FORE School of Management
New Delhi

Term-III

FODBMS Group Project

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Submitted by Group 18

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US Power Grid: Social Network Analysis using Gephi

This undirected network deals with the power grid of the Western States of the USA. Here, an edge represents a power supply line and a node is a generator or a substation. There are 4941 nodes in total.

The following **steps** were followed:-

Figure 1:

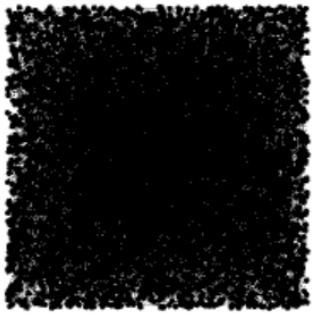


Figure 2:

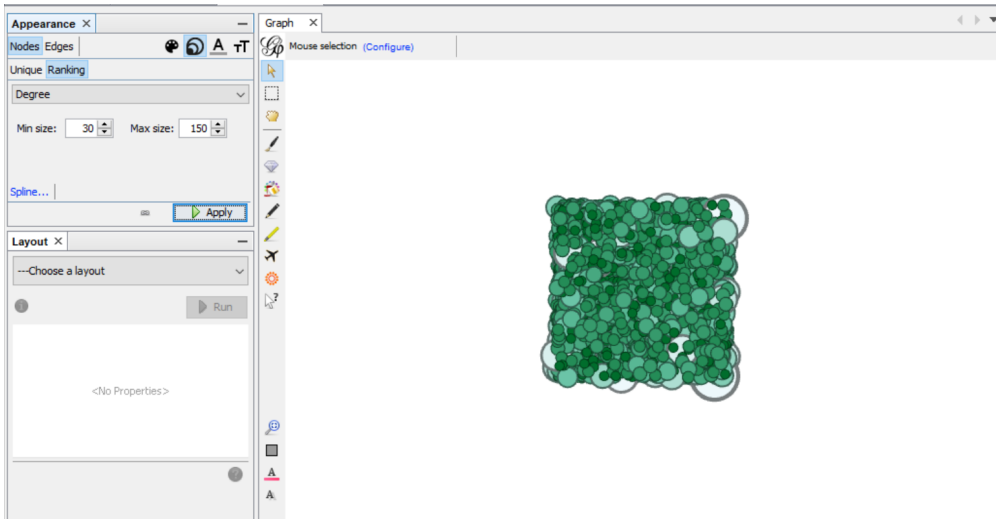


Figure 3:

