

Comparative Network Analysis Report

eman ahmed 2205143

NON Network vs. 5G Misinformation Network

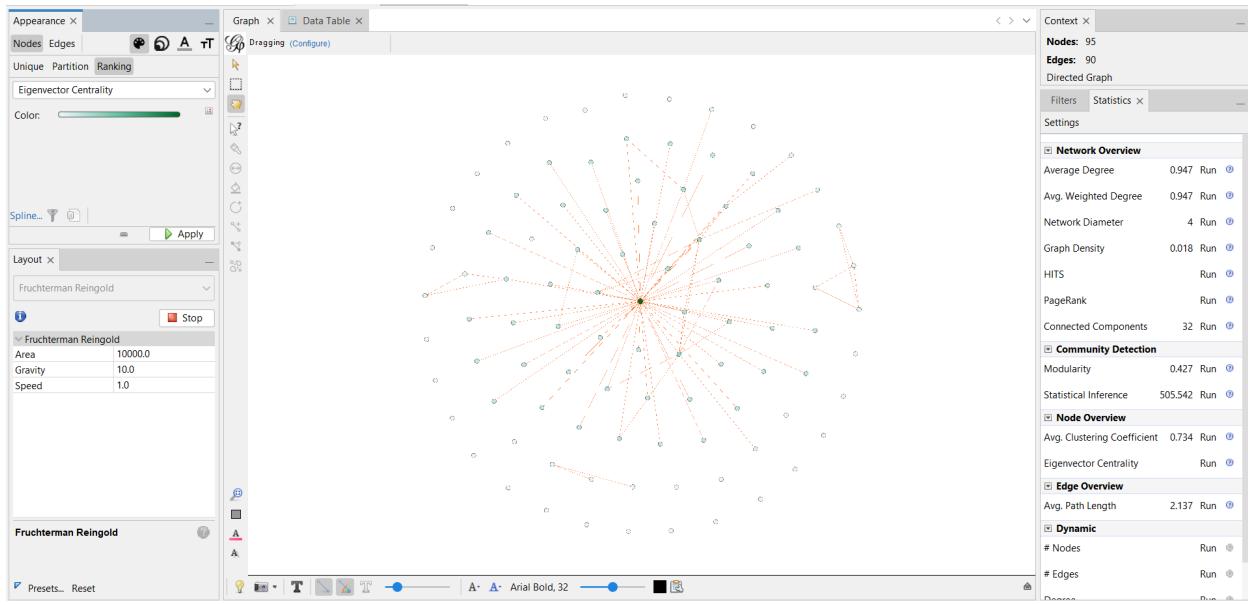
1. Introduction

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)



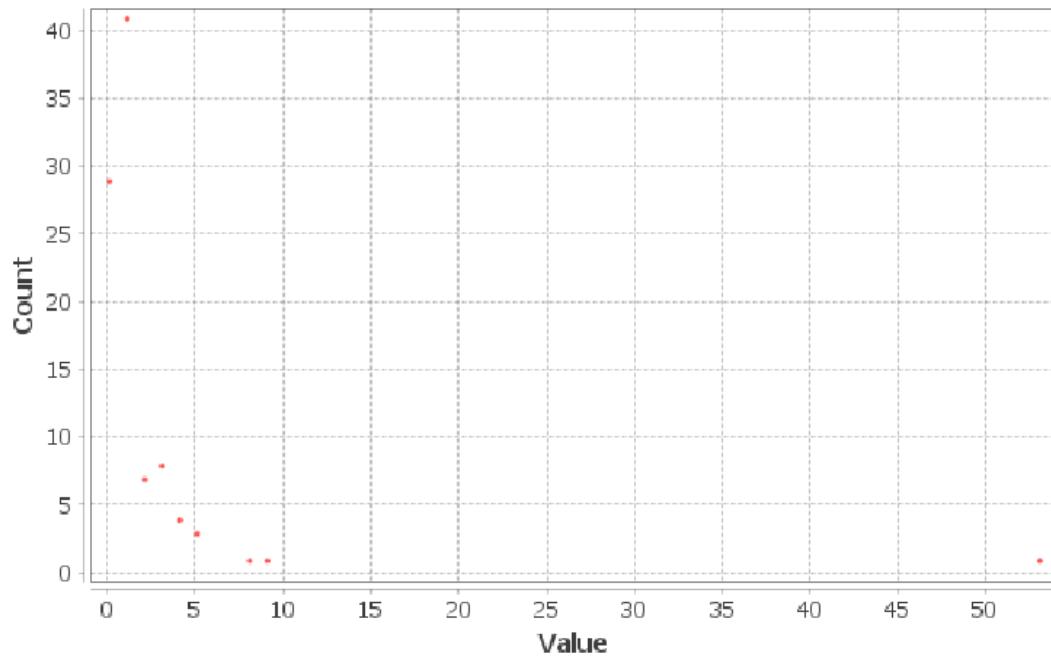
Nodes: 95

Edges: 90

Average Degree: 0.947

Results:

Average Degree: 0.947

Degree Distribution**In-Degree Distribution** Print  Copy  Save

Close

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

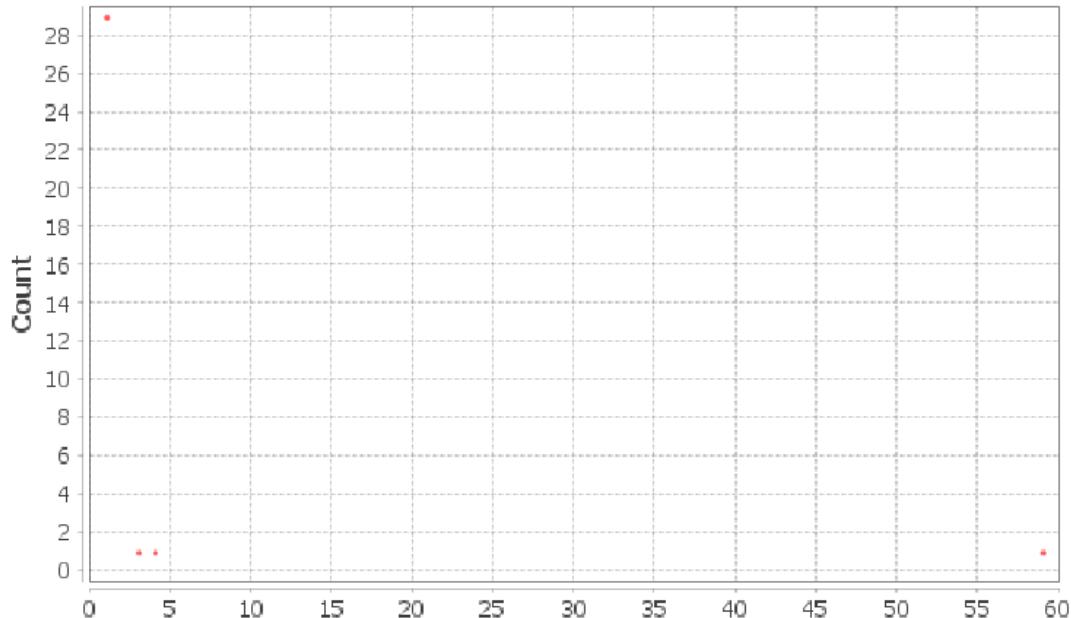
Connected Components: 32 WCC, 85 SCC



Network Interpretation: directed

Results:

Number of Weakly Connected Components: 32
Number of Strongly Connected Components: 85

Size Distribution

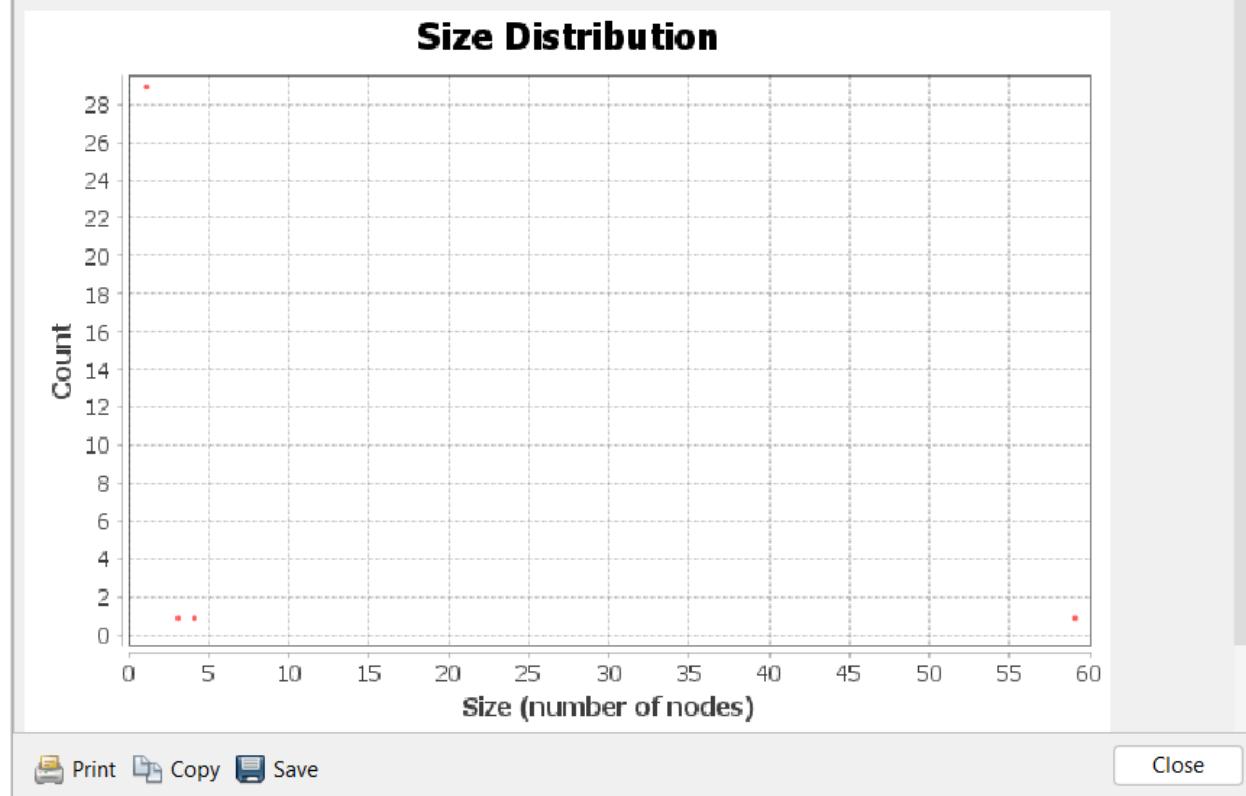
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Network Interpretation: undirected

Results:

Number of Weakly Connected Components: 32



Modularity: 0.427 (36 communities)



HTML Report



Modularity Report

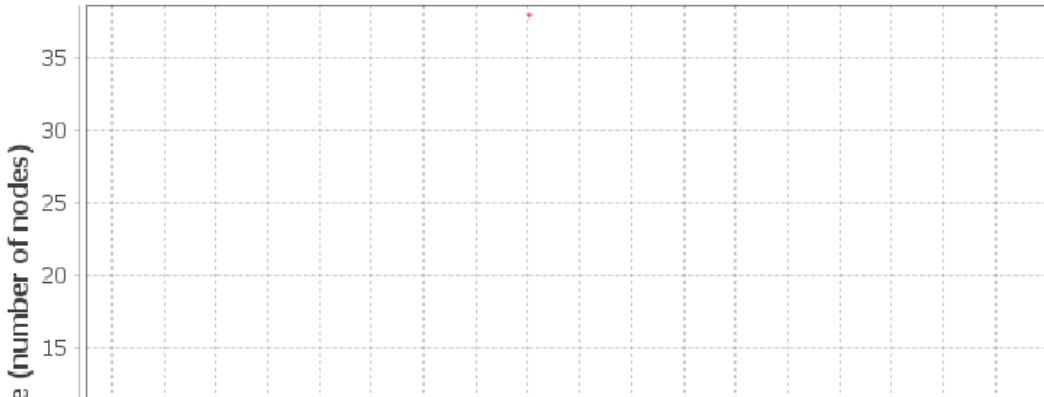
Parameters:

Randomize: On
Use edge weights: On
Resolution: 1.0

Results:

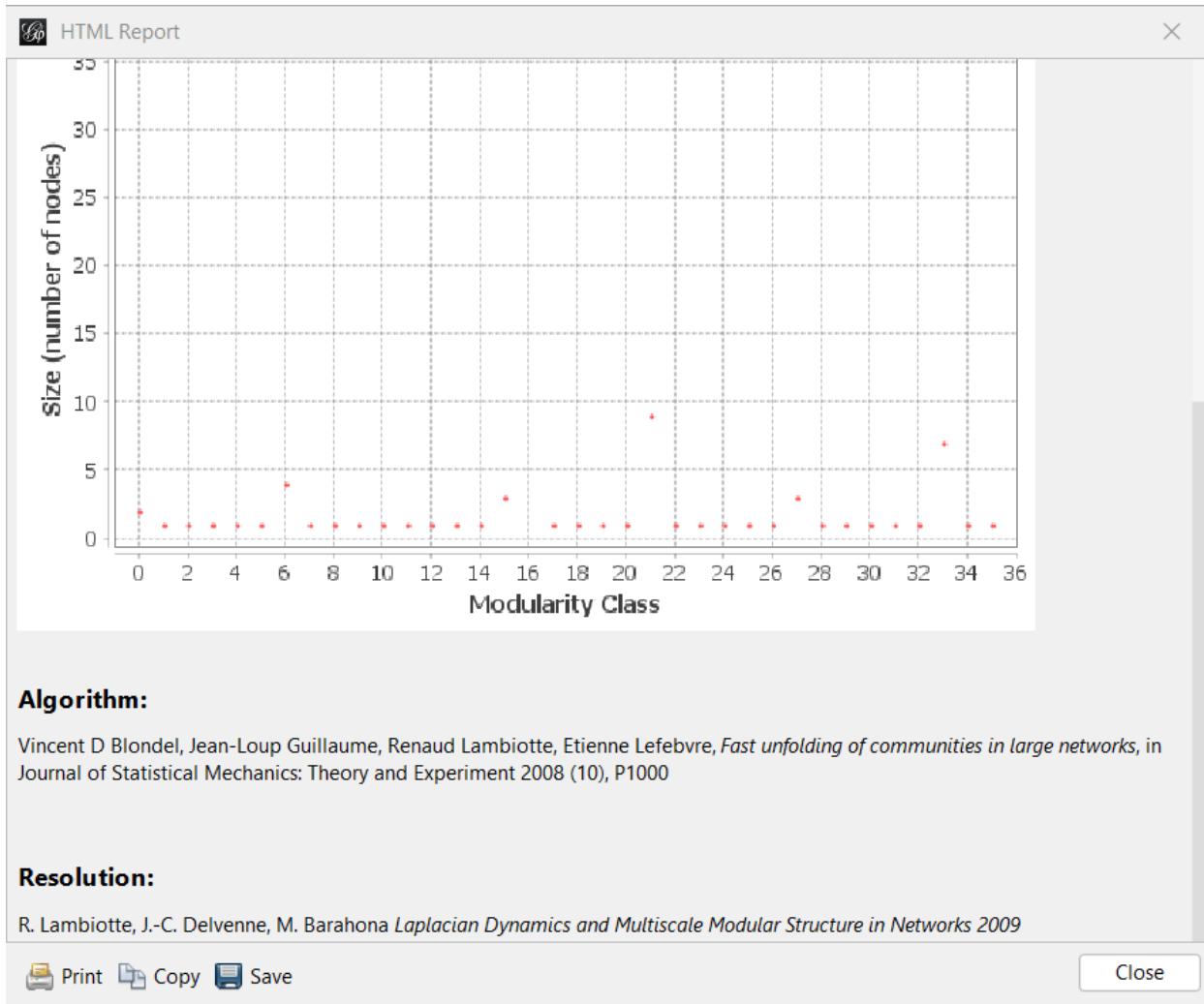
Modularity: 0.429
Modularity with resolution: 0.429
Number of Communities: 36

Size Distribution



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

Parameters:

Network Interpretation: directed

Results:

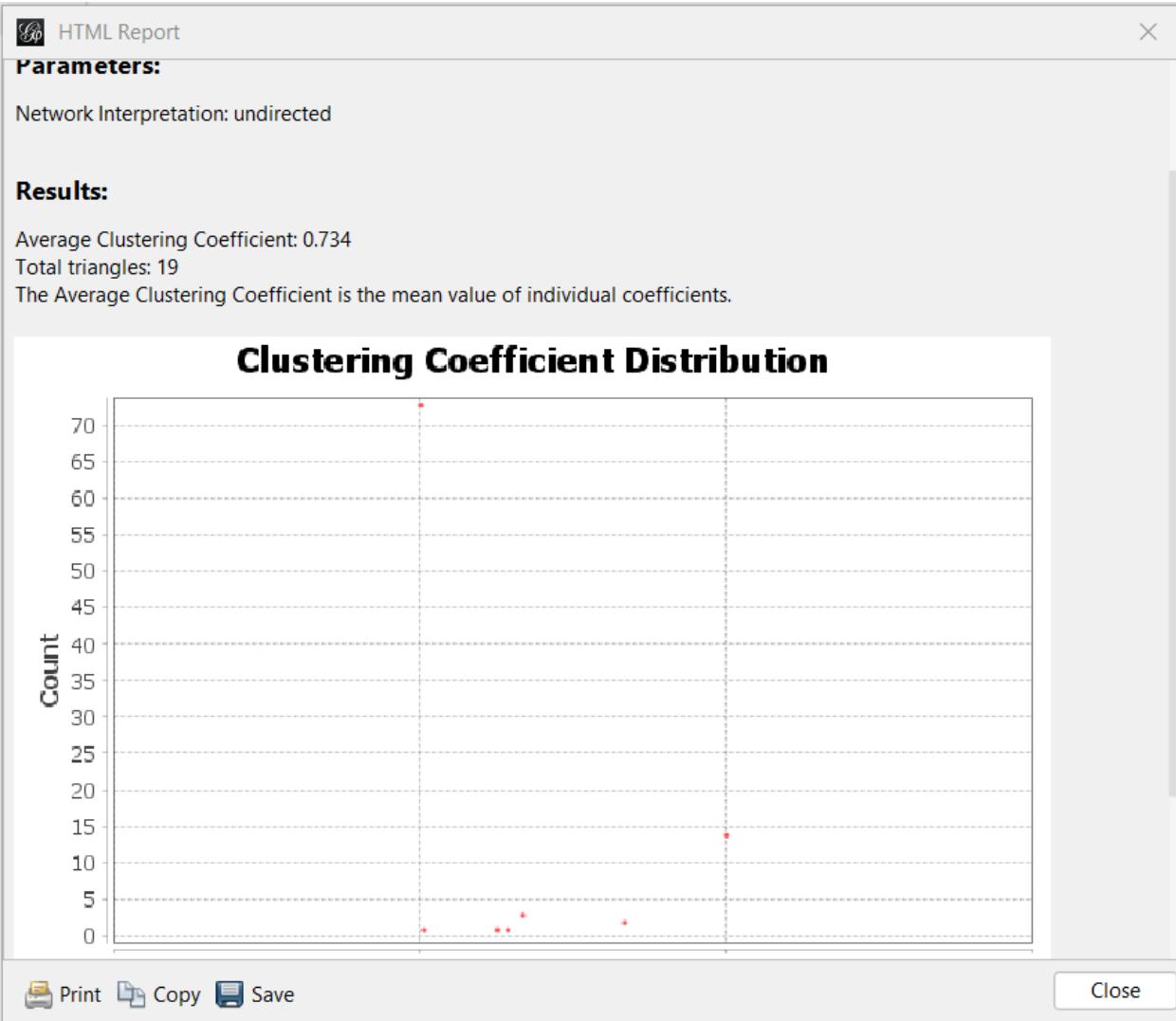
Average Clustering Coefficient: 0.135

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

Clustering Coefficient Distribution

Count

 Print  Copy  Save



Diameter: 3

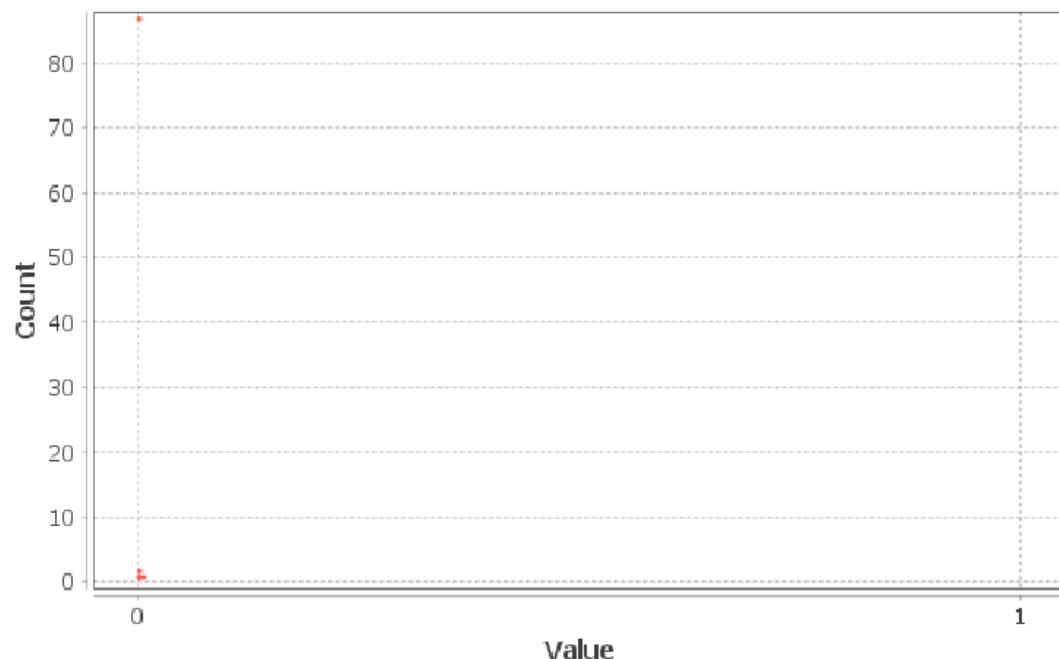
Parameters: Network Interpretation: directed

