

Comparative Network Analysis Report

eman ahmed 2205143

NON Network vs. 5G Misinformation Network

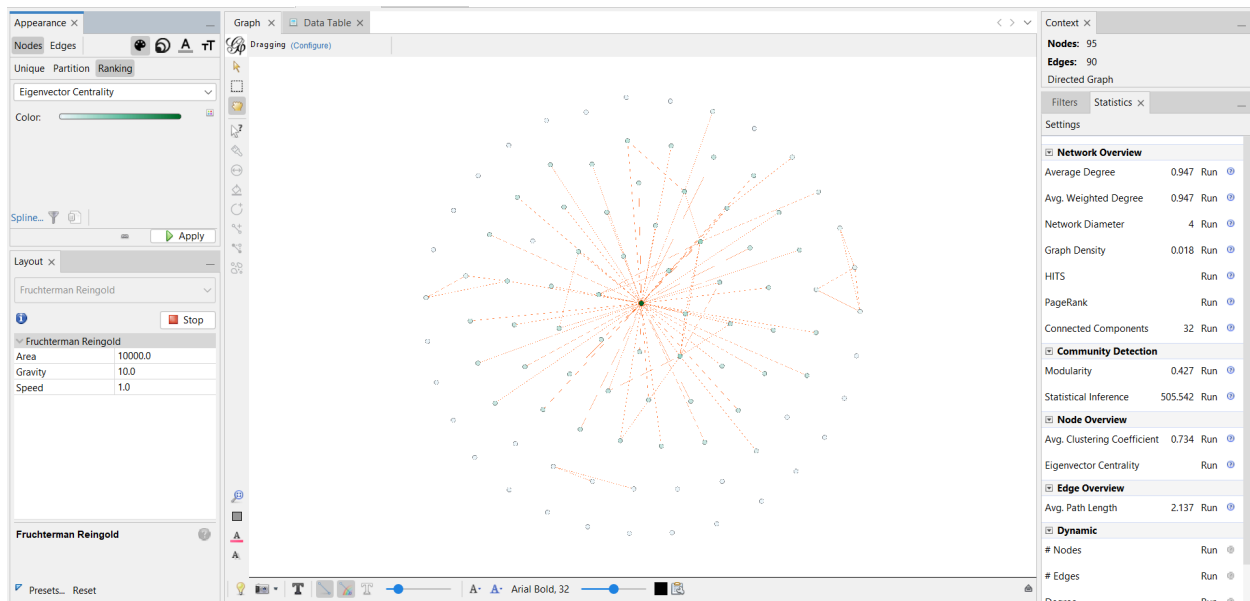
1. Introduction

This report presents a comparative structural analysis between two Twitter-based social graphs generated in Gephi:

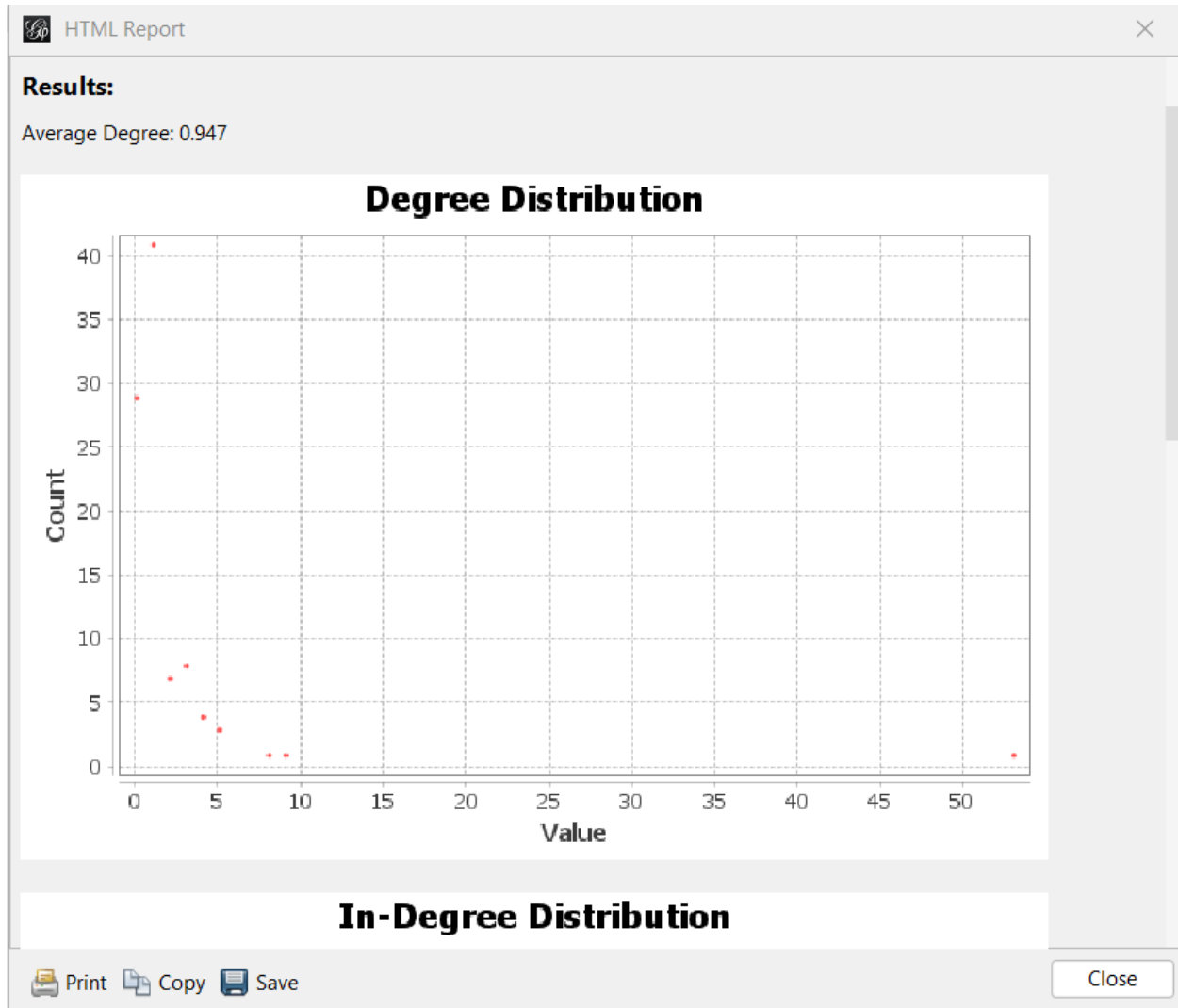
- NON Network (Normal Interaction Network)
- 5G Network (Misinformation Network)

The objective is to show, using quantitative graph metrics, that the 5G network exhibits structural properties typical of misinformation ecosystems, while the NON network displays normal, organic interaction patterns.

1. NON Network (Normal Interaction Network)



Nodes: 95
Edges: 90
Average Degree: 0.947



Graph Density: 0.010 (directed), 0.018 (undirected)

Connected Components: 32 WCC, 85 SCC



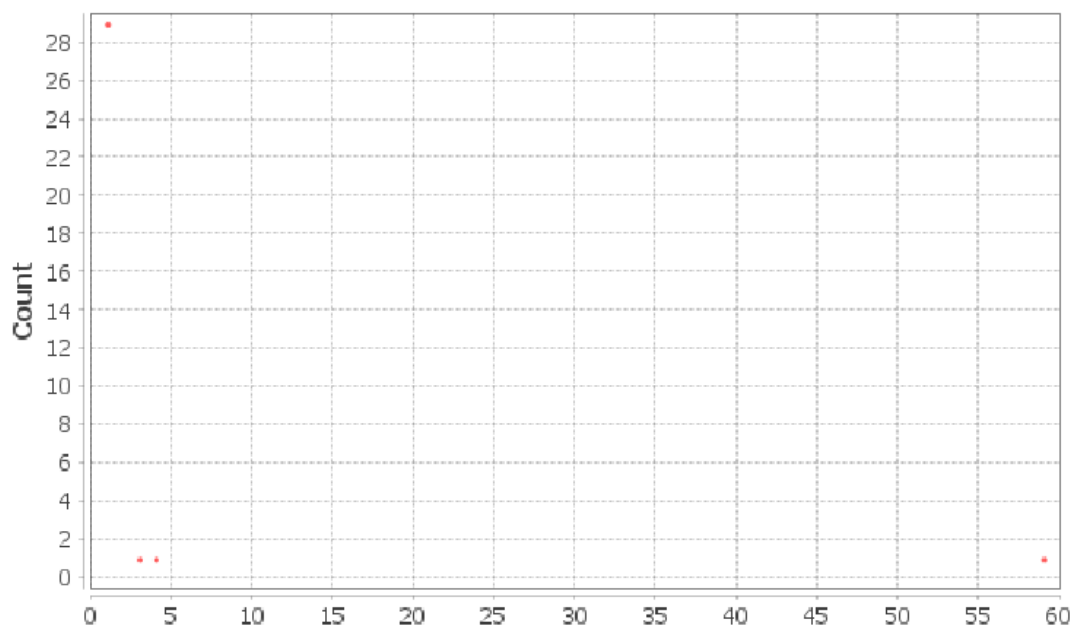
Network Interpretation: directed

Results:

