

2. Trump's Personal & Business Relationships

Identify the 10 most influential nodes in the network using i) degree, ii) page rank, and iii) betweenness centrality. Visualize the network.

You can extract the nodes and links from the original data file or simply import the graphML file.

You can read more information about the network here: https://www.buzzfeed.com/johntemplon/help-us-map-trumpworld?utm_term=.vaJO0mwvX0#.ifDlvxpM1v

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Figure 1a presents the graph that shows Trump and 1513 entities that he has direct or indirect personal and business relationship. Figures 1b through 1d show progressively zoomed in portion of the complete graph. This network has a low average clustering coefficient of 0.236, and low average shortest path length of 3.800. Most of the entities do not have a relationship among themselves. This can be clearly seen in the outer rings of the graph that the nodes are not connected.

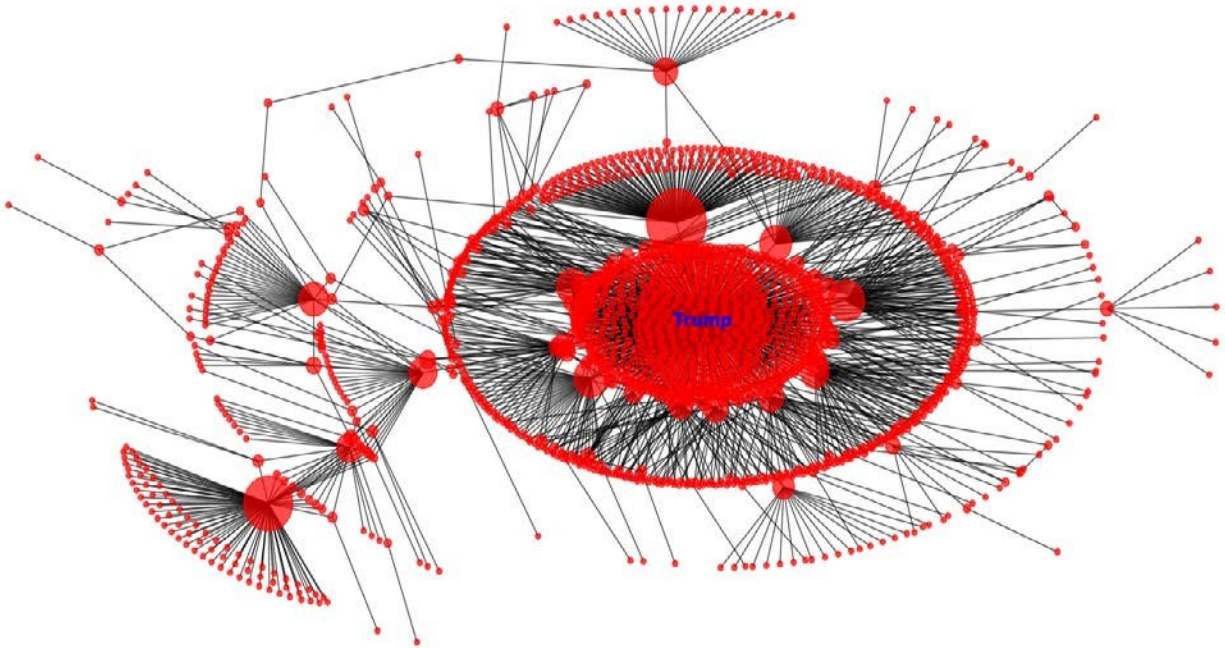


Figure 1a. Graph Showing Trump's Personal and Business Relationships

Graph name: Trump World
Type: Graph
Number of nodes: 1514
Number of edges: 1857
Average degree: 2.4531
Average clustering coefficient = 0.23631932409465756
Average shortest path length = 3.7999862049817477

