Create a friendship network on your own and visualize the same using any online tool. Provide the different network measures and centrality measures.
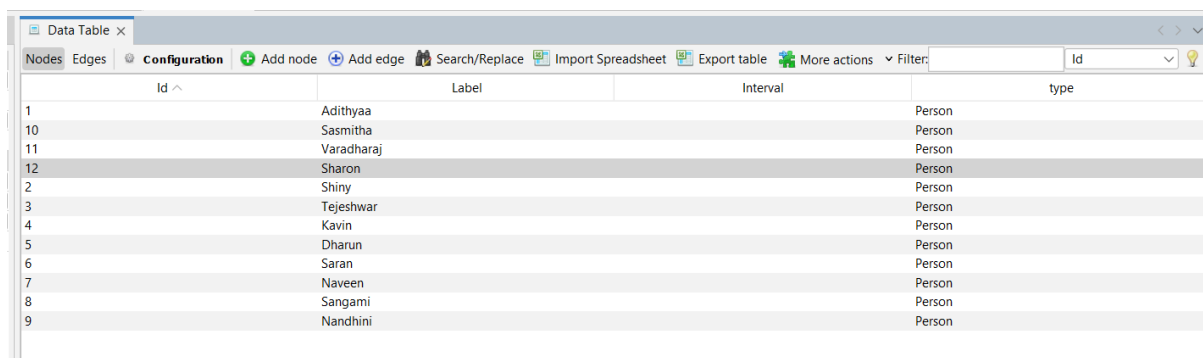
Tool used: Gephi

Gephi, an open-source software, serves as a crucial tool for visualizing and comprehending intricate networks. It offers an intuitive platform equipped with diverse tools for researchers, analysts, and anyone dealing with network data.

Some key aspects of Gephi:

- ❖ **Network Visualization**: It allows interactive and visually engaging representations of large-scale networks, aiding in understanding their structures and relationships.
- ❖ **Graph Analysis and Metrics**: Gephi provides algorithms for computing metrics like centrality and clustering coefficients, offering profound insights into network properties.
- ❖ **User-Friendly Interface**: With an intuitive graphical interface, users can directly interact with networks, adjusting layouts and visual aspects effortlessly.
- ❖ **Data Import/Export**: Supporting multiple file formats, Gephi facilitates seamless import, visualization, analysis, and export of network data for further exploration.
- ❖ **Layout Algorithms**: Various algorithms like Force Atlas and Fruchterman-Reingold arrange nodes based on criteria, enhancing visual clarity within graphs.
- ❖ **Customization Options**: Users can customize node/edge appearances and the entire network graph, altering colors, sizes, shapes, and label visibility for informative representations.
- ❖ **Community Support**: Gephi boasts an active user community offering forums, tutorials, and documentation, aiding users in starting off and troubleshooting.
- ❖ **Cross-Platform Compatibility**: Accessible across Windows, macOS, and Linux, Gephi caters to a wide user base exploring diverse network analyses.

Person-Nodes.csv:

Person-Edges.csv:

Source	Target	Type	Kind	Id	Label	Interval	Weight
1	2	Undirected		33			1.0
1	3	Undirected		34			0.8
1	4	Undirected		35			0.6
2	3	Undirected		47			0.9
2	5	Undirected		46			0.7
3	4	Undirected		45			0.75
4	5	Undirected		44			0.85
4	6	Undirected		43			1.0
5	6	Undirected		42			0.65
5	7	Undirected		41			0.7
6	8	Undirected		40			0.6
7	8	Undirected		39			0.55
8	9	Undirected		38			0.75
8	10	Undirected		37			0.7
9	10	Undirected		36			0.8
11	12	Undirected		30			0.95
8	12	Undirected		31			0.75
11	6	Undirected		32			0.6

