FOLLOW THE MONEY

Term Project Research Report – MSDS 452

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Abstract

Political contributions have a profound effect on elections. Campaign contributions could stem from a tiny, wealthy elite or a large corporation or organization that is purposely founded for election such as a PAC. Campaign donations are known to be socially contagious so mapping out and understanding how campaign donations diffuse through the network would be indicative and helpful on election prediction. In this study, a deep dive network analysis leveraging Python and Gephi is conducted to look into 2022 election donation data including organizational donors, receivers, donation amount and so on. The primary goal of this study is to dissect the network from different angle such as Party and organization type and identify top organizational entities measured by donation amount or connection based on network centralities.

Key Words:

Election, Donation, Network Analysis

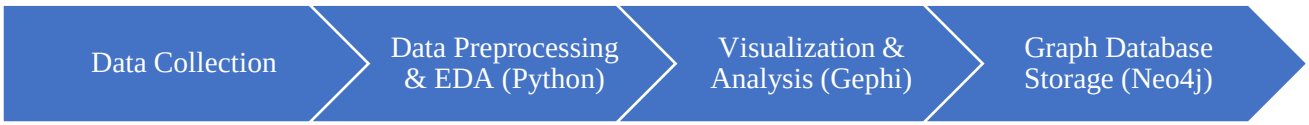
Introduction

Political contributions have a profound effect on elections. Campaign contributions could stem from a tiny, wealthy elite or a large corporation or organization that is purposely founded for election such as a PAC. Campaign donations are known to be socially contagious so mapping out and understanding how campaign donations diffuse through the network would be indicative and helpful on election prediction. In this study, a collection of data regarding election campaign funds are sourced from https://www.data-science-quarterly.io/ and used to generate network graph for further analysis. The graphs generated are visualized through Gephi with an attempt to identify underlying patterns. The network data is organized and stored into Neo4j which provides robust capability of storing and querying the data for further analysis.

Literature Review

Money is central in US politics, and most campaign contributions stem from a tiny, wealthy elite. Like other political acts, campaign donations are known to be socially contagious (Traag, 2016). In Traag's tudy, the diffusion of campaign donations through a network of more than 50,000 individual donors have been studied on their connectivity and contagion. Some findings from the study includes that people are more likely to donate when exposed to donors from different social groups than when they are exposed to equally many donors from the same group. Another study studied the donation connectivity between large American corporates and political leaders and uncovered the changing structure of the network and its impact on US politics. Donors associated with the same firm or industry are substantially more likely to donate to the same candidates in all the elections we study. Likewise, politicians serving on the same congressional committees have been consistently more likely to receive campaign funds from the same donors (Rickey and Zakir, 2021).

Method



The dataset used for this study was downloaded from https://www.data-science-quarterly.io/, which contains contribution and expenditures of 2022 Election Cycle to Date obtained from the Federal Elections Commission. The dataset is structured into two files, one is "*Nodes with Attributes*", which contains individual committee names with associated attributes such as organization type, Party name and so on. The other file is "*Nodes, Edges, with Corresponding Weights*", which tracks the money flow as edges with amount as weights. The data was then loaded into python notebook and constructed into directed network graph object using networkX package. Then the network graph object was converted into .gexf file and loaded into Gephi for visualization. Meanwhile, the network dataset is saved into graph database by Neo4j via naxneo4j package.

Results

There are a total of 4,064 nodes (entities) and 4,558 edges in the network. Some exploratory analysis is conducted through embedded feature called Statistics within Gephi. As shown in the Figure 2, the weighted degree is right skewed with average level at $80,398.44 as donation amount. There are 566 connected components detected overall with average degree 1.122.