Results: Diameter: 3

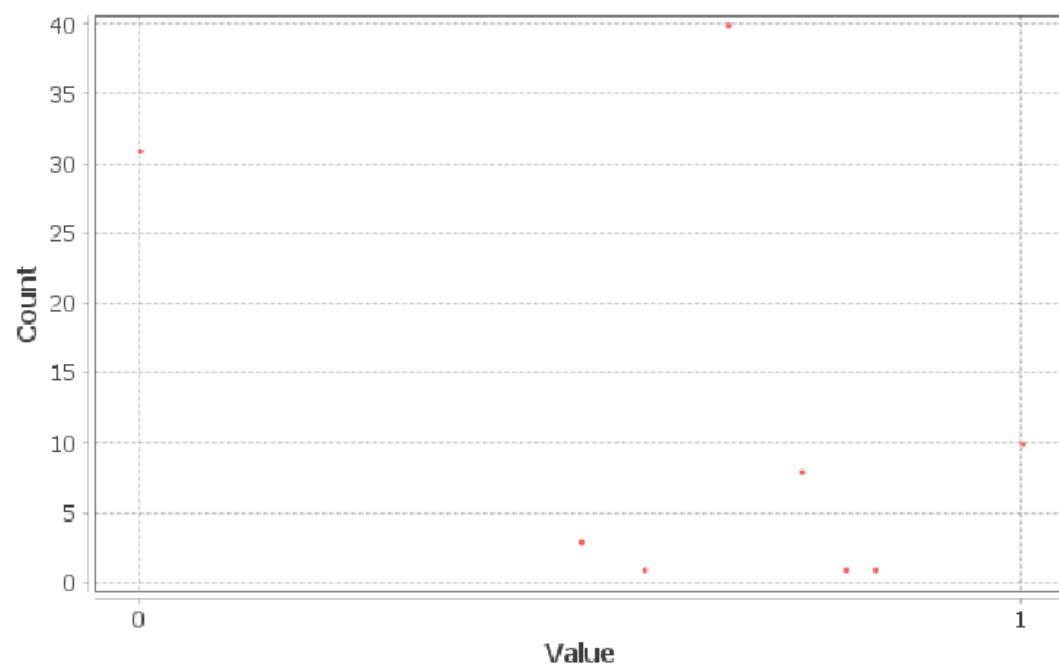
Radius: 0

Average Path length: 1.4304635761589404

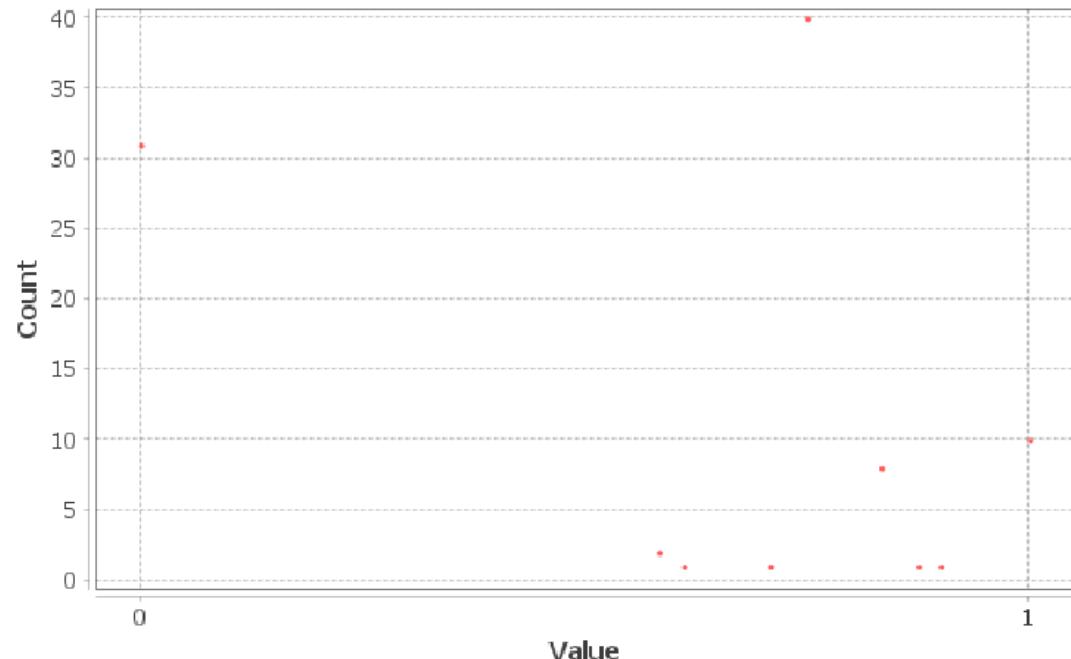
Betweenness Centrality Distribution

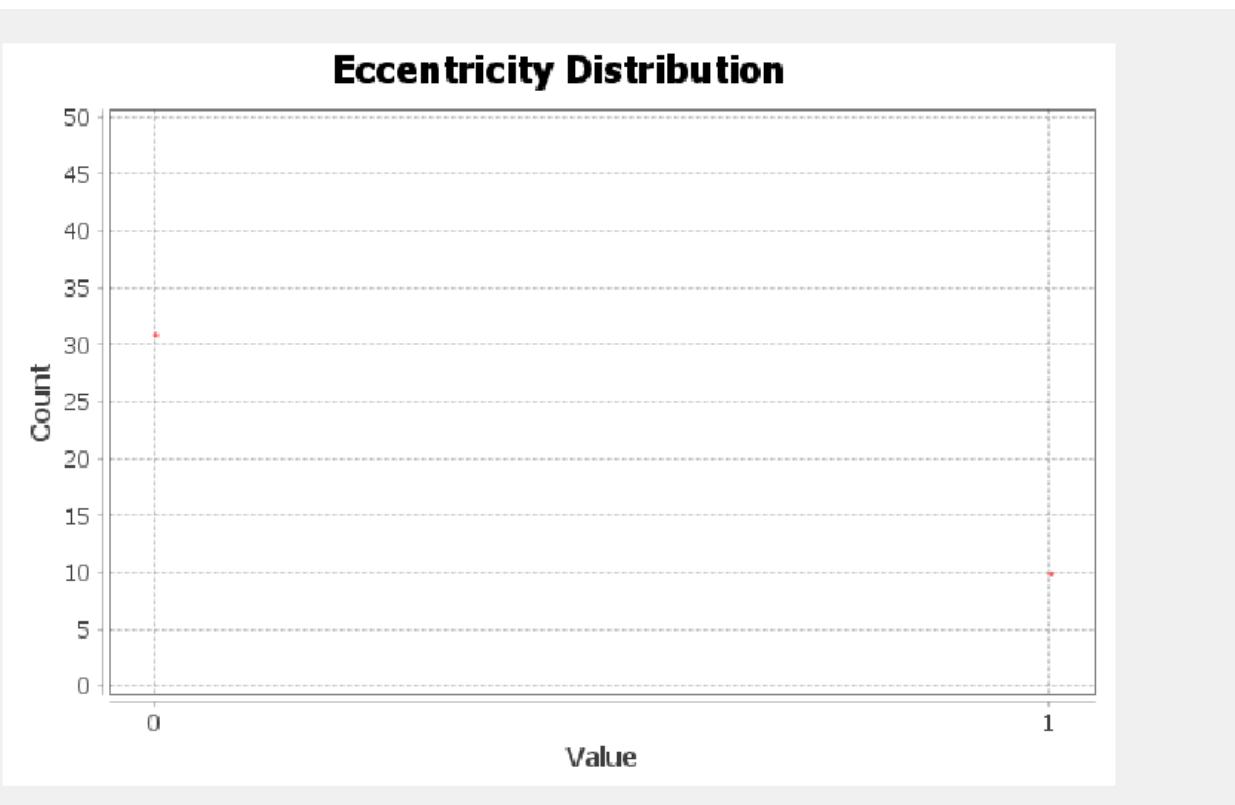


Closeness Centrality Distribution



Harmonic Closeness Centrality Distribution





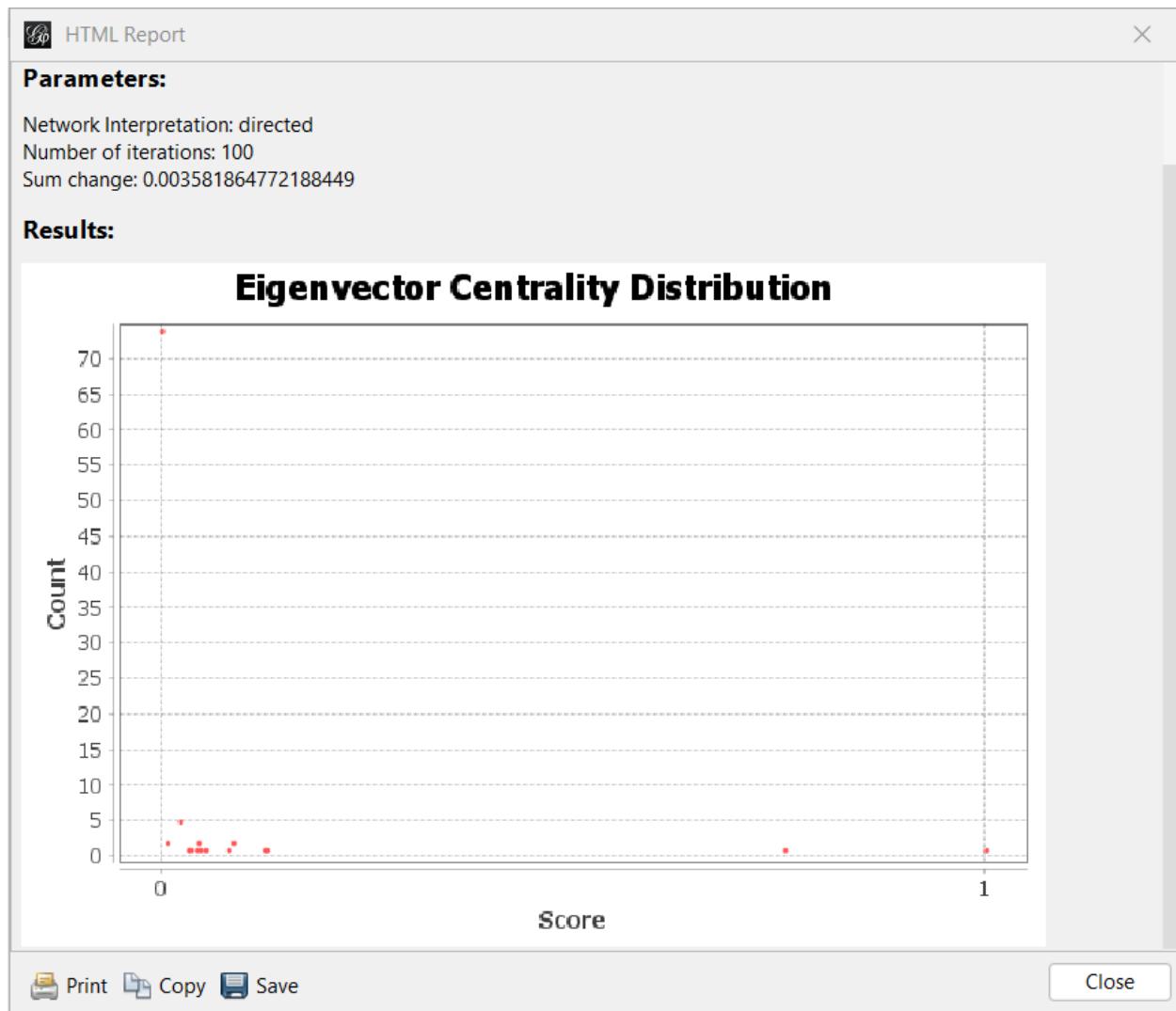
Algorithm:

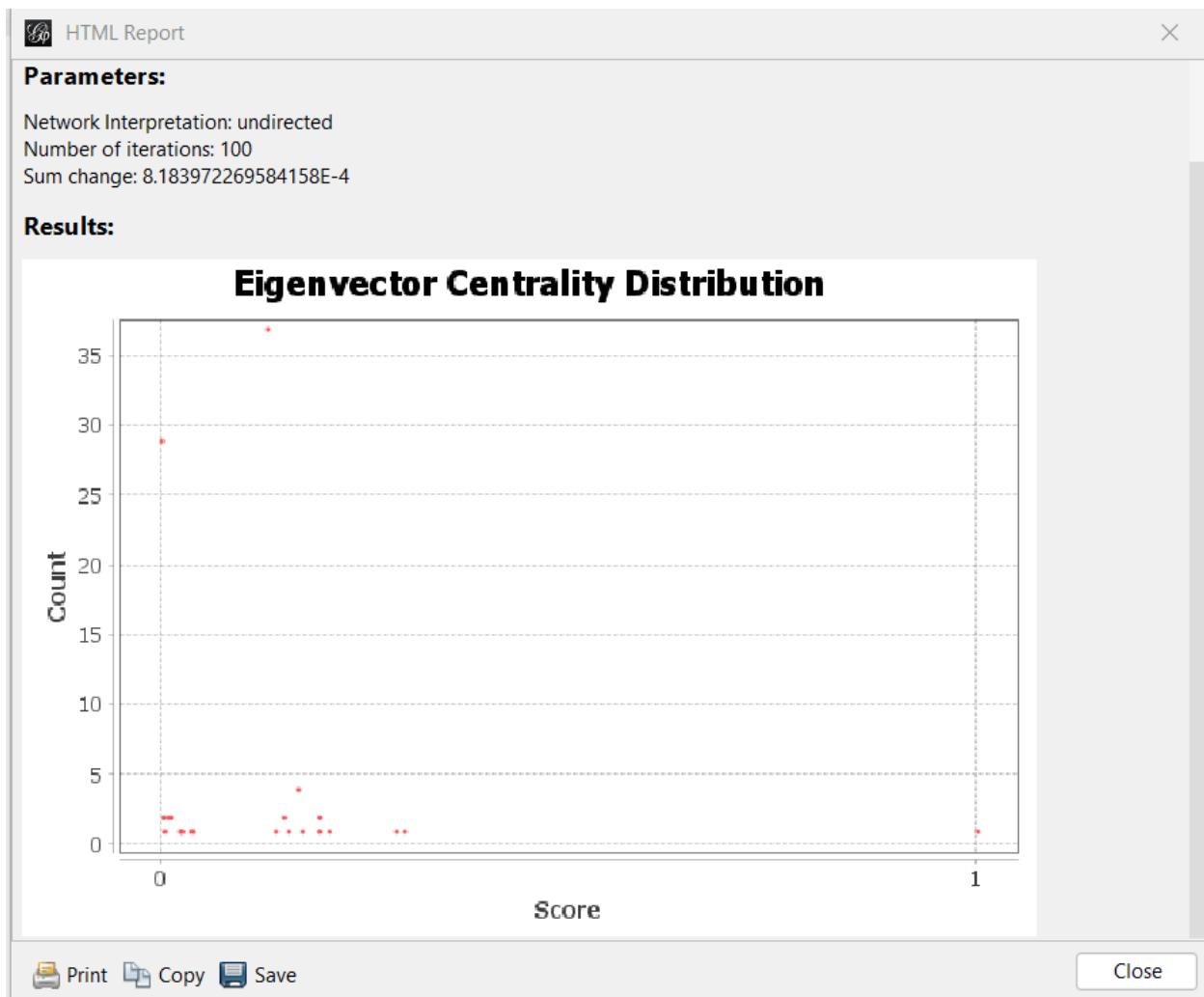
Ulrik Brandes, *A Faster Algorithm for Betweenness Centrality*, in Journal of Mathematical Sociology 25(2):163-177, (2001)