Number of Weakly Connected Components: 32

Number of Strongly Connected Components: 85

Size Distribution



Print

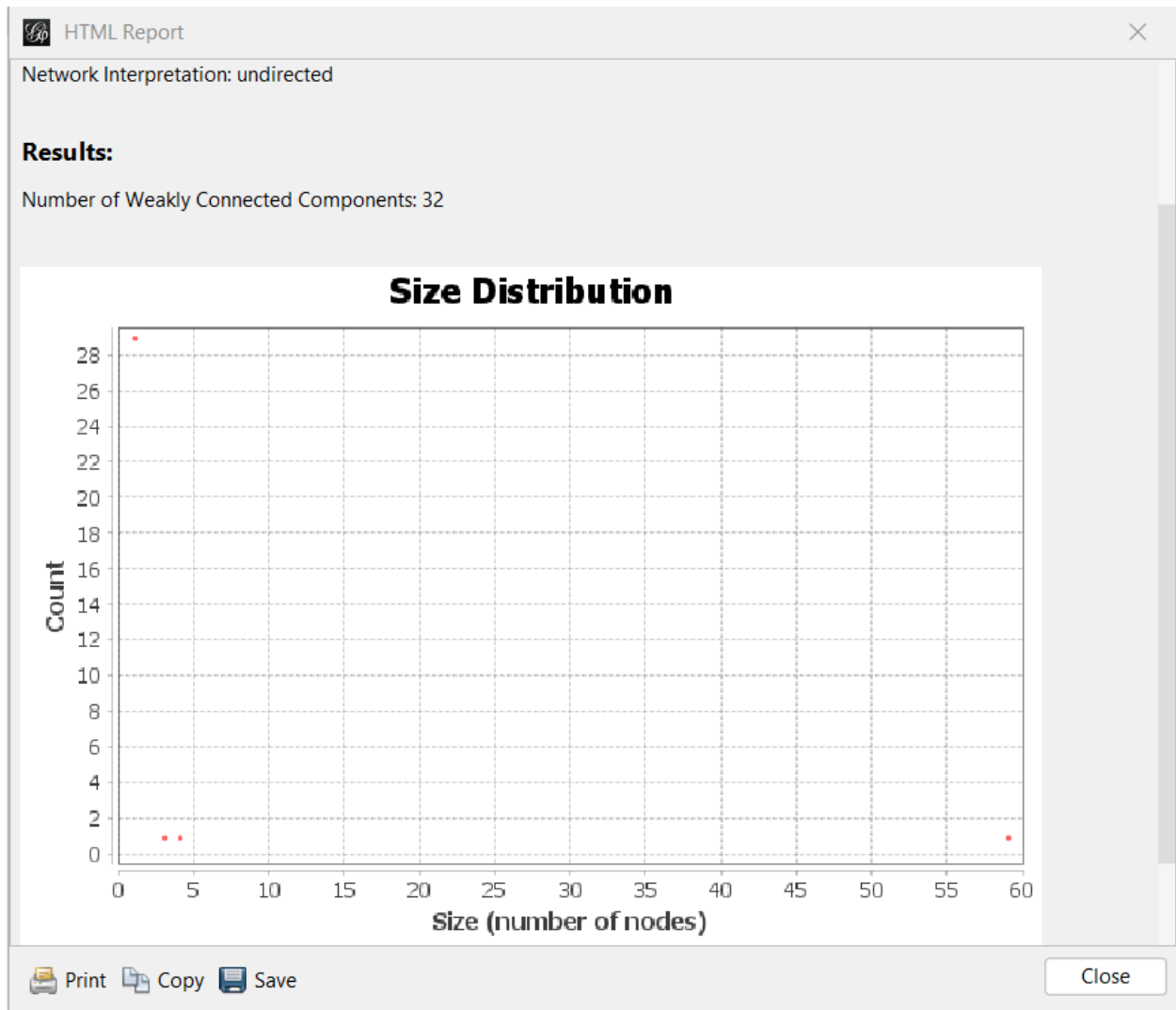


Copy

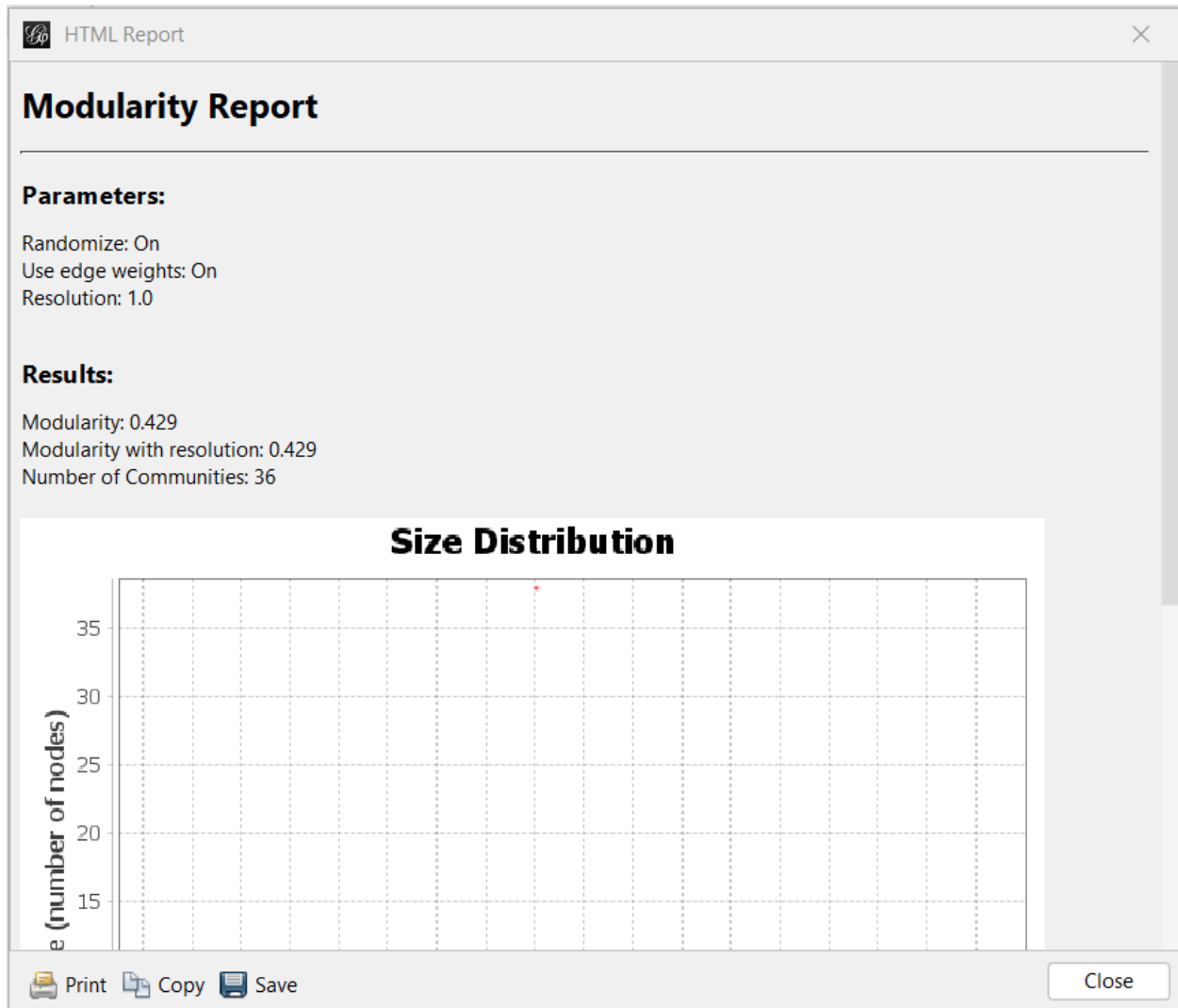


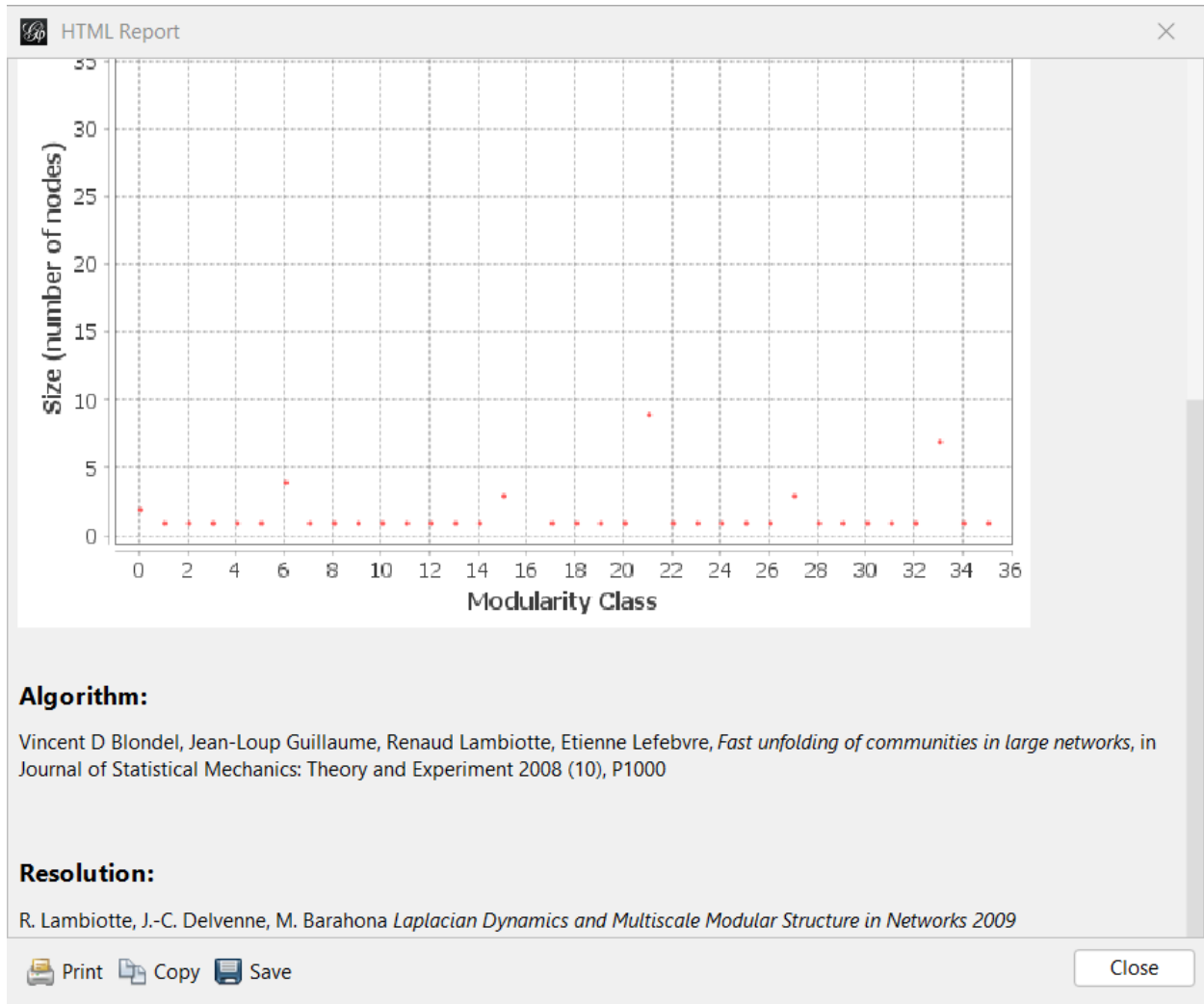
Save

Close

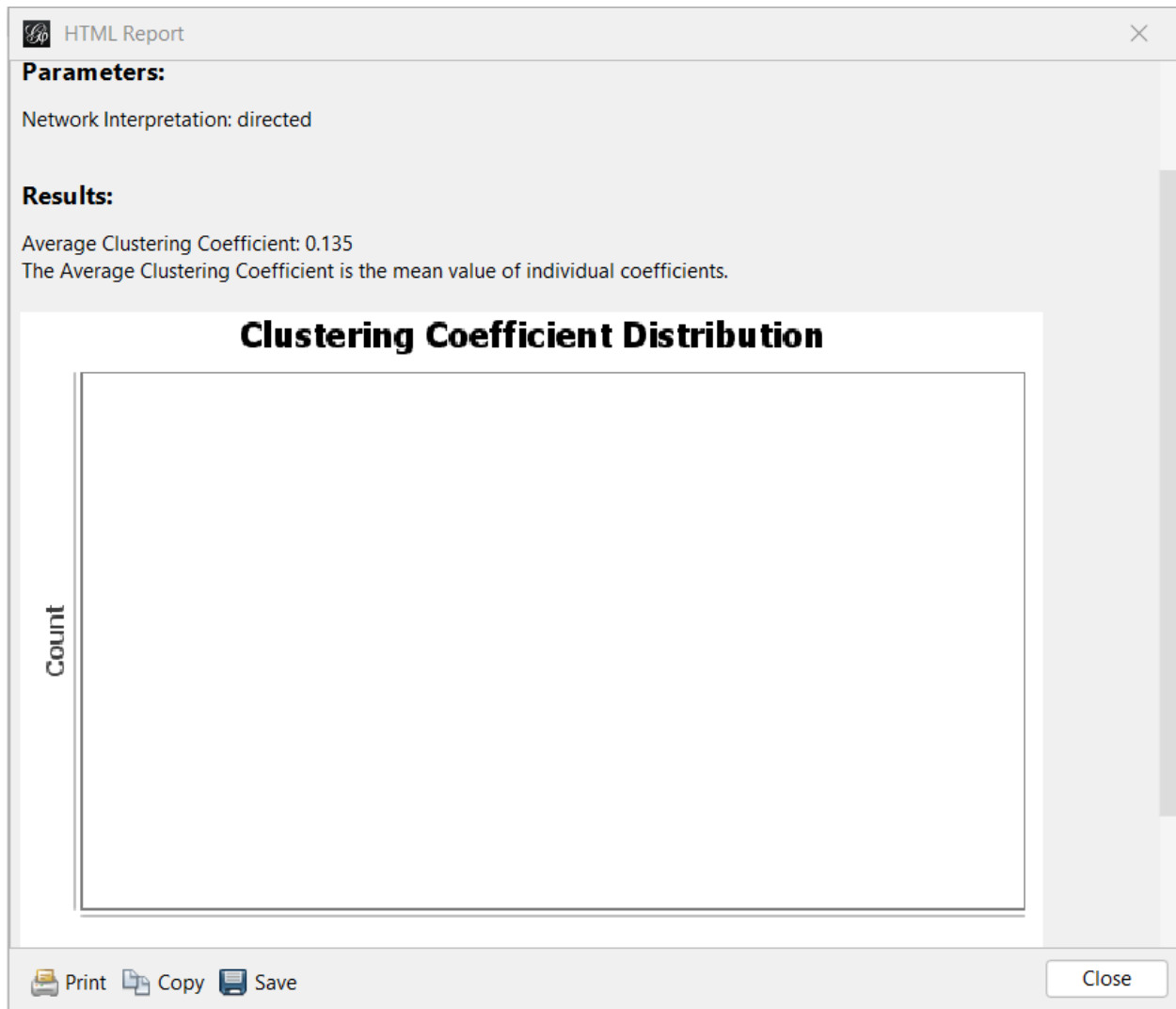


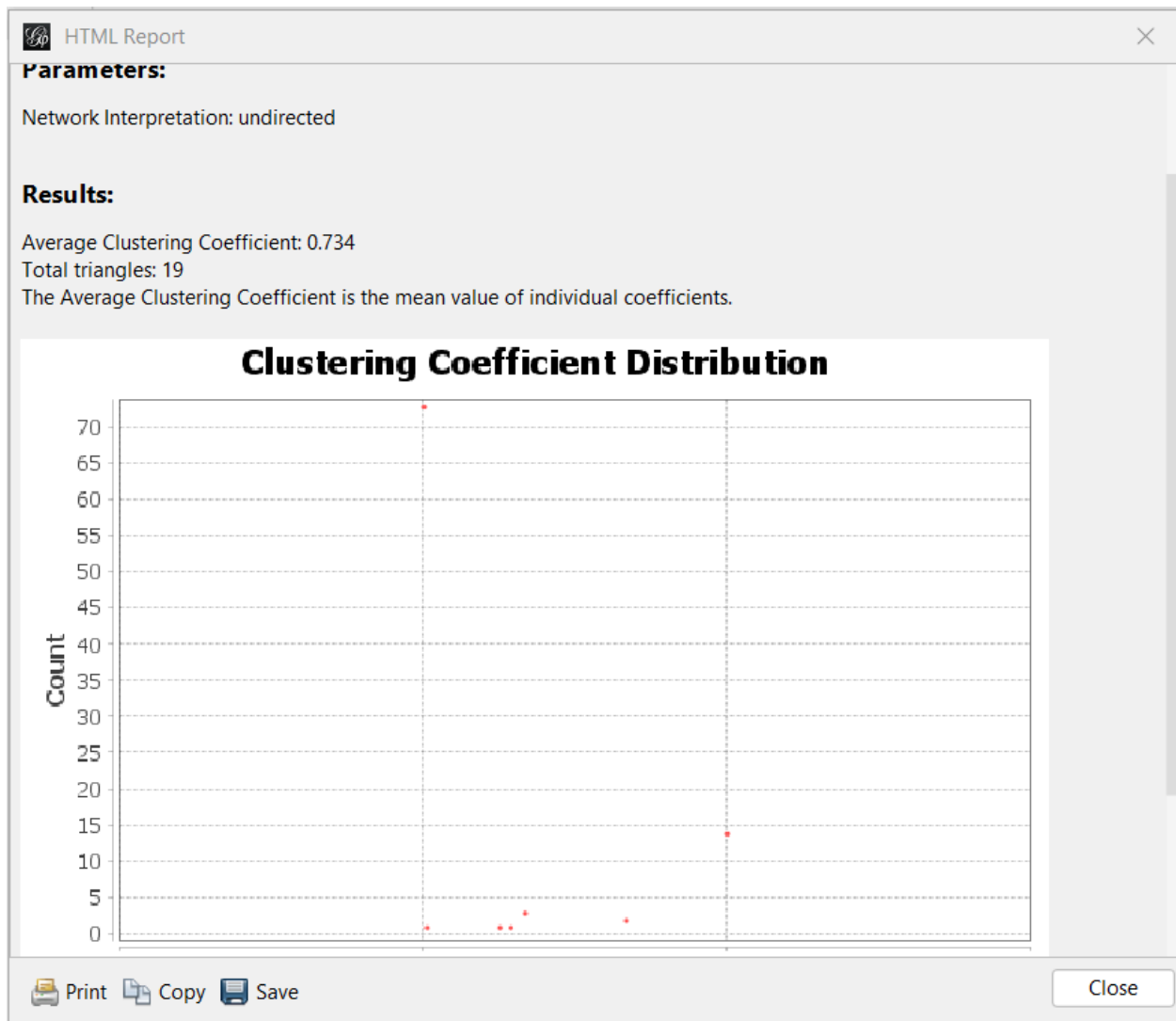
Modularity: 0.427 (36 communities)





Clustering Coefficient: 0.135 (directed), 0.734 (undirected), Triangles: 19





Diameter: 3

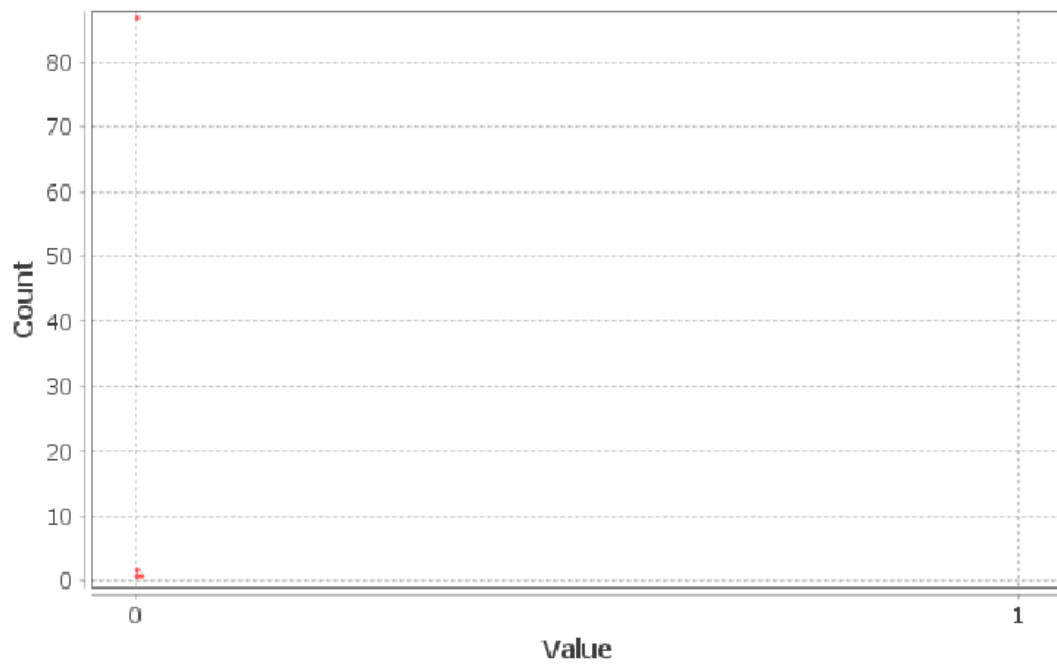
Parameters: Network Interpretation: directed