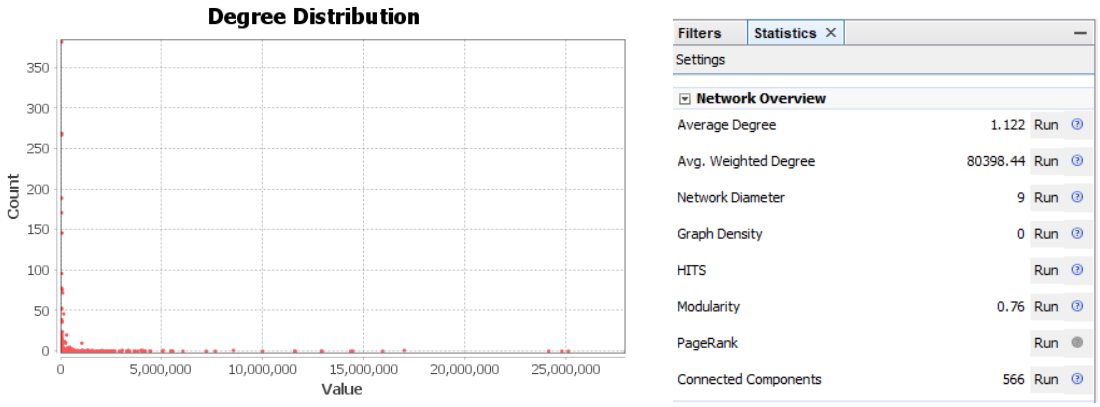


Figure 2. Data Exploratory Analysis

The visualization is primarily implemented through Gephi. A snapshot (Figure 3) of overall network is generated under OpenOrd layout, which seems to be outstanding layout converge faster with capability to separate congested nodes into communities in a cleaner format.

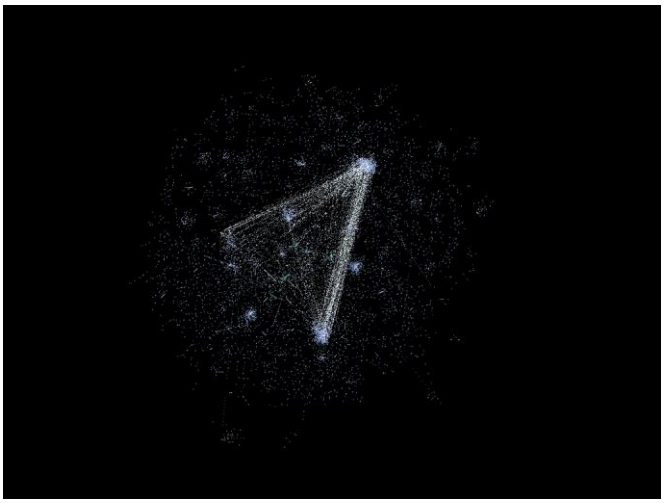


Figure 3. Snapshot of network graph

To demonstrate the pattern and extract key insights out of the pattern, a few experiments have been done to exaggerate some aspects of the graph. Nodes are resized (ranking) by degrees and color coded based on modularity class, while edges are partitioned by weight intuitively as shown in Figure 4.

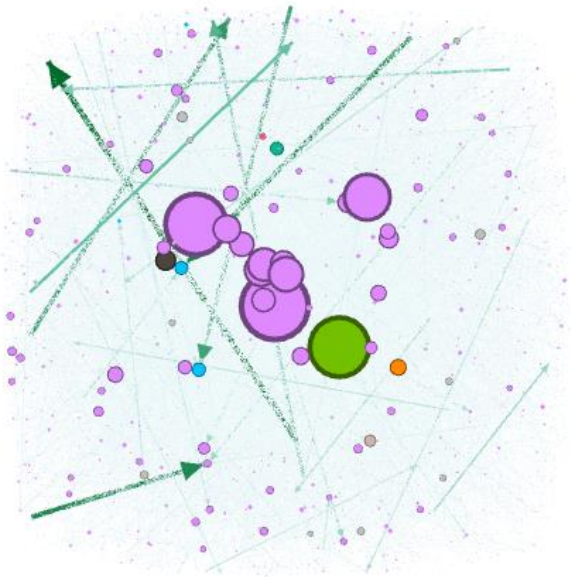


Figure 4. Network Graph with Node & Edge Partition

(Nodes are differentiated with partition by modularity class and size ranking by degree, edges are differentiated by weights)

By apply filtering feature based on degree range (degree > 70), the bigger nodes in the Figure remain including Actblue (153), Fair Fight(115), Winred(169), American Veteran Society PAC(149), Morongo Band of Mission Indians(81), Poarch Band of Creek Indians(81), The Chickasaw Nation(86). It makes good sense that Actblue has highest degree centrality as the organization dedicates to grassroot fundraising programs so that more individual donors that regular organizations who focus on enterprises. Interestingly, all these nodes except American Veteran Society PAC are categorized under same Modularity Class, suggesting their closer relationship.