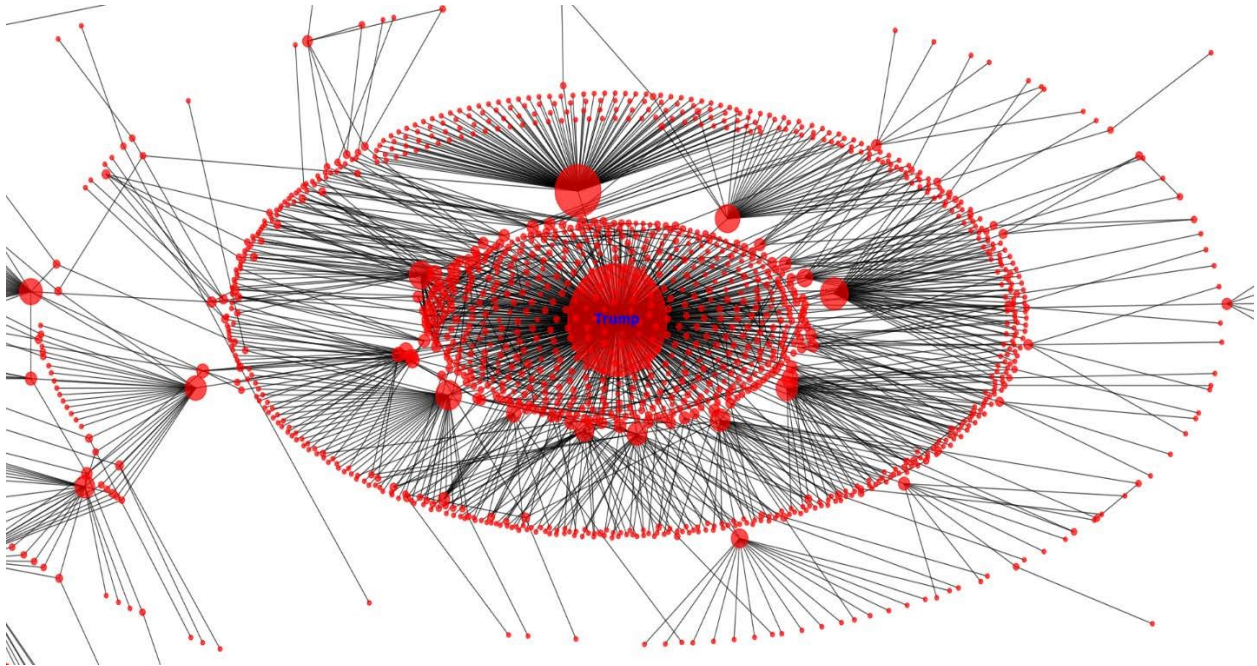


Figure 1b. Graph Showing Trump's Personal and Business Relationships – Zoomed In 3rd Ring

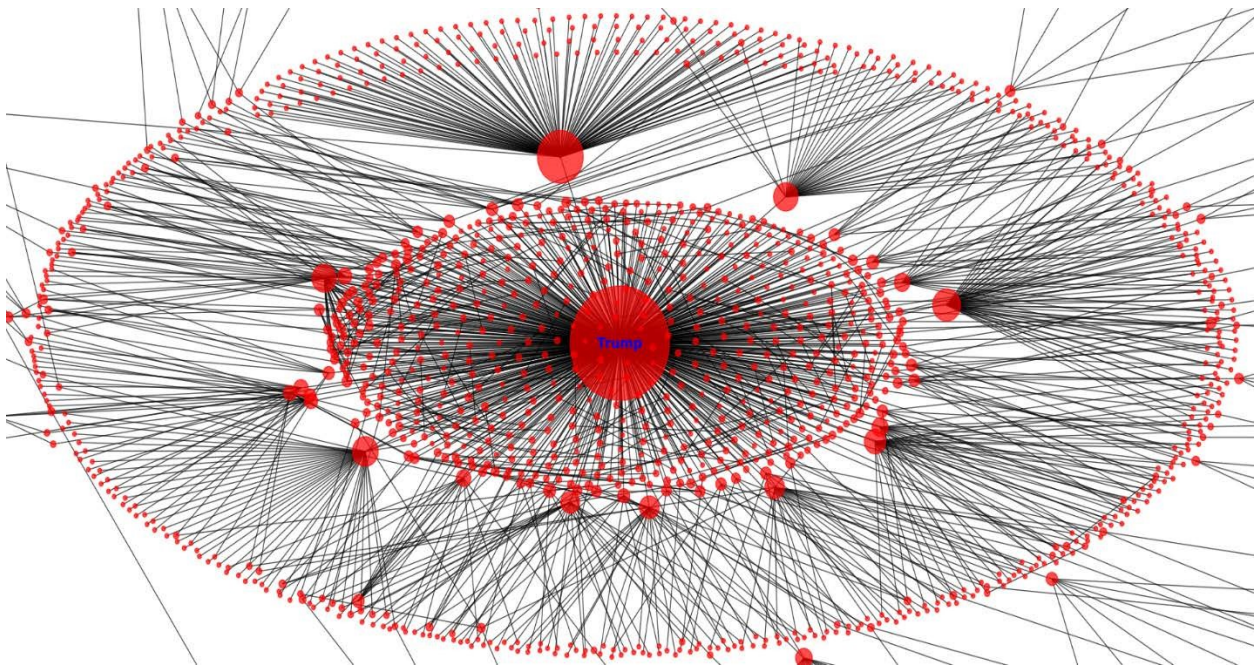


Figure 1c. Graph Showing Trump's Personal and Business Relationships – Zoomed In 2nd Ring