Avg. Path Length: 1.43

same photos for the last

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

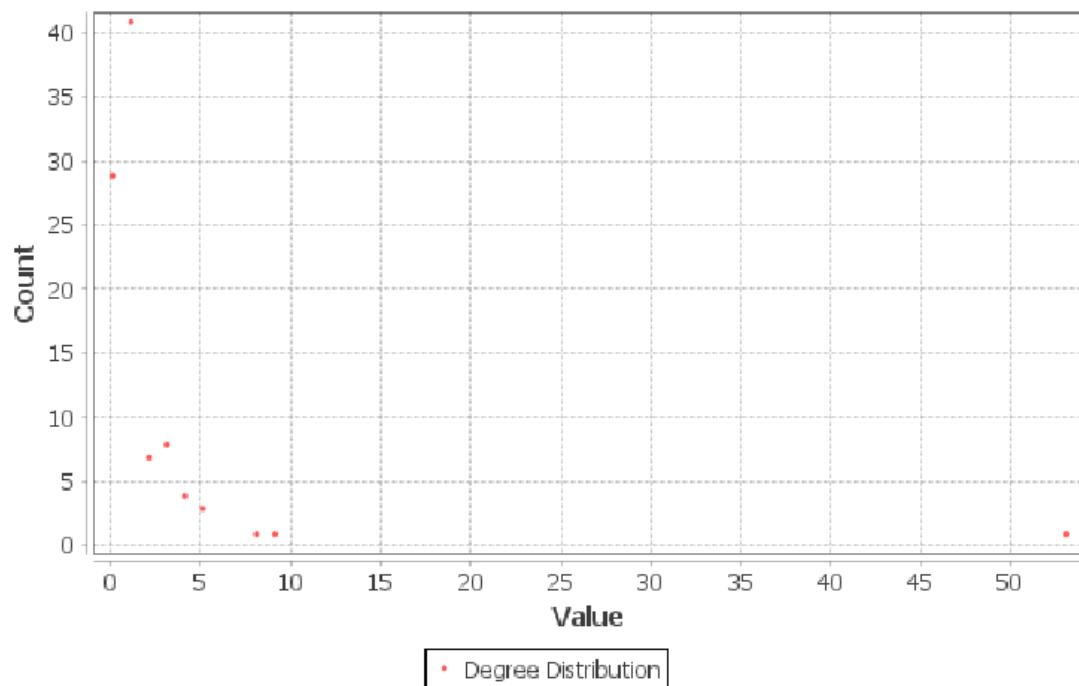




Avg. Weighted Degree: \approx Avg. Degree

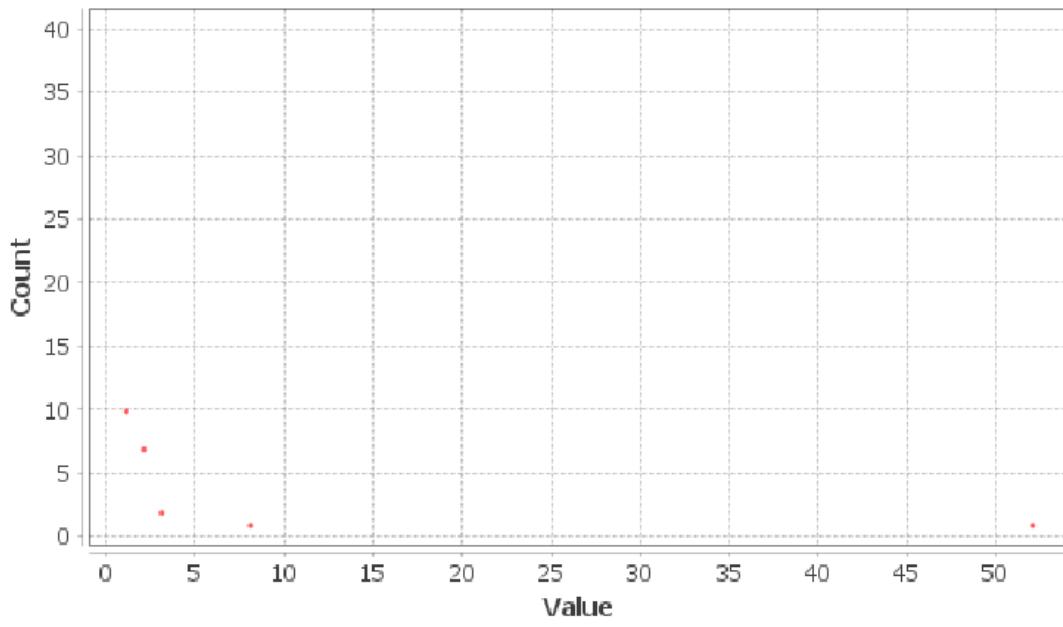
Results: Average Weighted Degree: 0.947

Degree Distribution

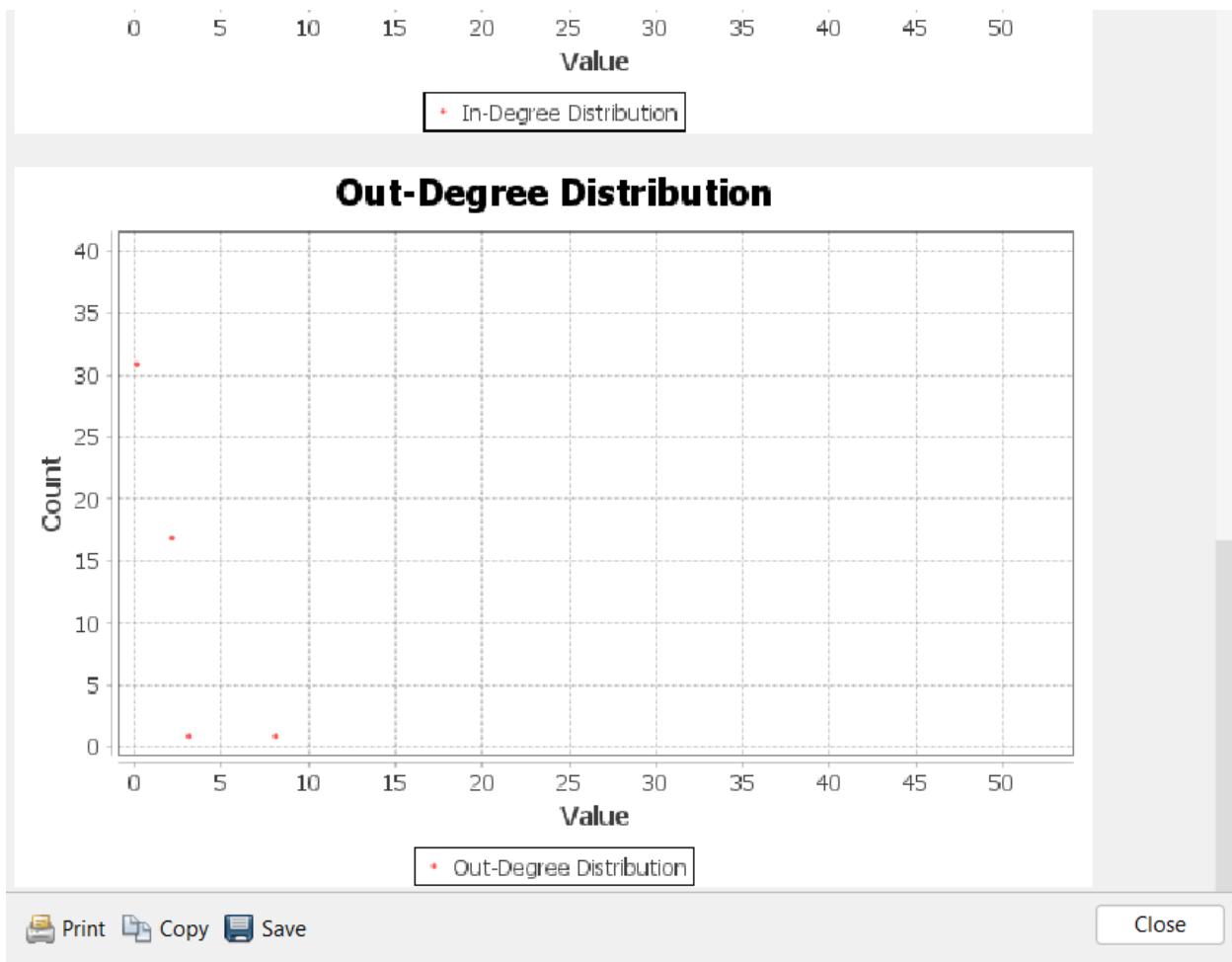


• Degree Distribution

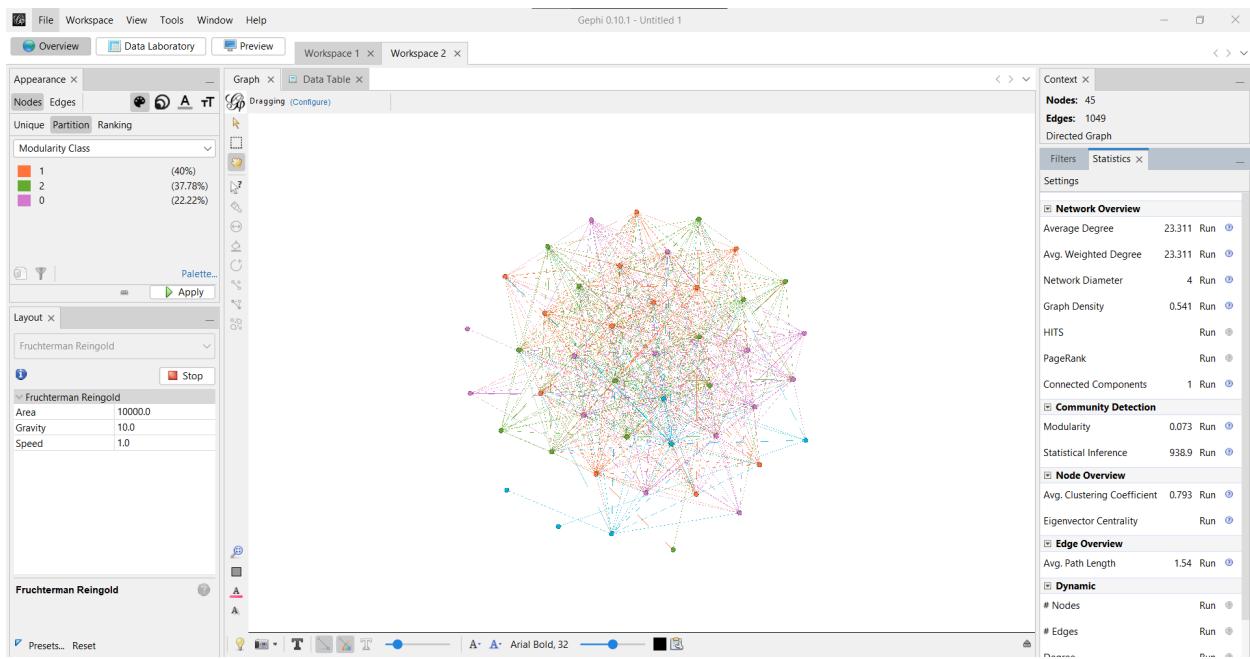
In-Degree Distribution



• In-Degree Distribution



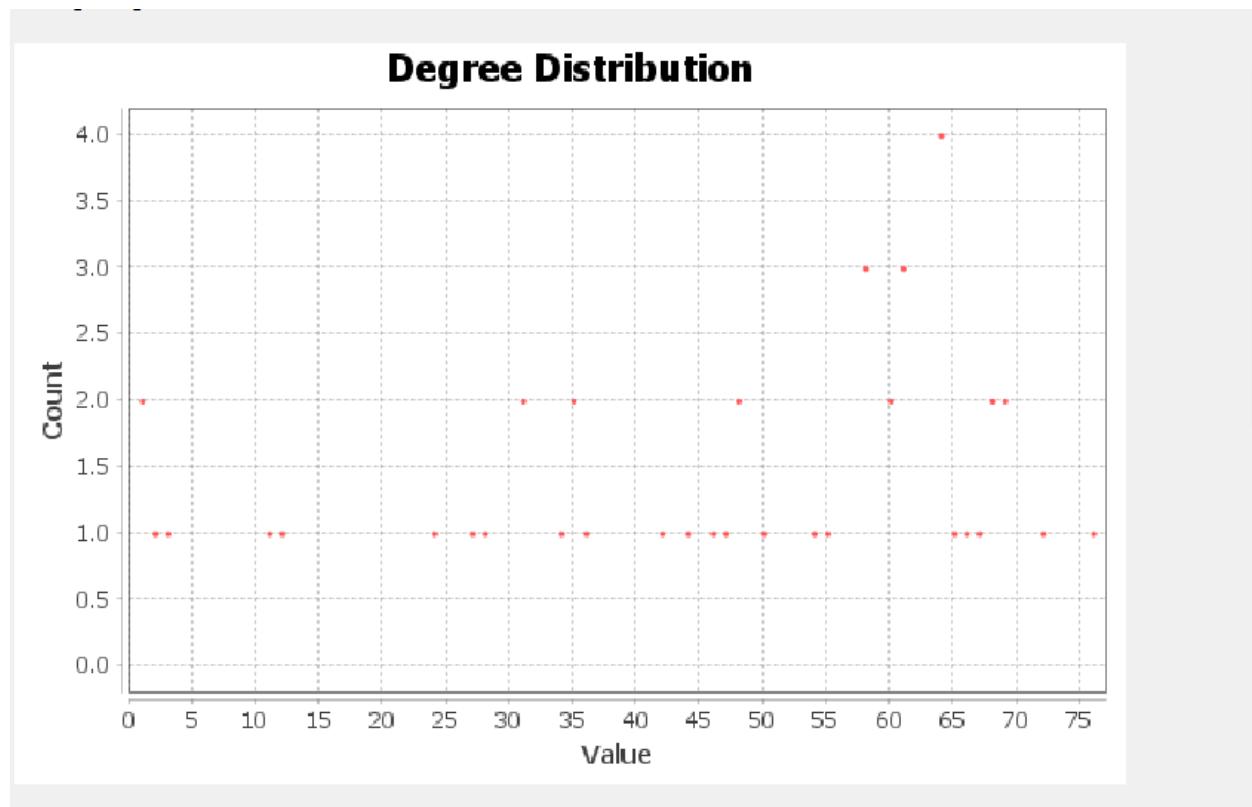
1. 5G Network (Misinformation Network)

