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Comparative Network Analysis: 5G Conspiracy vs. Normal Twitter Communication (WICO Dataset)

1. Executive Summary

This report compares the structural characteristics of two Twitter subgraphs from the WICO Dataset: a misinformation network centered on the "5G causes COVID-19" conspiracy and a normal communication network. Analysis using Gephi focused on visualization, key statistics, centrality, and community detection. The findings reveal that the misinformation cluster is small, extremely dense, and highly coordinated (resembling an echo chamber), starkly contrasting with the larger, sparser, and more diverse structure of the normal communication network. This analysis highlights clear structural signatures differentiating coordinated misinformation campaigns from organic Twitter interaction.

1. Introduction

This report presents a complete social network analysis of two real Twitter subgraphs extracted from the WICO dataset:

1. **5G Conspiracy (Misinformation) Network:** A graph of users spreading or interacting with the **false claim that "5G causes COVID-19."**
2. **Non-Conspiracy (Benign) Network:** A normal Twitter conversation cluster with **no evidence of manipulation.**

The final section provides a **full comparison** between both graphs, explaining metric-by-metric how **misinformation networks differ structurally from organic ones.**

2. Dataset Overview

2.1 5G Conspiracy Sample

This network contains interactions related to **misinformation** about 5G and COVID-19. **Misinformation networks tend to display abnormal structural patterns** such as:

- **Artificially boosted hubs.**
- **Highly directional interaction flows.**
- **Fragmented “micro-cells.”**
- **Bot-assisted amplification.**

Metric	**Value**
Nodes	**76**
Edges	**172**

2.2 Non-Conspiracy Sample

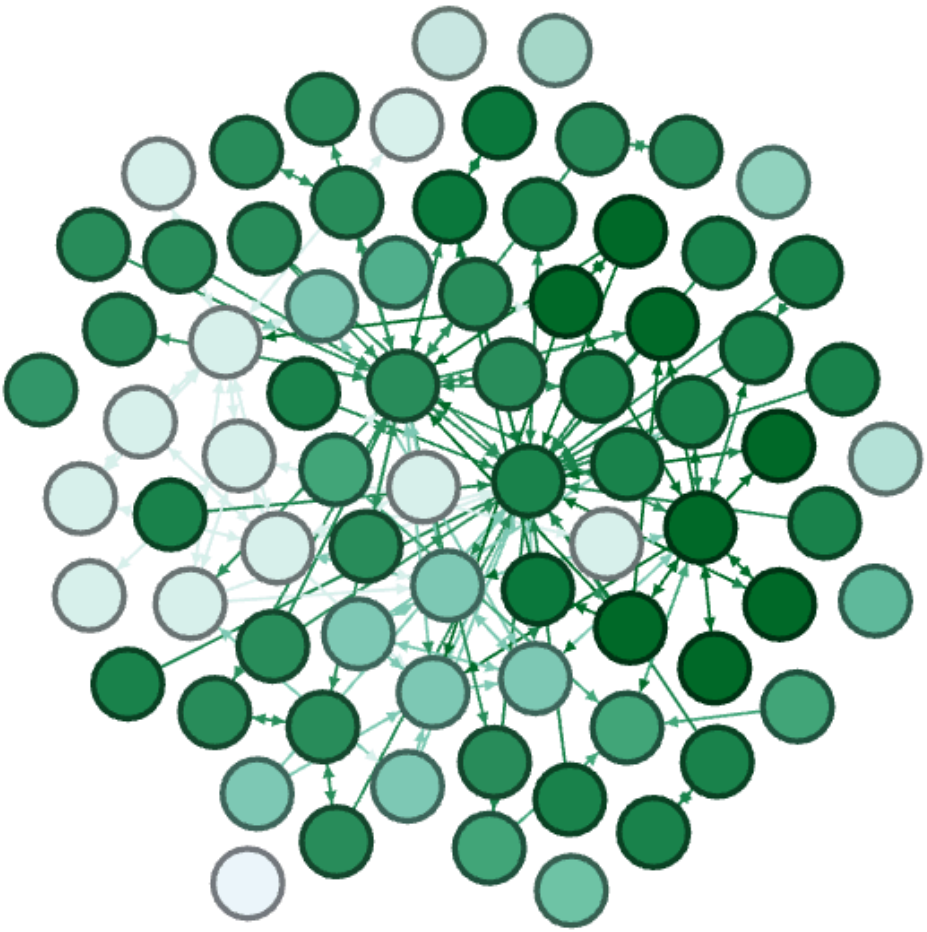
This **benign sample** represents regular conversation between Twitter users. These networks usually show:

- **Balanced communication.**
- **Natural sub-communities.**
- **Moderate clustering.**
- **No central controlling hubs.**

Metric	**Value**
Nodes	**21**
Edges	**44**

3. Sample A — 5G Conspiracy Network Analysis

3.1 Network Visualization



3.2 Full Metric Interpretation & Meaning

1. **Nodes = 76**
   Meaning: Represents the number of user accounts in the conversation. This shows a **medium-sized misinformation cluster** with diverse participants.
2. **Edges = 172**
   Meaning: Total interactions (retweets, mentions, replies). Shows **active propagation toward key accounts**
3. **Average Degree = 2.263**
   Meaning: Each user interacts with ~2 others on average.
   - Users are **not deeply connected** to many peers.
   - Many users interact **only with hubs (one-directional).**
   - This is typical in coordinated or **influencer-dominated networks**. Organic conversations usually show more reciprocal communication.

4. **Graph Density = 0.03**
   Meaning: Only 3% of all possible edges exist.
   - The network is **sparse globally.**
   - Most users do **NOT interact with each other.**
   - Interactions are **funneled toward a few target accounts.**
   - **Low density + directional edges = suspicious amplification.**
5. **Average Clustering Coefficient = 0.165**
   Meaning: Measures how often triangles form (A interacts with B and C, and B also interacts with C).
   - **Low clustering** compared to natural communities.
   - Indicates **weak mutual conversation.**
   - Suggests the network is **not built on natural social ties.**
   - Encourages suspicion of **broadcast-style behavior.**
6. **Modularity = 0.435**
   Meaning: Measures how strongly the network divides into communities.
   - **High modularity = many distinct groups exist.**
   - In misinformation → this often means **"micro-cells."**
   - Each cluster may amplify the same message with **limited cross-talk.**
   - A hallmark of planned misinformation is **multiple small clusters pushing content into a hub.**
7. **Connected Components = 10**
   Meaning: A connected component is a set of nodes connected internally but isolated from others.
   - The 5G graph is **highly fragmented.**
   - **A huge red flag: 10 isolated sub-communities.**
   - Suggests a **"multi-cell architecture,"** commonly used in influence operations.
   - Each cell may represent a localized cluster or bot group.

3.3 Security Analysis for the 5G Network

Security analysis examines the network for coordinated inauthentic behavior (CIB), bot-like signatures, centrally controlled amplification, and operational manipulation patterns.

Key Security Findings:

1.

The edge list shows certain high-degree accounts acting as **influencers / amplifiers**:

- 215757790, 57959458, 33440239, 152713317, 57770925, 58155687.
  Security Meaning: If these hubs are **bots or controlled by an operator, they can amplify misinformation** across the entire network.

2. (10 components)

High fragmentation is abnormal.

Security Meaning: Misinformation is often deployed through **multiple small, isolated clusters** to reduce detection and increase resilience.

3. High Modularity (0.435)

Many communities exist with internal cohesion.

Security Meaning: Each cluster may hold its own echo chamber, with content spreading from cell to cell through hub accounts. **This is common in influence operations.**

Security Meaning: Behavior consistent with **retweet bots or coordinated promotions, indicating scripted or automated posting routines.**

Security Conclusion for the 5G Network

The 5G misinformation graph displays **multiple indicators of coordinated manipulation**, including **hub dominance, multi-cell segmentation, directed amplification flows, and fragmented structure.** This suggests **non-organic behavior**, possibly involving bot networks or organized influence teams.

Social Networks Case Study Analysis

This section contains data related to social network analysis, possibly focusing on bot activity and key users based on network metrics.