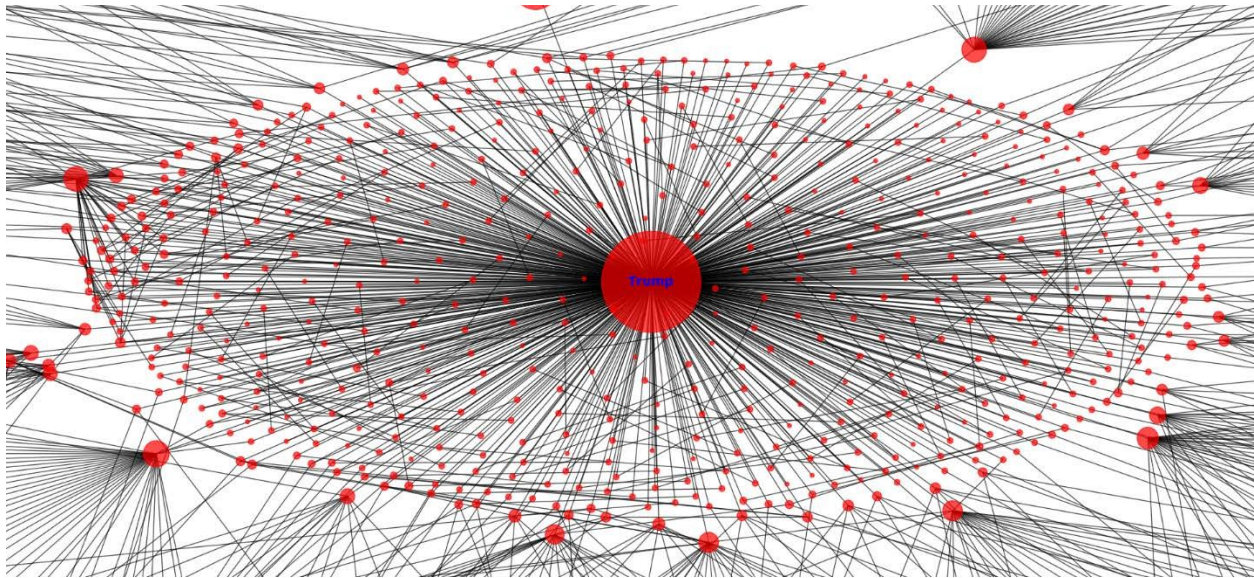


Figure 1d. Graph Showing Trump's Personal and Business Relationships – Zoomed In the Center

Figure 2 shows Trump and 605 entities who have direct personal and business relationship with Trump. The average clustering coefficient of this subgraph is 0.595 while the average shortest path length is 1.995, which shows that the sub-network is a high clustered small world. As shown in the Figure 2, most of the entities are interconnected in some degrees.

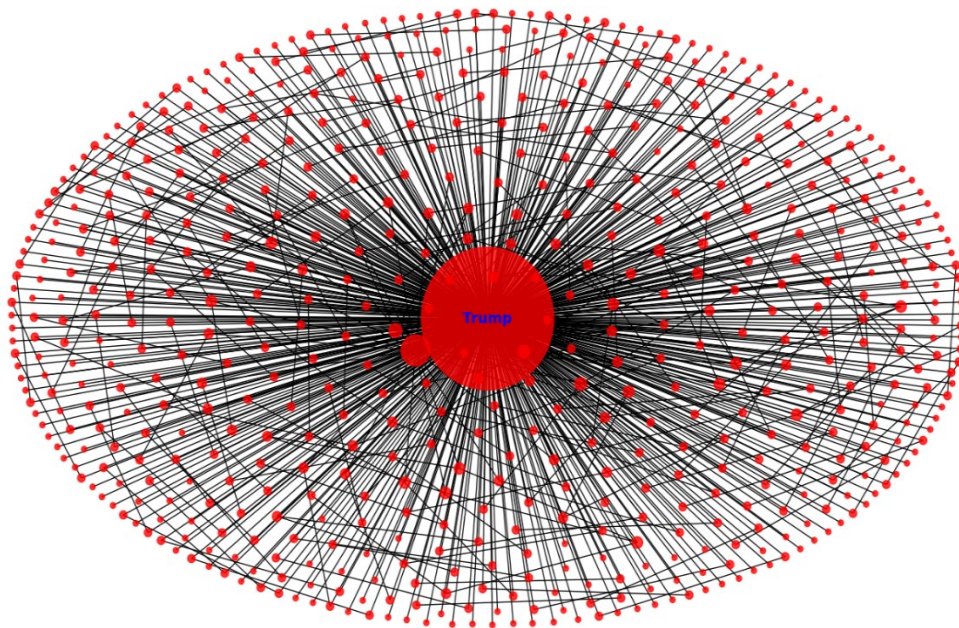


Figure 2. Subgraph: Trump and 605 Entities with Direct Personal and Business Relationships