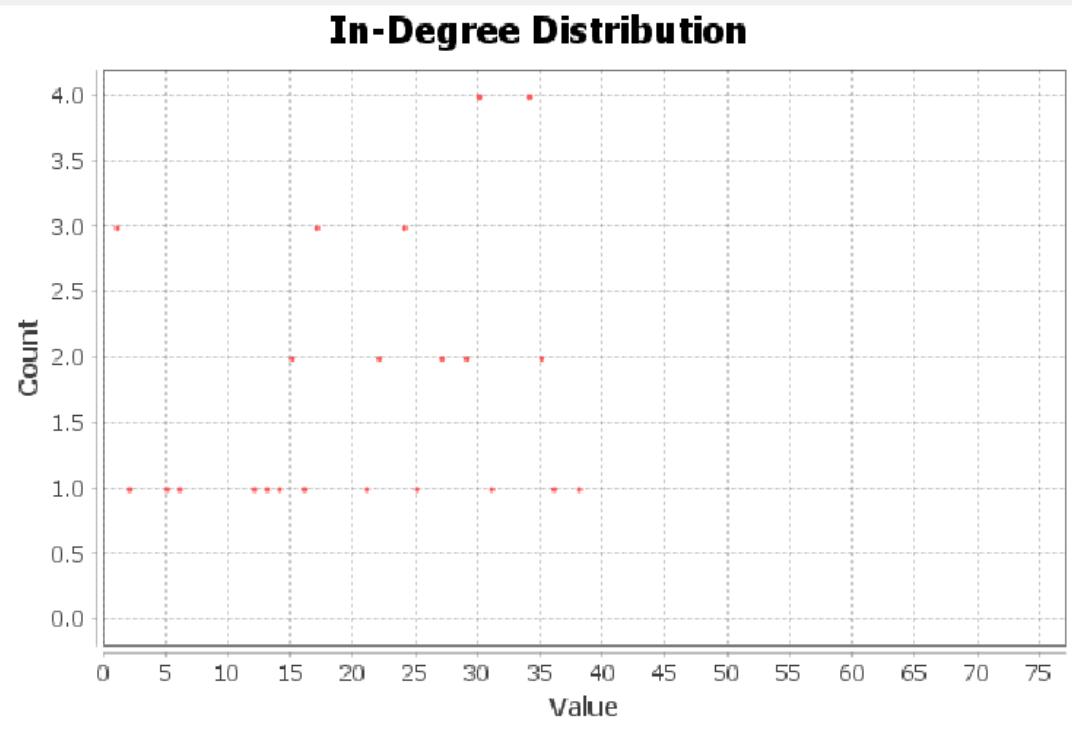


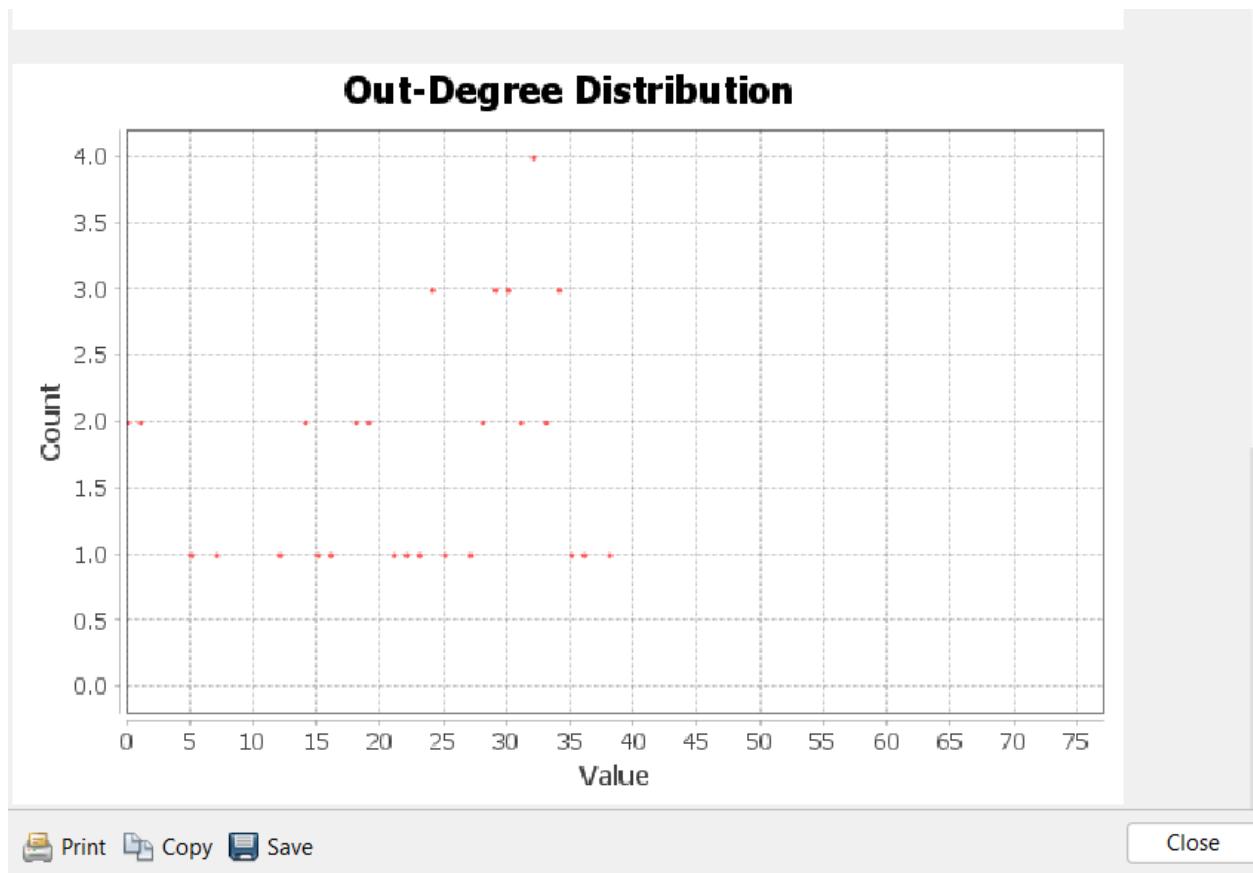
Nodes: 45

Edges: 1049

Average Degree: 23.311







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

Connected Components: 1 WCC, 3 SCC



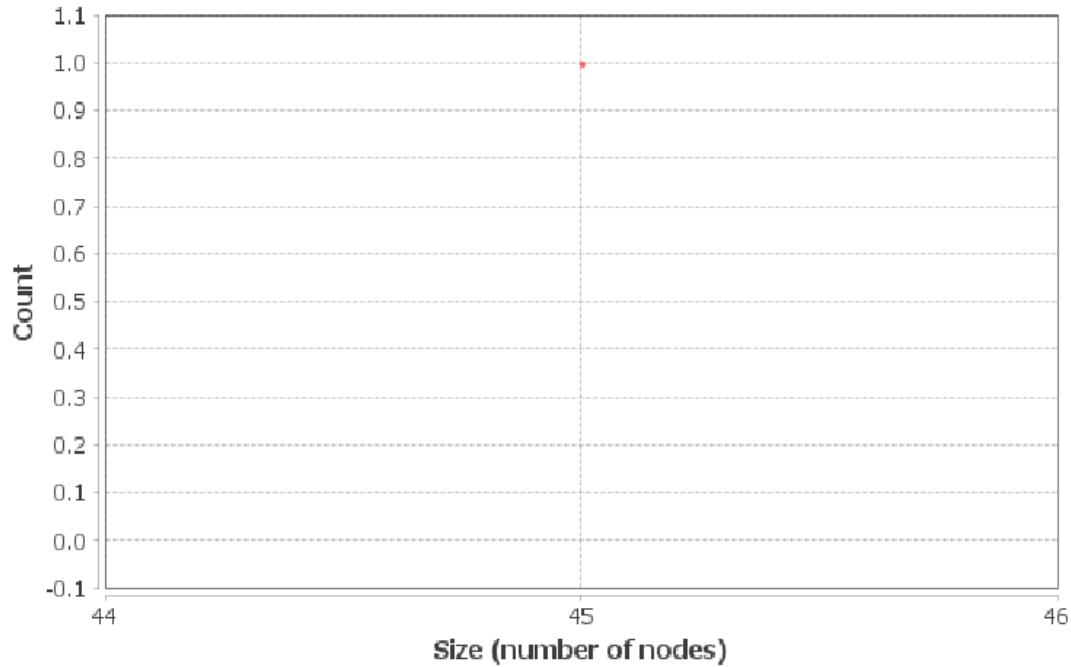
HTML Report

X

Number of weakly Connected Components: 1

Number of Strongly Connected Components: 3

Size Distribution

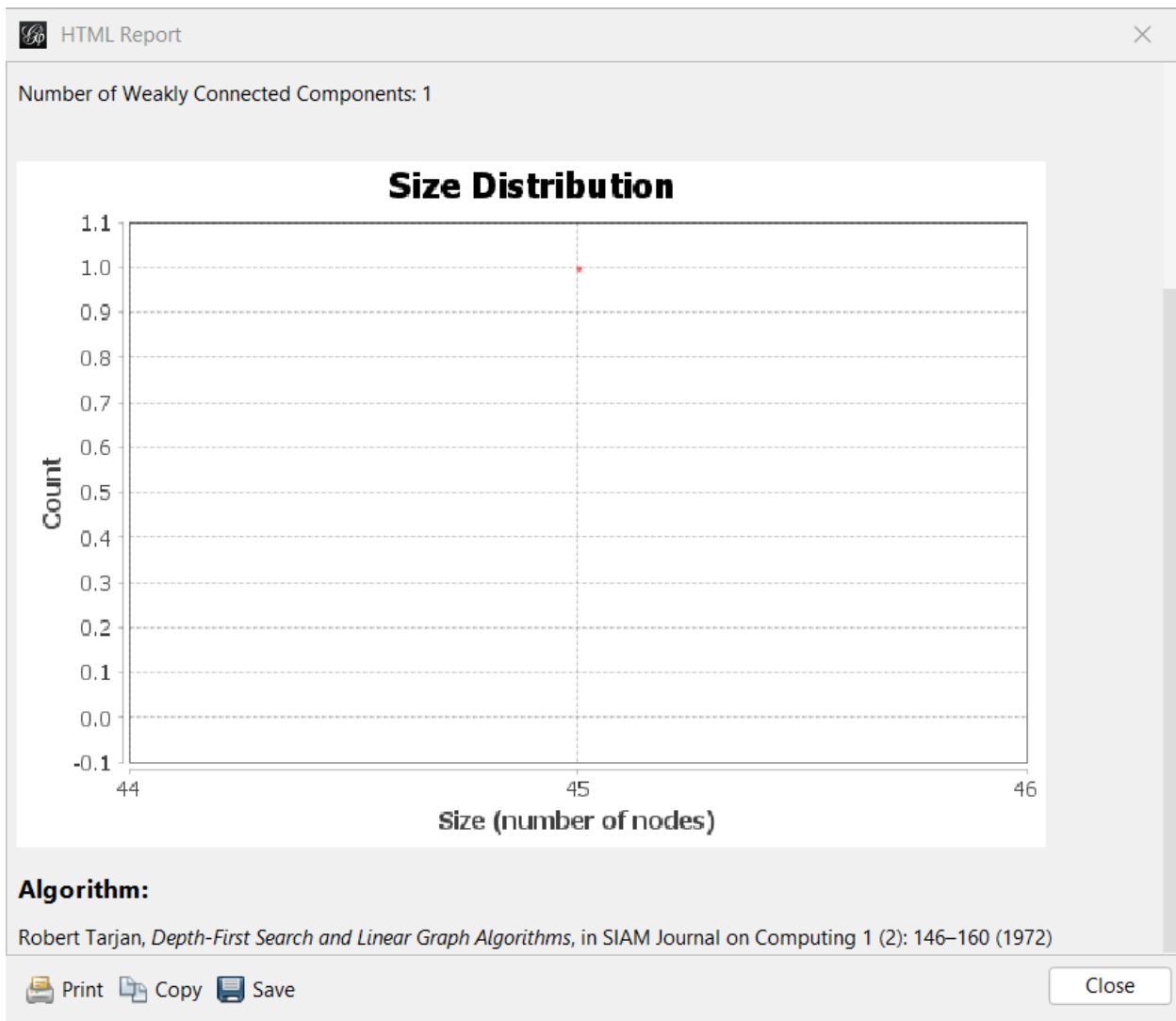


Algorithm:

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

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Close



Modularity: 0.073 (3 communities)

Parameters:

Randomize: On

Use edge weights: On

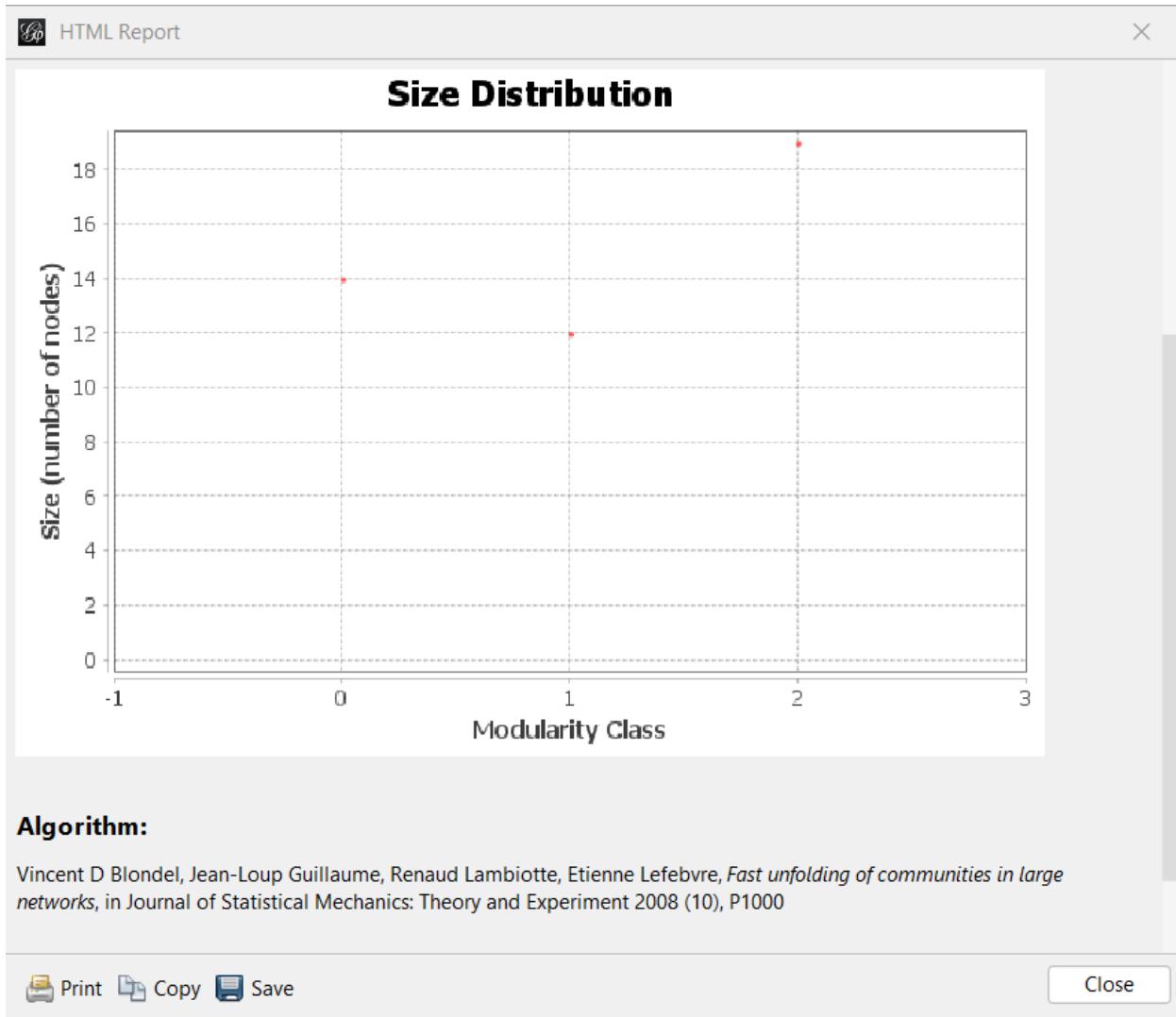
Resolution: 1.0

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

Count

Value

Algorithm:

 Print  Copy  Save

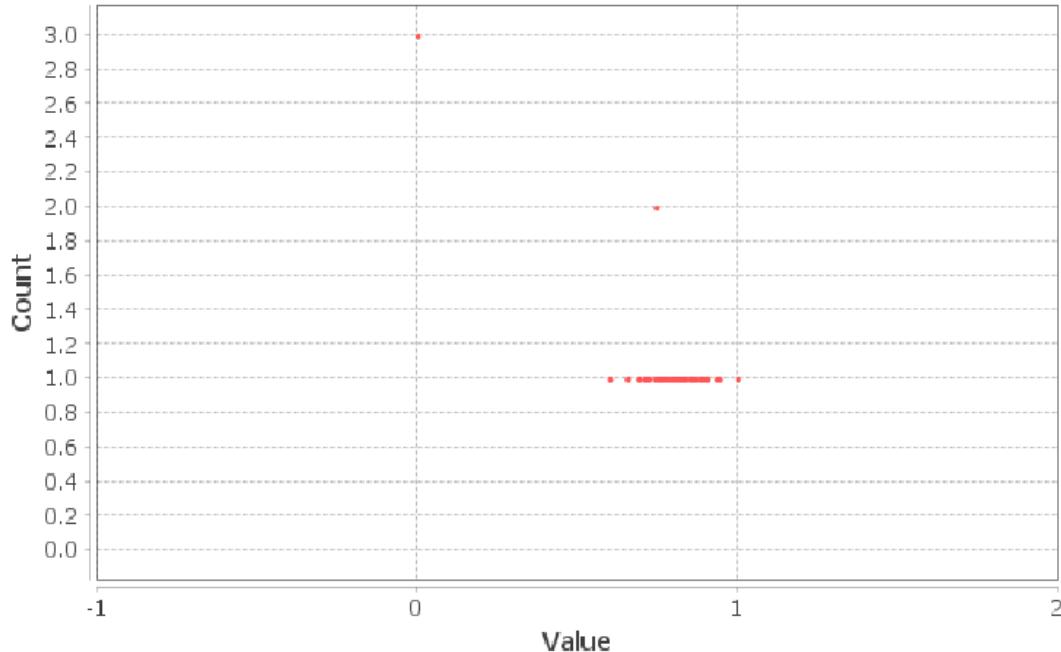
**Results:**

Average Clustering Coefficient: 0.793

Total triangles: 3762

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

Clustering Coefficient Distribution

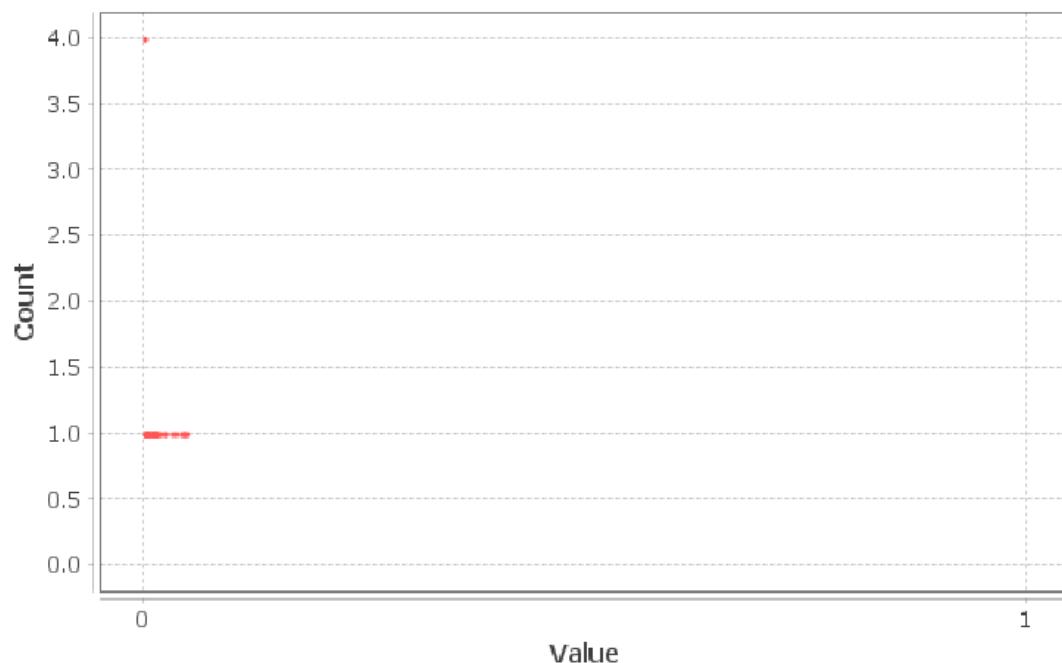


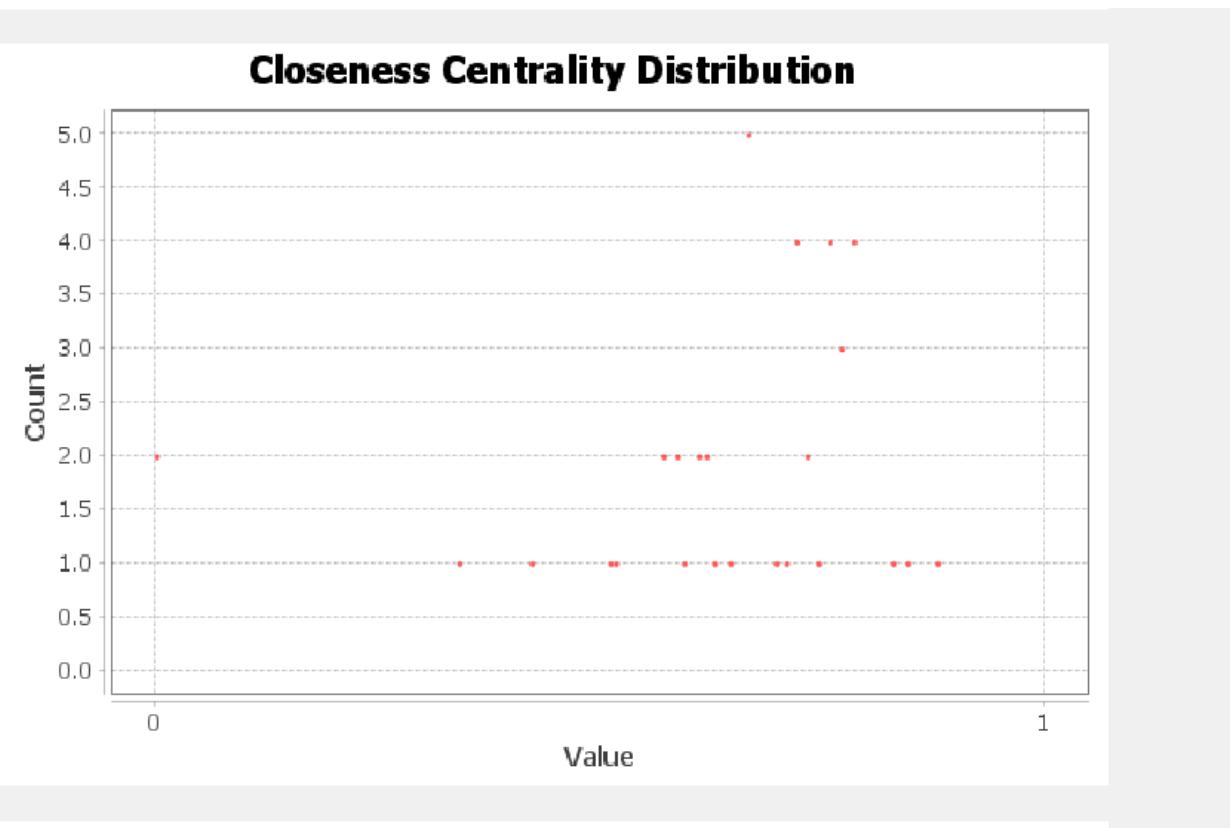
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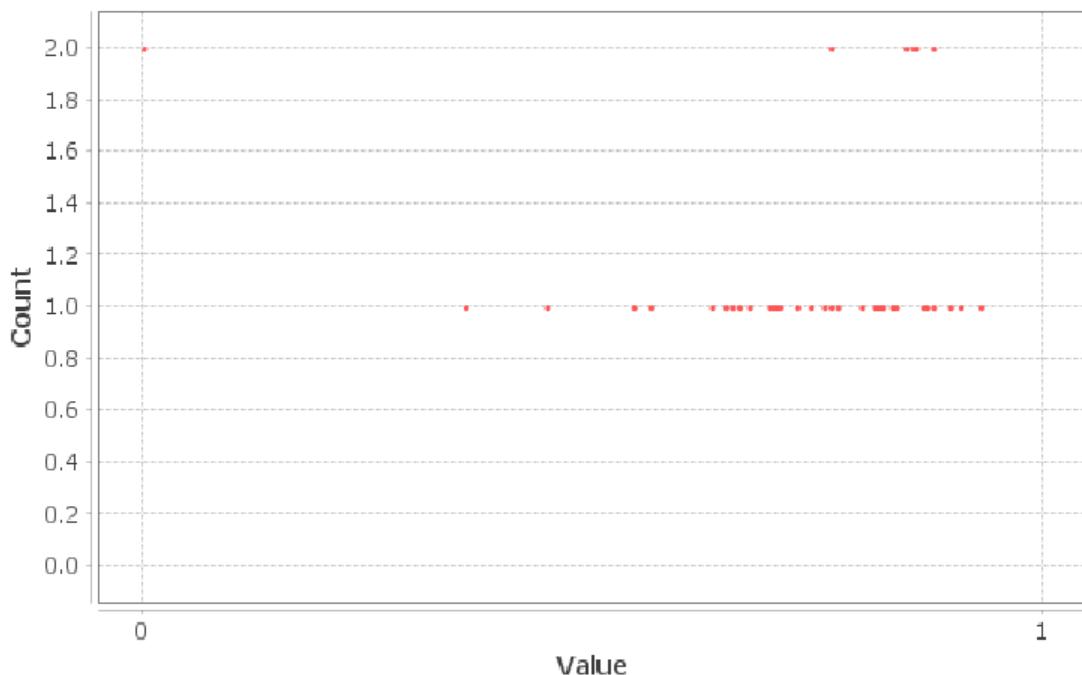
Diameter: 4