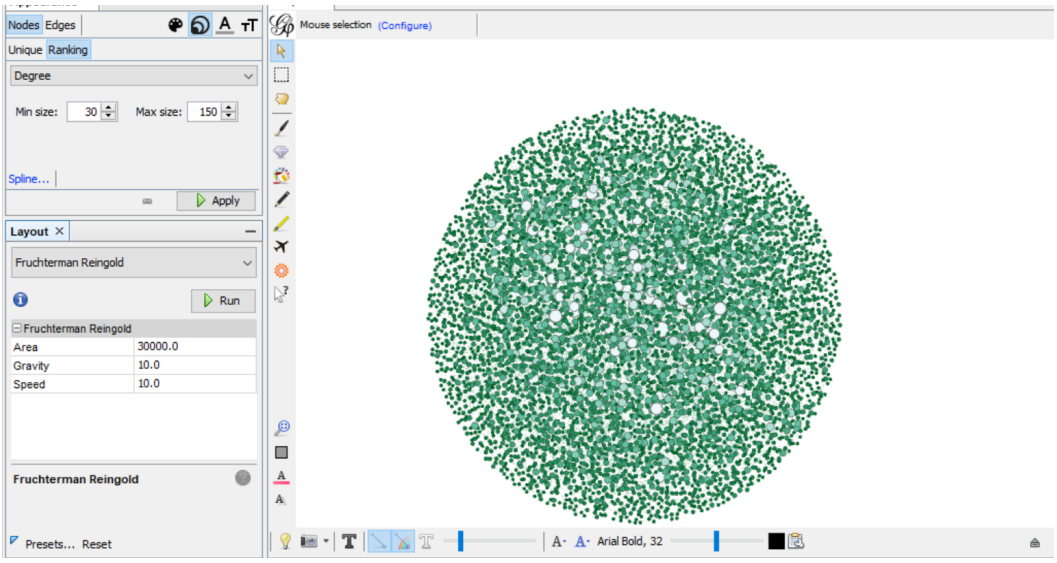
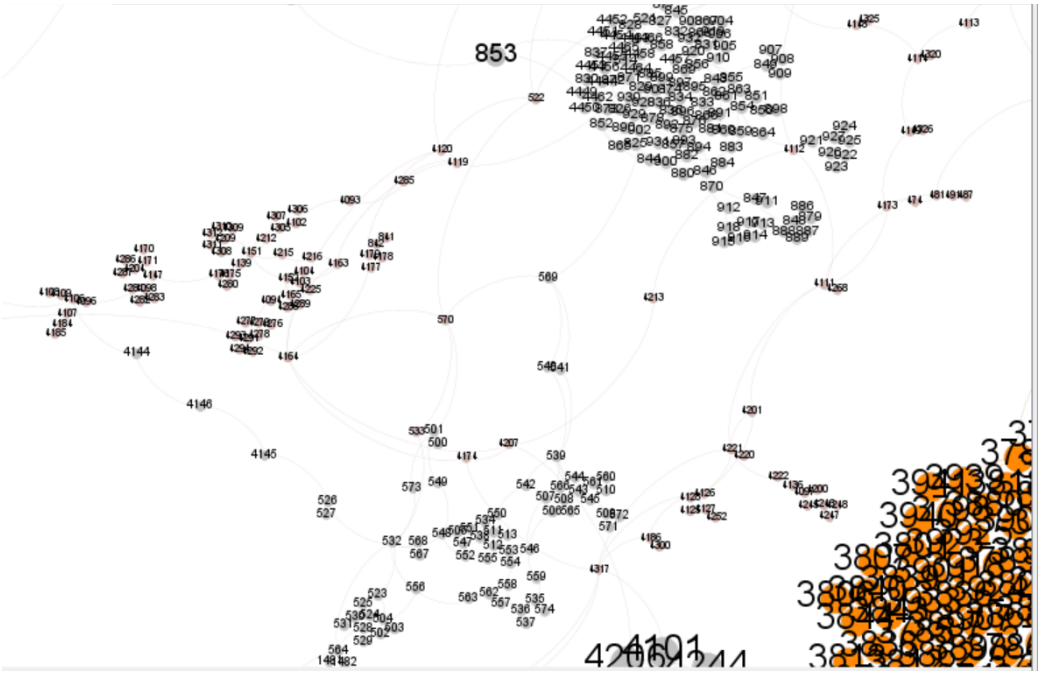
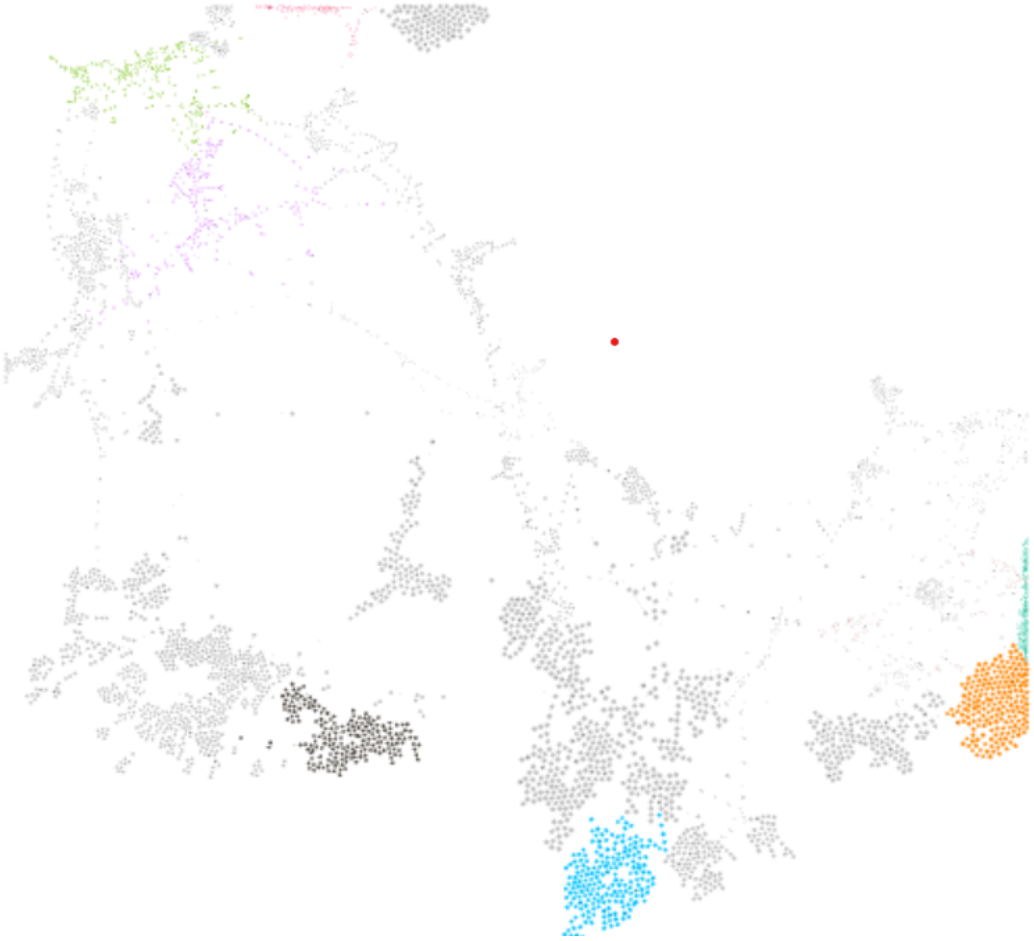


Figure 4:



The Final image (Figure 5):



Who are important entities from different points of view?