Results: Diameter: 3

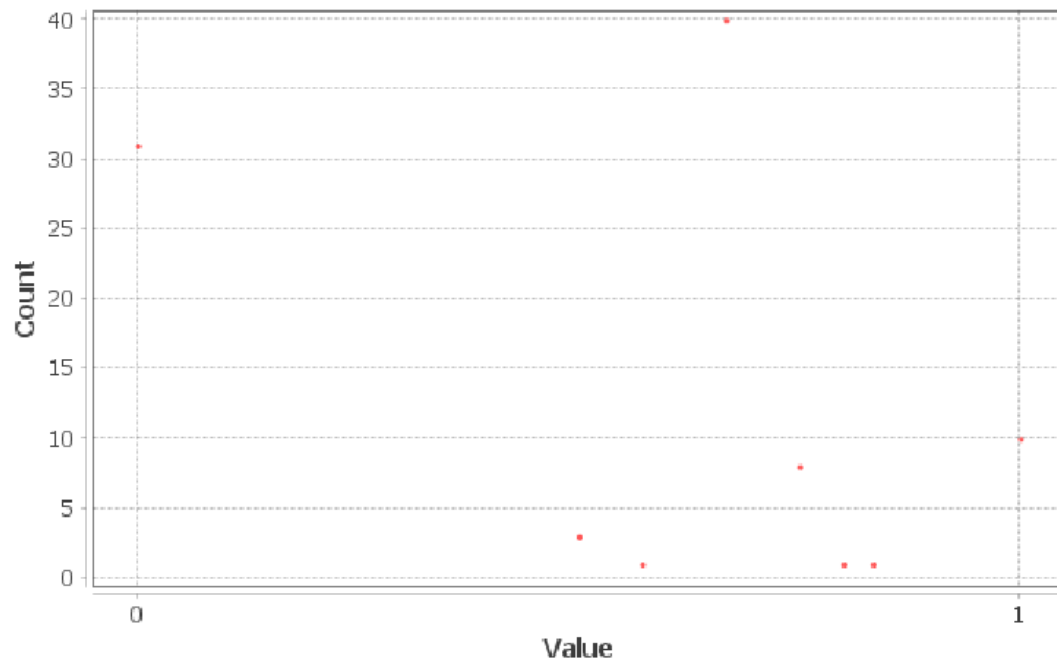
Radius: 0

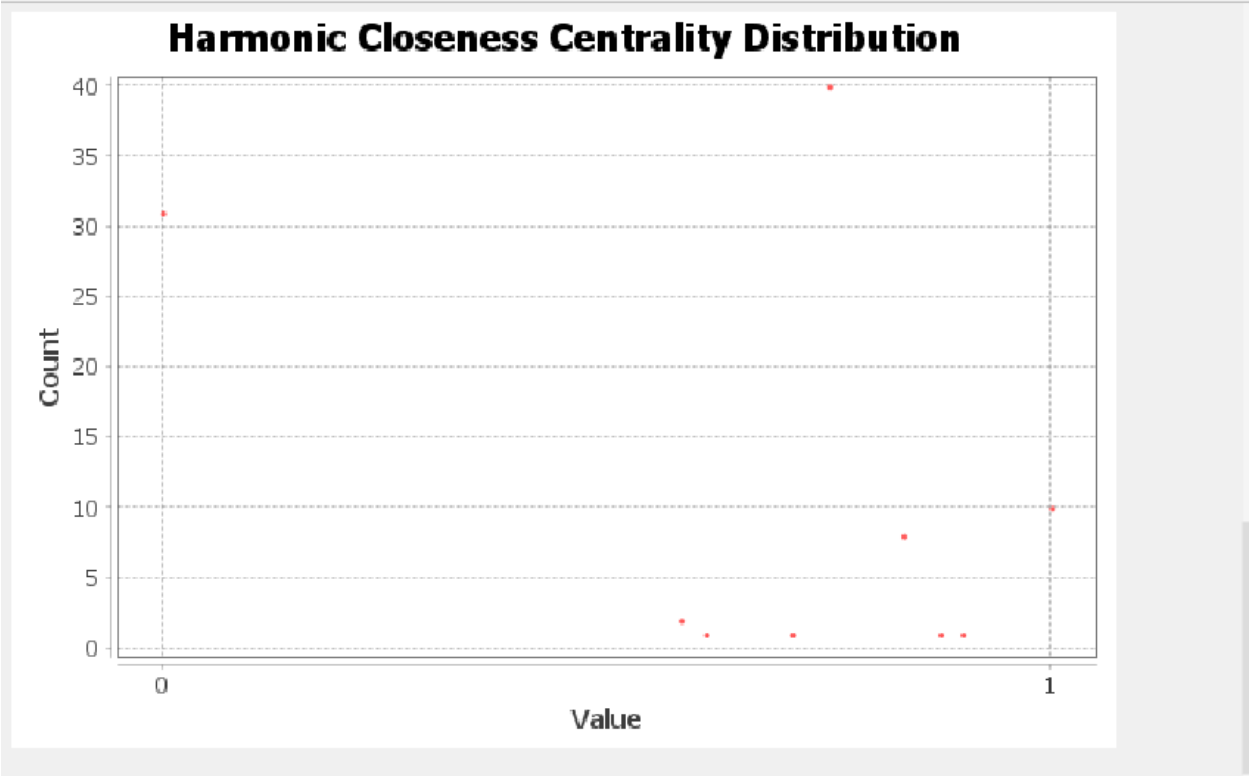
Average Path length: 1.4304635761589404

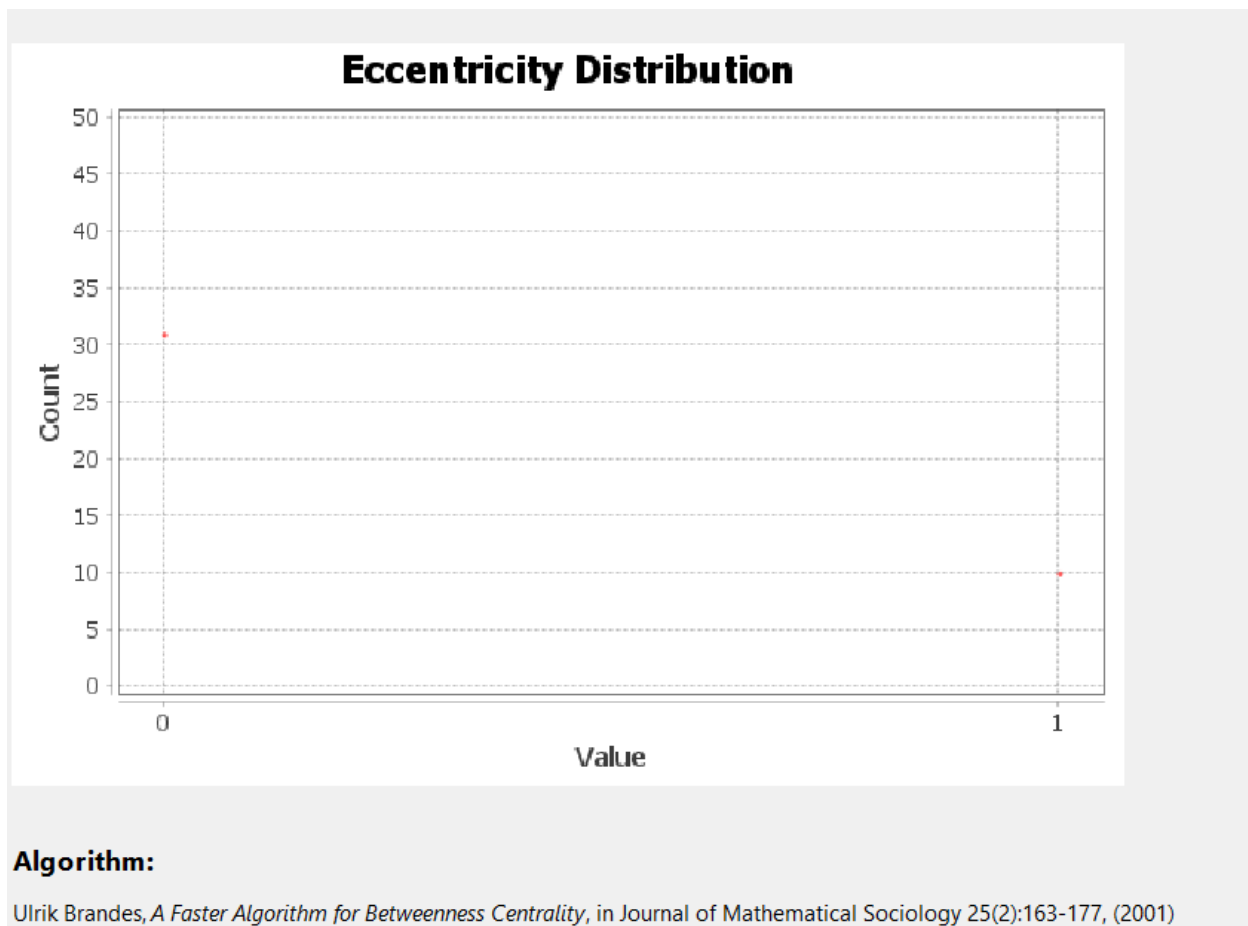
Betweenness Centrality Distribution



Closeness Centrality Distribution







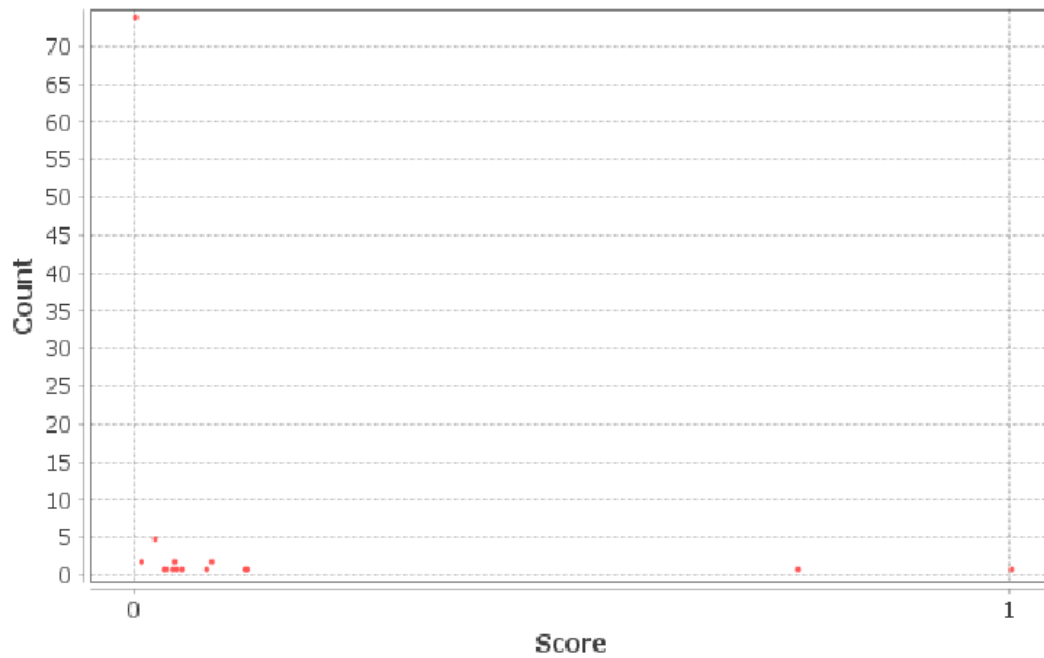
Avg. Path Length: 1.43

same photos for the last

Eigenvector Centrality: concentrated at 0 for most nodes; one node at

**Parameters:**

Network Interpretation: directed
Number of iterations: 100
Sum change: 0.003581864772188449