Id	Label	Interval	CMTE_ID	CMTE_ST	Ctype	PartyName	InterestGroup	ComDesignation	CONNECTED_ORG_NM	Modularity Class	In-Degree	Out-Degree	Degree
Winred	Winred		C00694323	VA	PAC with non-con...	NaN		Unauthorized		116	129	40	169
Actblue	Actblue		C00401224	MA	PAC with non-con...	NaN		Unauthorized		116	82	71	153
American Veteran...	American Veteran...		C00708453	AZ	Independent exp...	NaN		Unauthorized	None	311	149	0	149
Fair Fight	Fair Fight		C00693515	GA	PAC with non-con...	NaN		Unauthorized	None	116	113	2	115
The Chickasaw N...	The Chickasaw N...									116	0	86	86
Morongo Band Of...	Morongo Band Of...									116	0	81	81
Poarch Band Of C...	Poarch Band Of C...									116	0	81	81

Apart from nodes with high degree centrality, several weighted edges are also highlighted in the graph. Below is the list of edges (donation) with fund more than $ 10 million.

Source	Target	Type	Id	Label	Interval	Weight
Majority Forward	Smp	Directed	487			14300000.0
One Nation	Senate Leadership Fund	Directed	529			14400000.0
American Action Network	Congressional Leadership Fund	Directed	692			11519704.0
League Of Conservation Voters, Inc.	Lcv Victory Fund	Directed	2202			12750000.0
Republican Governors Association	Rga Right Direction Pac	Directed	3248			16950000.0

Community detection analysis is conducted via Modularity feature embedded in Gephi (randomized, resolution 10). 569 communities have been detected suggesting the sparse distribution of nodes across different communities. The top three communities are color-coded accounting for almost 50% of nodes with largest community accounting for 27.26% nodes as shown in Figure 3. Five out of seven nodes with 70+ degrees are within this community including Winred, Actblue, The Chickasaw Nation and Morongo Band of Mission Indians, and Poarch Band of Creek Indians, which probably makes sense that the latter three nodes are all Indian tribe related as details shown in Figure 4.