Friendship Network Formation:
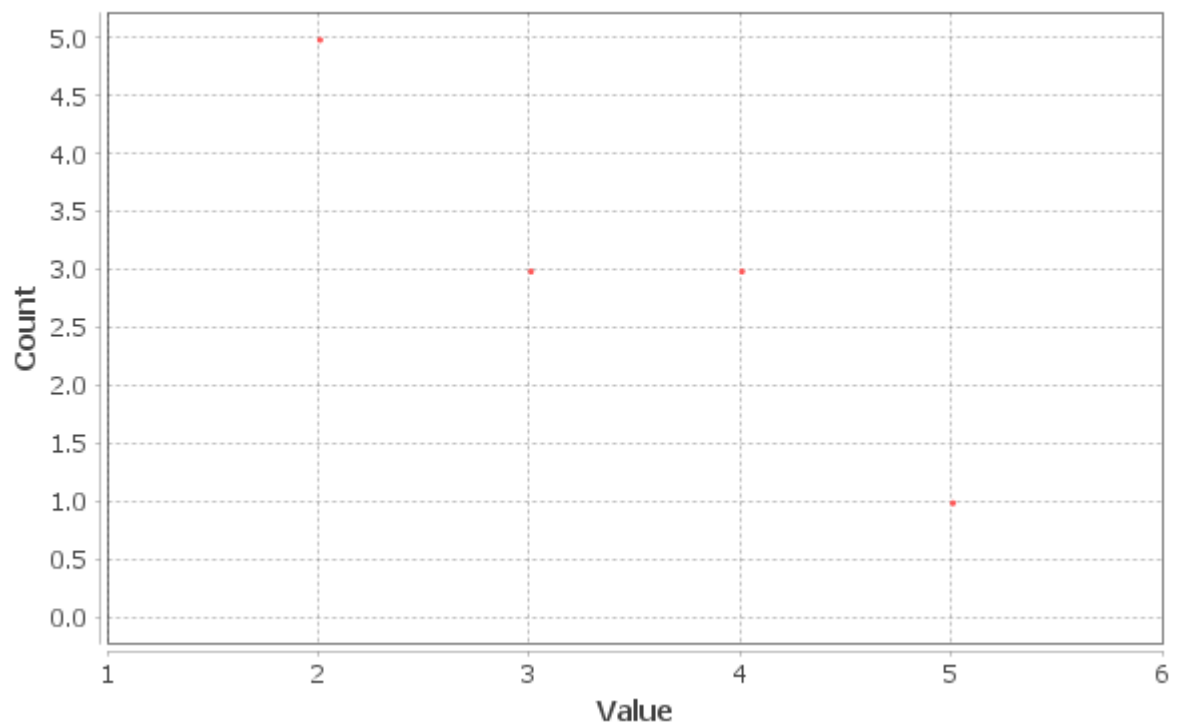
- ❖ Undirected Graph Nodes: 12
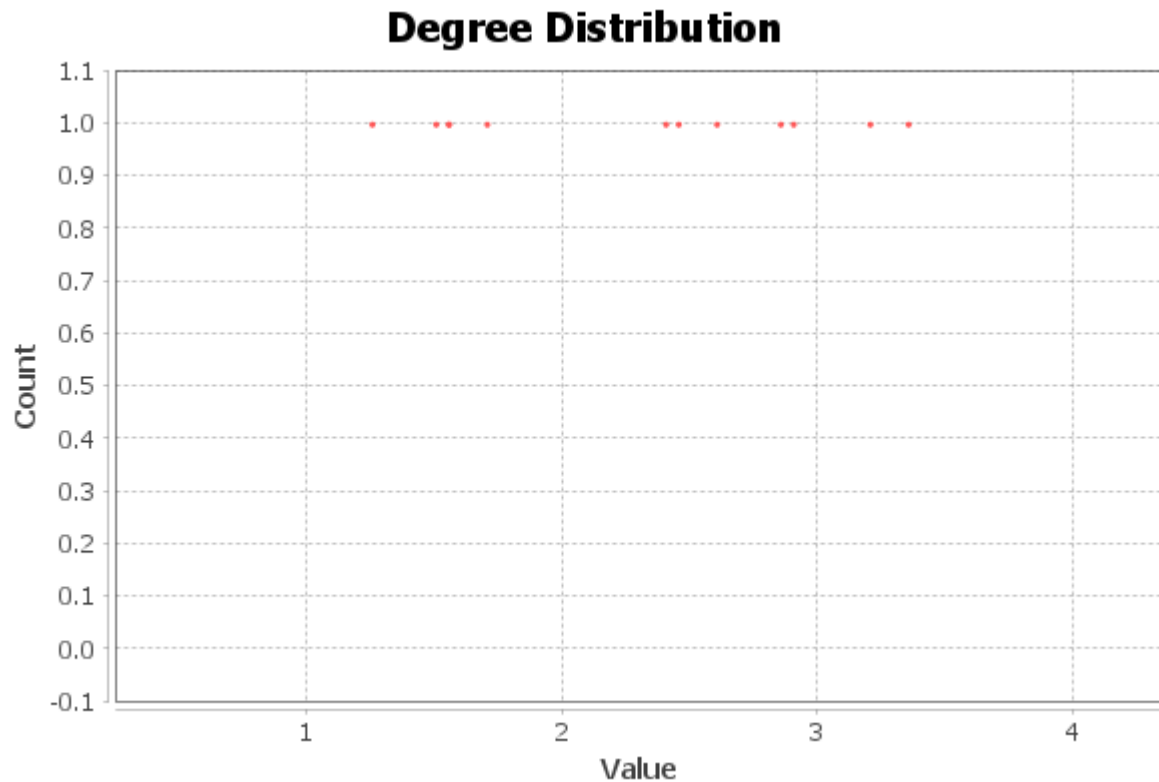- ❖ Edges: 18
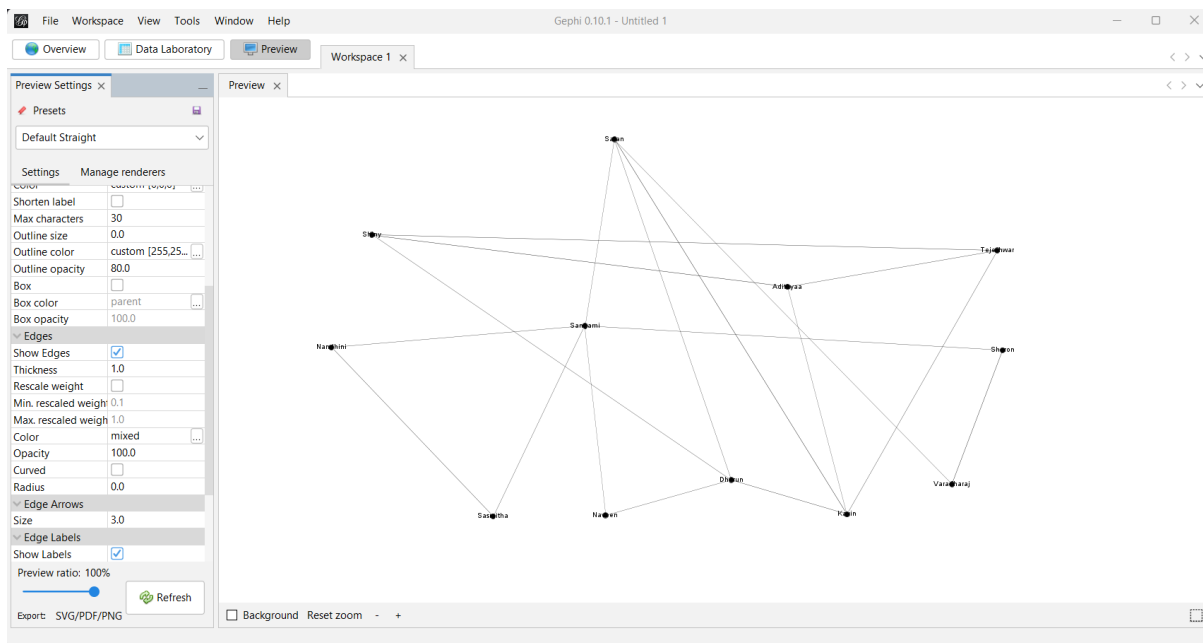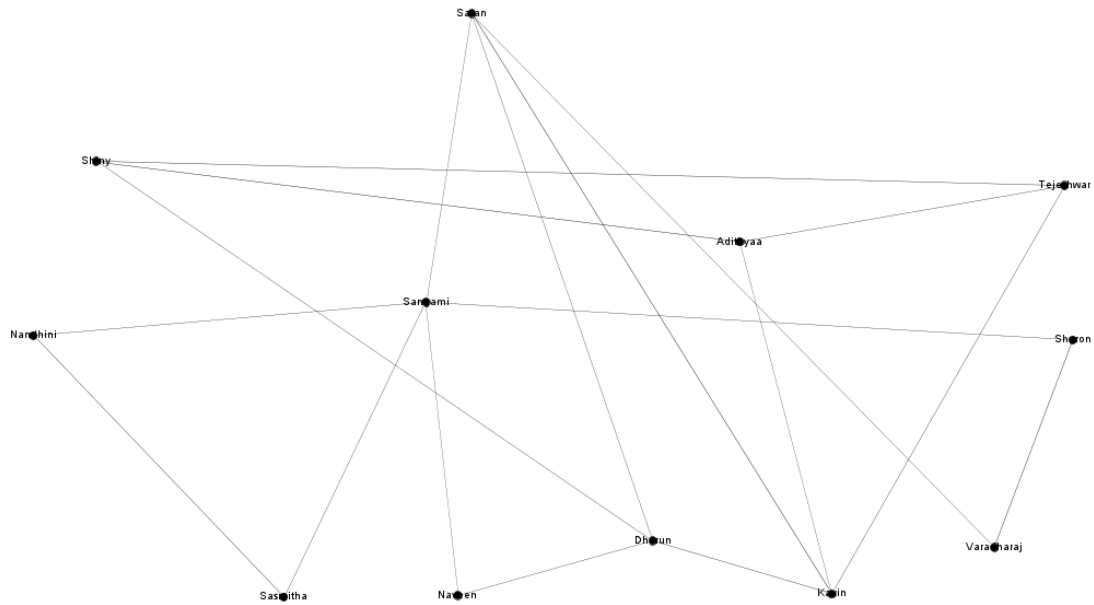
Network and Centrality measures:

   1) Average Degree

Average Degree: 3.000

Degree Distribution

2) Average Weighted Graph:

Average Weighted Degree: 2.275

Degree Distribution

3) Network Diameter:

Graph Distance settings

Distance

The average graph-distance between all pairs of nodes. Connected nodes have graph distance 1. The diameter is the longest graph distance between any two nodes in the network. (i.e. How far apart are the two most distant nodes).

○ Directed

☐ Normalize Centralities in [0,1]

◉ Undirected

Betweenness Centrality: Measures how often a node appears on shortest paths between nodes in the network.

