Team 28

Centrality Metrics

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Social Network Analysis (Gossip Network)

Metric Used

- Degree Centrality
- Closeness Centrality
- Betweenness Centrality
- Eigenvector Centrality
- Katz Centrality

Degree Centrality:

Priority: High
Assigned a high weight to degree centrality as we want to prioritize nodes with a large number of connections. This is useful for spreading information quickly in the network.

Betweenness Centrality:

Priority: Medium

Assigned a moderate weight to betweenness centrality as we want to identify nodes that act as important bridges or intermediaries in the network. These nodes can play a crucial role in transmitting information across different parts of the network.

Closeness Centrality:

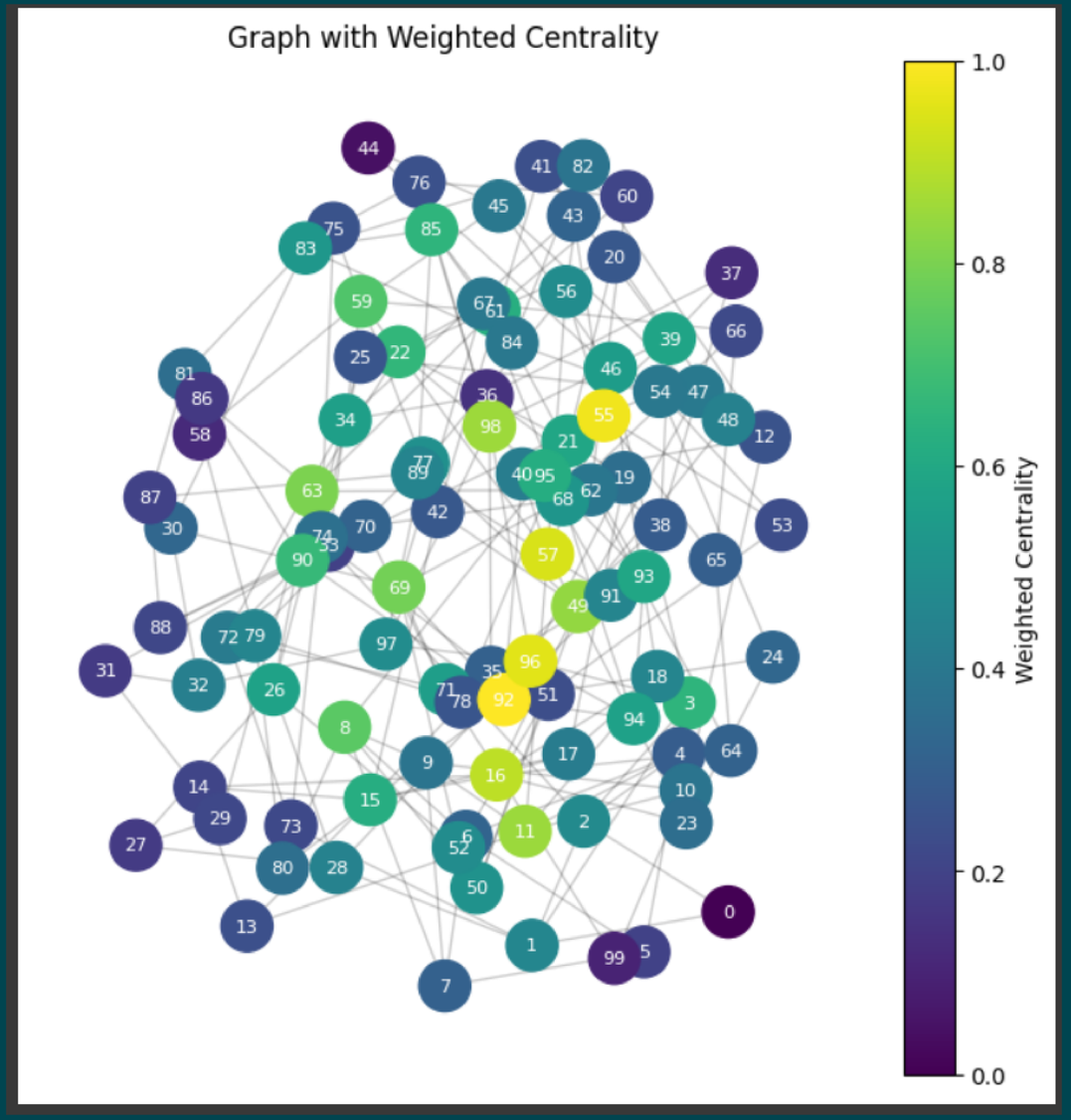
Priority: Medium
Value: Assigned a moderate weight to closeness centrality as we want to prioritize nodes that are close to other nodes in terms of distance. This measure can be useful for ensuring efficient information flow within the network.