Results:**Eigenvector Centrality Distribution**

Print

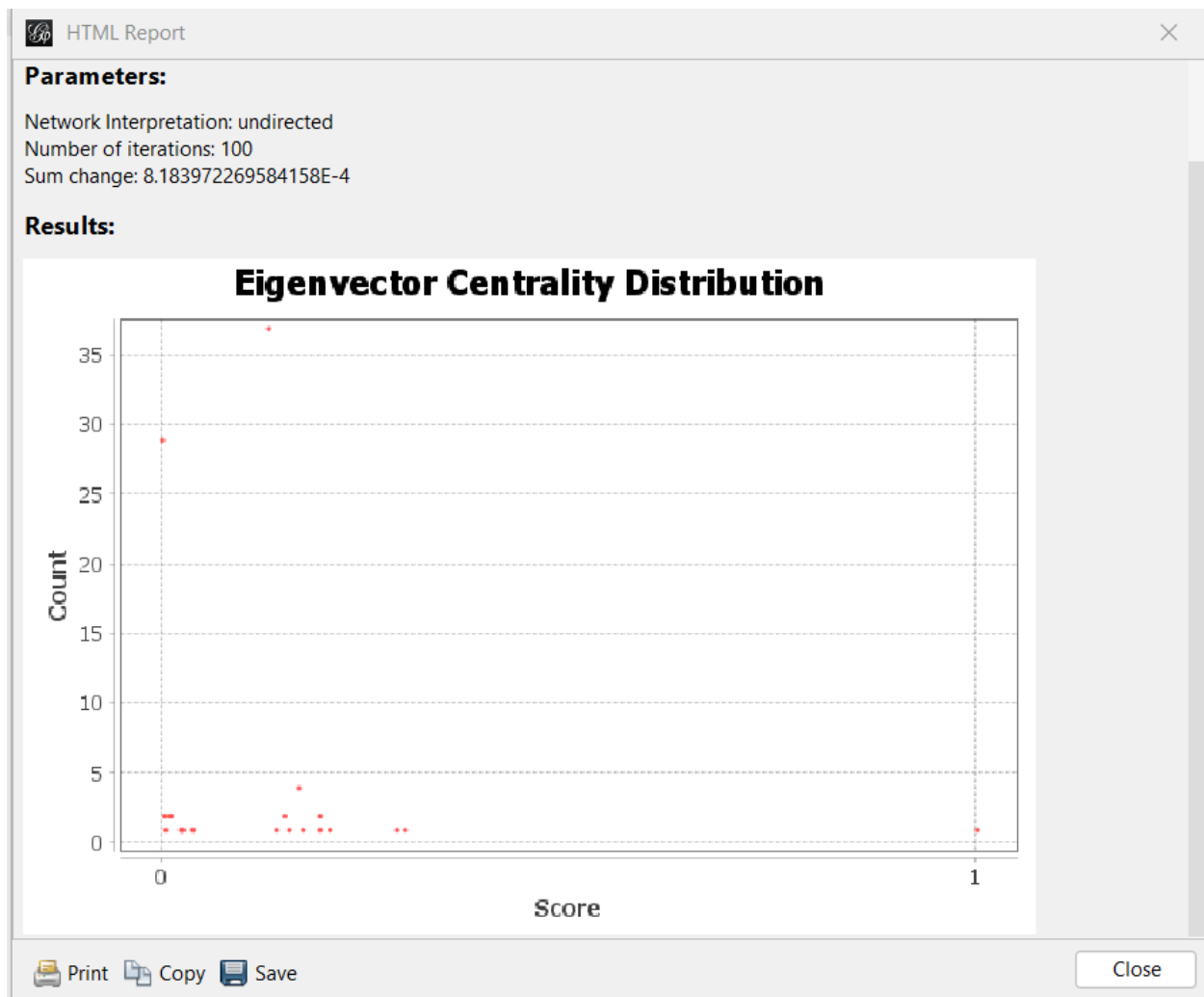


Copy



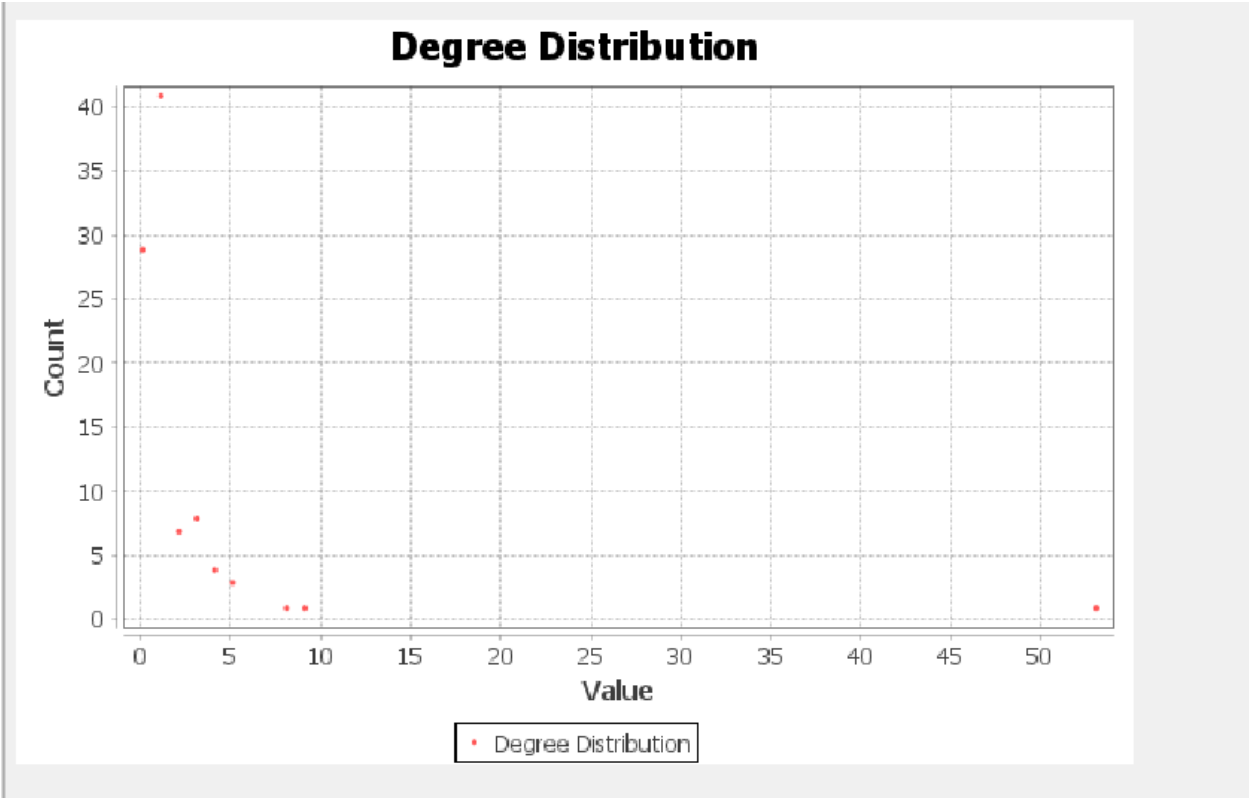
Save

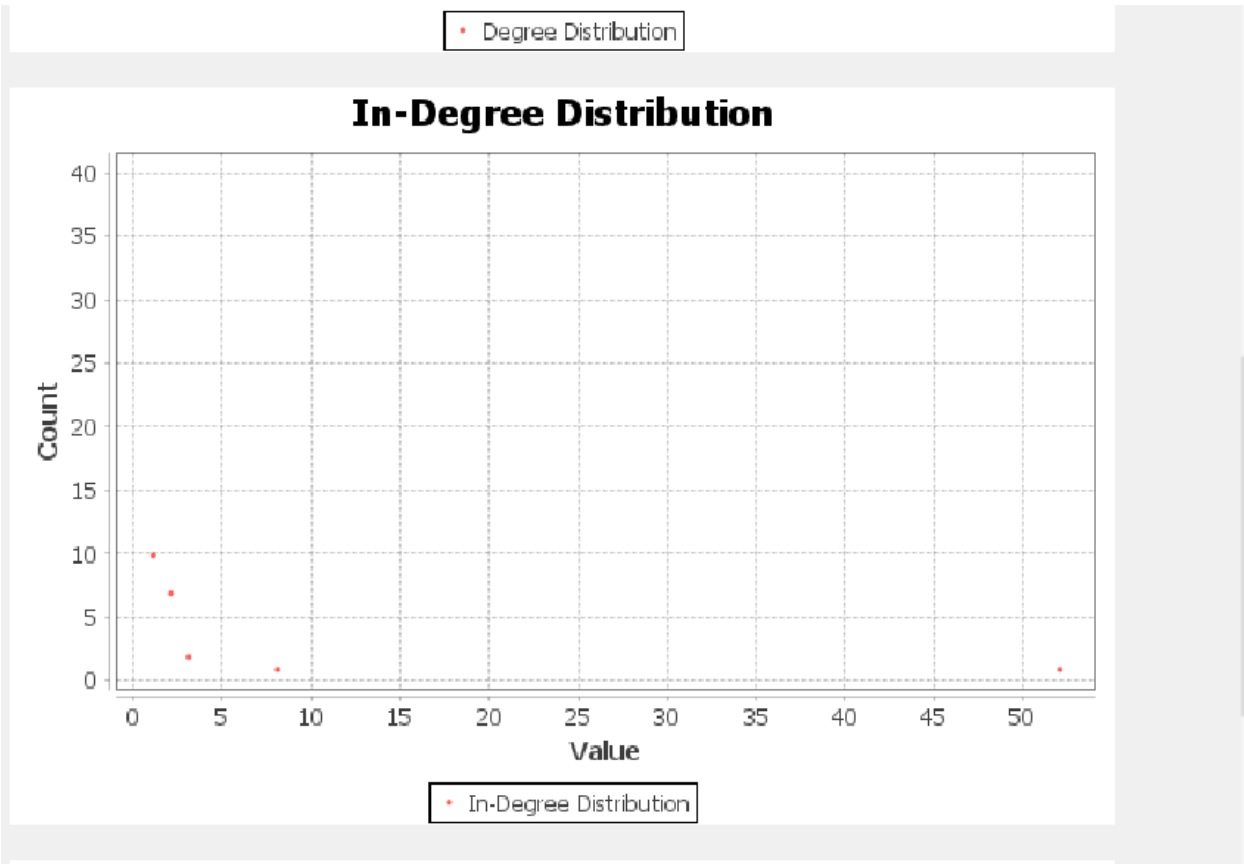
Close

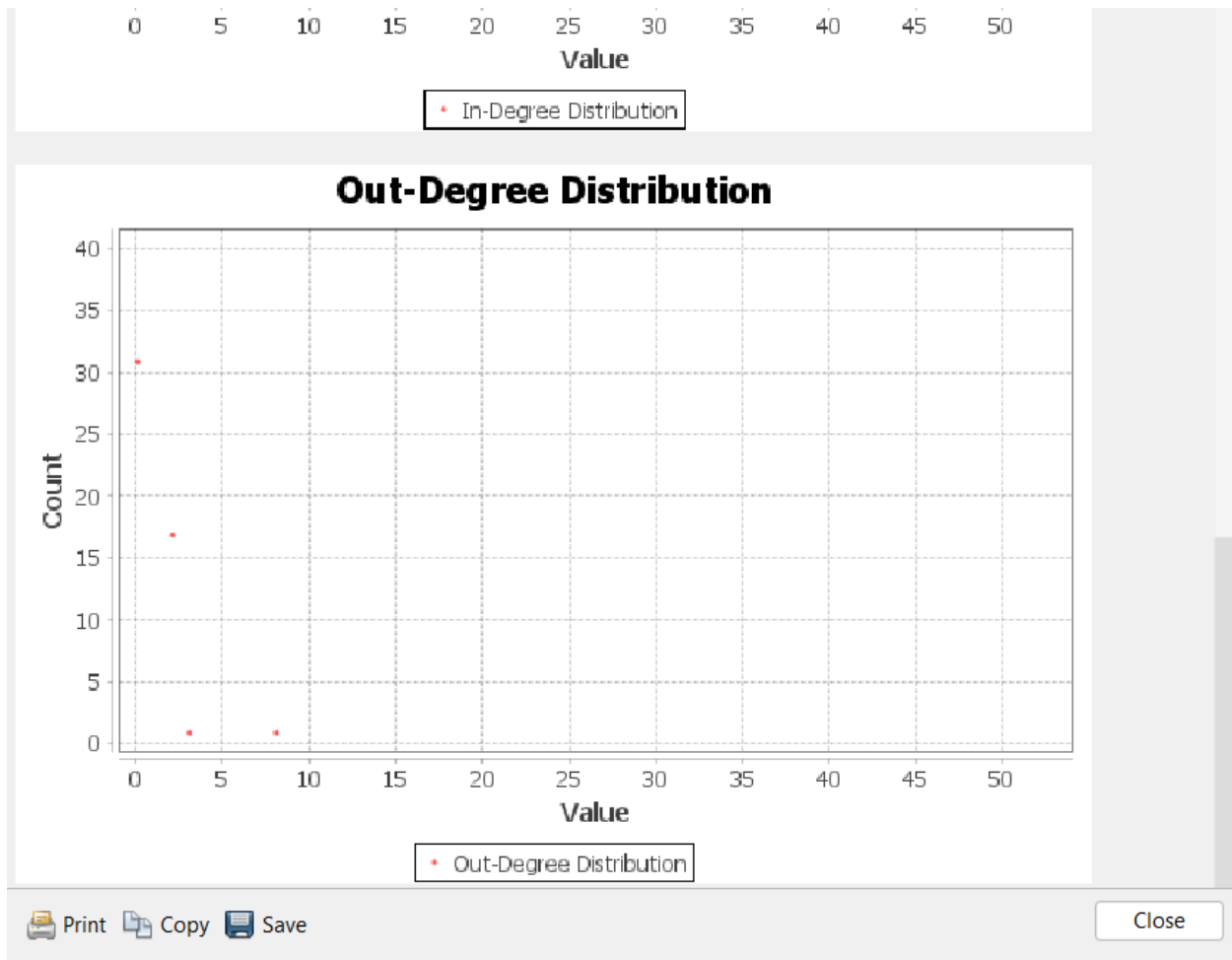


Avg. Weighted Degree: \approx Avg. Degree

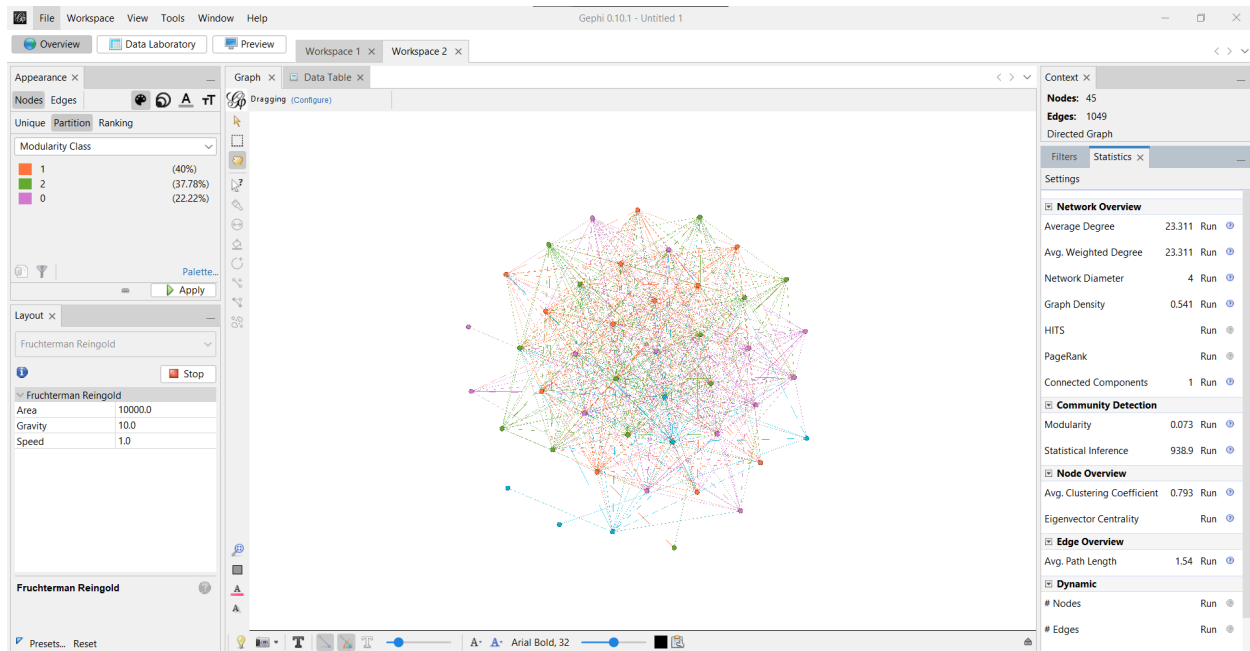
Results: Average Weighted Degree: 0.947



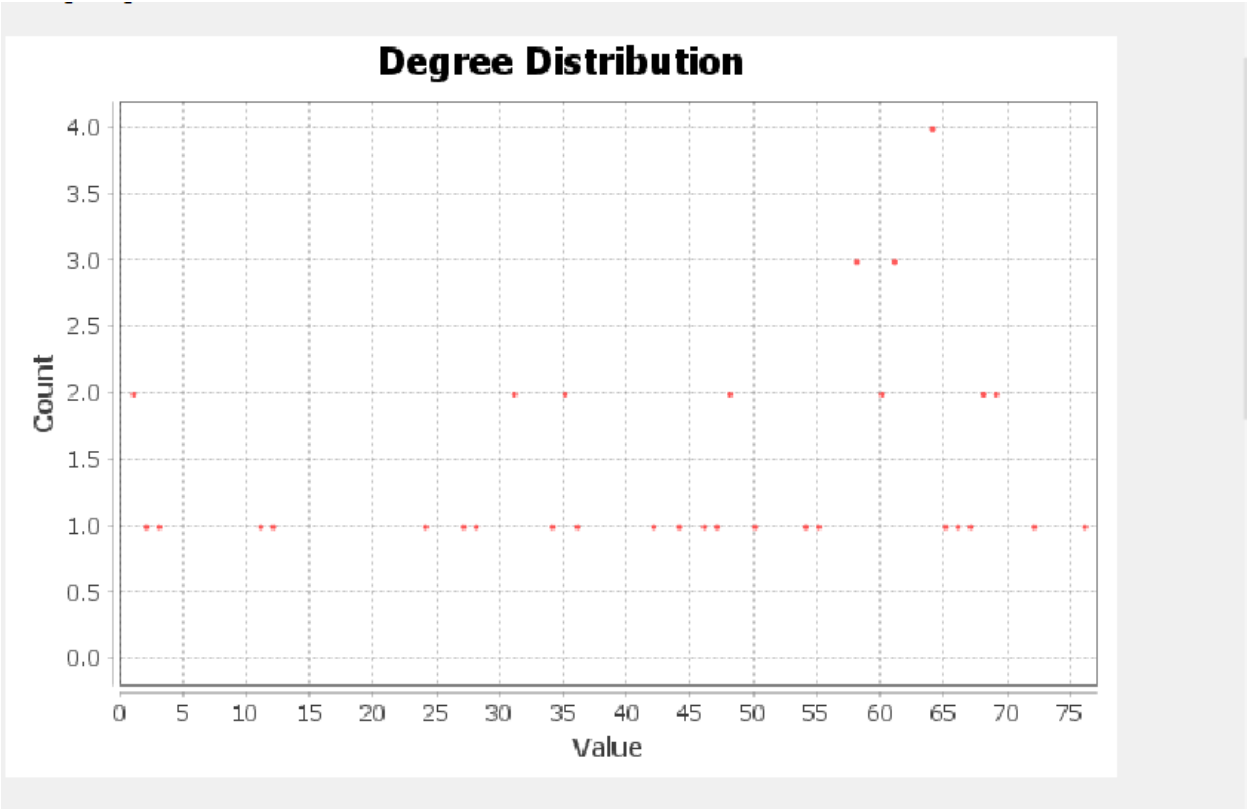




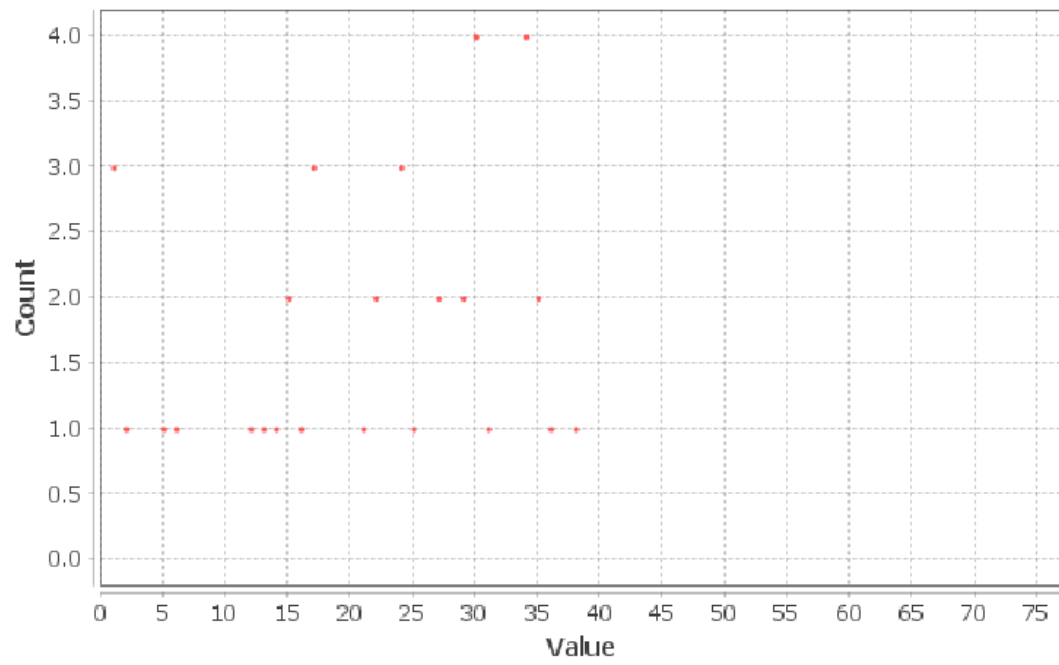
1. 5G Network (Misinformation Network)

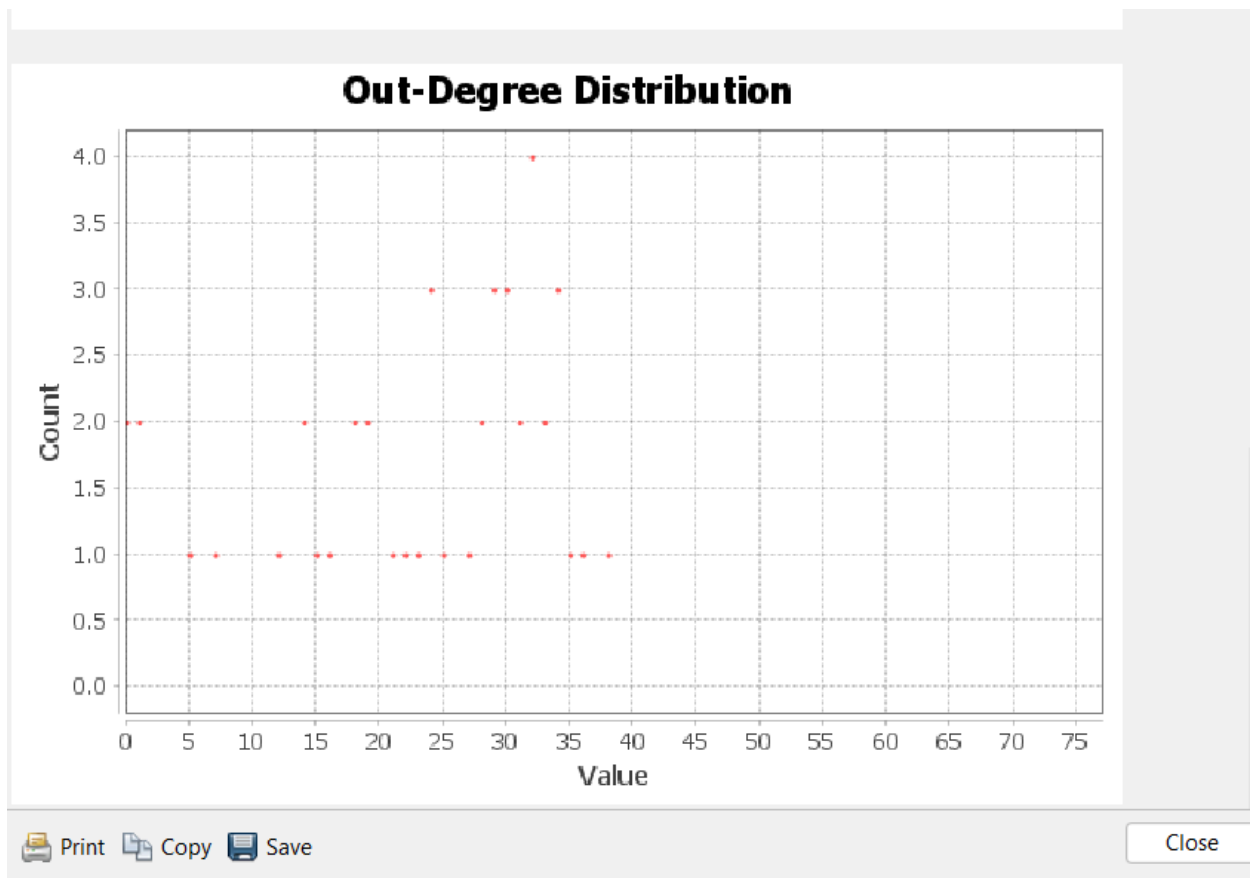


