Social Network Analysis Report

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1. Introduction

This report analyzes and compares two real Twitter subgraphs from the **WICO Graph Dataset**—one from the **5G_Conspiracy_Graphs (misinformation cluster)** and one from the **Non_Conspiracy_Graphs (normal cluster)**. The objective is to understand how structural differences in social networks reflect the spread of misinformation versus normal online interactions.

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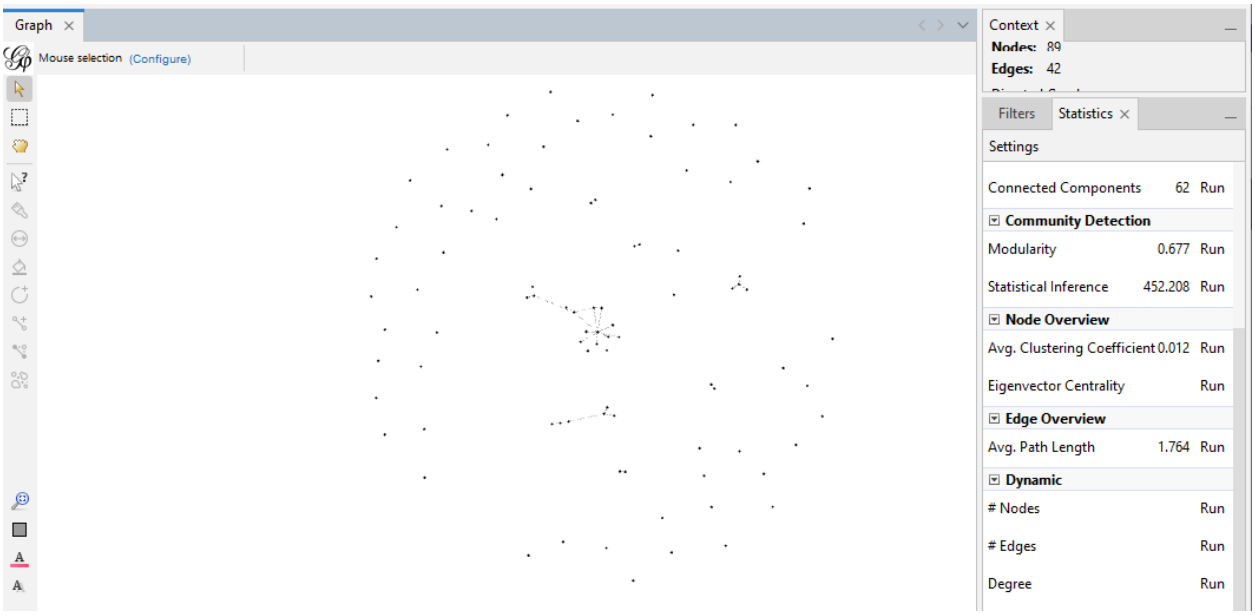
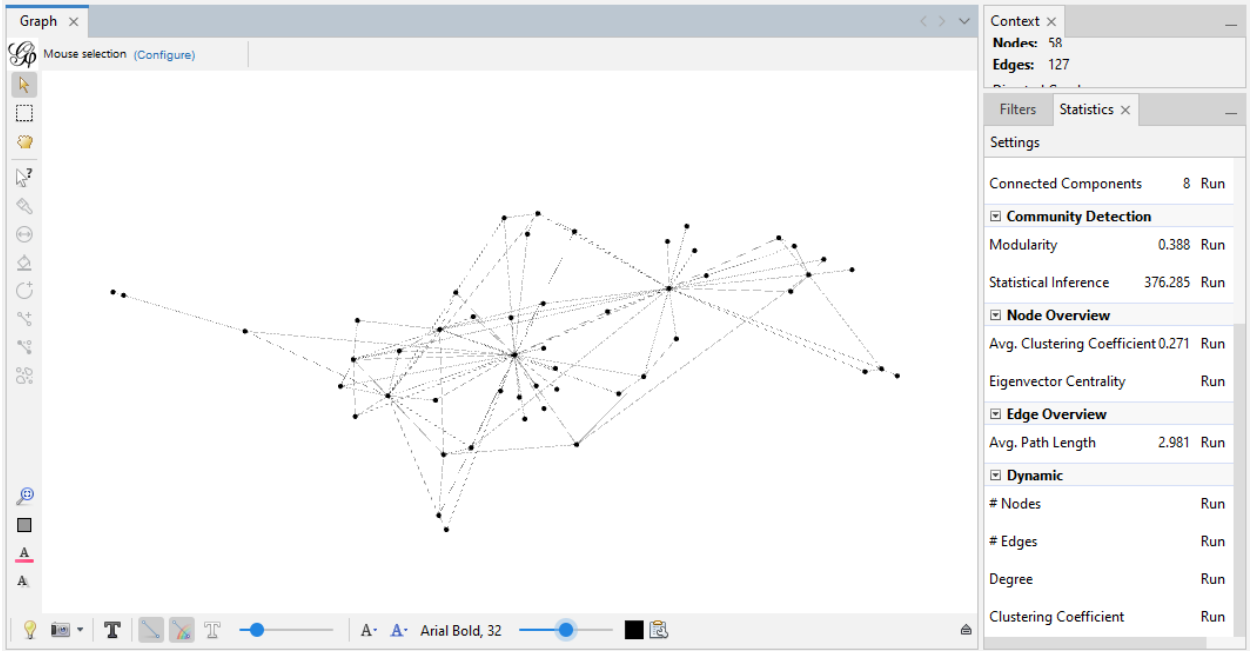
2. Overview of Selected Graphs