Eigenvector Centrality:

Priority: Low
Value: Assigned a relatively lower weight to eigenvector centrality as we want to identify nodes that are connected to other highly central nodes. This measure can help in finding influential nodes with connections to other influential nodes.

Katz Centrality:

Priority: Low
Value: Assigned a relatively lower weight to Katz centrality as we want to consider both direct and indirect connections of nodes, with an emphasis on shorter paths. This measure can help identify nodes that are influential in terms of their direct connections as well as their connections to other influential nodes.

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weight_closeness = 0.2
weight_degree = 0.3
weight_eigenvector = 0.1
weight_betweenness = 0.2
weight_katz = 0.2
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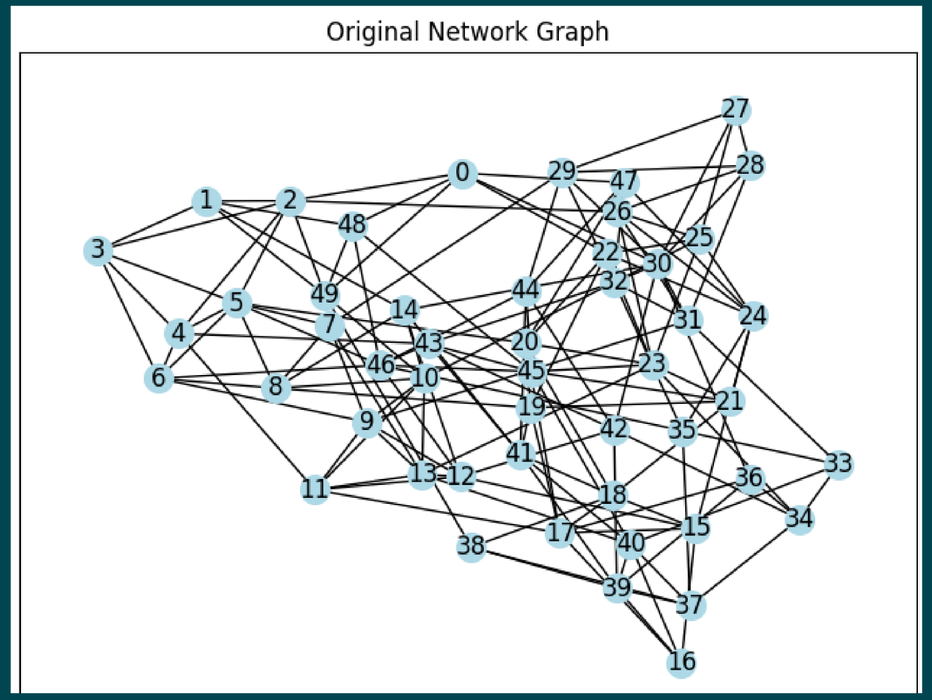
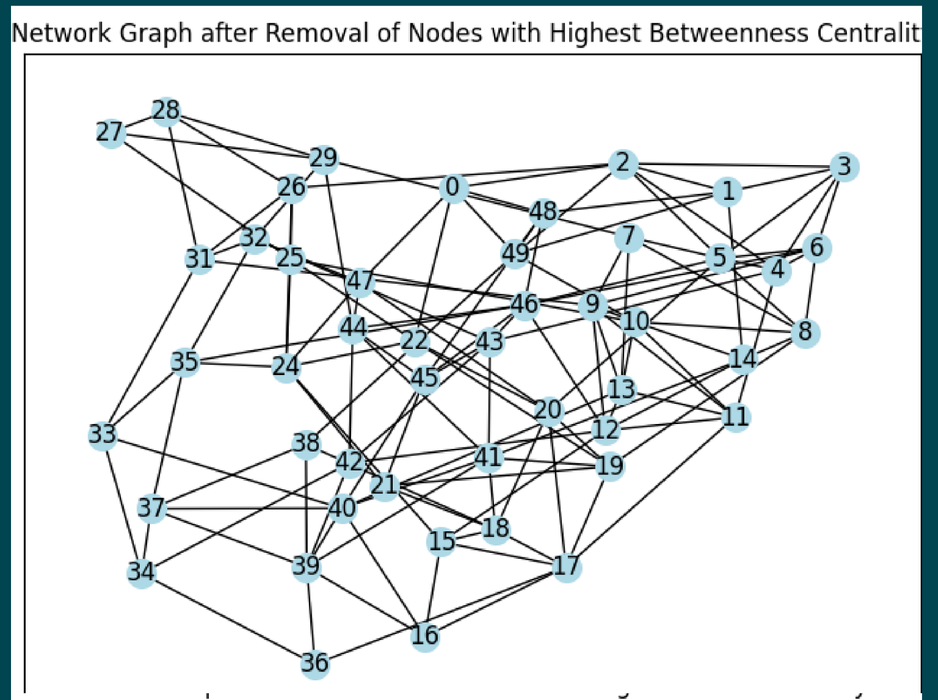
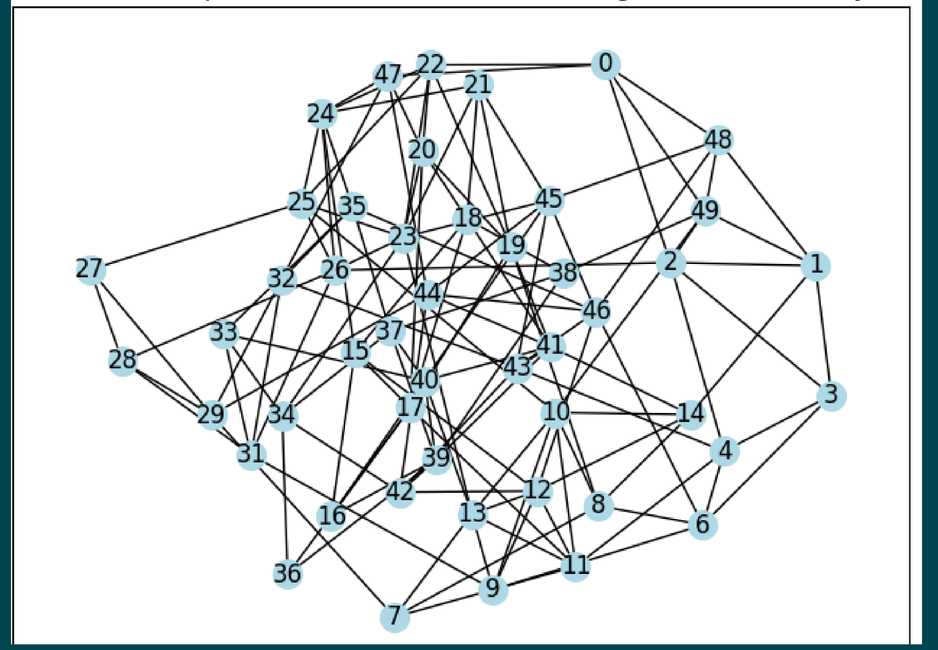
Analysing Disease Spread Using Centrality Metrices