Closeness Centrality: The average distance from a given starting node to all other nodes in the network.
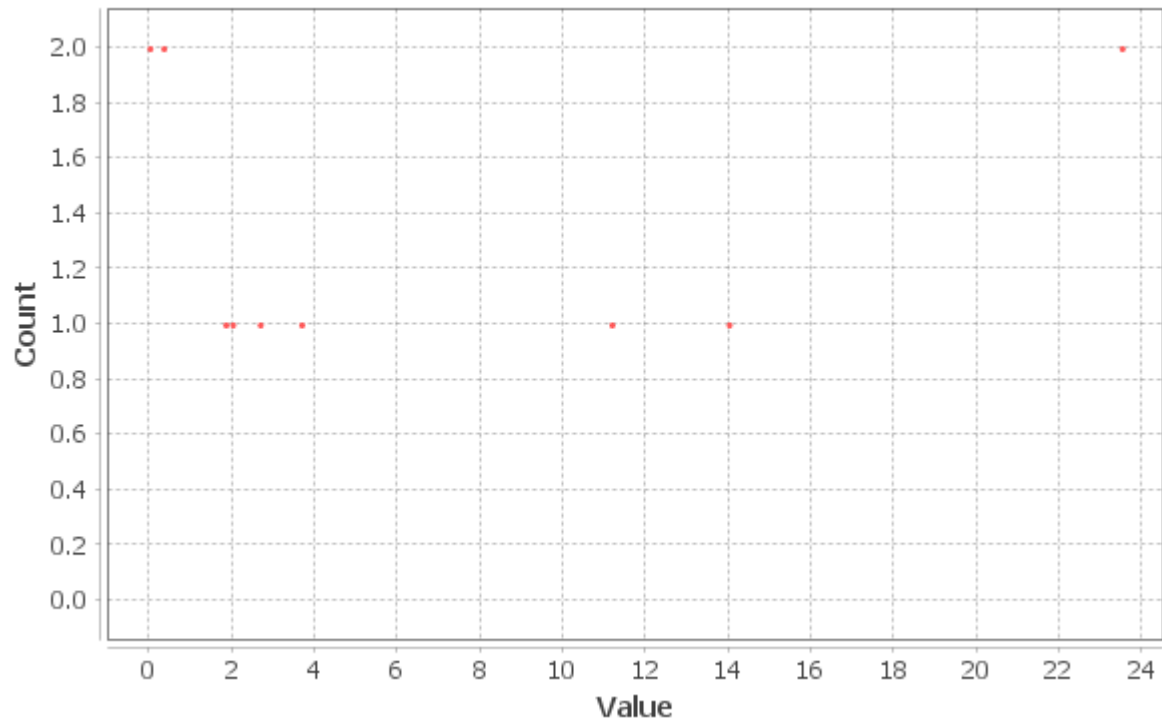
Eccentricity: The distance from a given starting node to the farthest node from it in the network.
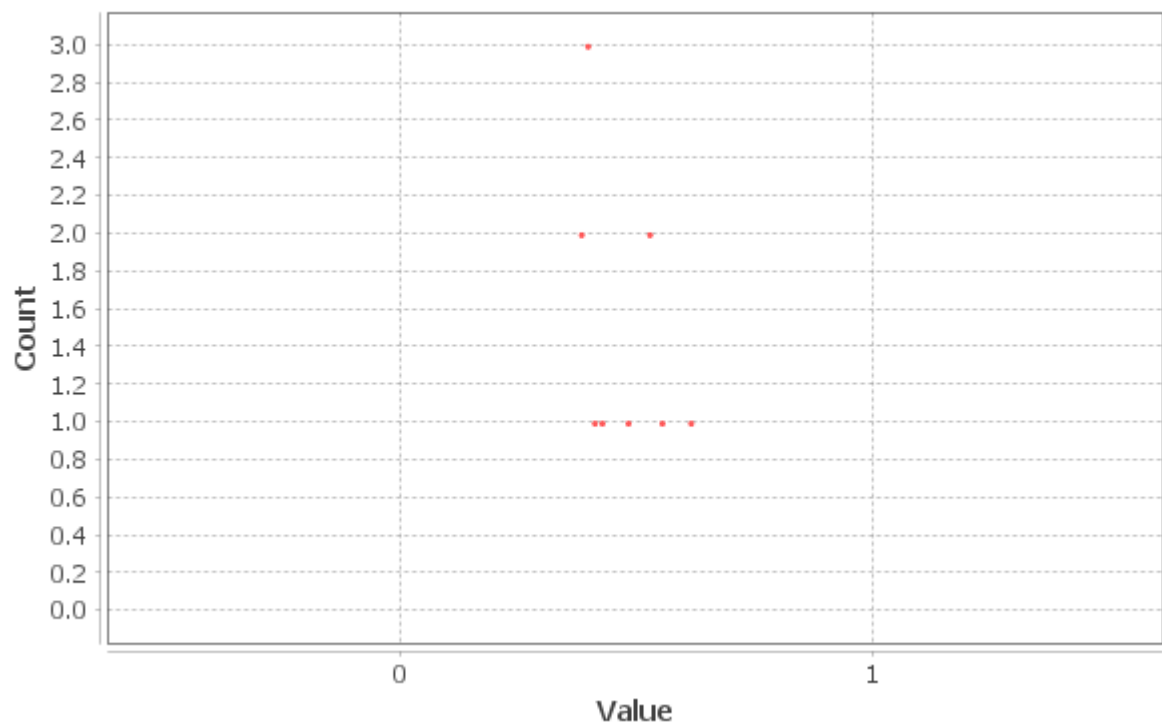
OK   Cancel

Network Interpretation: undirected

Diameter: 4
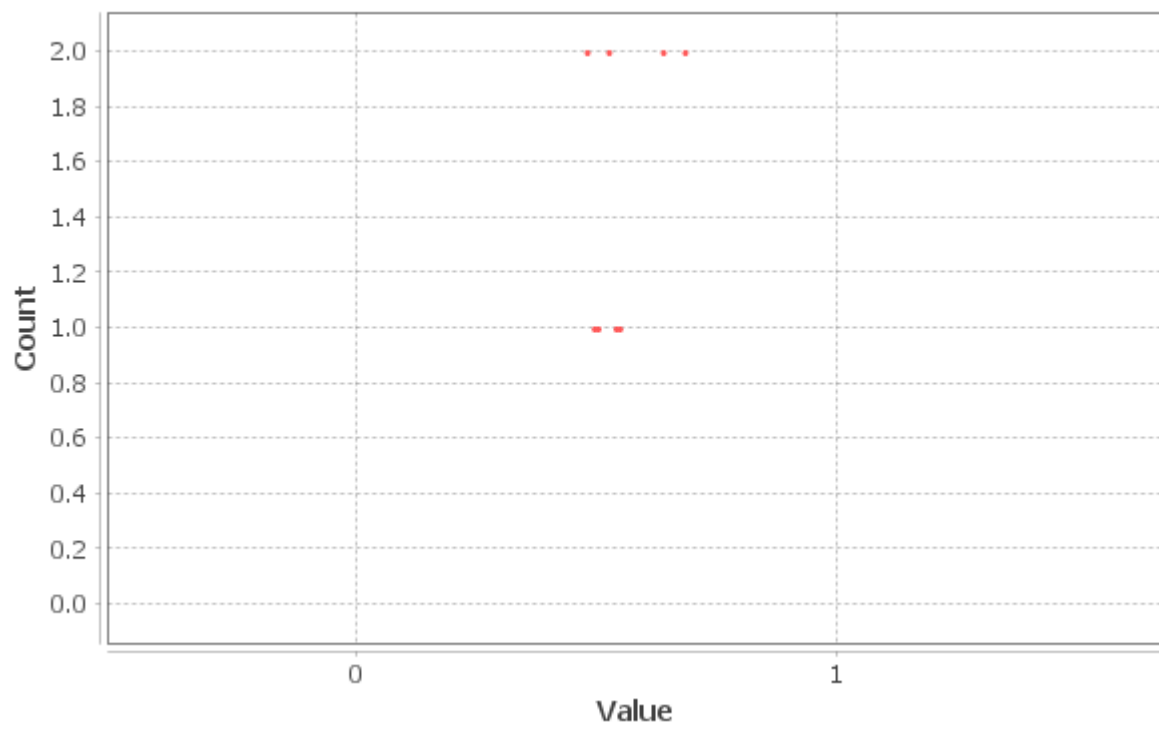Radius: 2
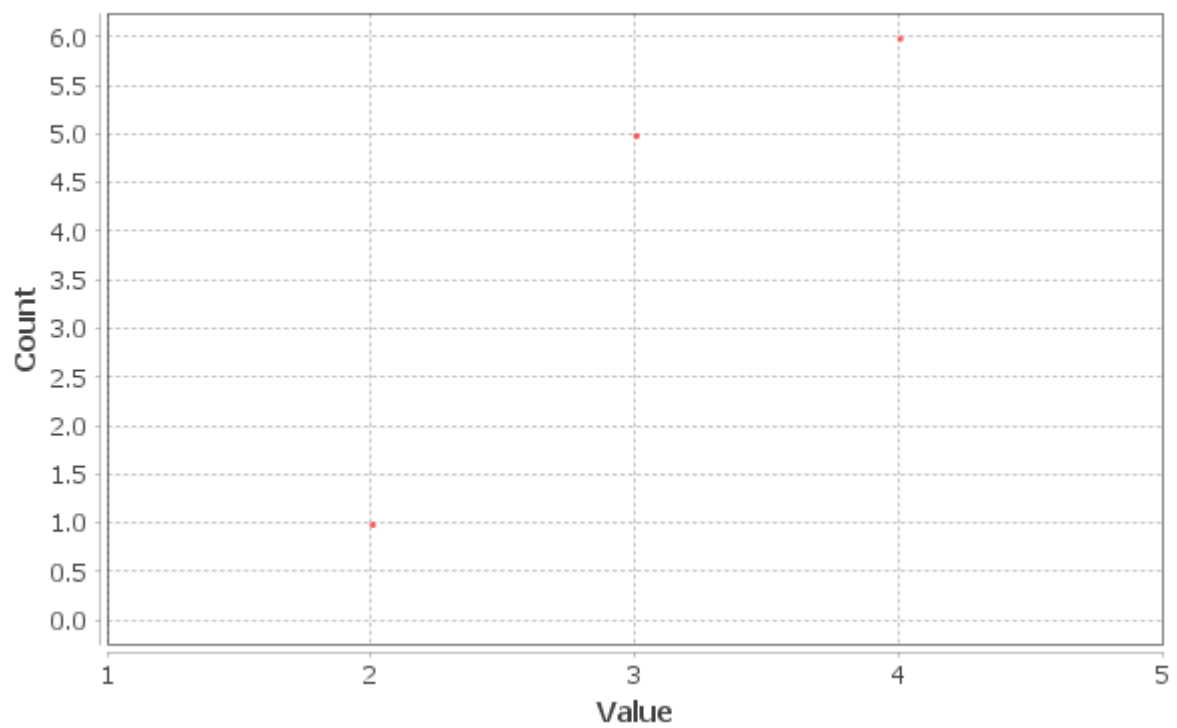Average Path length: 2.257575757575758