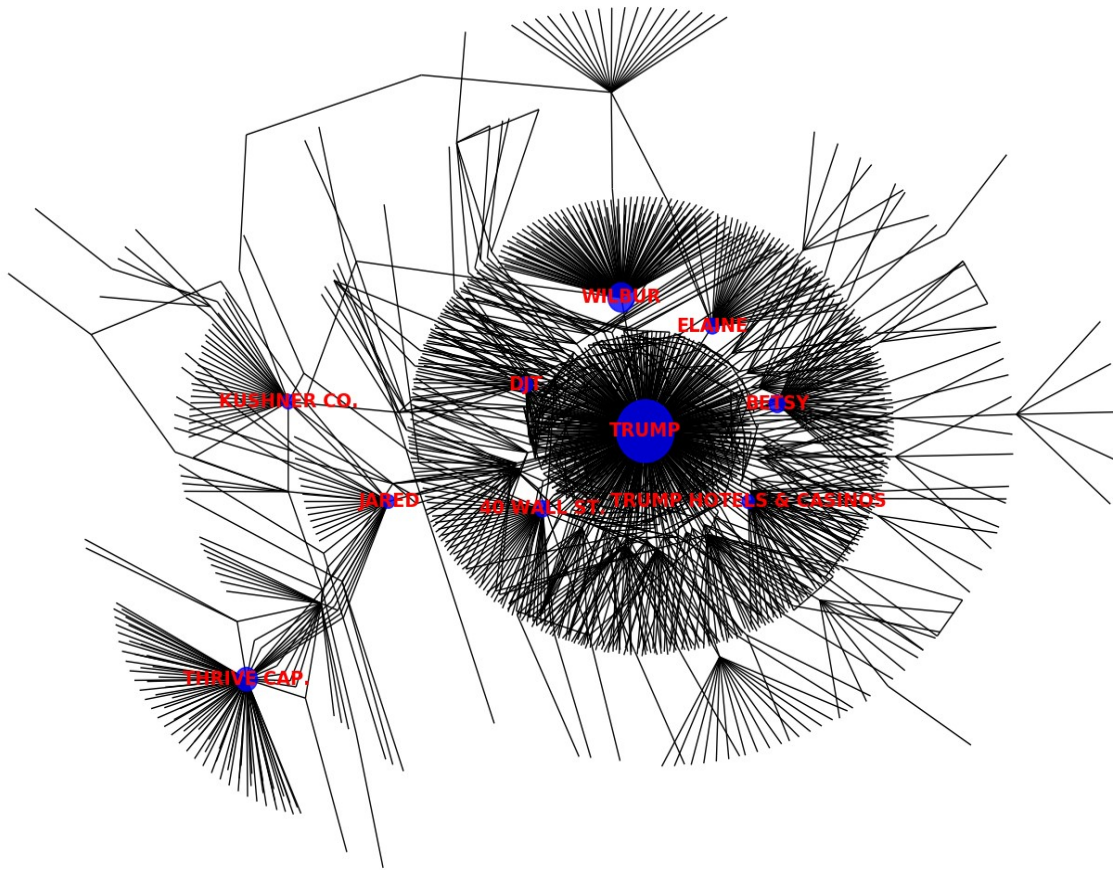
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Type: SubGraph
Number of nodes: 605      Number of edges: 847      Average degree: 2.8000
Average clustering coefficient = 0.594555310618618
Average shortest path length = 1.995364238410596
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From the original network, top 10 most influential entities are identified in terms of degree centrality, page rank and betweenness centrality (see Table 1). Figures 3, 5 and 7 show the positions of these top 10 entities in the network. Note that while these top 10 entities are influential in the network in these centrality, most of them are not directly related to others (Figures 4, 6 and 8). Trump is the only entity that has a high degree of 5 or 6 in each of the subgraph. The same 10 entities rank top 10 in both degree centrality and page rank, but in different orders. Ivanka Trump and Goldman Sachs (underlined below) made it in the list for top 10 betweenness in place of Trump Hotels and Casino Resorts and DJT Holdings, LLC.