Betweenness Centrality Distribution

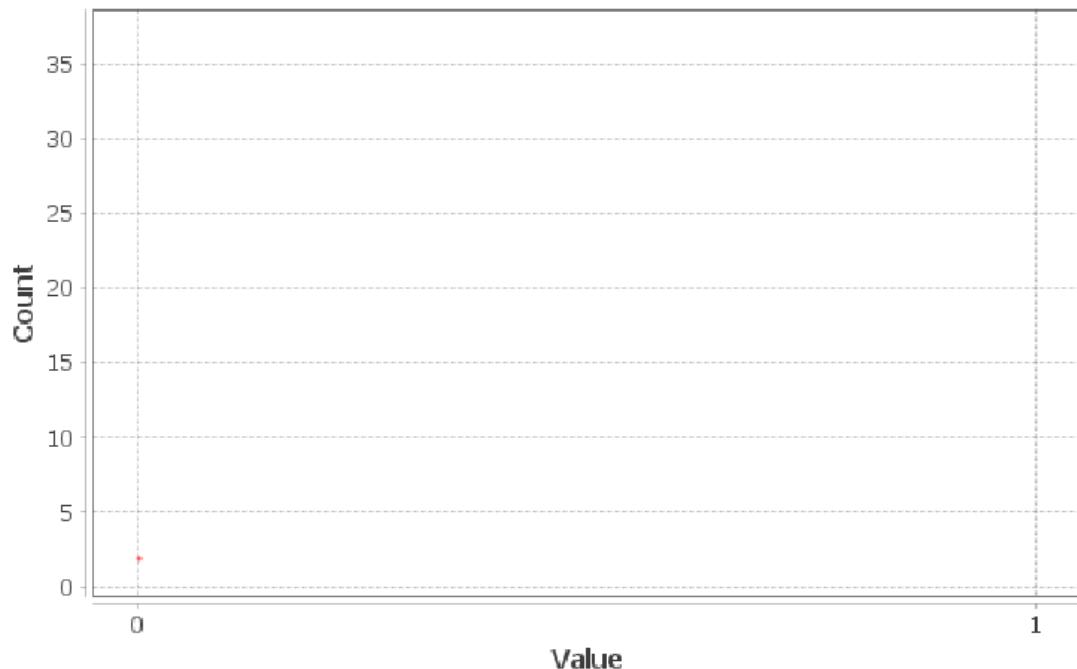




Harmonic Closeness Centrality Distribution



Eccentricity Distribution

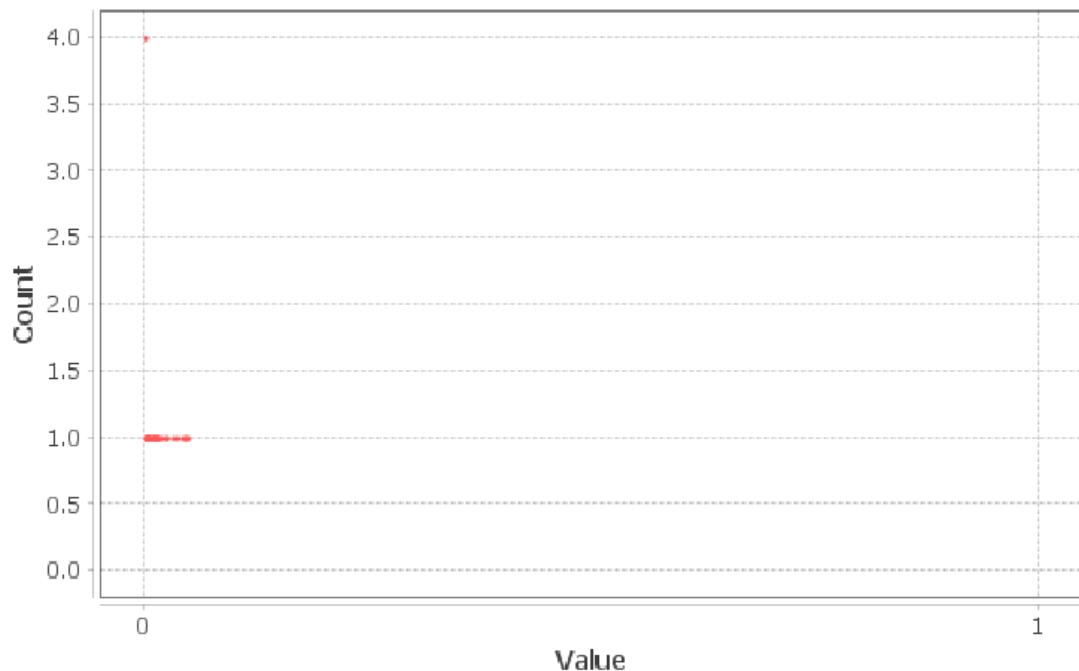


Algorithm:

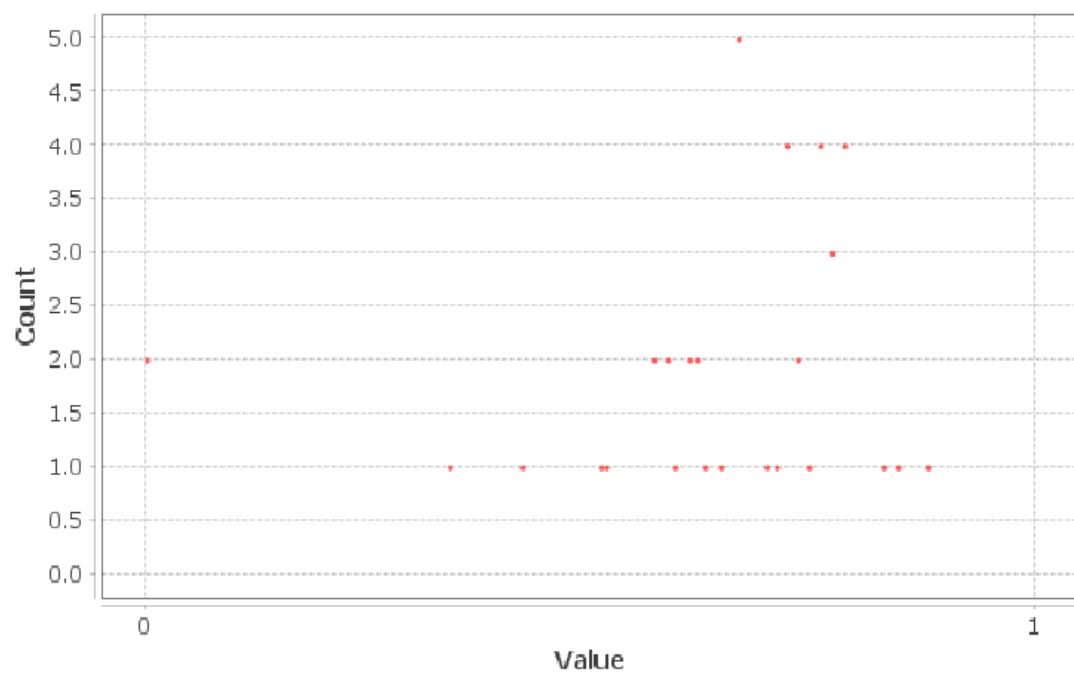
Ulrik Brandes, *A Faster Algorithm for Betweenness Centrality*, in Journal of Mathematical Sociology 25(2):163-177, (2001)