Nodes: 45
Edges: 1049
Average Degree: 23.311



In-Degree Distribution





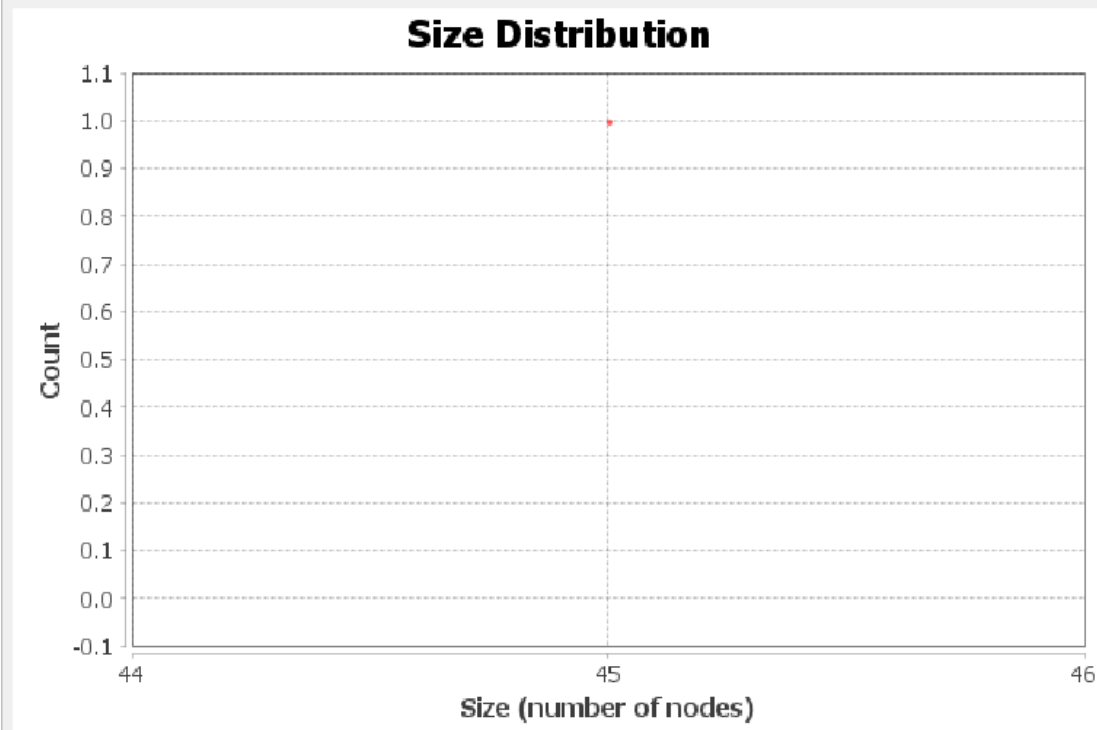
Graph Density: 0.530 (directed), 0.541 (undirected)

Connected Components: 1 WCC, 3 SCC



Number of weakly Connected Components: 1

Number of Strongly Connected Components: 3



Algorithm:

Robert Tarjan, *Depth-First Search and Linear Graph Algorithms*, in *SIAM Journal on Computing* 1 (2): 146–160 (1972)



Print

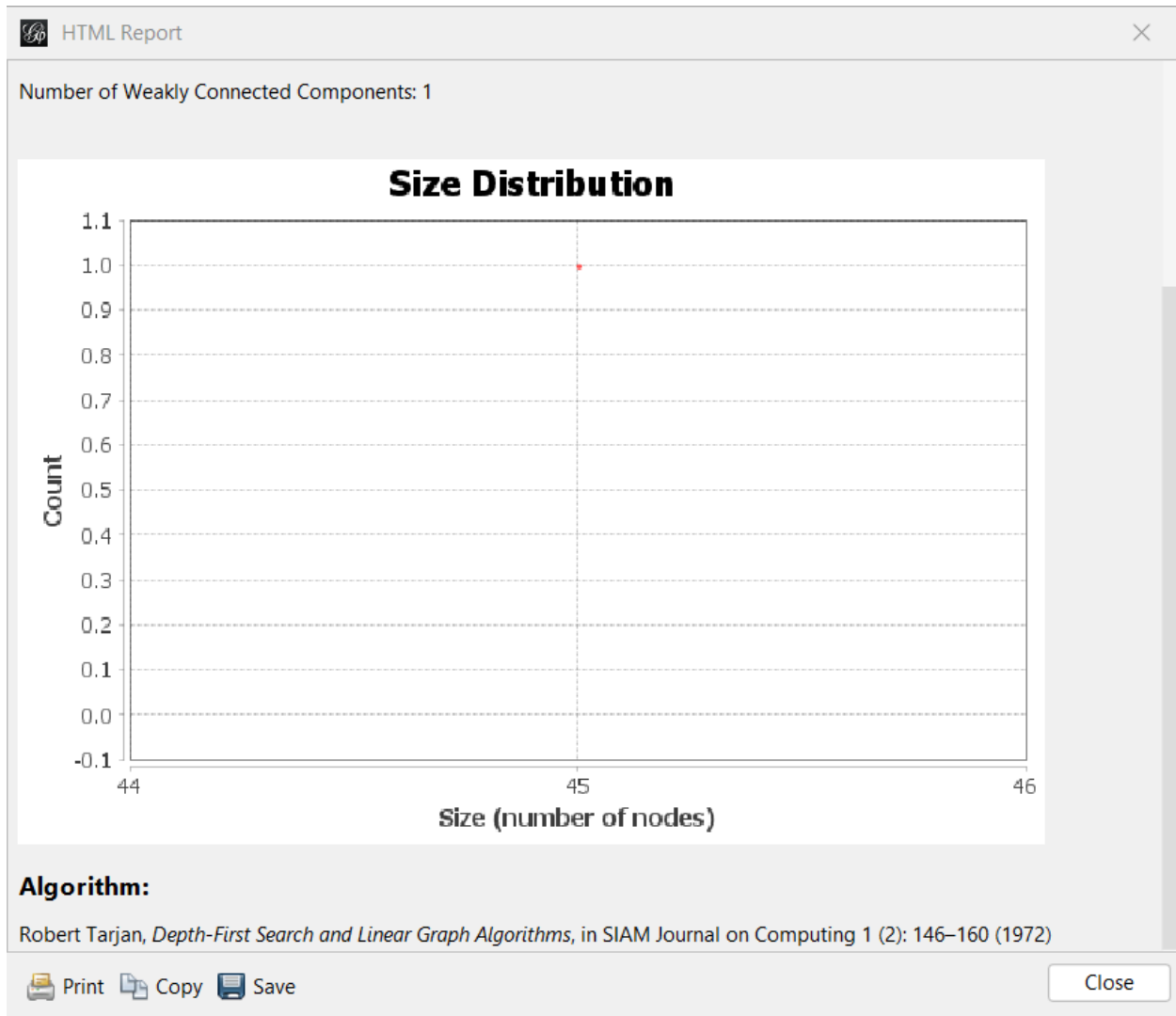


Copy



Save

Close



Modularity: 0.073 (3 communities)

Parameters:

Randomize: On

Use edge weights: On

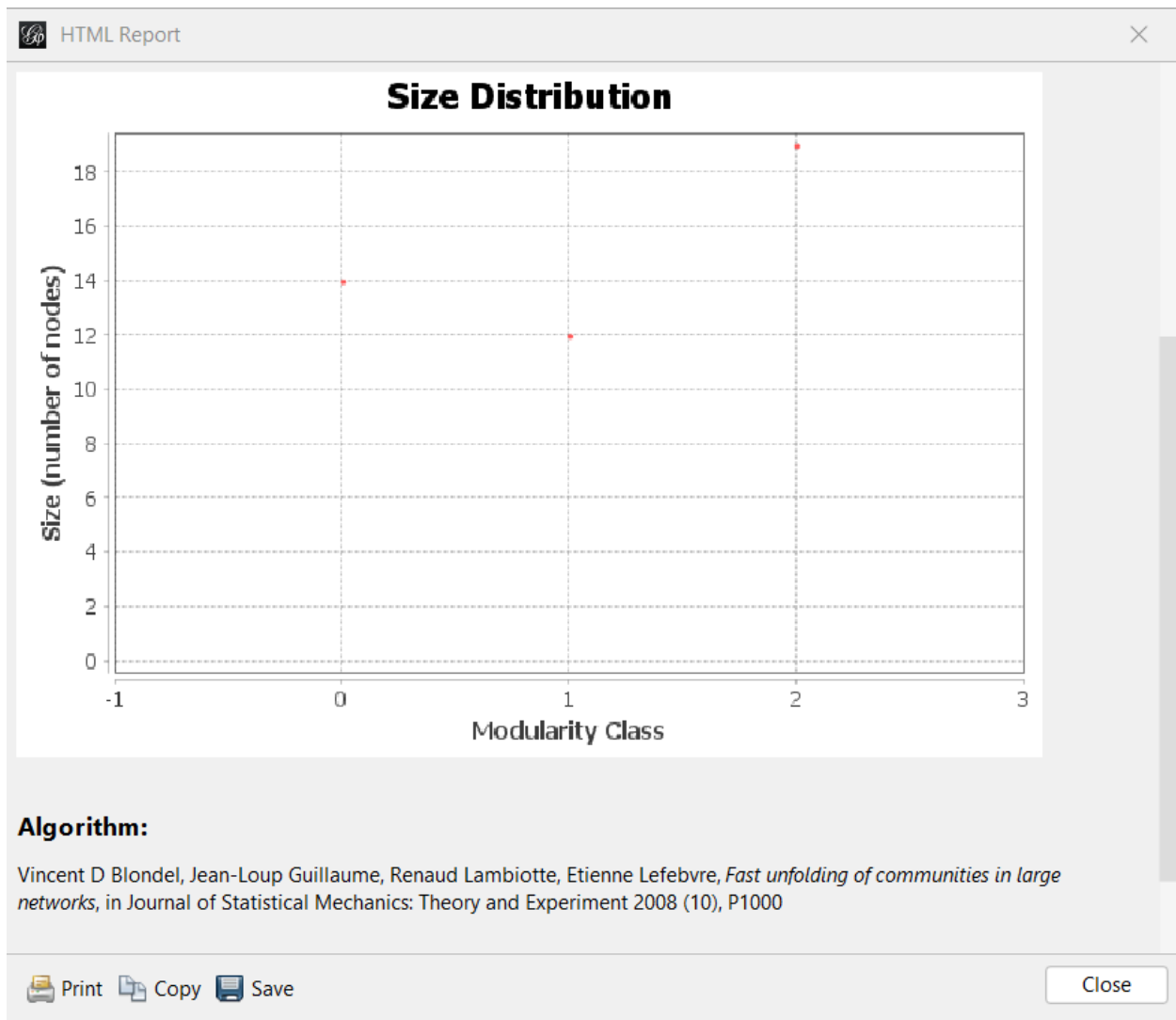
Resolution: 1.0

Results:

Modularity: 0.072

Modularity with resolution: 0.072

Number of Communities: 3



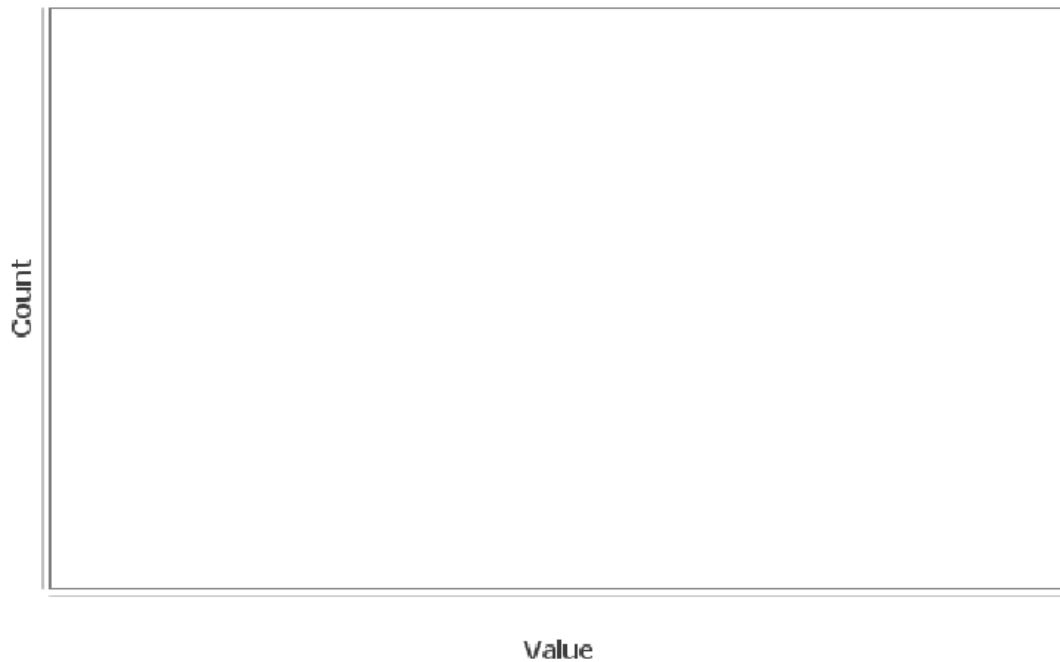
Clustering Coefficient: 0.720 (directed), 0.793 (undirected), Triangles: 3762



Average Clustering Coefficient: 0.720

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

Clustering Coefficient Distribution



Algorithm:



Print



Copy



Save

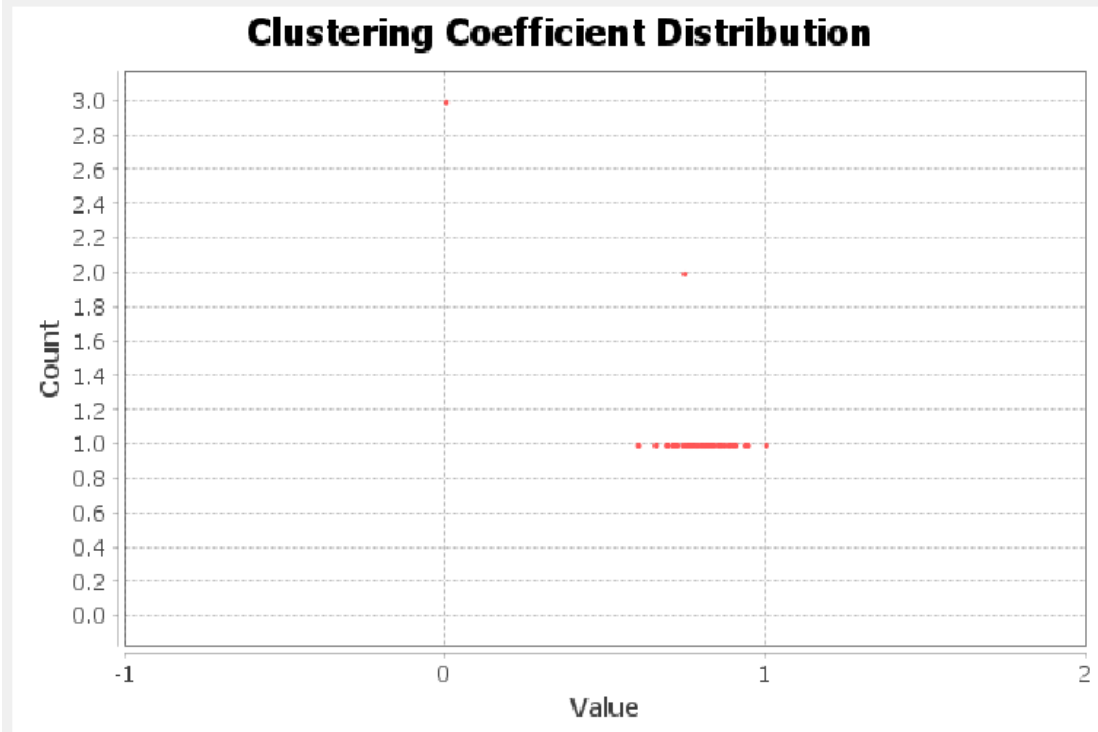
Close

Results:

Average Clustering Coefficient: 0.793

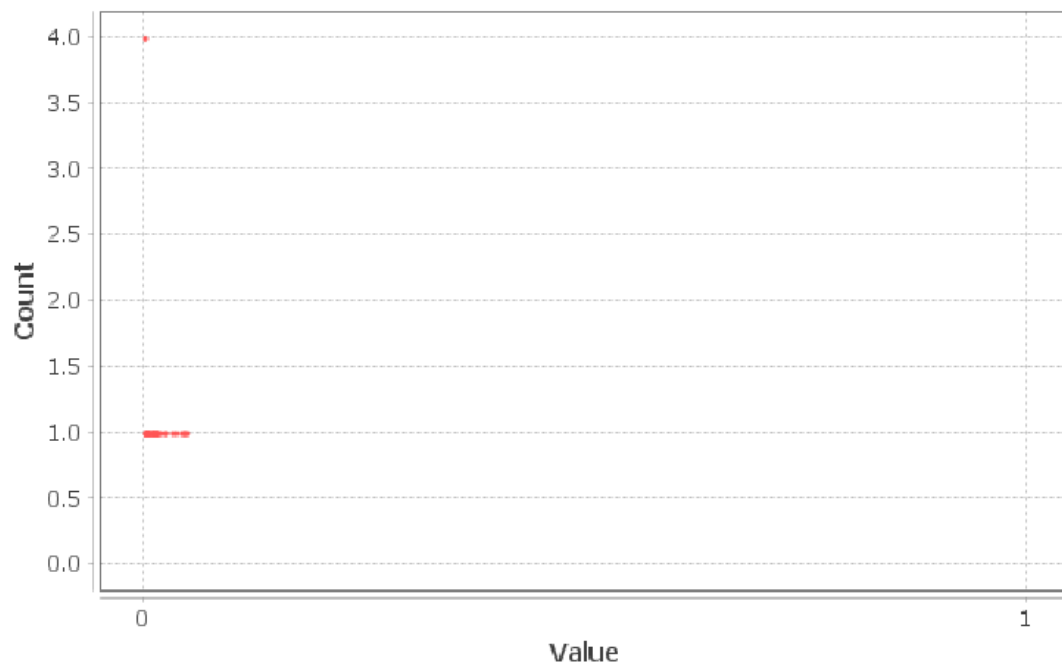
Total triangles: 3762

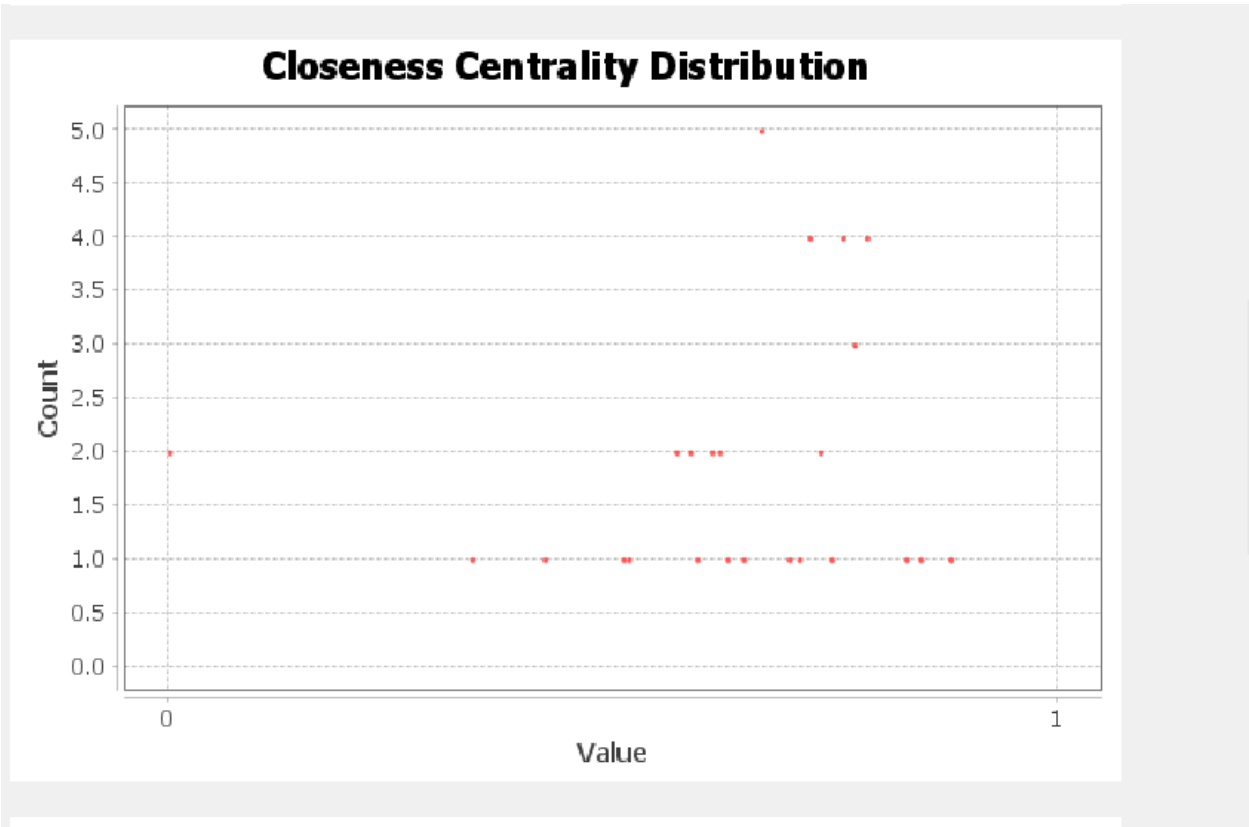
The Average Clustering Coefficient is the mean value of individual coefficients.