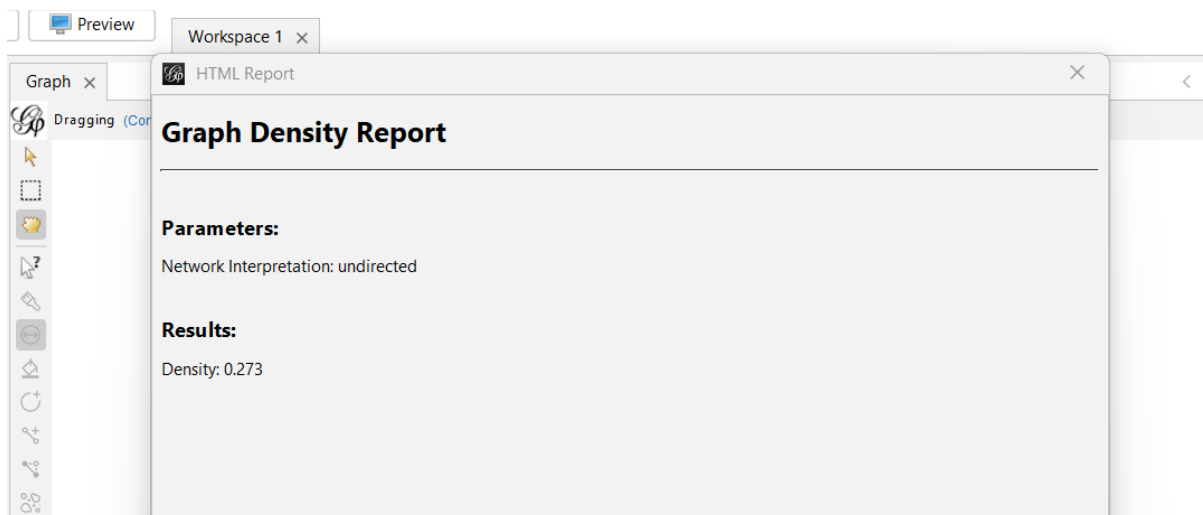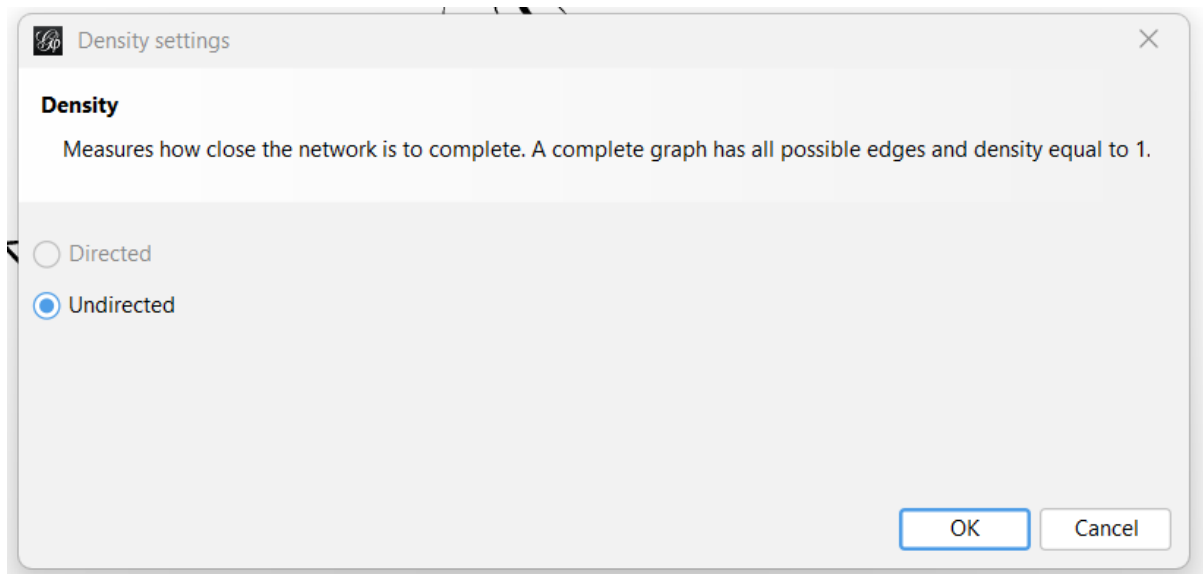## Betweenness Centrality Distribution