Avg. Path Length: 1.51

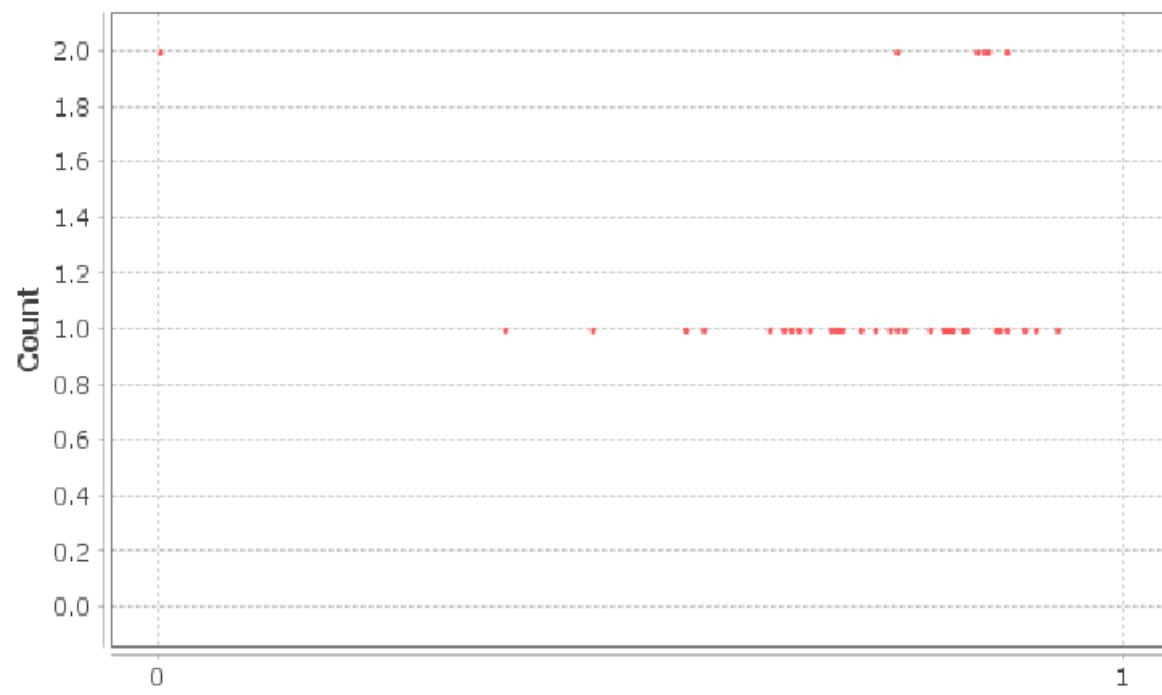
Betweenness Centrality Distribution

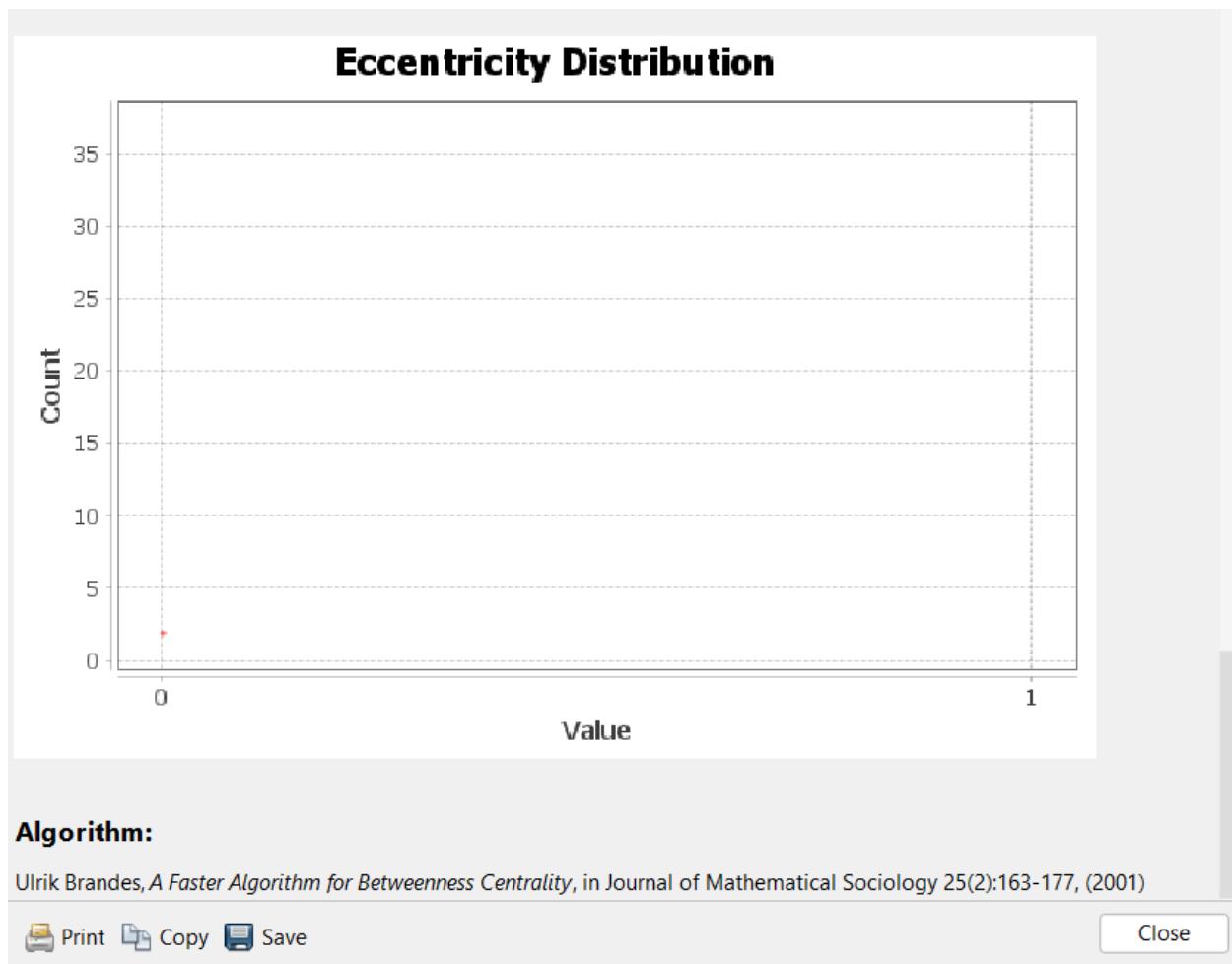


Closeness Centrality Distribution



Harmonic Closeness Centrality Distribution





Eigenvector Centrality: nearly all nodes ≈ 1.0

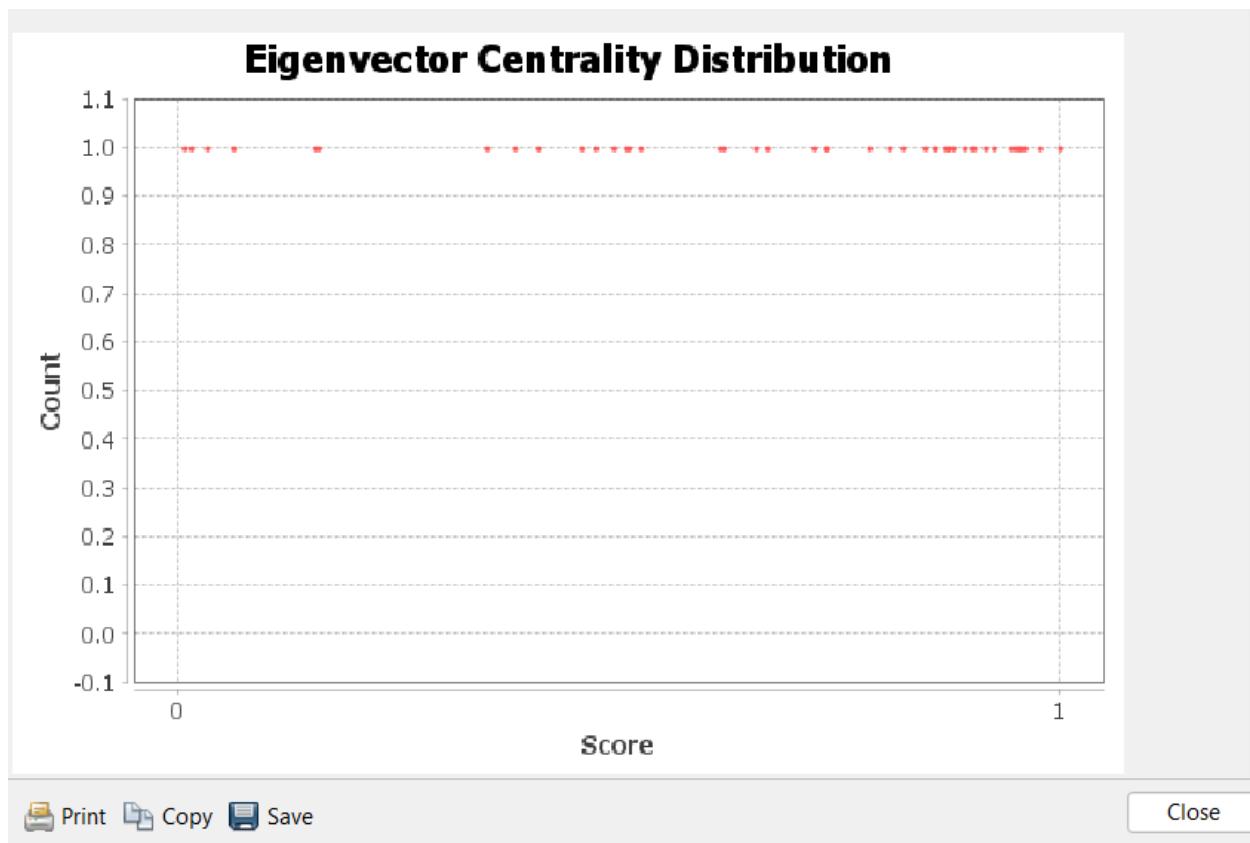
Parameters:

Network Interpretation: directed

Number of iterations: 100

Sum change: 2.815337401765152E-4

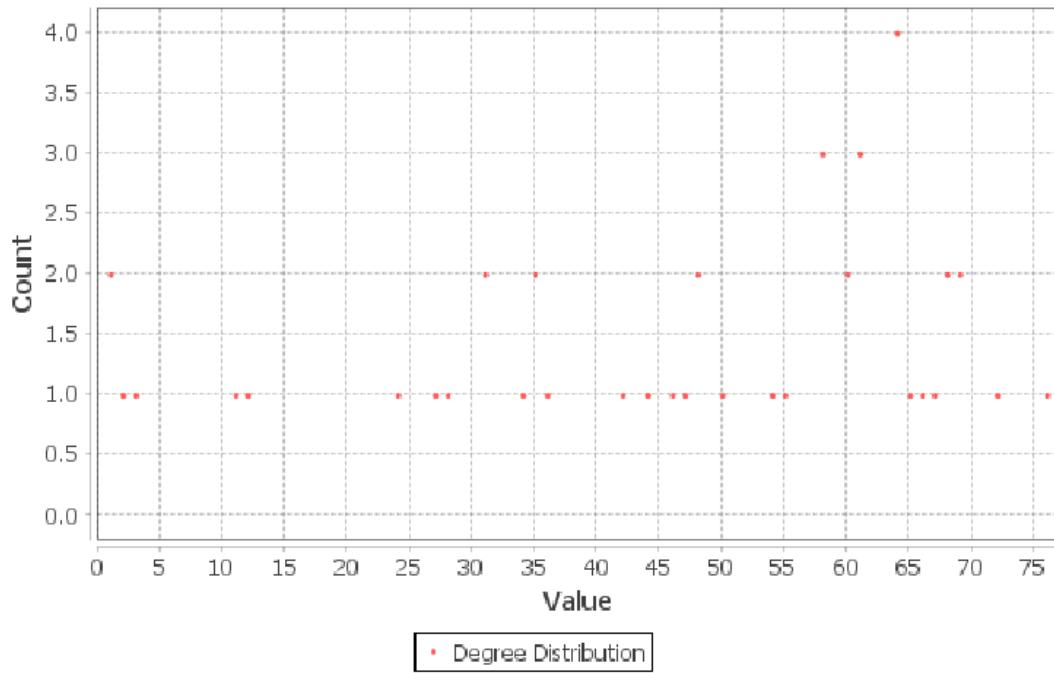
Results:



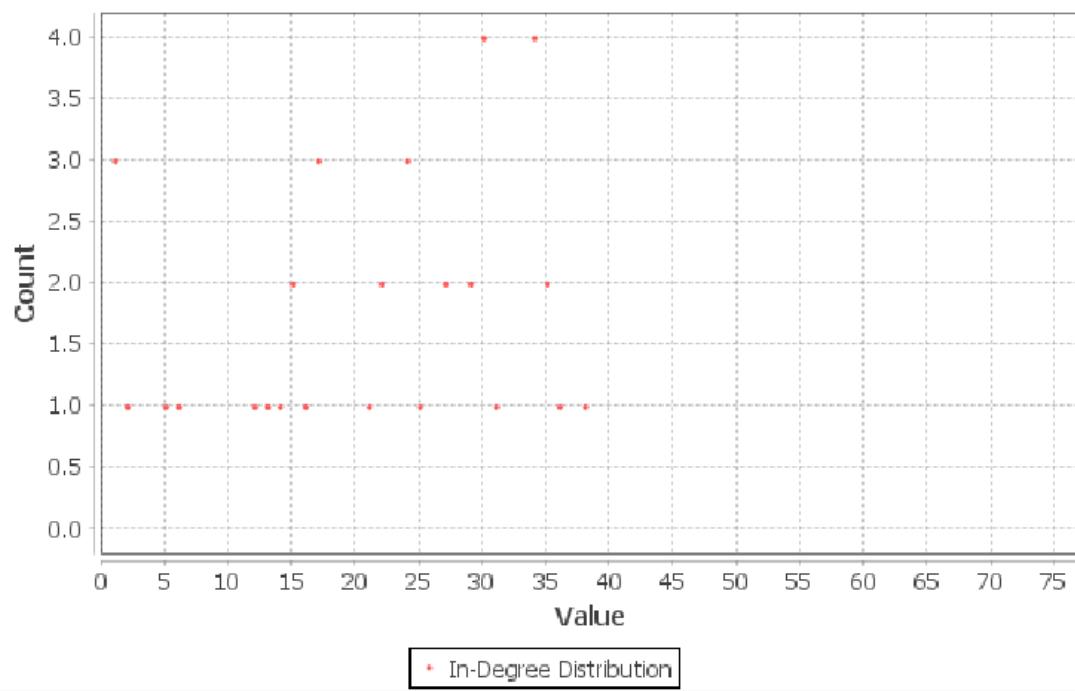
Avg. Weighted Degree: proportional to Avg. Degree

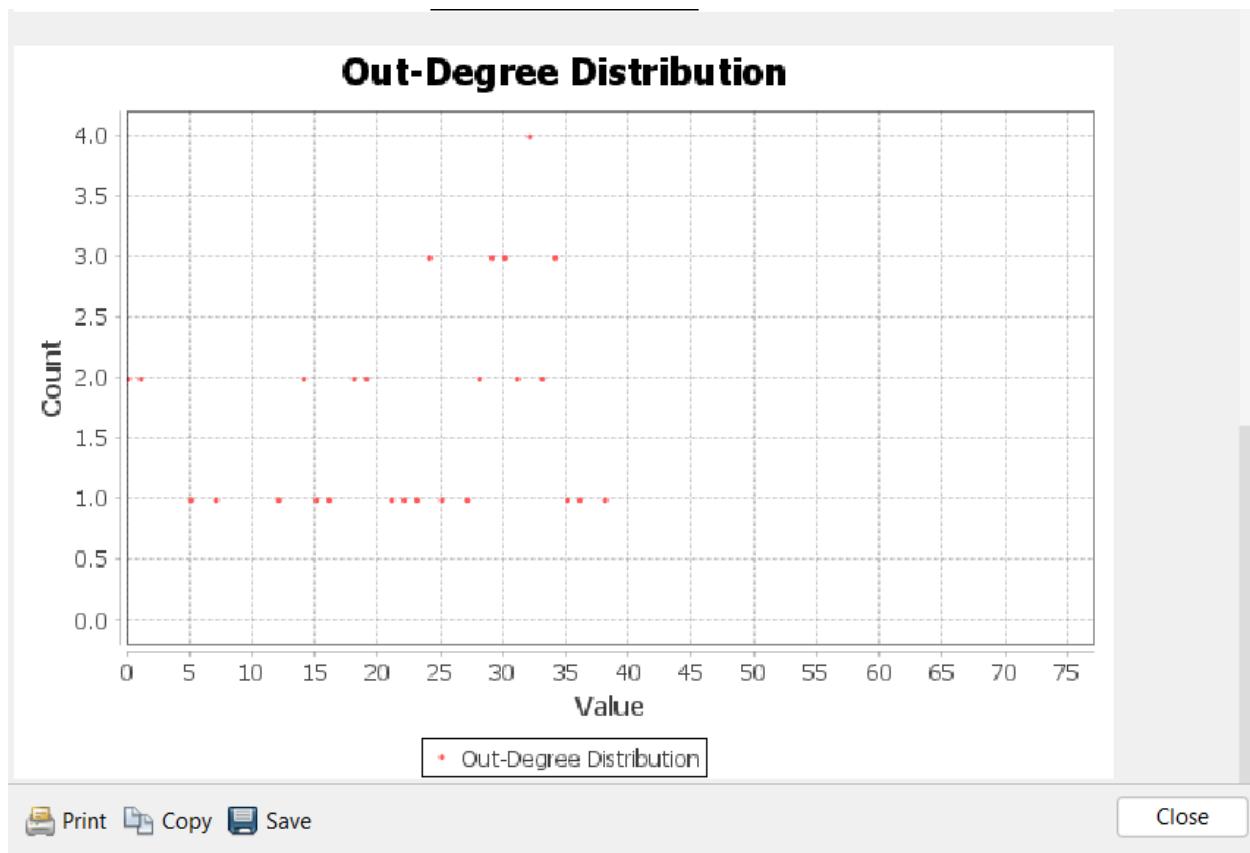
**Results:**

Average Weighted Degree: 23.311

Degree Distribution

In-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.**