Table 1. Top 10 most Influential Entities in the Trump World

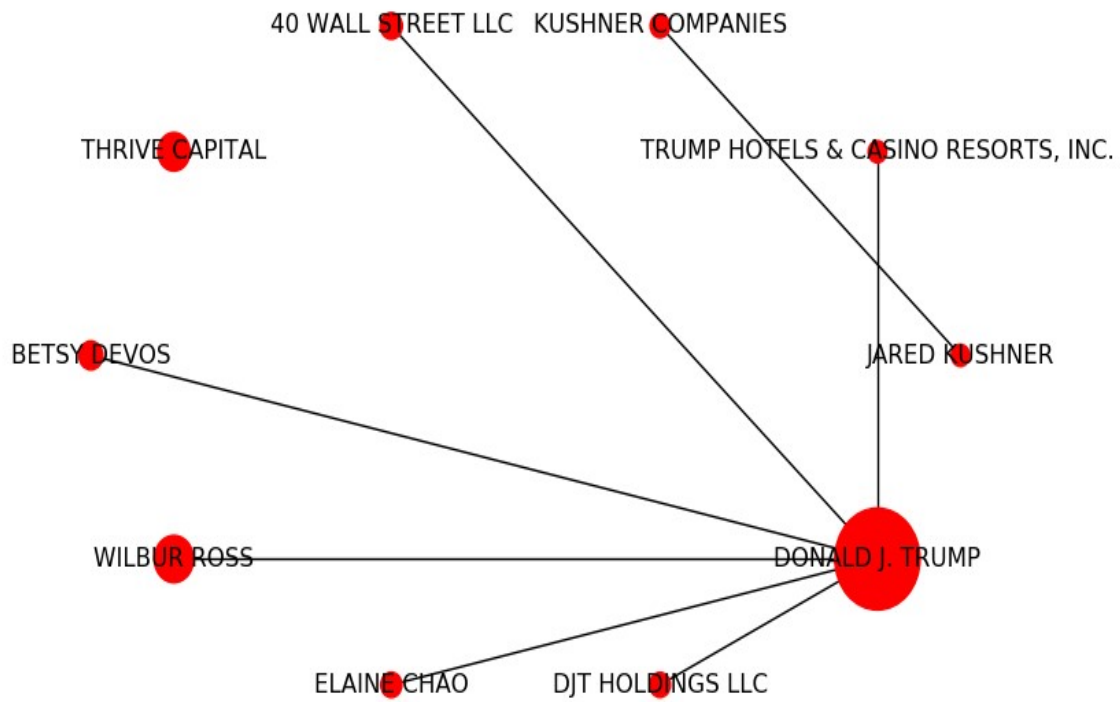
Top 10 by degree centrality:	Top 10 by page rank:	Top 10 by betweenness centrality:
DONALD J. TRUMP, 0.3992	DONALD J. TRUMP, 0.1301	DONALD J. TRUMP, 0.9452
WILBUR ROSS, 0.0853	WILBUR ROSS, 0.0385	WILBUR ROSS, 0.1733
THRIVE CAPITAL, 0.0568	THRIVE CAPITAL, 0.0232	<u>IVANKA TRUMP, 0.1488</u>
BETSY DEVOS, 0.0317	BETSY DEVOS, 0.0140	JARED KUSHNER, 0.1456
40 WALL STREET LLC, 0.0271	ELAINE CHAO, 0.0107	THRIVE CAPITAL, 0.0908
ELAINE CHAO, 0.0245	40 WALL STREET LLC, 0.0105	BETSY DEVOS, 0.0650
DJT HOLDINGS LLC, 0.0238	KUSHNER COMPANIES, 0.0085	ELAINE CHAO, 0.0566
KUSHNER COMPANIES, 0.0212	TRUMP HOTELS & CASINO RESORTS, INC., 0.0082	<u>GOLDMAN SACHS, 0.0516</u>
JARED KUSHNER, 0.0185	JARED KUSHNER, 0.0069	40 WALL STREET LLC, 0.0471
TRUMP HOTELS & CASINO RESORTS, INC., 0.0185	DJT HOLDINGS LLC, 0.0065	KUSHNER COMPANIES, 0.04687

