Alexandria National University Faculty of Computers and Data Science Cyber Security Program

Task 1 : Social Networks

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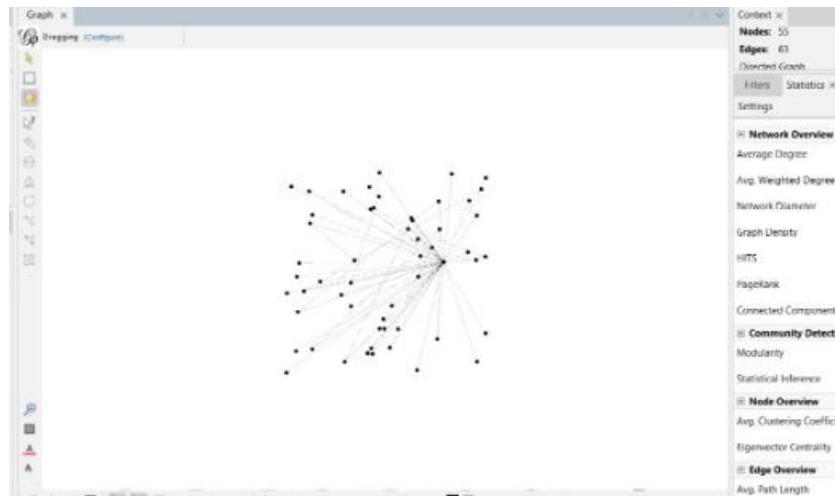
Student ID: 2205069

Comparison of 5G_Conspiracy and Non_Conspiracy Networks:

5G_Conspiracy Network
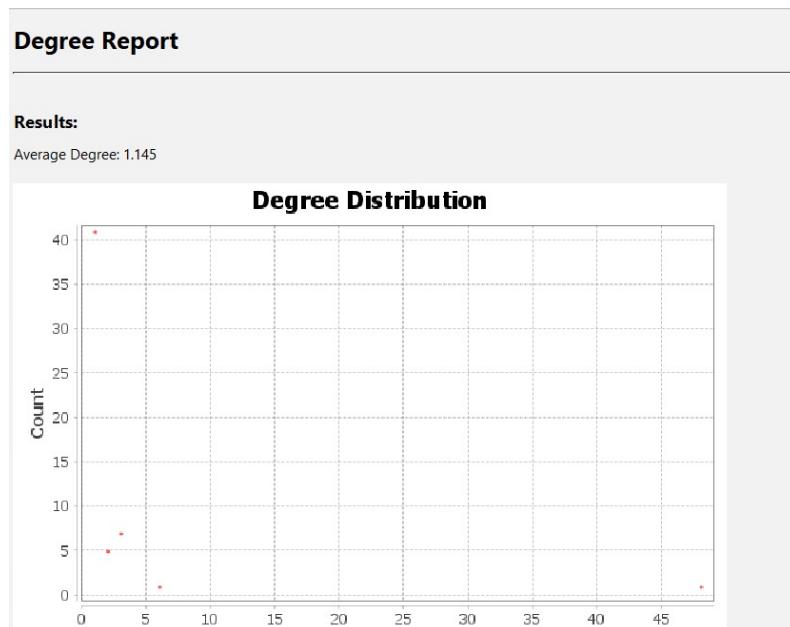
1. **Number of Nodes and Edges**:

   - **Nodes**: 55, **Edges**: 63


2. **Average Degree**:

   - **1.145** (Low connectivity)
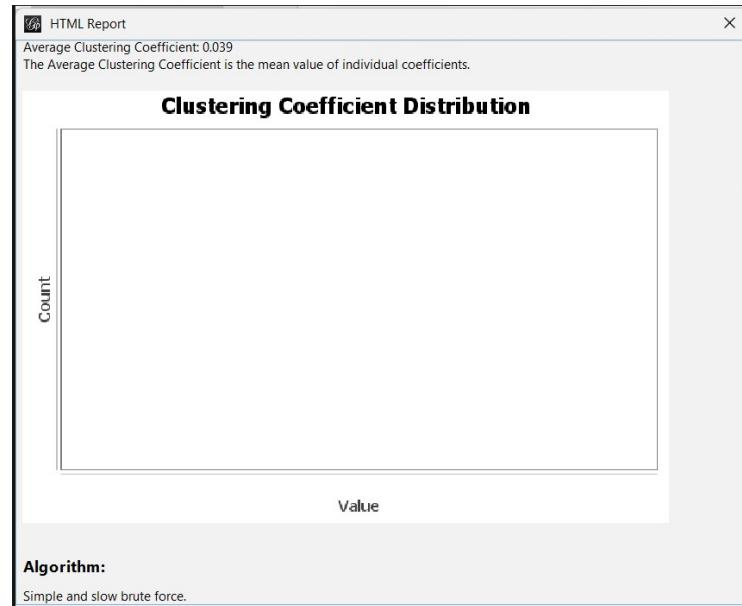
3. **Graph Density:**