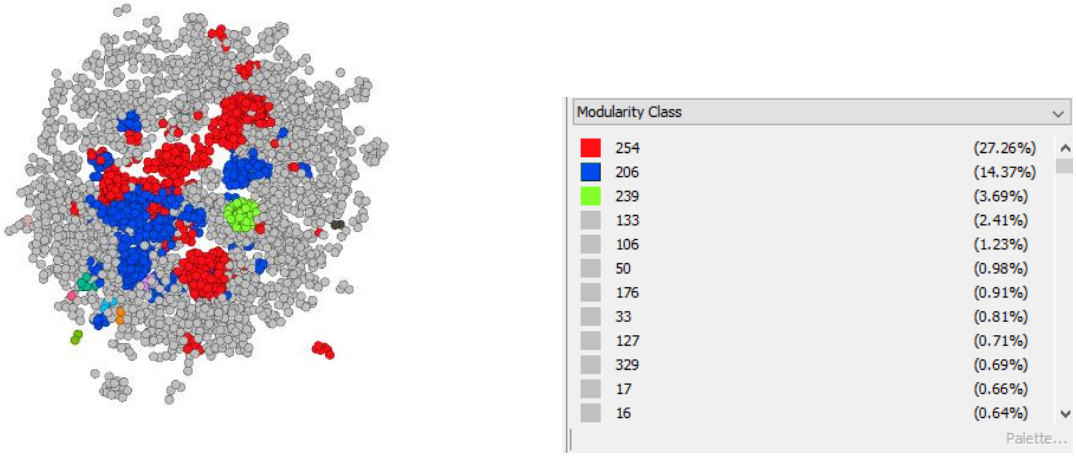


Figure 5. Modularity Community Detection – Gephi

Id	Label	Interval	CMTE_ID	CMTE_ST	Ctype	PartyName	InterestGroup	ComDesignation	CONNECTED_ORG_NM	Modularity Class	In-Degree	Out-Degree	Degree
Winred	Winred		C00694323	VA	PAC with non-contributi...	NaN	◆	Unauthorized		254	129	40	169
Actblue	Actblue		C00401224	MA	PAC with non-contributi...	NaN	◆	Unauthorized		254	82	71	153
The Chickasaw Nation	The Chickasaw Nation									254	0	86	86
Morongo Band Of Missio...	Morongo Band Of Missio...									254	0	81	81
Poarch Band Of Creek I...	Poarch Band Of Creek I...									254	0	81	81

Figure 4. Nodes with 70+ degrees in community 254

Another look was taken on betweenness centrality of nodes. The betweenness centrality above 200 have been highlighted. Winred and Actblue are ranked top 2 with highest betweenness centrality, which is also reflected by their in-degree and out-degree. Winred is with 129 in-degree and 40 out-degree while Actblue has 82 in-degree and 71 out-degree. This could be partially explained by the fact that WinRed is the official secure payment technology via which a lot of donations are wired to candidates (https://winred.com/about/).

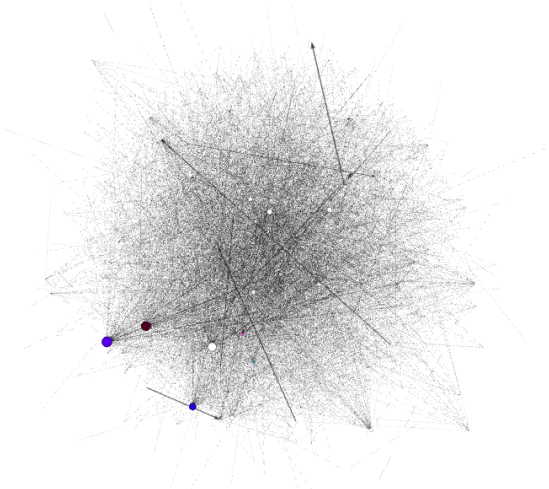
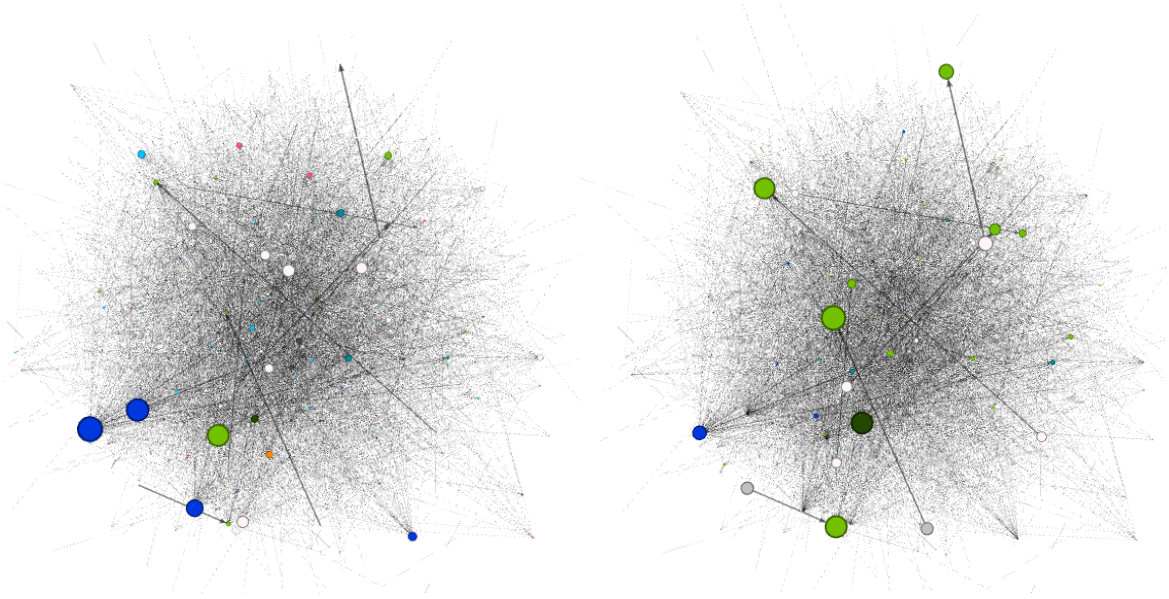