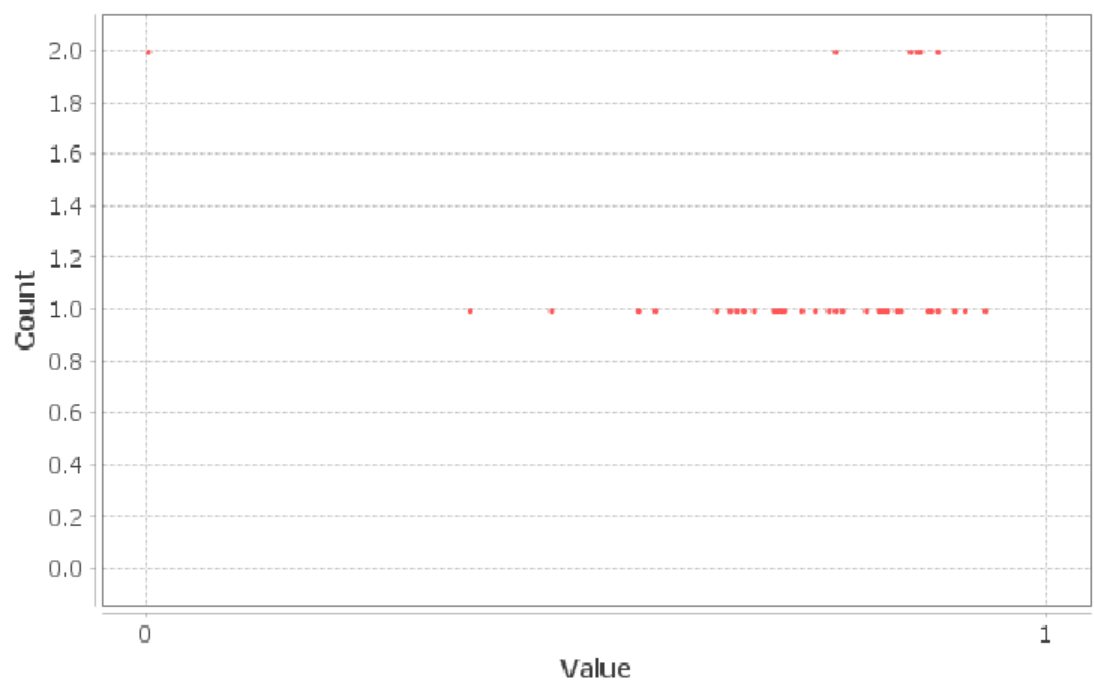
Diameter: 4

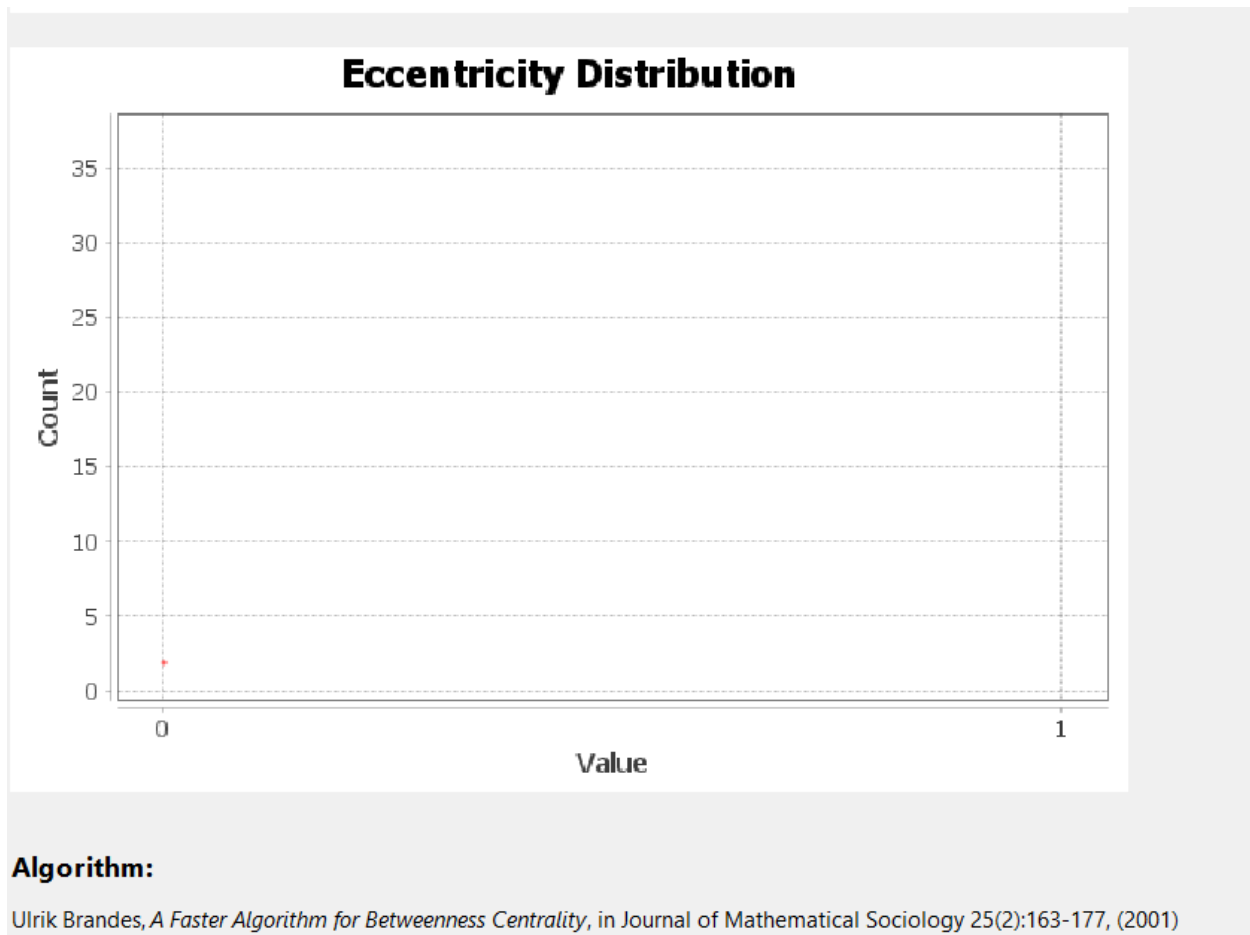
Betweenness Centrality Distribution





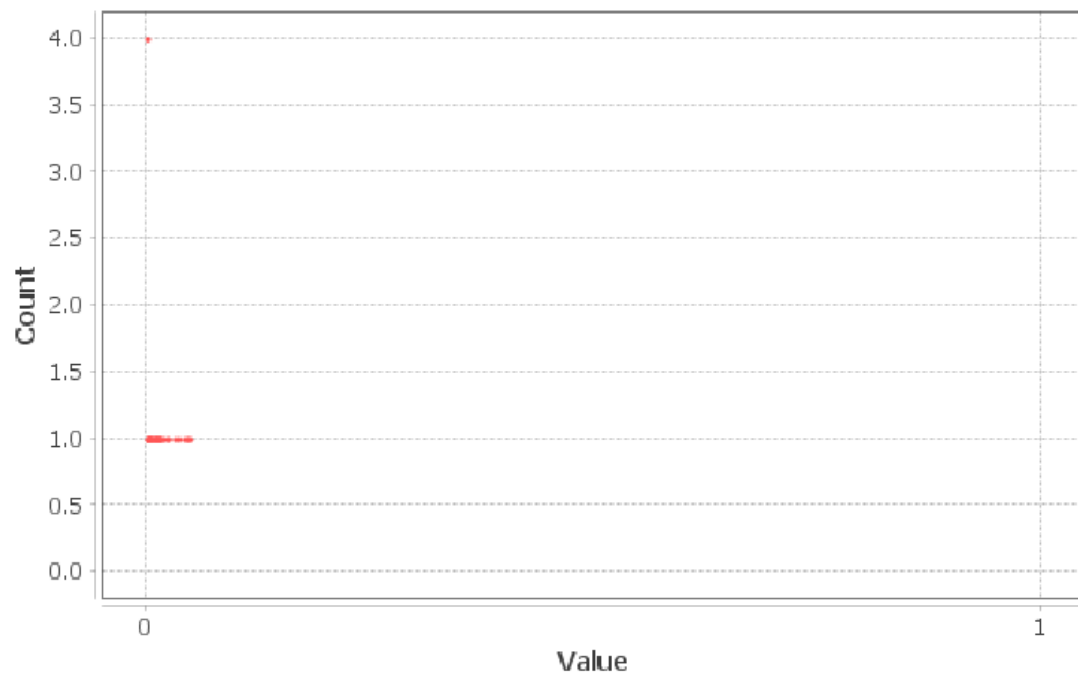
Harmonic Closeness Centrality Distribution