   o **0.021** (Sparse network)

   Graph Density Report

   Parameters:

   Network Interpretation: directed

   Results:

   Density: 0.021
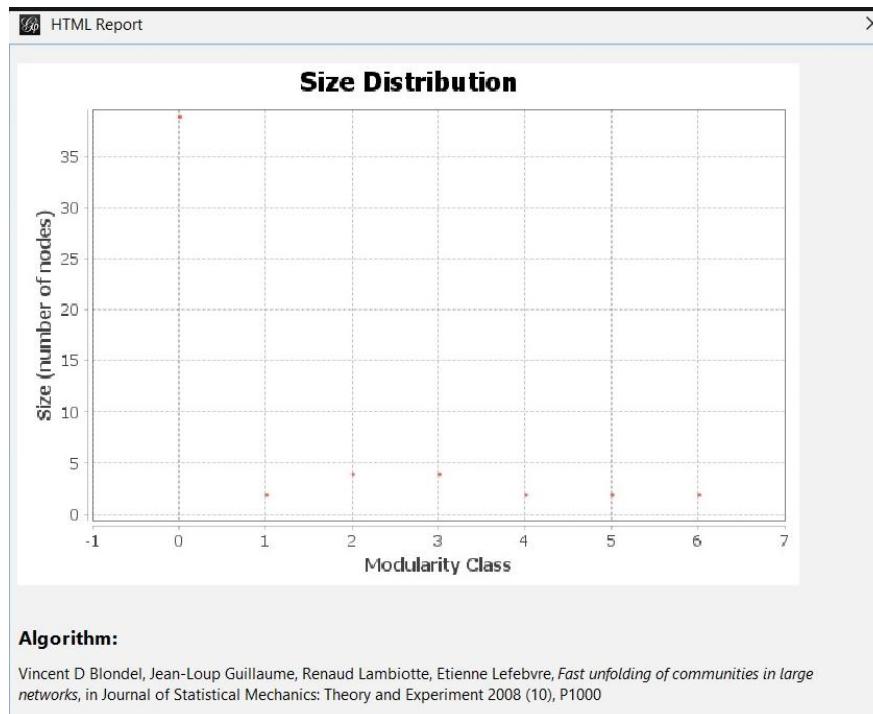
4. **Average Clustering Coefficient:**

   o **0.039** (Weak clustering)

   HTML Report

   Average Clustering Coefficient: 0.039
   The Average Clustering Coefficient is the mean value of individual coefficients.

   Clustering Coefficient Distribution

   Count

   Value

   Algorithm:

   Simple and slow brute force.

5. **Modularity and Number of Communities**:

   o **Modularity**: 0.264, **Communities**: 7

HTML Report ✕

Size Distribution

Algorithm:

Vincent D Blondel, Jean-Loup Guillaume, Renaud Lambiotte, Etienne Lefebvre, *Fast unfolding of communities in large networks*, in Journal of Statistical Mechanics: Theory and Experiment 2008 (10), P1000