21 Misinformation Cluster (5G_Conspiracy_Graph)



22 Normal Cluster (Non_Conspiracy_Graph)



3. Network Statistics

Metric	**5G Conspiracy Graph (Misinformation)**	**Non-Conspiracy Graph (Normal)**
Number of Nodes	89	58
Number of Edges	42	127
Average Degree	**0.472**	**2.190**
Graph Density	**0.005**	**0.038**
Average Clustering Coefficient	**0.012**	**0.271**
Modularity (Q)	**0.685**	**0.396**
Number of Communities	**63**	**13**
Weakly Connected Components	**62**	**8**
Metric	**5G Conspiracy Graph (Misinformation)**	**Non-Conspiracy Graph (Normal)**
Strongly Connected Components	**76**	**29**

Diameter	**4**	**7**
Average Path Length	**1.764**	**2.980**

4. Interpretation of Results

4.1 Degree Metrics

The **normal graph's average degree (2.19)** is significantly higher than the misinformation network's **0.47**.

This indicates:

- **Normal Graph:** Users interact with multiple others, forming reciprocal relationships.
- **Misinformation Graph:** Most accounts interact with only one or no other accounts, suggesting automated or broadcast-style behavior.

4.2 Density

- **Normal graph density (0.038)** is nearly **eight times** higher than the **misinformation density (0.005)**.
- Low density in misinformation networks reflects minimal engagement between users and one-directional content spread.

4.3 Clustering Coefficient

- **Normal graph clustering > 0.271**
- **Conspiracy graph clustering > 0.012**

A high clustering coefficient in the normal graph shows formation of cohesive communities with triangular connections.

The conspiracy network's extremely low clustering shows the absence of conversation loops and almost no mutual interactions.

4.4 Modularity and Community Structure

The misinformation graph has:

- **Higher modularity (Q > 0.685)**
- **More communities (63 total)**

This indicates heavy fragmentation, polarized pockets, and isolated groups.

The normal graph:

- **Lower modularity (0.396)**
- **Fewer communities (13)**

This reflects a more unified communication environment with broader, interconnected discussions.

4.5 Connectivity (Components)

The misinformation graph displays:

- **62 weakly connected components**
- **76 strongly connected components**

These values imply extreme fragmentation, many isolated nodes, and minimal communication pathways.

The normal graph is much more cohesive with:

- **8 weakly connected components**
- **29 strongly connected components**

4.6 Diameter & Average Path Length

- **Misinformation network:** diameter > 4, average path length > 1.76
- **Normal network:** diameter > 7, average path length > 2.98

A short diameter indicates that information flows from a small handful of central accounts outward quickly, without depth.

The normal graph's longer paths reflect multi-step conversations and richer, layered interactions.