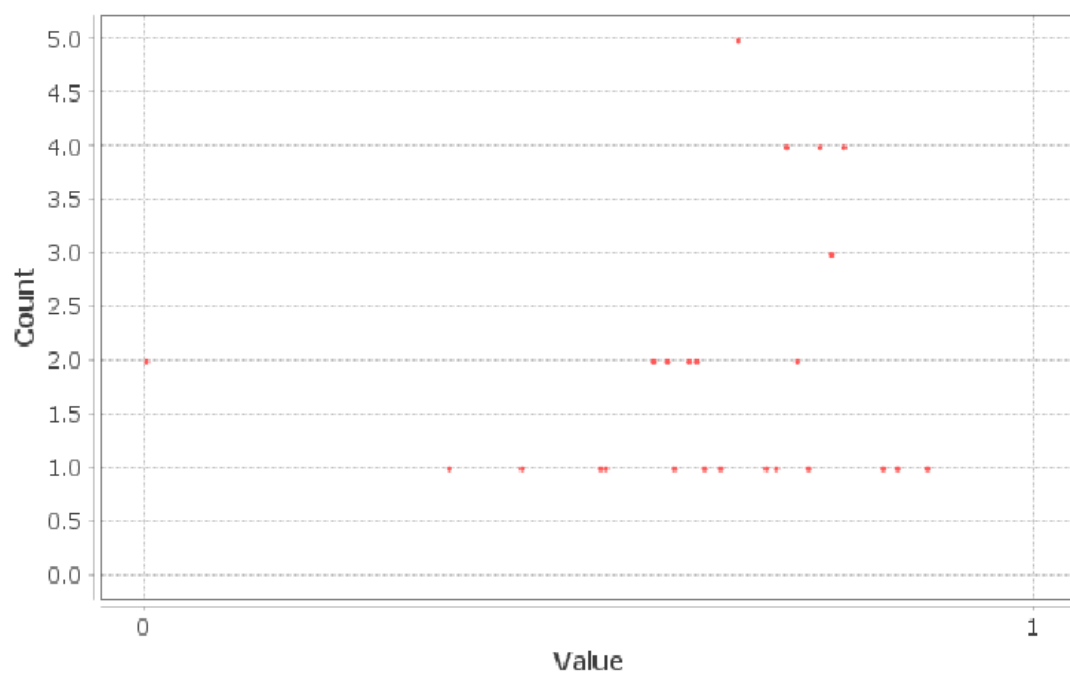


Avg. Path Length: 1.51

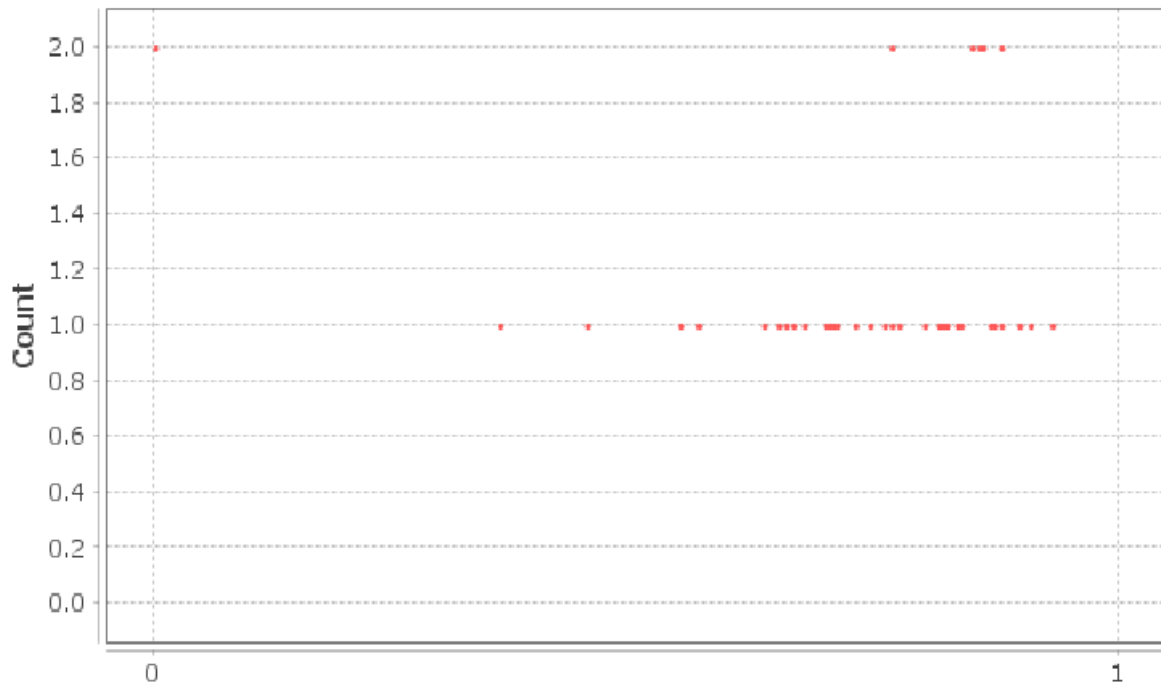
Betweenness Centrality Distribution

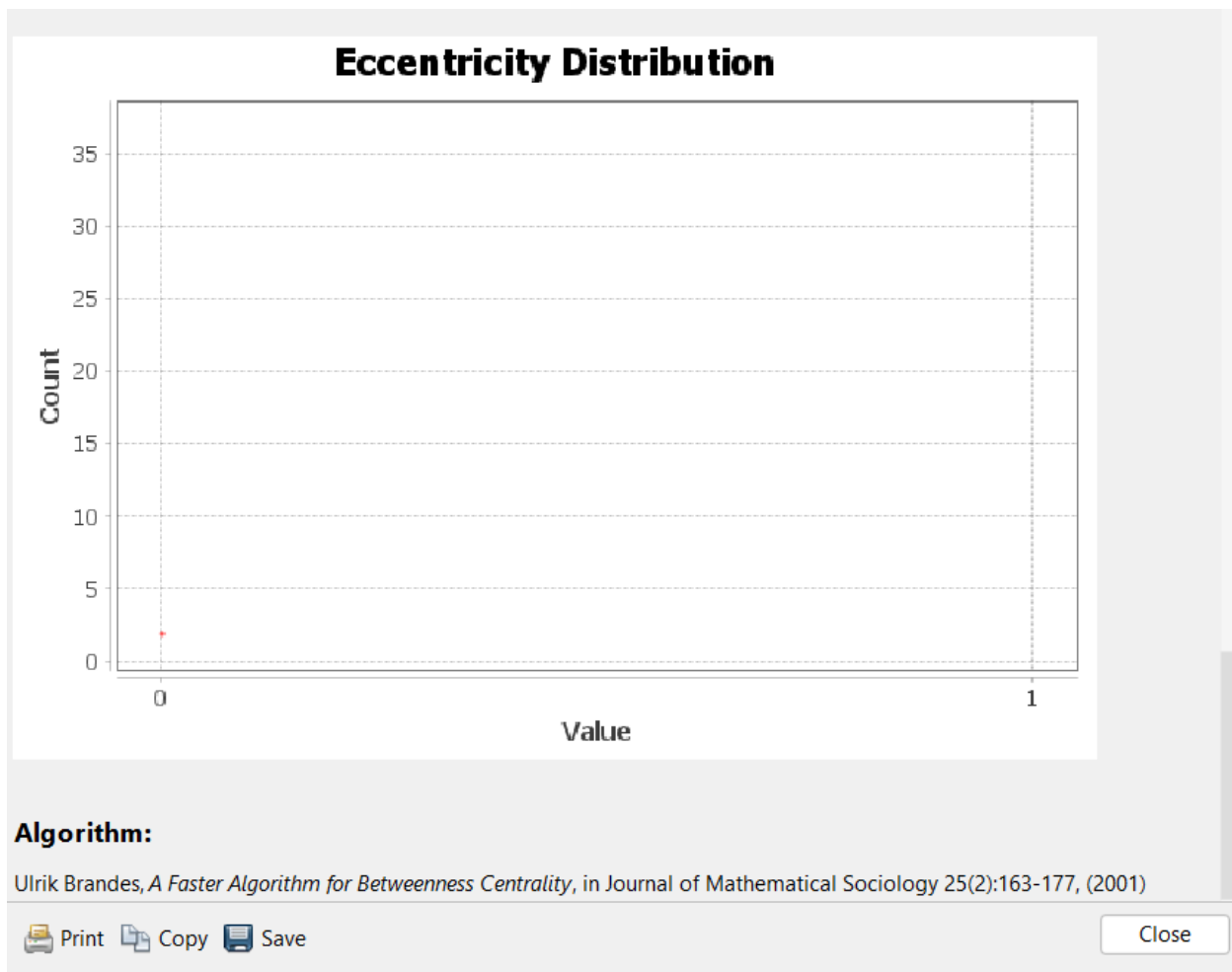


Closeness Centrality Distribution



Harmonic Closeness Centrality Distribution





Eigenvector Centrality: nearly all nodes ≈ 1.0

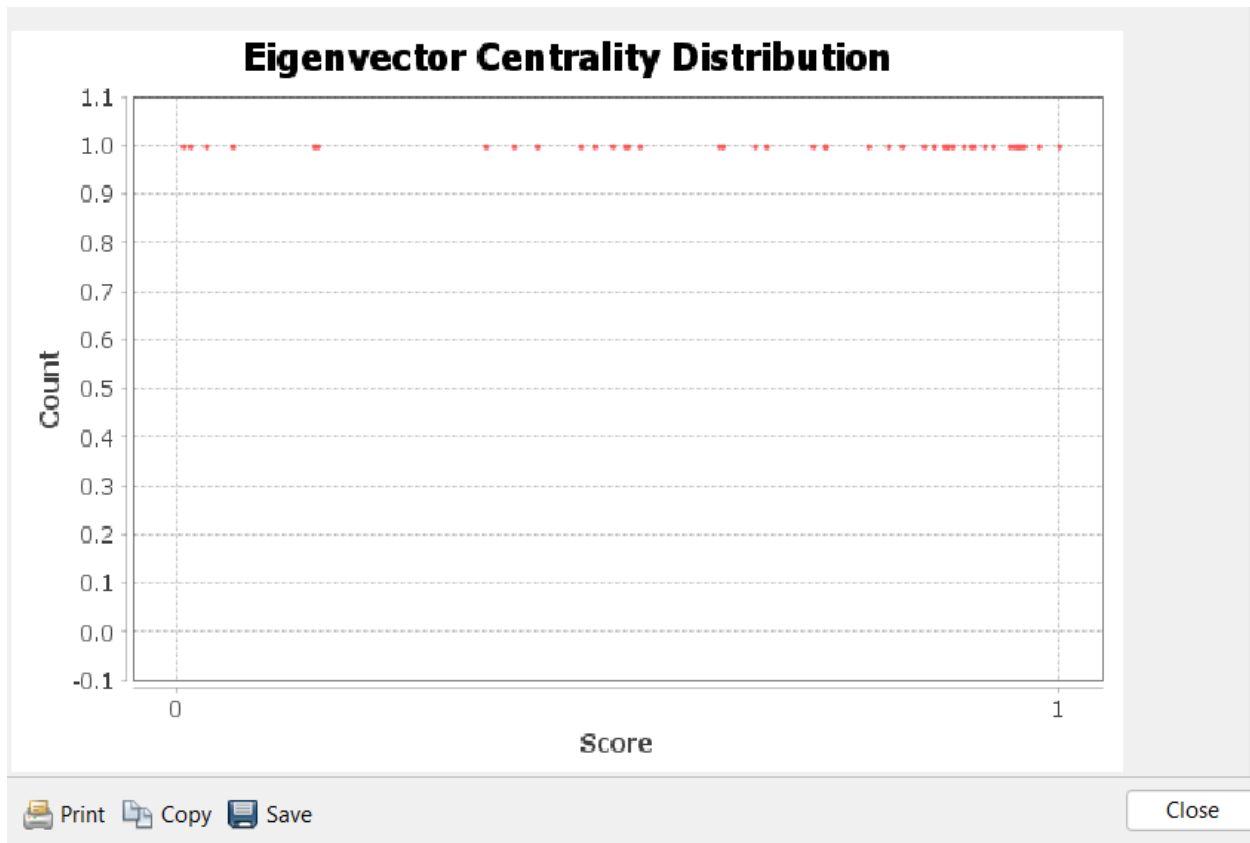
Parameters:

Network Interpretation: directed

Number of iterations: 100

Sum change: 2.815337401765152E-4

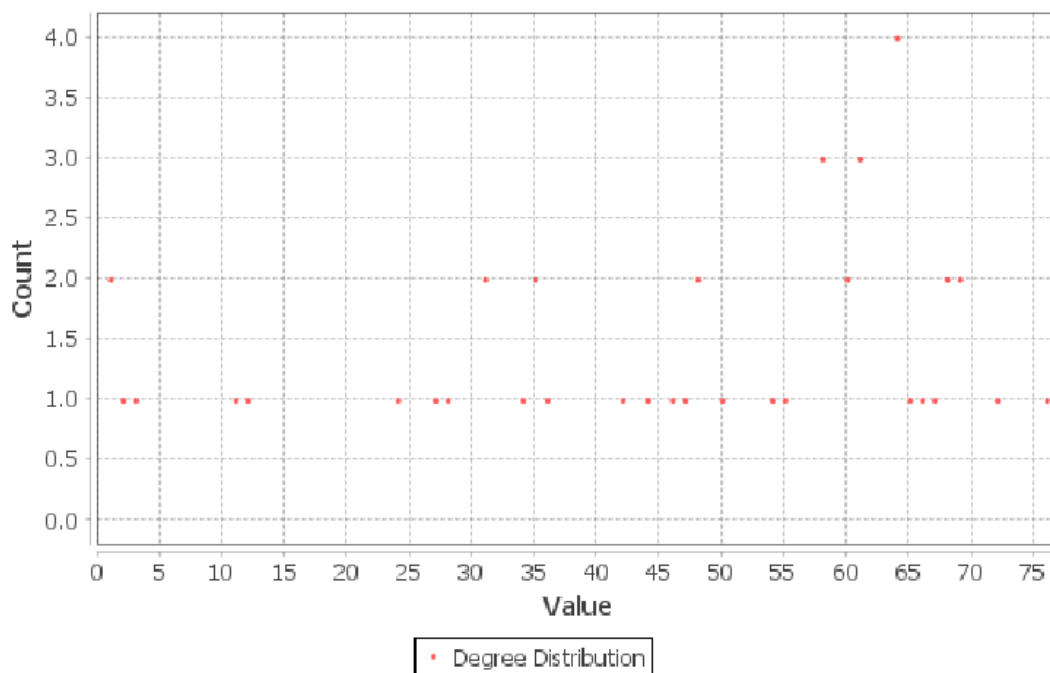
Results:

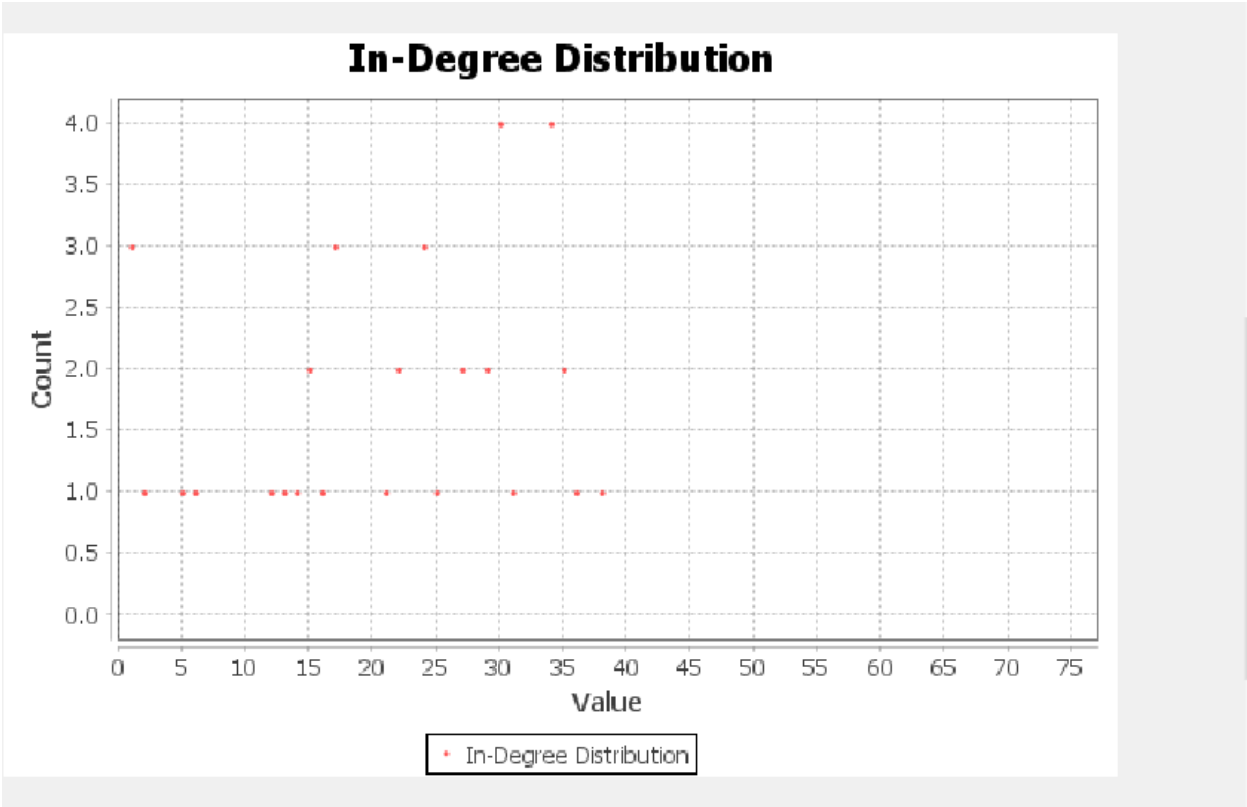


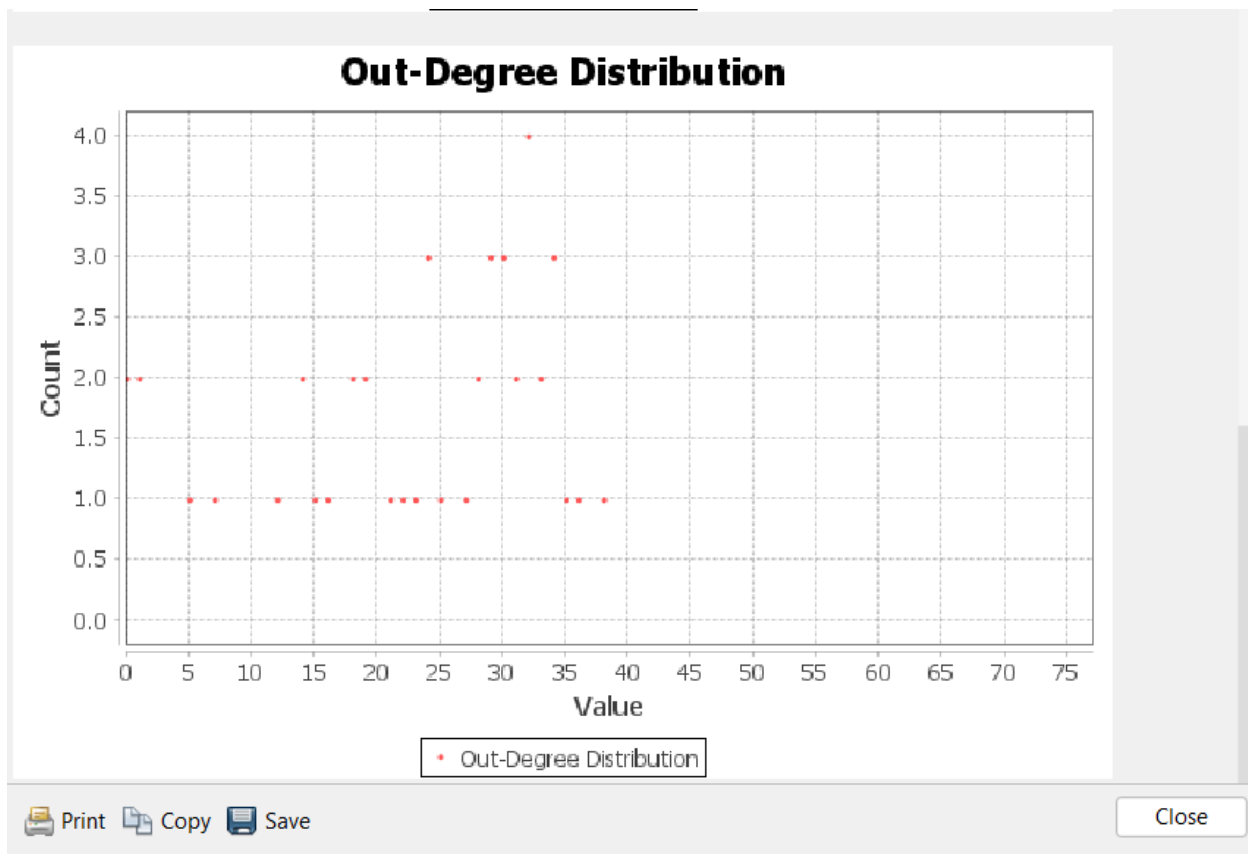
Avg. Weighted Degree: proportional to Avg. Degree

Results:

Average Weighted Degree: 23.311

Degree Distribution





Why the 5G Network Contains Misinformation

Non Network (Normal Interaction):

- **Sparsely Connected:** 95 nodes and 90 edges → very low density (**Density = 0.010**)
- **Random Interactions:** low average connectivity (**Avg Degree = 0.947**)
- **Highly Fragmented:** many disconnected components (**Weakly Connected Components = 32**)
- **Conclusion:** misinformation struggles to spread due to fragmented and uncoordinated structure.

5G Network (Misinformation):

- **Highly Connected:** 45 nodes and 1049 edges → very high density (**Density = 0.530**)

- **Hyper-Active & Coordinated:** high average connectivity (**Avg Degree = 23.311**)
- **Echo Chambers:** strong clustering (**Clustering Coefficient Directed = 0.720**)
- **Centralized Control:** Eigenvector Centrality concentrated on a few nodes → a small number of accounts control information flow
- **Low Fragmentation:** few connected components (**Weakly CC = 1**)
- **Conclusion:** information, including false content, spreads rapidly due to dense, coordinated, and centralized structure → **misinformation-prone network.**