Closeness Centrality Distribution

Harmonic Closeness Centrality Distribution

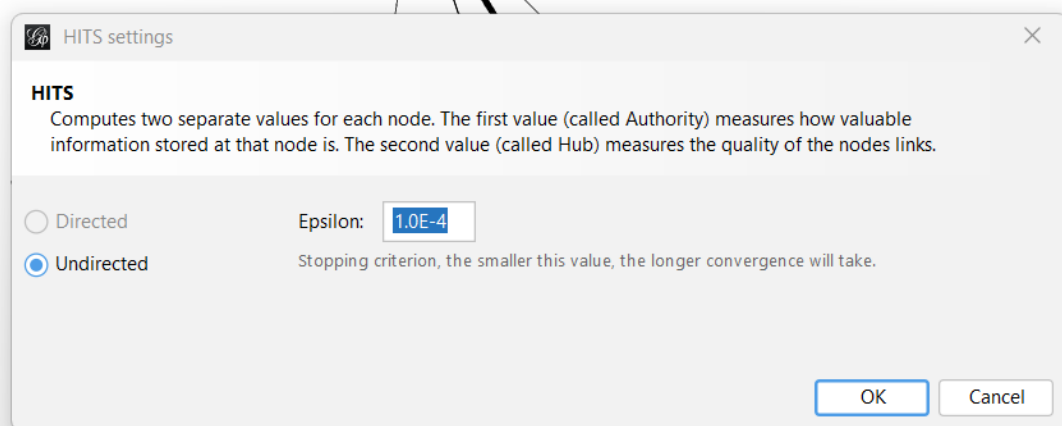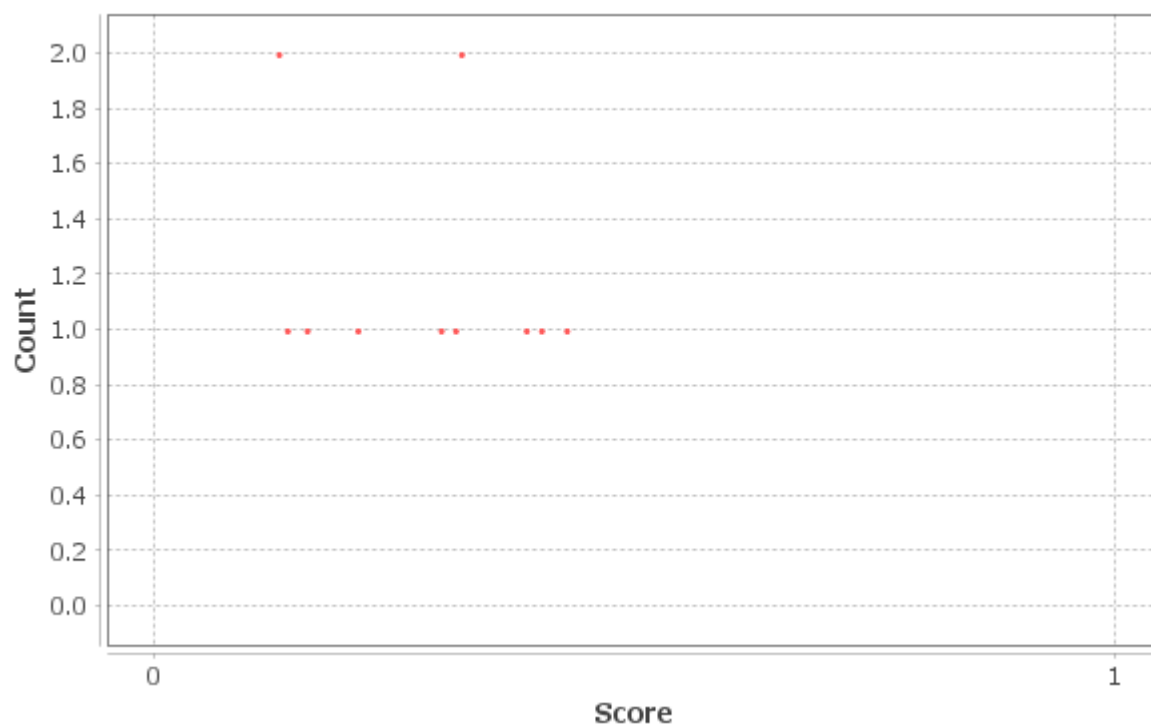# Eccentricity Distribution

4) Graph Density:

5) HITS:

Parameters:

E = 1.0E-4

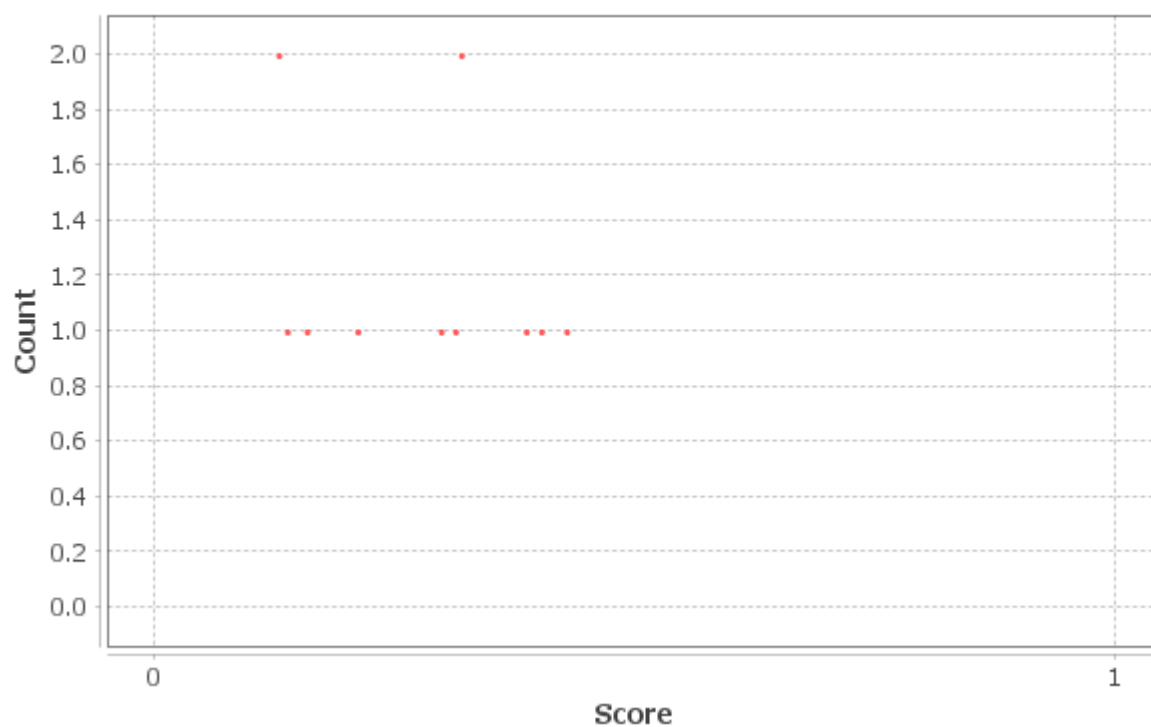**Results:**

Hubs Distribution

Authority Distribution

6) Page Rank:

Page Rank settings ✕

PageRank

Ranks nodes "pages" according to how often a user following links will non-randomly reach the node "page".

○ Directed

◉ Undirected

Probability (p): `0.85`

Used to simulate the user randomly restarting the web-surfing.

Epsilon: `0.001`

Stopping criterion, the smaller this value, the longer convergence will take.

Use edge weight ☐

OK   Cancel
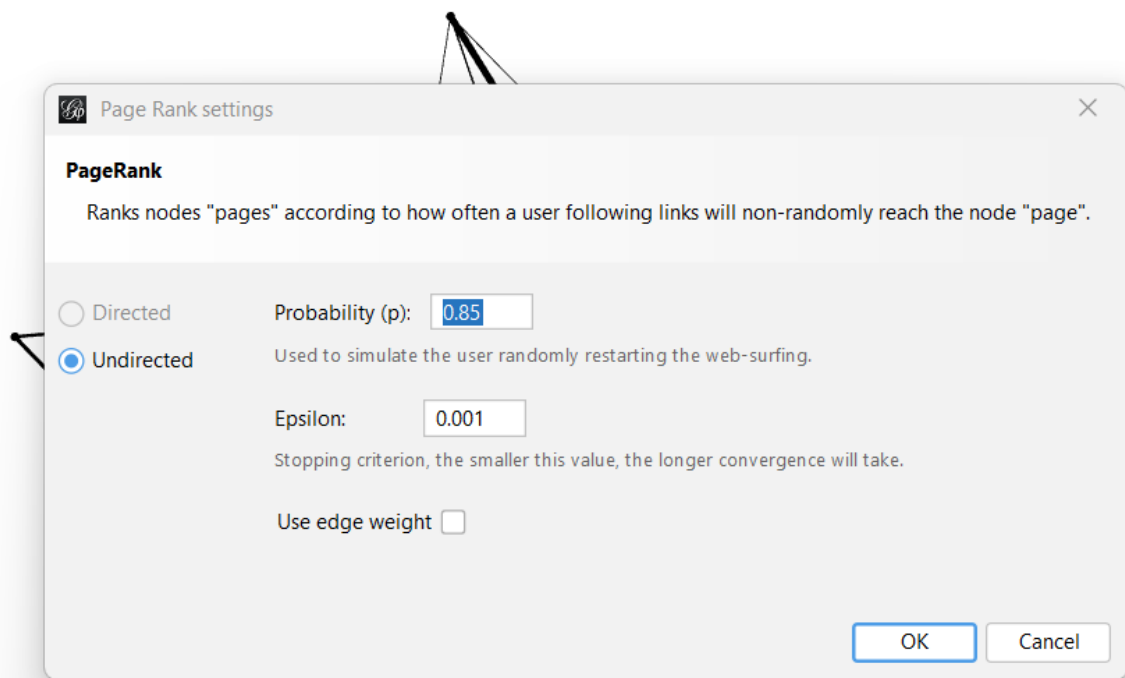
Parameters:

Epsilon = 0.001
Probability = 0.85

Results:

PageRank Distribution

7) Modularity:

Modularity settings

Modularity
Community detection algorithm.