Figure 6. Network Graph – Nodes Partitioned by Between Centrality

Views of nodes portioned by attributes have been mapped out. One experiment carried out is to compare the network of nodes with partition by Ctype and ranking by degree versus weighted degree.



Node Ranking – Degree **Node Ranking – Weighted Degree**

Figure 6. Network Graph – Nodes with Size Ranking by Degree vs Weighted Degree

In the graph in which nodes are sized by degree, WinRed and Actblue are the top 2, both are PAC with non-contribution account – nonqualified. While in the graph in which nodes are sized by weighted degree, two independent Super PACs pop out, Senate Majority PAC and Senate Leadership Fund, as top 2 with weighted average degree above $25 million. The former serves solely Democratic while the latter offers support to Republicans, both are legacy PAC running for senate race with donations mainly from large enterprises or group.

A deeper dive is taken to look at the e go network of top 2 super PACs. Figure 7 and 8 shows the ego network of SMP (Senate Majority PAC) and Senate Leadership Fund. For SMP, the biggest donation comes from Majority Forward with $14.3 Million, Majority Forward is a 501(c)(4) organization working with Senate Majority PAC as clarified on their website (https://www.majorityforward.com/). While the biggest donation source for Senate Leadership Fund is One Nation.

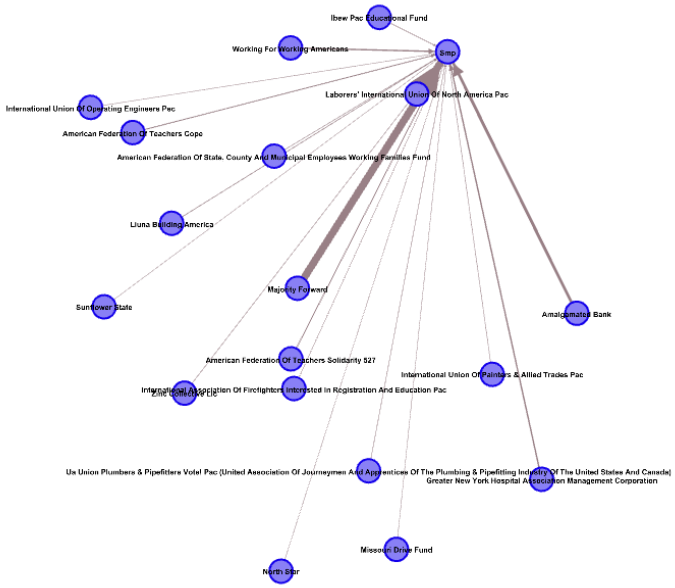


Figure 7. Ego Network Subgraph – SMP

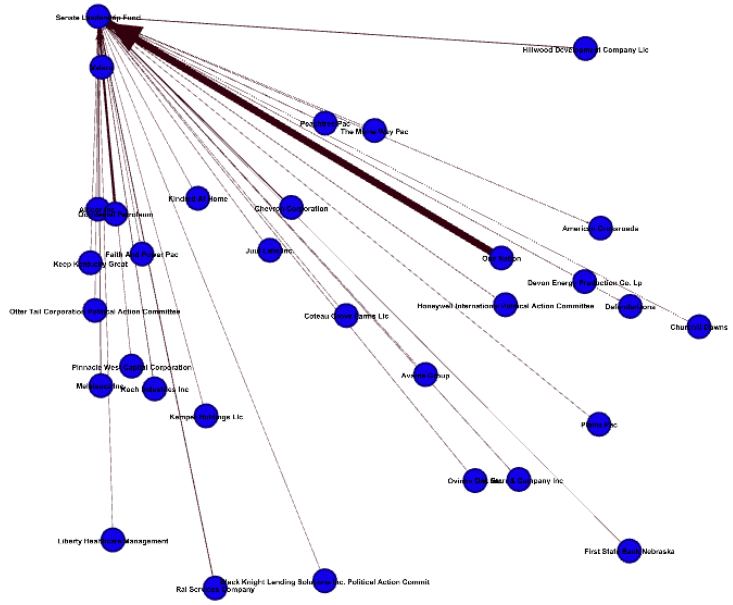


Figure 8. Ego Network Subgraph – Senate Leadership Fund

Figure 9 demonstrates the ego network of WinRed including 166 nodes and 203 edges, there are more neighboring nodes and associated edges out of which the highest two transaction are wired to NRSC (National Republican Senatorial Committee) with $504.8 thousands and to NRCC (National Republican Congressional Committee) with $477.7 thousands. Figure 10 illustrates the ego network of Actblue, the subgraph involves 154 nodes and 192 edges with highest weight of $20k flowing to Sunflower Seeds PAC.

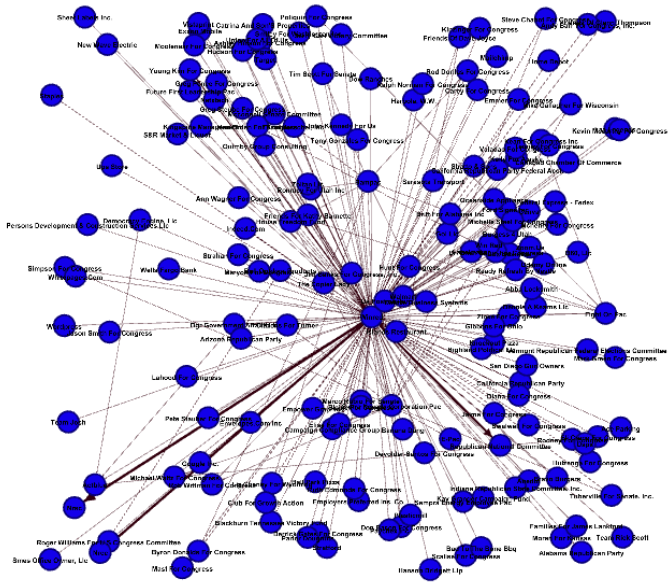


Figure 9. Ego Network Subgraph – WinRed

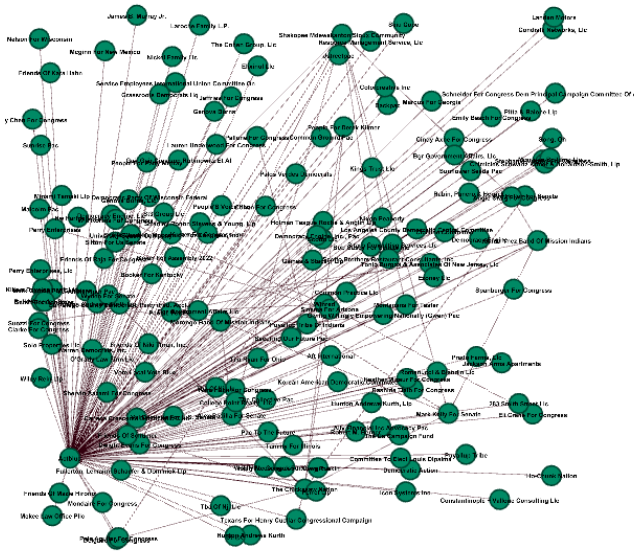


Figure 9. Ego Network Subgraph – Actblue

To get better understanding on the nodes where the money ends up with high in-flow, another graph view is generated so that nodes are resized based on weighted in-degree and portioned by Ctype as shown in Figure 10. Among the top 10 entities, 8 of them are super PACs including SMP, Senate Leadership Fund, 1 of them is House Majority PAC, which is PAC with non-contribution account as one type of hybrid

PAC according to Federal Election Commission. The remaining one is NRCC, as party-qualified for Republican.

