, and most who interacted with his tweets did not either). In the case of the Epoch times, while they did mention @KariLake directly, they did not tweet anything to connect them to the Georgia run-offs. Notably, neither of the outlets or their community members had a tweet directly connected to Georgia or the GOP, and only had one user tying them to each other. This shows that users connected to these two communities may exist in somewhat of an echochamber, interacting with the outlet, yet not joining the larger conversation.

Another interesting aspect when sampling from the news outlet communities is that a majority of the users are simply retweeting the posted article or opinion, echoing support while not adding anything to the wider conversation as with a reply or mention. This may show a reason why the communities are so separate from the others, in that the users are not participating in the discourse surrounding these wider topics, and are showing support only by echoing the opinions of their outlet of choice.

This is in contrast to the closely knit GOP and Kari Lake communities that also have ties to the Warnock community. These communities all consist of more left-leaning opinions, with the Warnock community being heavily left-leaning based on sampling of tweets, and the GOP and Kari Lake communities being split between left and right (though the GOP community appears significantly more critical of the GOP, it is split between left-leaning criticism and right-leaning criticism). The presence of these communities make sense as they are the hottest topics in American Politics at the moment following the midterms. Kari Lake recently announced her challenge to election results in AZ, Warnock is going into a run-off election against Walker, and with Trump announcing another run for the presidency and subsequent criticism of Trump ideology in the GOP following the across the board Midterm underperformance, the GOP's stance on how they align themselves is being questioned by those on the left and right.

Notably, in the Warnock community, almost all tweets are centered around Warnock, with even criticism of Warnock not referencing his opponent Herschel Walker. Walker is actually a fairly small node in this community, meaning he is not referenced or retweeted as much as Warnock himself or other figures that tweeted out support or criticism of Warnock which may have gained traction. This

is in contrast to Kari Lake and Katie Hobbs, which, while Lake is mentioned significantly more, Hobbs still has a fair amount of tweets mentioning her either in support or criticism. This may indicate an overall presence of Warnock as a figure to support or criticize versus Walker, who mostly was mentioned in a negative light when he was mentioned at all in the connected tweets, whereas Hobbs and Lake are more equitably supported and criticized as figures in their election.

With our Julia Statistics and the identified communities that we zoomed in on the crucial component, we can see that even this interconnected component amongst the sea of smaller components is at risk of disconnection given the removal of key bridges. This shows that users typically only are interacting with one topic regarding the midterms or even just one account/news source. This strengthens our conclusion that there are echo chambers of political discourse on Twitter regarding the aftermath of the midterms and that these echo chambers, which lean towards conservative ideology, are not directly interacting with key figures or communities surrounding key post-Midterm discourse, such as the Georgia run-off. Even when they do discuss the key issues such as in the instance of the JoeTalkShow and Kari Lake, they and their community of users do not interact with the key community surrounding the issue and thus do not join the wider discourse.

Given access to a Twitter API, we would be interested in running this analysis in the future to see what changes and whether we would still see these same communities and echo chambers, or whether some of these accounts would be more connected given a wider range of dates (particularly with the news outlets and the users in their communities).