Metric Used

- Degree Centrality
- Closeness Centrality
- Betweenness Centrality
- Eigenvector Centrality
- Katz Centrality







The graphs are randomly generated (these plots are for a specific case only)

1. Degree Centrality: Degree centrality measures the number of connections a node has. Nodes with higher degree centrality are more connected and have a higher potential to spread the disease. In our analysis, we identified the node with the highest degree centrality as the most influential node based on this measure.

2. Betweenness Centrality: Betweenness centrality quantifies how often a node acts as a bridge in the shortest paths between other nodes. Nodes with higher betweenness centrality can control the flow of information or disease transmission in the network. Identifying nodes with high betweenness centrality helps us pinpoint critical points for intervention and control.

3. Closeness Centrality: Closeness centrality measures how close a node is to other nodes in terms of shortest path distances. Nodes with higher closeness centrality are more accessible to other nodes and can spread the disease more efficiently.

4. Eigenvector Centrality: Eigenvector centrality considers both the node's connections and the importance of its neighbors. Nodes with higher eigenvector centrality are well-connected to other influential nodes and have a higher potential to spread the disease.

5. Katz Centrality: Katz centrality combines both local and global information by considering the number of immediate neighbors and their respective centralities. It captures the influence of nodes based on both direct and indirect connections.

The network spread probability obtained after removing the node with maximum Katz centrality or the highest Betweenness Centrality suggests the likelihood of the disease spreading throughout the network. A higher spread probability indicates that the disease has a higher chance of reaching all nodes in the network.

We took the probability of the spread of disease due to an infected to be of some value say 0.2

Decrement in NSP is seen on removing the nodes with high katz centrality and betweenness centrality.

In general the NSP will decrease on removing the influential nodes in the disease spread network which not only slows down the spread but also ensures that the disease spreading is prevented to spread to the entire network.

Suggesting ways to Stop The Disease Spread on The Basis of The Analysis Done

1. Targeting High Katz Centrality Nodes: Prioritize interventions and resources towards nodes with high Katz centrality. These nodes have the greatest potential to impact the spread of the disease. Implement measures such as quarantine, vaccination, or targeted awareness campaigns to reduce transmission from these influential nodes.

2. Disrupting High Degree and Betweenness Nodes: Identify nodes with high degree and betweenness centrality, as they act as key bridges and hubs for disease transmission. Implement control strategies to limit their interactions or influence, such as isolating or providing extra resources to these nodes.

3. Promoting Awareness and Education: Utilize the network structure to disseminate information effectively. Target nodes with high closeness centrality to spread accurate information and educate individuals about preventive measures, symptoms, and treatment options.

THANK YOU