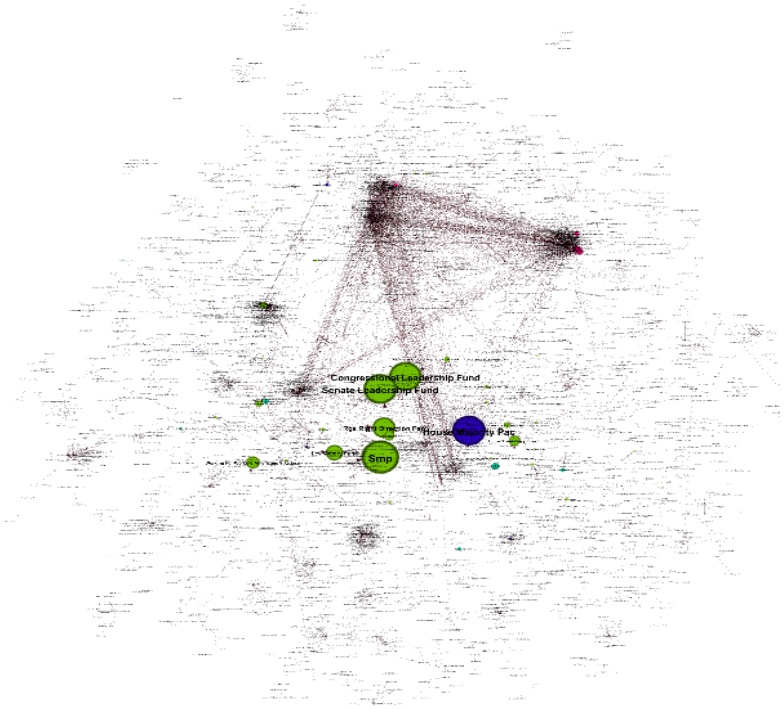
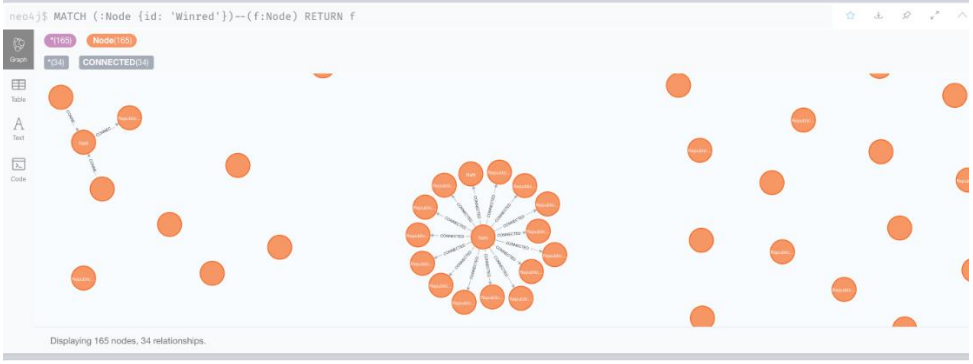