Figures 3. Original Graph with Top 10 Influential Nodes by Degree Centrality

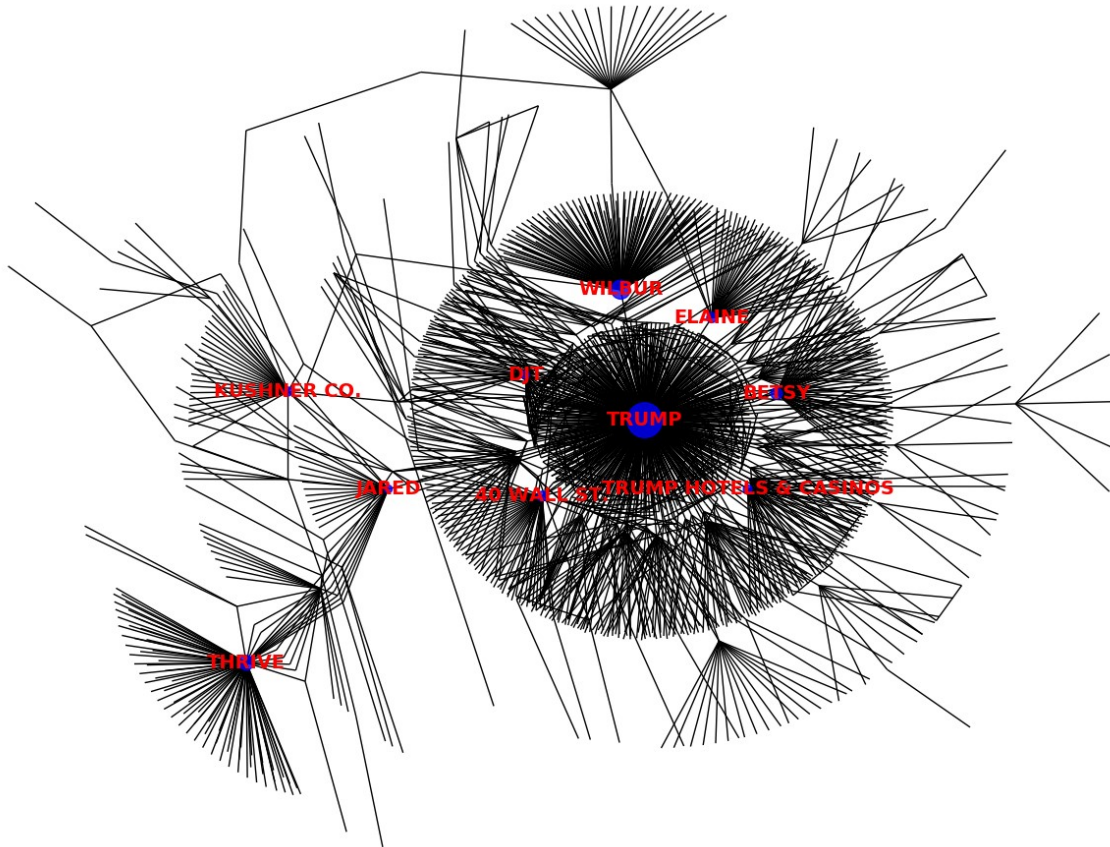


Nodes sorted by degree centrality:

```
( 'DONALD J. TRUMP', 0.3992068737607402)
( 'WILBUR ROSS', 0.085261070720423)
( 'THRIVE CAPITAL', 0.05684071381361533)
( 'BETSY DEVOS', 0.03172504957038995)
( '40 WALL STREET LLC', 0.02709847984137475)
( 'ELAINE CHAO', 0.024454725710508923)
( 'DJT HOLDINGS LLC', 0.023793787177792465)
( 'KUSHNER COMPANIES', 0.021150033046926635)
( 'JARED KUSHNER', 0.018506278916060805)
( 'TRUMP HOTELS & CASINO RESORTS, INC.', 0.018506278916060805)
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Figures 4. Subgraph: Top 10 Influential Nodes by Degree Centrality



Figures 5. Original Graph with Top 10 Influential Nodes by Page Rank

Nodes sorted by page rank:

```
( 'DONALD J. TRUMP', 0.13013174597007712)
( 'WILBUR ROSS', 0.03847738345722221)
( 'THRIVE CAPITAL', 0.023248572406997688)
( 'BETSY DEVOS', 0.013962852313231746)
( 'ELAINE CHAO', 0.010702630459283678)
( '40 WALL STREET LLC', 0.010487462008664914)
( 'KUSHNER COMPANIES', 0.008484919781768241)
( 'TRUMP HOTELS & CASINO RESORTS, INC.',
0.008166537779596172)
( 'JARED KUSHNER', 0.00688423582975088)
( 'DJT HOLDINGS LLC', 0.006530631471853009)
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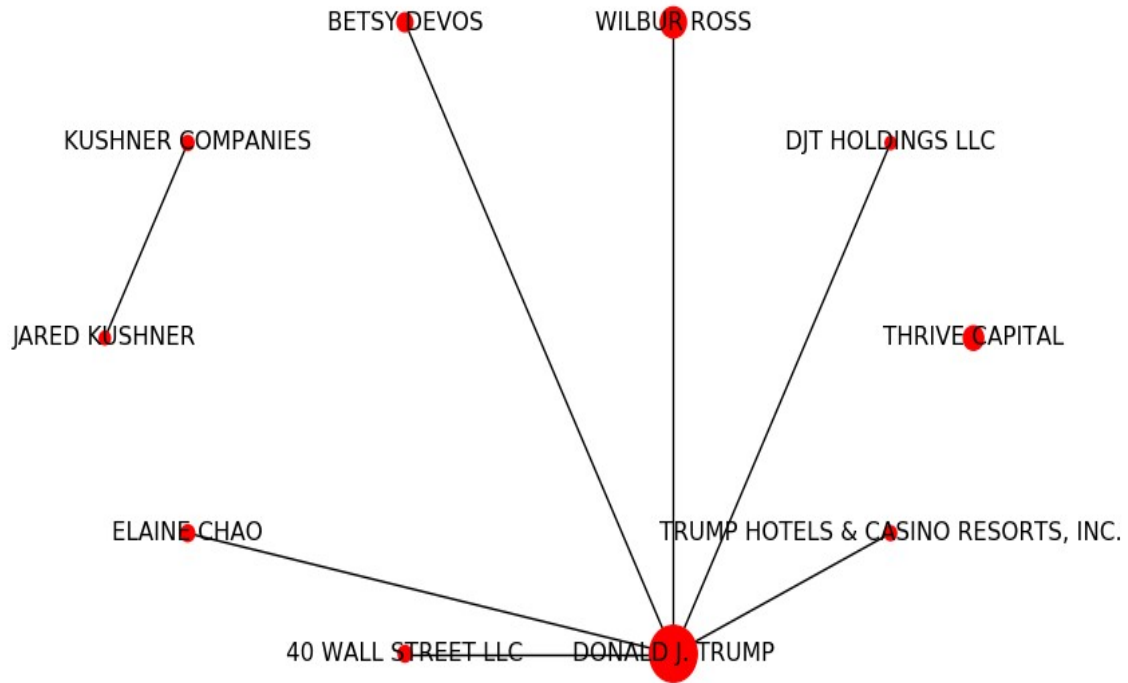
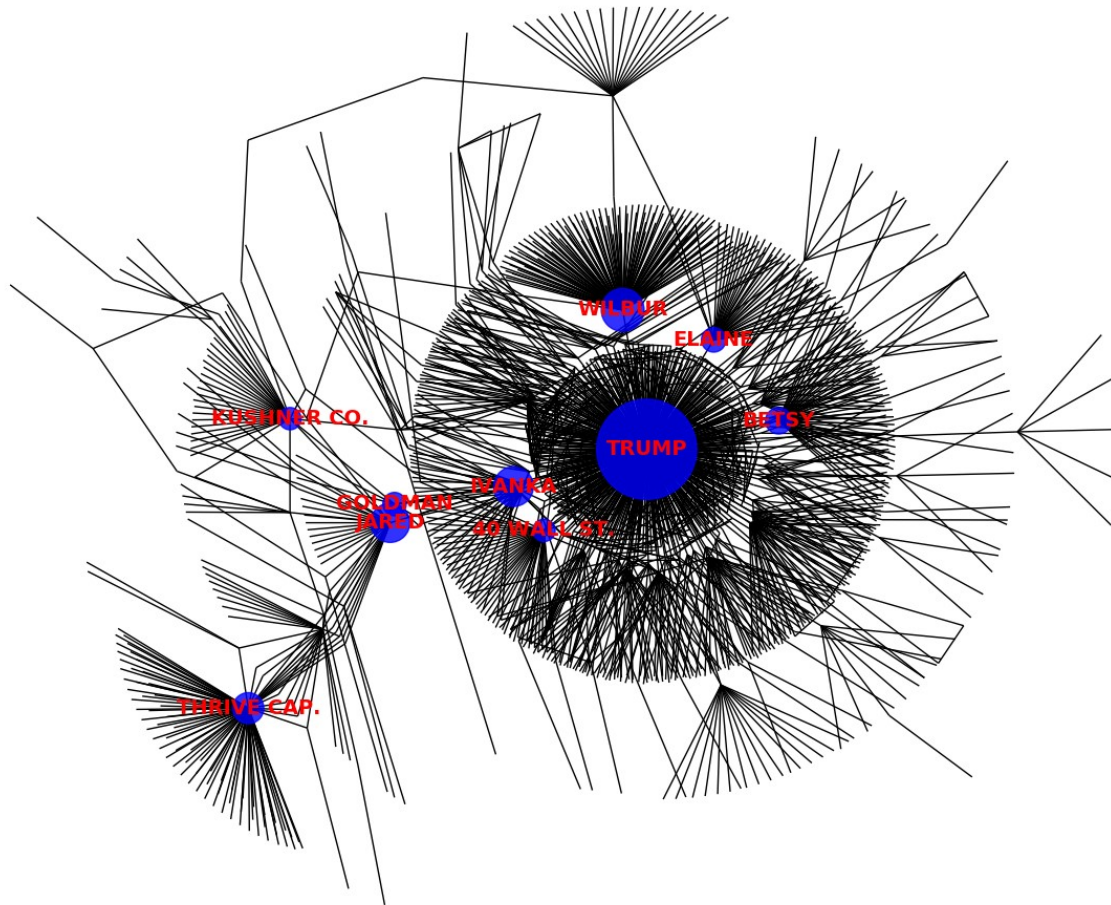