☑ Randomize   Produce a better decomposition but increases computation time

☑ Use weights   Use edge weight

Resolution: Lower to get more communities (smaller ones) and higher than 1.0 to get les..

`1.0`

Classes start at:

`0`

OK   Cancel
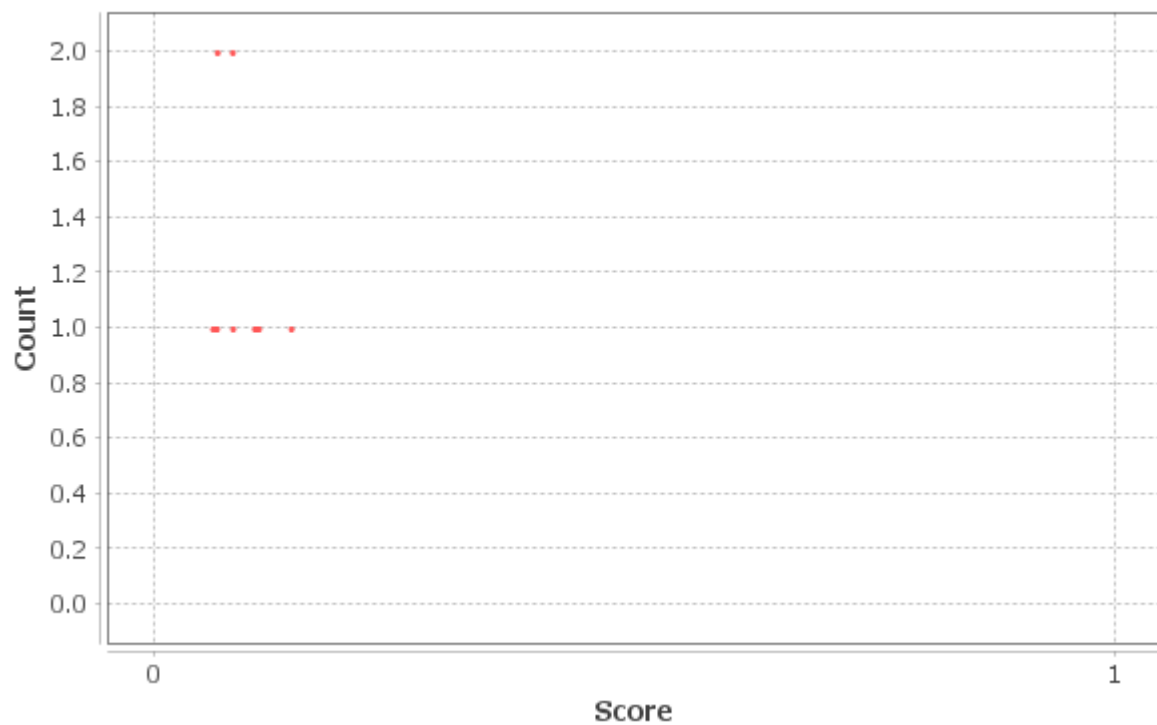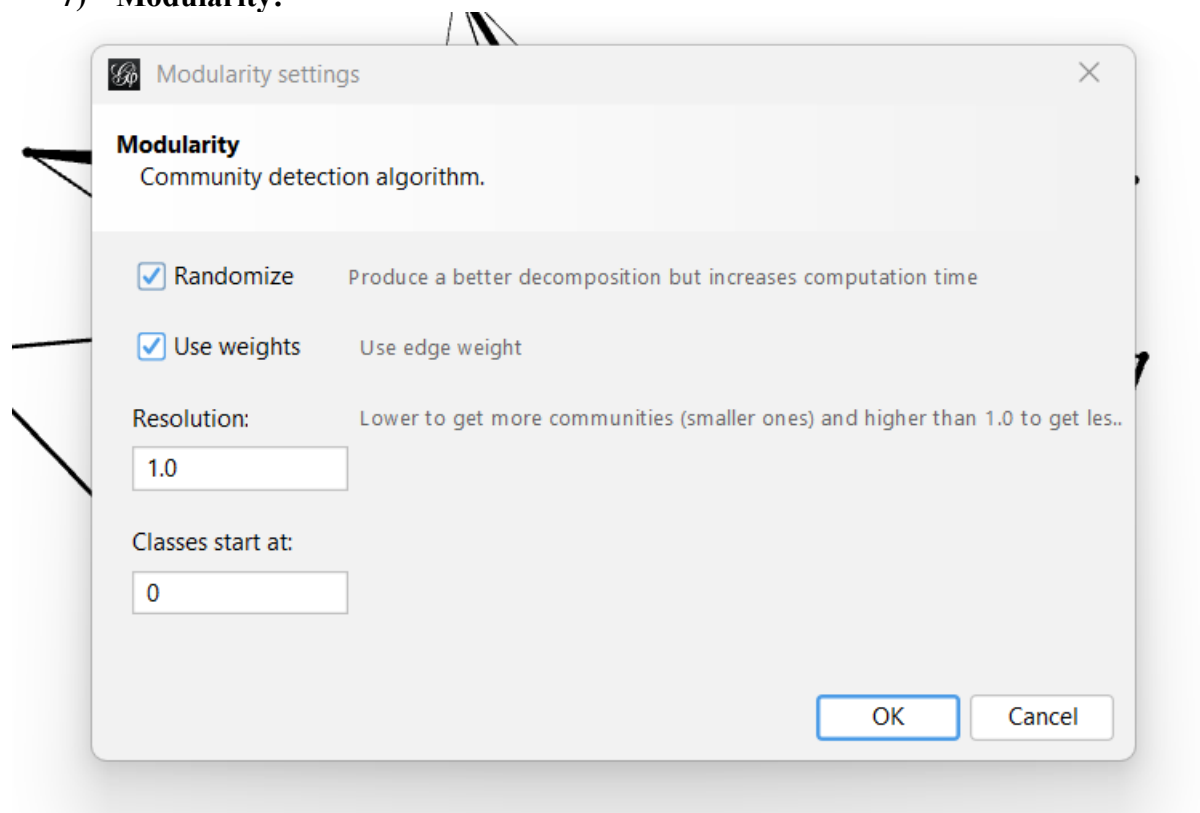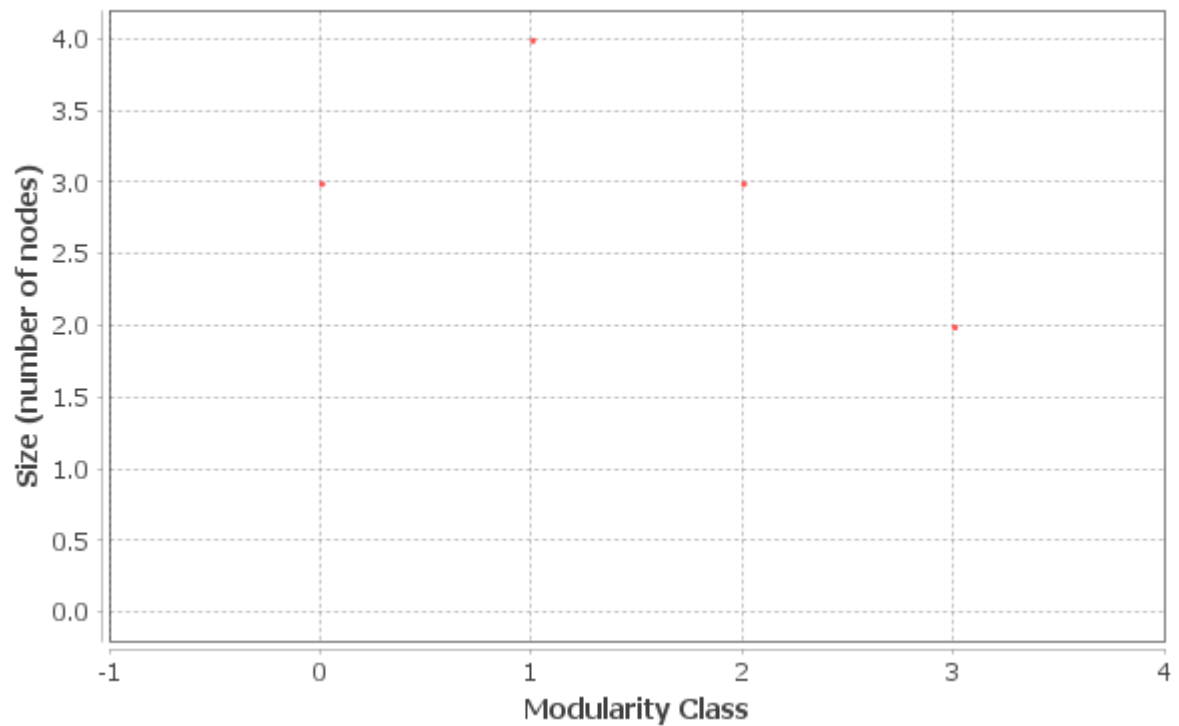
Parameters:

Randomize: On
Use edge weights: On
Resolution: 1.0

Results:

Modularity: 0.383
Modularity with resolution: 0.383
Number of Communities: 4

Size Distribution

8) **Statistical Inference Report:**

Results:

Description Length: 49.751
Number of Communities: 1

Size Distribution

9) Clustering Coefficient
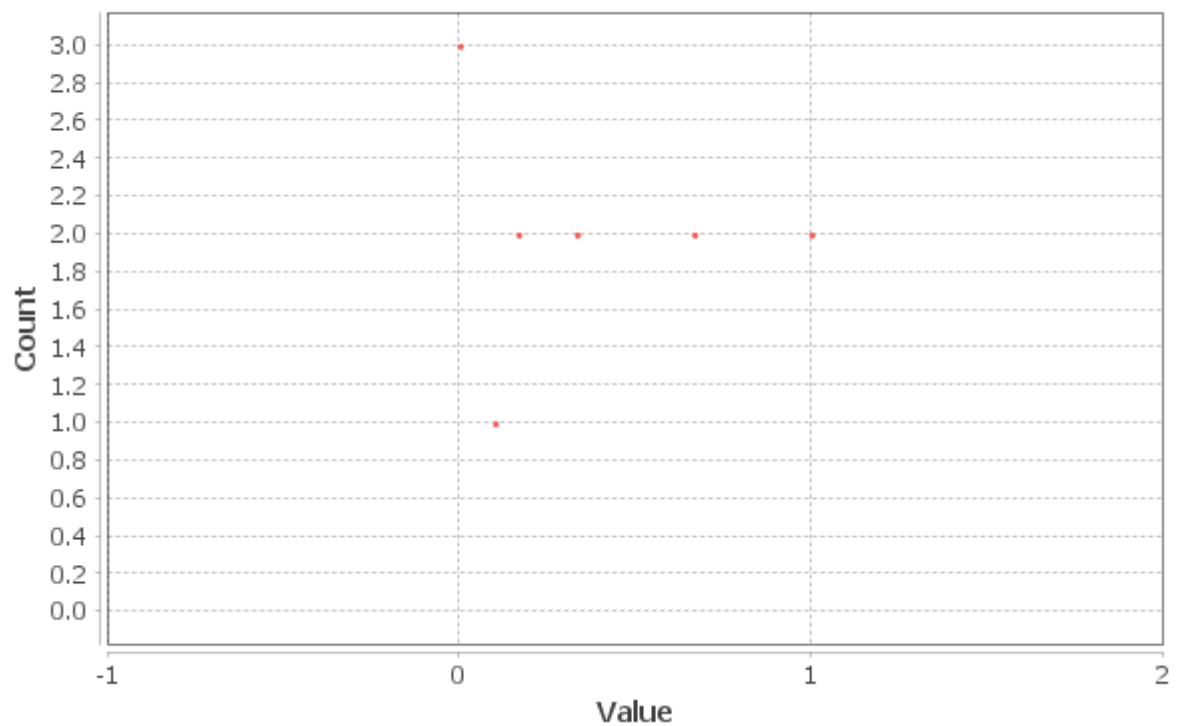
Parameters:

Network Interpretation: undirected

Results:

Average Clustering Coefficient: 0.369
Total triangles: 4
The Average Clustering Coefficient is the mean value of individual coefficients.

Clustering Coefficient Distribution

10) Eigenvector Centrality

Parameters:
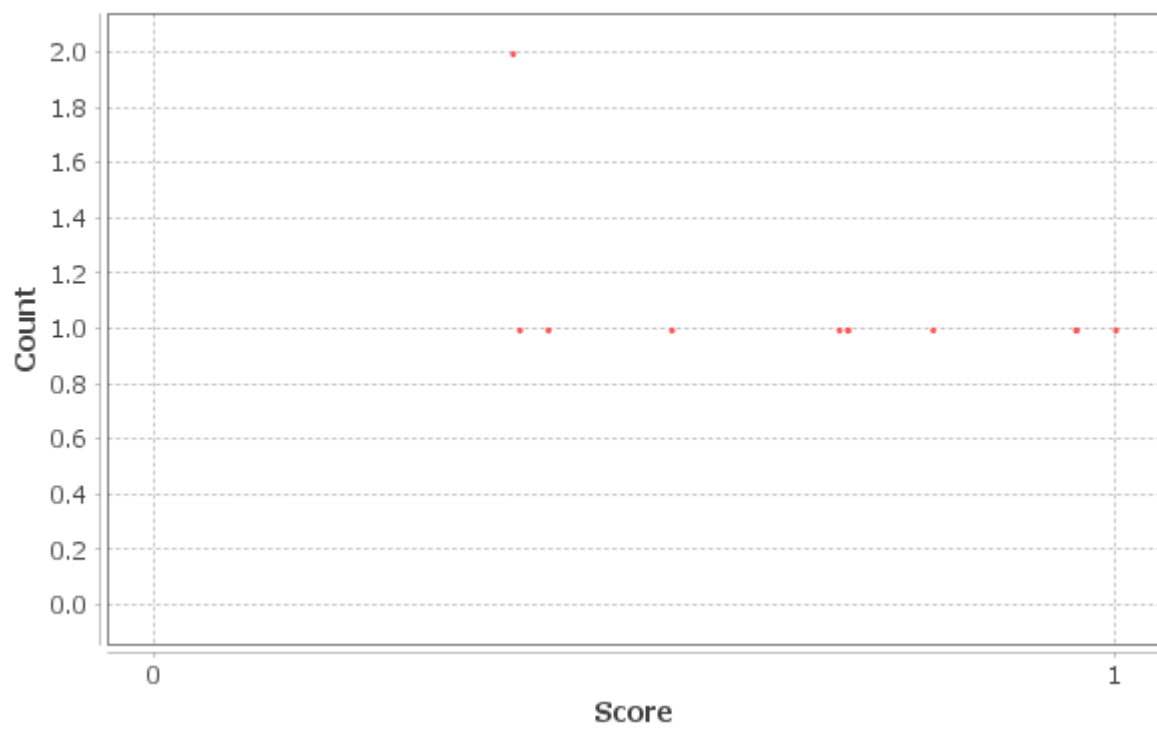
Network Interpretation: undirected
Number of iterations: 100
Sum change: 0.001330293526937254

Results:

Eigenvector Centrality Distribution

11) Average Graph Distance:

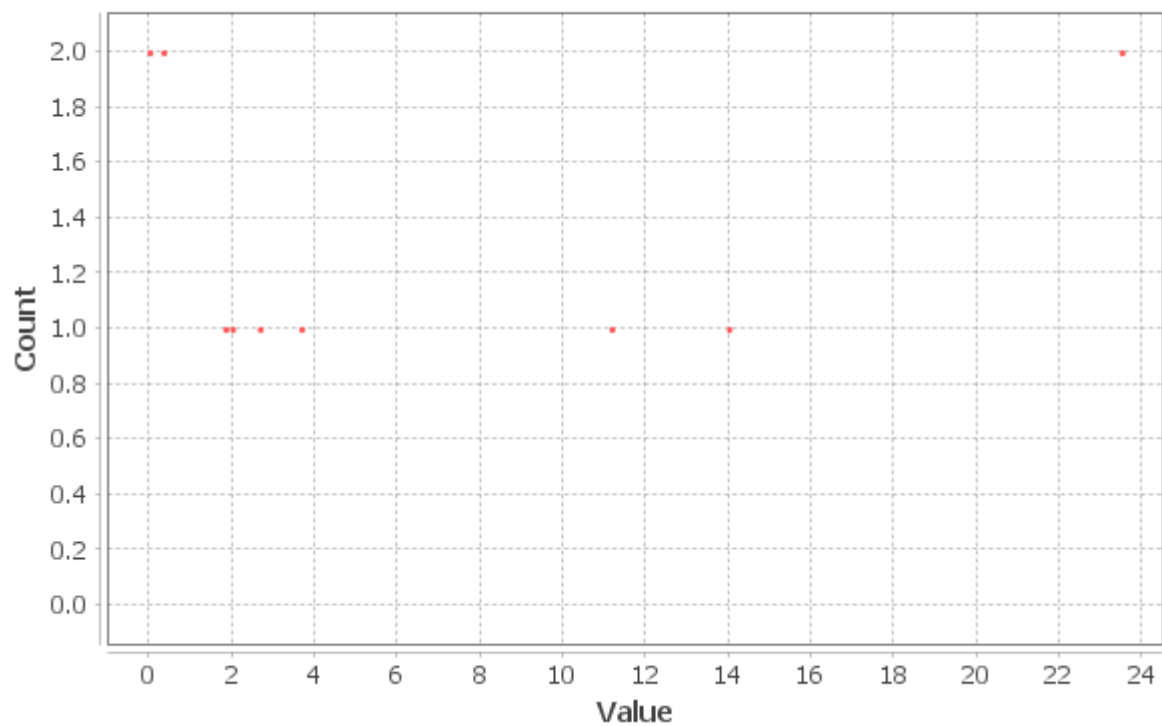**Parameters:**

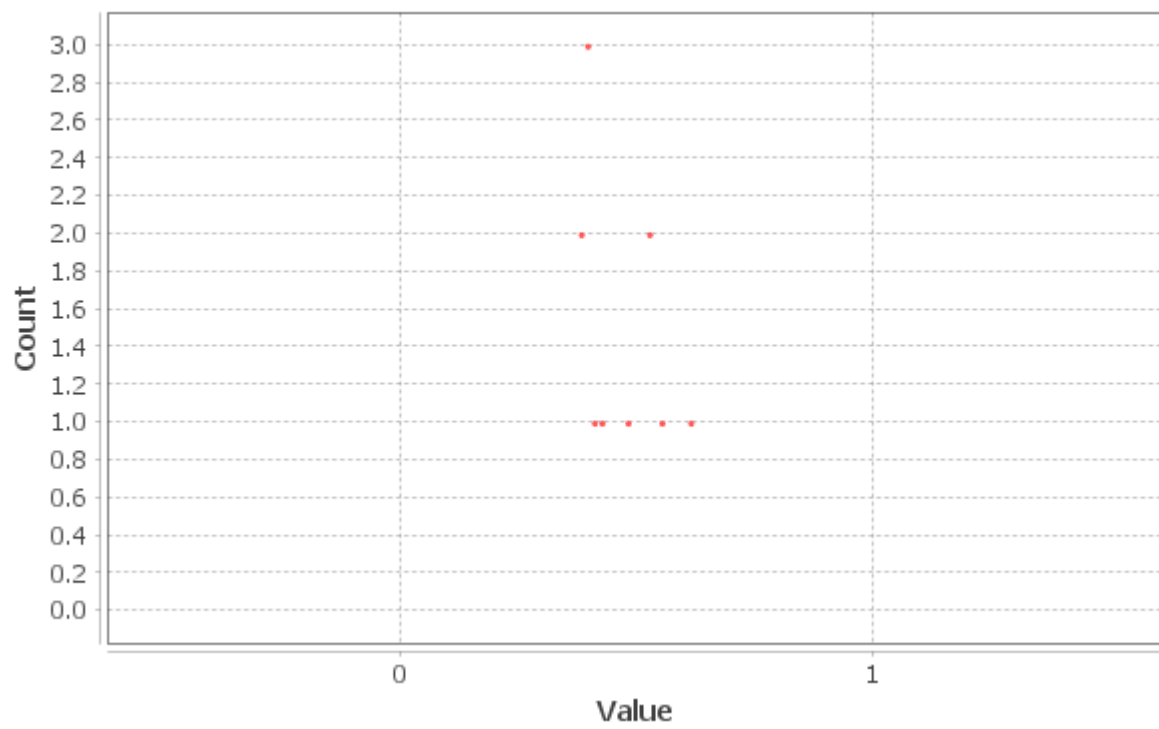Network Interpretation: undirected

Results:

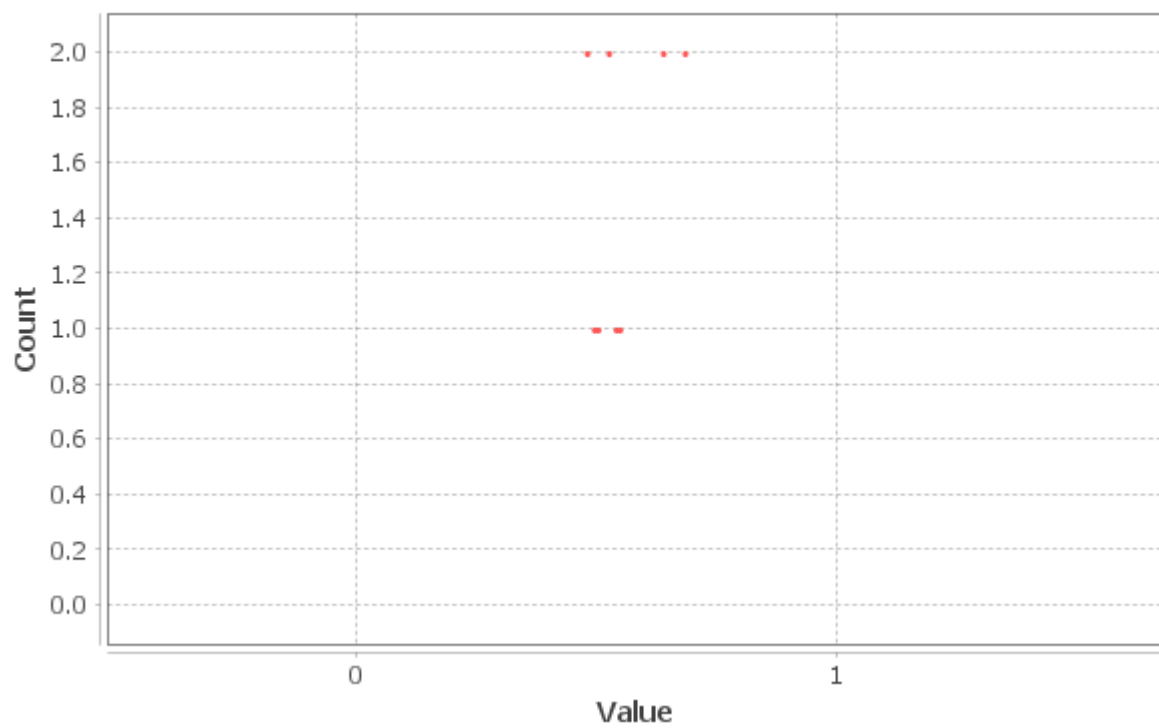Diameter: 4
Radius: 2
Average Path length: 2.257575757575758

Betweenness Centrality Distribution

Closeness Centrality Distribution

Harmonic Closeness Centrality Distribution

Eccentricity Distribution