- The important entities are the power suppliers, generators that connect the supply and the users, the government, other state entities, companies and the other ministries associated with the same.

How many communities exist within the network? Examine the relationship of nodes within and outside communities.

Nine communities exist within the network. Overall, the power grid is a simple network as compared to more complex ones.

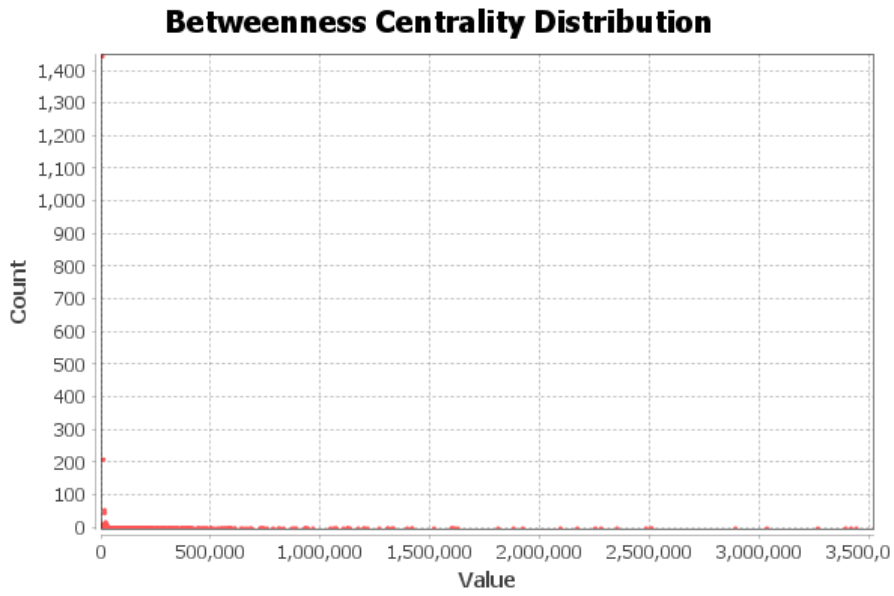
Following observations were made:

- Orange community- it is a close community as the distance between the nodes is less. On the other hand, the size of each node is large, depicting more power supply.
- Turquoise community- there is relatively lesser supply but as the nodes are distant, indicating a wider network.
- Beige and Grey community- they have comparatively wider networks and are more likely to be one of the nodes in betweenness centrality.
- Pink community- it has one of the least power supply networks with less distance between nodes and hence, a close community.
- Green and Purple community- similar power supply networks can be observed i.e. smaller and a bit widespread.
- Blue community- it is a close community as the distance between the nodes is less. On the other hand, the size of each node is medium, depicting medium levels of power supply.

Further Analysis:

In calculating betweenness and closeness centralities, it is assumed that graphs are undirected and connected with the allowance of loops and multiple edges.

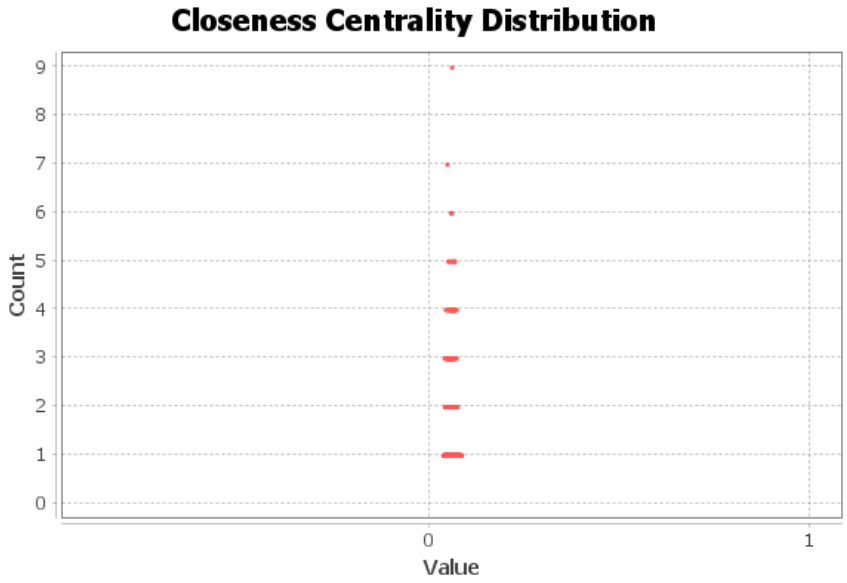
Figure 6:



Here, it can be seen that the nodes carry a high statistical value ranging from 35,000 till 500,000.

Moreover, it was found that a no. of nodes were present between 75% of the shortest paths between the graph nodes.

Figure 7:



Here, there are multiple points of special interest in the graph at value 4, 3, 2 and 1, which represents two chapters each very close to the rest of the network's chapters.