6. **Betweenness and Closeness Centrality**:

   o **Diameter**: 3, **Average Path Length**: 1.47

Graph Distance Report

Parameters:
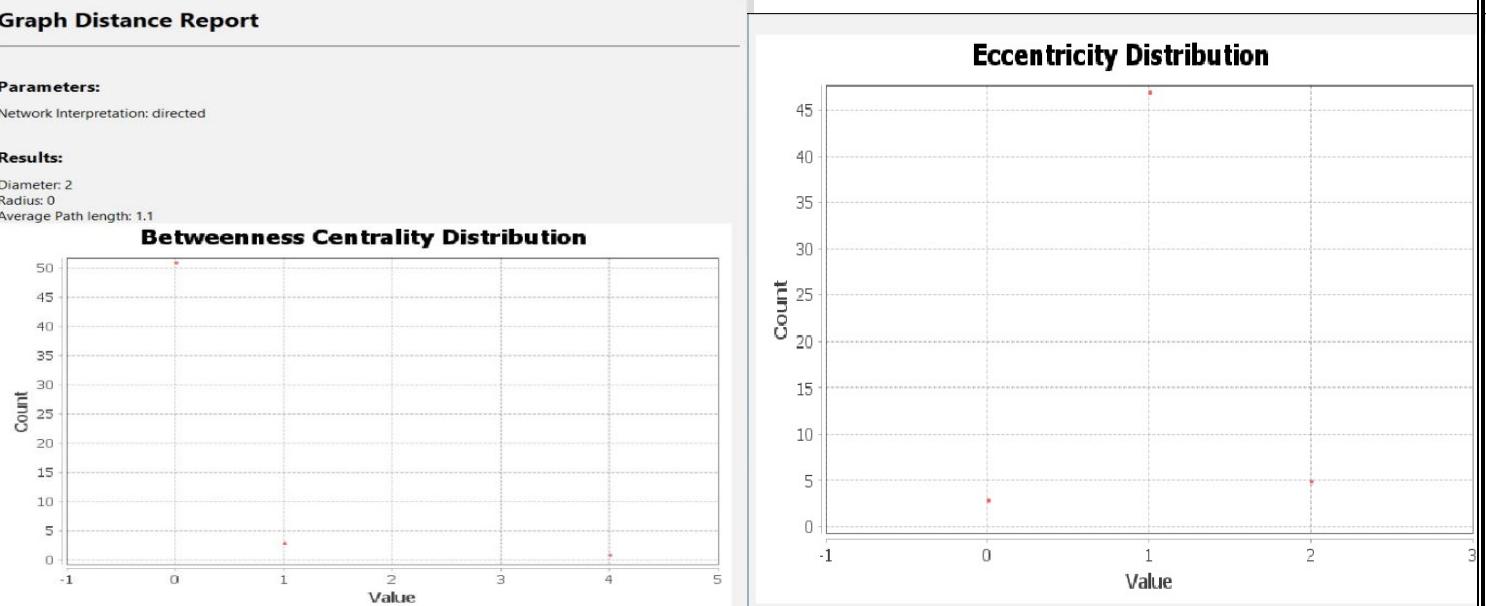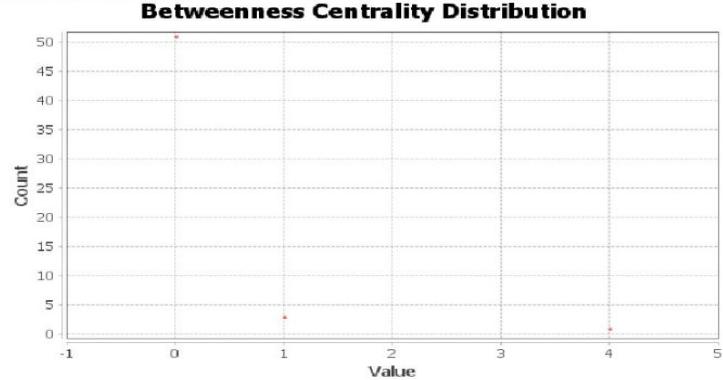
Network Interpretation: directed