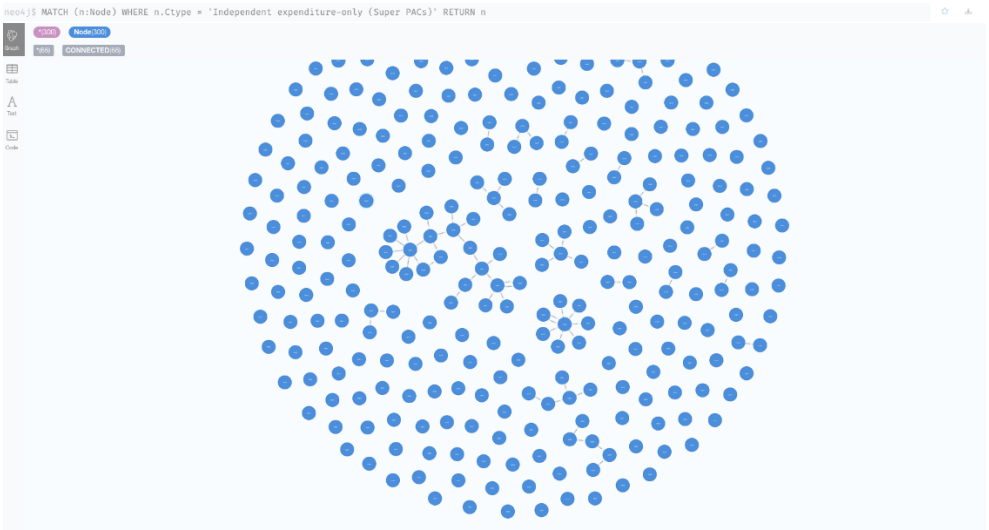
Figure 9. Ego Network Subgraph – Actblue

Id	Label	Interval	CMTE_ID	CMTE_ST	Ctype	PartyName	InterestGr...	ComDesign...	CONNECTED_...	In-Degree	Out-Degree	Degree	Weighted In...
Smp	Smp		C00484642	DC	Independen...	NaN		Unauthorized		18	0	18	27893648.0
Senate Leadership Fund	Senate Leadership Fund		C00571703	DC	Independen...	NaN		Unauthorized		29	3	32	24901103.0
House Majority Pac	House Majority Pac		C00495028	DC	PAC with no...	NaN		Unauthorized	None	49	1	50	24743962.0
Congressional Leadership Fund	Congressional Leadership ...		C00504530	DC	Independen...	NaN		Unauthorized	Take Back The ...	33	0	33	24094983.0
Rga Right Direction Pac	Rga Right Direction Pac		C00490730	DC	Independen...	NaN		Unauthorized	None	1	0	1	16950000.0
Lcv Victory Fund	Lcv Victory Fund		C00486845	DC	Independen...	NaN		Unauthorized	League Of Con...	4	1	5	12831258.0
Working For Working Americans ? Federal	Working For Working Ame...		C00490847	NV	Independen...	NaN		Lobbyist/Regi...	Carpenters Leg...	1	0	1	9931579.0
United Democracy Project	United Democracy Project		C00799031	DC	Independen...	NaN		Unauthorized		1	0	1	8500000.0
Dga Action	Dga Action		C00503789	DC	Independen...	NaN		Unauthorized	Democratic Action	2	0	2	7600000.0
Nrcc	Nrcc		C00075820	DC	Party - quali...	Republican P...		Unauthorized	Cole Combined ...	28	0	28	5494355.0

While the data has been pumped into Gephi for visualization, it has been populated into Neo4j database for storage. The Figures below provides some snapshots of the “follow the money” data stored in Neo4j and some queries that have been run for testification purpose.

```
MATCH (:Node {id: 'Winred'})--(f:Node)
RETURN f
```






```
MATCH (n:Node {id: 'Winred'})--(Node)
RETURN Node.id
```

neo4j$ MATCH (n:Node {id: 'Winred'})--(Node) RETURN Node.id

Table | Text | Code

	Node.id
1	"Harpole, W.W."
2	"Zoom.Us"
3	"Zoltan Llc"
4	"Zinke For Congress"
5	"Wordpress"
6	"Win Red"
7	

Started streaming 169 records after 2 ms and completed after 10 ms.

Conclusion

Super PACs such as SMP (Senate Majority PAC) and Senate Leadership Fund are still the final destination for large lump sum of donation fund. For more fragmented donations from individual donors or smaller organizations, the donation are likely to be wired through middle man such as WinRed, those with higher between centralities, and converges at the Super PACs or some other larger organizations.

Reference

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