Figure 6. Subgraph: Top 10 Influential Nodes by Page Rank



Figures 7. Original Graph with Top 10 Influential Nodes by Betweenness Centrality

Nodes sorted by betweenness centrality:

```
( 'DONALD J. TRUMP', 0.9452682400221283)
( 'WILBUR ROSS', 0.17326048223771057)
( 'IVANKA TRUMP', 0.14881006807417613)
( 'JARED KUSHNER', 0.14557025982876173)
( 'THRIVE CAPITAL', 0.09080055451227514)
( 'BETSY DEVOS', 0.06501443690251797)
( 'ELAINE CHAO', 0.05655362364570866)
( 'GOLDMAN SACHS', 0.05162062543111188)
( '40 WALL STREET LLC', 0.04710498535660623)
( 'KUSHNER COMPANIES', 0.046866141283716606)
```

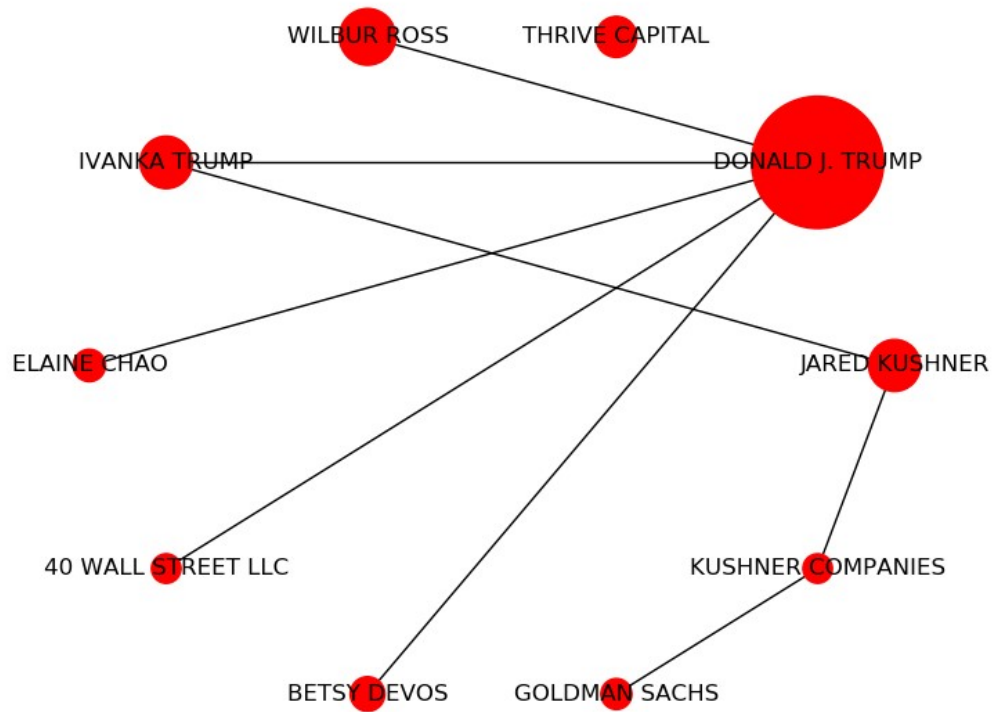


Figure 8. Subgraph: Top 10 Influential Nodes by Betweenness Centrality