Results:
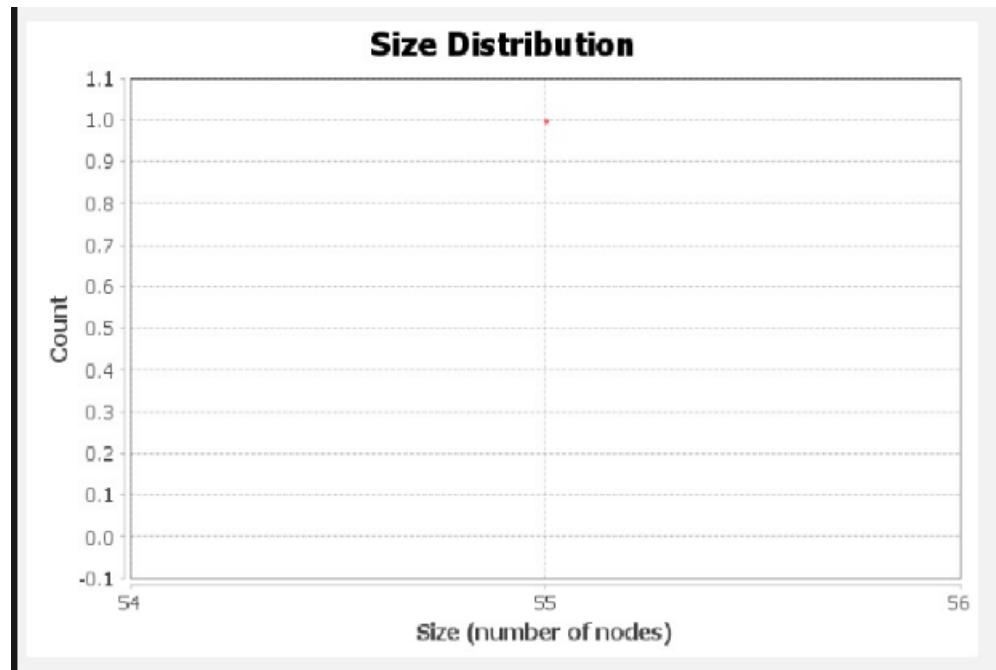
Diameter: 2
Radius: 0
Average Path length: 1.1

Betweenness Centrality Distribution

Eccentricity Distribution
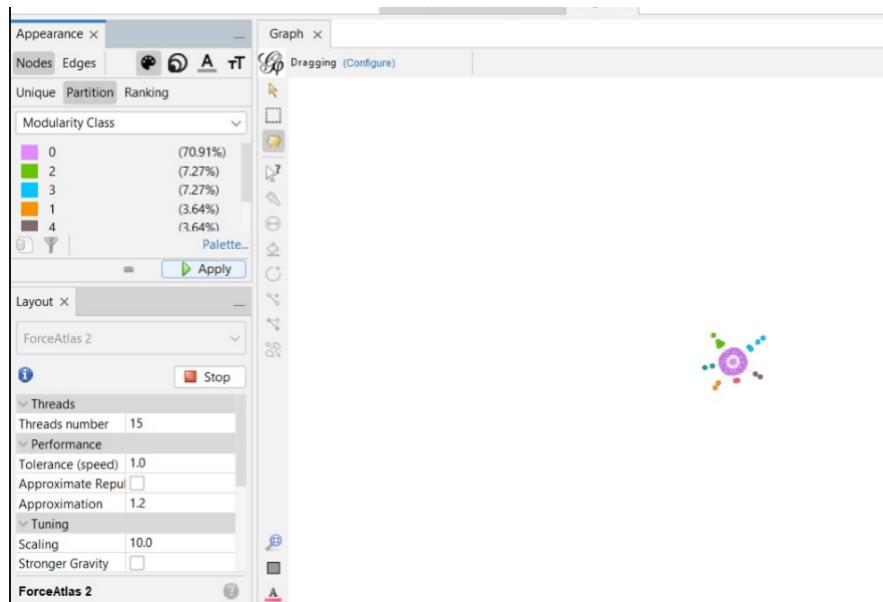
7. **Connected Components**:

   o **Weakly Connected Components**: 1, **Strongly Connected Components**: 50
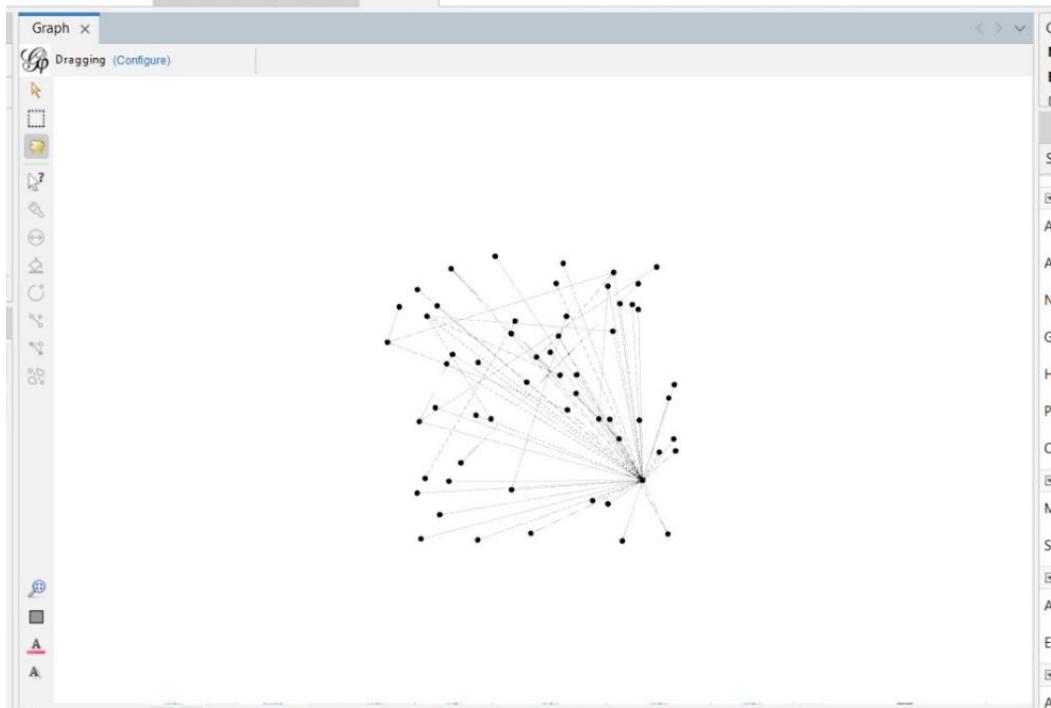

- After applying the **ForceAtlas2** layout and running it, I used the **Appearance** and **Partition** options to color the nodes based on their **Modularity Class**.

## Non_Conspiracy Network

1. **Number of Nodes and Edges**:

   o **Nodes**: 58, **Edges**: 96

2. **Average Degree**:

   o **1.655** (Higher connectivity)
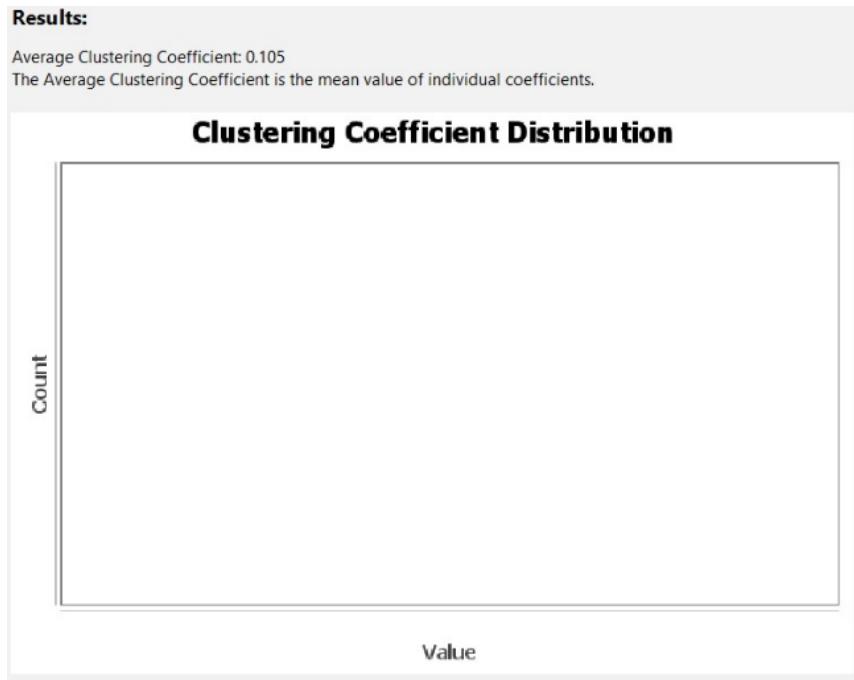
3. **Graph Density**:

   o **0.029** (More connected)
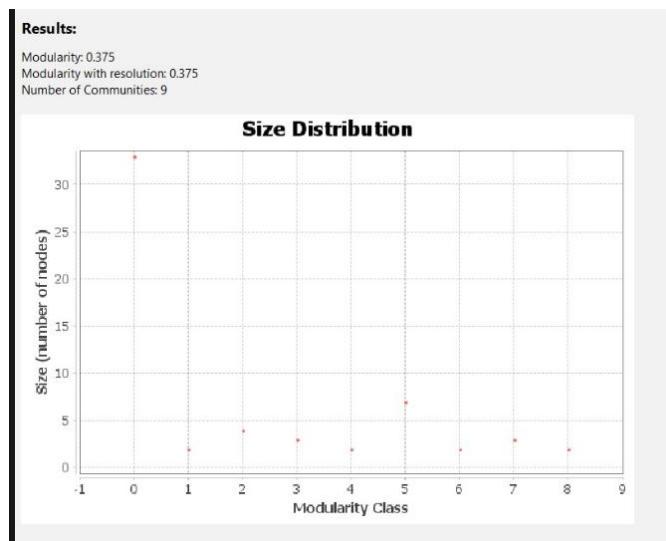
Graph Density Report

Parameters:

Network Interpretation: directed

Results:

Density: 0.029

4. **Average Clustering Coefficient**:

   o **0.105** (Stronger clustering)

Results:

Average Clustering Coefficient: 0.105
The Average Clustering Coefficient is the mean value of individual coefficients.

Clustering Coefficient Distribution

Count

Value
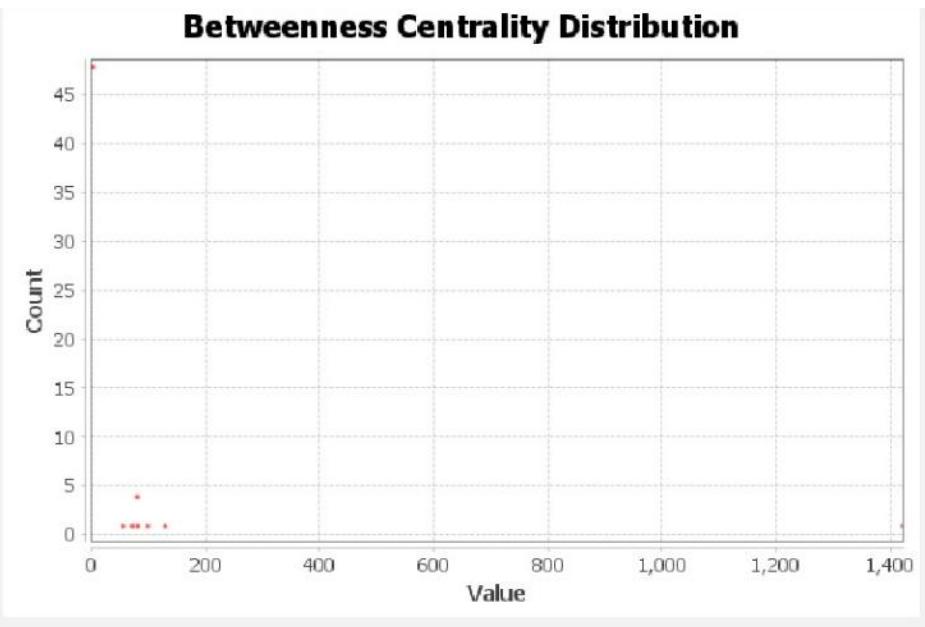
5. **Modularity and Number of Communities**:

   o **Modularity**: 0.375, **Communities**: 9
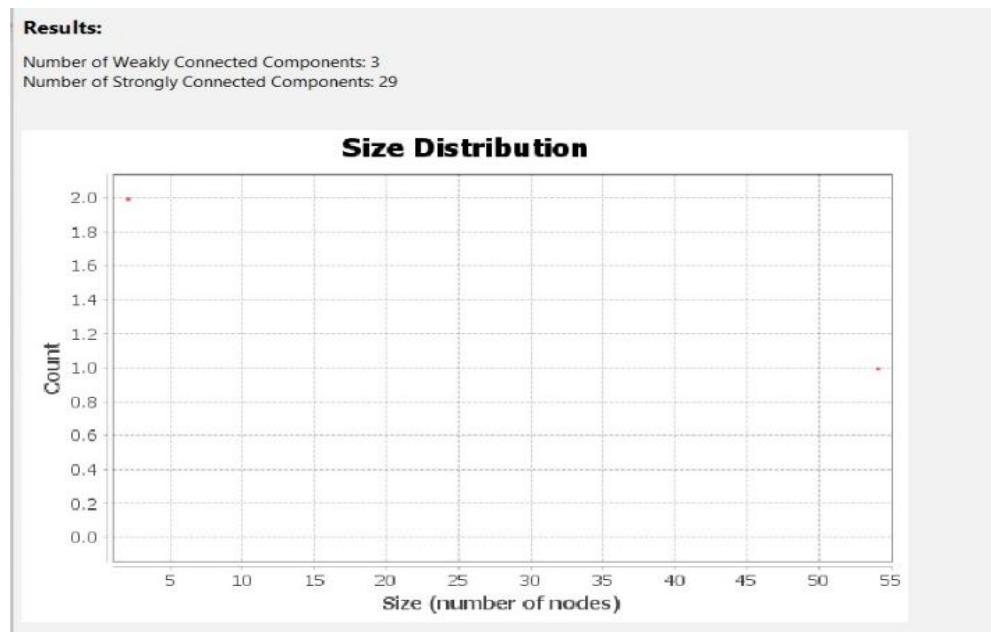
6. **Betweenness and Closeness Centrality**:

   o **Diameter**: 2, **Average Path Length**: 1.64
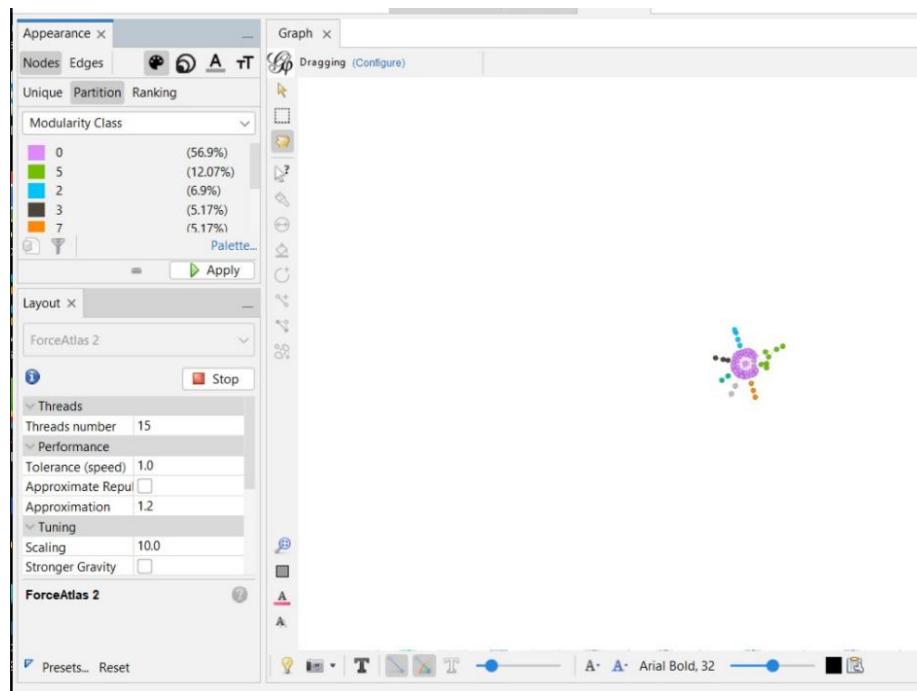
7. **Connected Components**:

   o **Weakly Connected Components**: 3, **Strongly Connected Components**: 29

Results:

Number of Weakly Connected Components: 3
Number of Strongly Connected Components: 29

Size Distribution

- After applying the **ForceAtlas2** layout and running it, I used the **Appearance** and **Partition** options to color the nodes based on their **Modularity Class**

Key Differences

- **Connectivity**: The **Non_Conspiracy network** is more connected with higher density (0.029 vs 0.021) and stronger clustering (0.105 vs 0.039).

- **Modularity**: The **Non_Conspiracy network** has more communities (9 vs 7) and higher modularity (0.375 vs 0.264), indicating better-defined subgroups.

- **Centralization**: The **Non_Conspiracy network** has lower diameter (2 vs 3) and higher centrality, making it more efficient in communication.

- **Fragmentation**: The **5G_Conspiracy network** is more fragmented with fewer connected components, showing weaker overall connectivity.