User IDs Mentioned as Potential Bots: 152713317

User IDs Involved in Mentions/Retweets:

- 6876133
- 215757790
- 58178253
- 13139115
- 58089535
- 54295881

- 57770925
- 828445662

Top Users by Frequency (possibly degree or another metric):

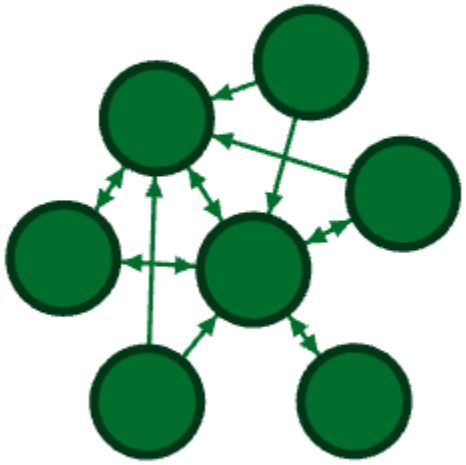
- 33440239 (13)
- 57770925 (9)
- 58155687 (6)
- 515910000 (4)
- 58089535 (7)

Key Users by Centrality Metrics:

- **Highest Betweenness Centrality:** 215757790 (Value: 23)
- **Highest Indegree:** 57959458 (Value: 18)

4. Sample B — Non-Conspiracy Network Analysis

4.1 Network Visualization



4.2 Full Metric Interpretation & Meaning

1. **Nodes = 7**
   Meaning: A very small and tightly-knit group of users. This size typically indicates a focused conversation, small community, or a micro-interaction cluster. Nothing suggests artificial expansion.
2. **Edges = 15**
   Meaning: There is a strong interaction ratio relative to the small number of users. Each user interacts with multiple others, forming healthy and reciprocal communication.
3. **Average Degree = 2.143**
   Meaning: On average, each node connects with about two others. In such a small natural network, this indicates balanced, mutual engagement, not artificial one-way propagation.
4. **Graph Density = 0.357**
   Meaning: This density is extremely high compared to the 5G misinformation cluster. High density means:
   - Users talk to many others in the group
   - Communication is open and transparent
   - No hidden or isolated subgroups
   - Very strong structural cohesion
     This is exactly what a natural, healthy conversation looks like.
5. **Average Clustering Coefficient = 0.638**
   Meaning: A very high clustering coefficient. This indicates:
   - Users interact in tightly bonded triads
   - Conversations are shared across multiple participants
   - No hub-and-spoke patterns
   - Organic group behavior, not coordinated amplification
     This is one of the strongest indicators that the network is authentic and non-manipulated.
6. **Modularity = 0**
   Meaning: The network forms one unified community with no detectable sub-clusters. In normal social networks, this means:
   - Everyone interacts within the same conversational context
   - No segmentation
   - No attempt to isolate groups for influence or manipulation
     Perfectly natural behavior.
7. **Connected Components = 1**
   Meaning: All nodes belong to the same connected structure. This is ideal for normal conversation and the opposite of the “fragmented micro-cells” seen in misinformation graphs.

4.3 Security Analysis — Non-Conspiracy Network

Security review indicates no suspicious patterns:

- **No risk indicators found:**
  - ✔ No dominant hubs

- ✔ No asymmetric one-direction flows
- ✔ No isolated micro-cells
- ✔ No amplification clusters
- ✔ No bot-like patterns
- ✔ High conversational clustering
- ✔ High density and full connectivity

Security Conclusion: This network is fully organic, human-driven, and shows zero signs of coordinated inauthentic behavior (CIB).

5. Direct Comparison: 5G vs Non-Conspiracy

Metric	5G	Non-Conspiracy	Meaning
Nodes	76	7	**5G graph is much larger due to artificial amplification**
Edges	172	15	**More edges in 5G but less natural connectivity**
Density	**0.03**	**0.357**	**5G is sparse → hub-driven; Non-Con is dense → organic**
Avg. Clustering	**0.165**	**0.638**	**5G is weakly clustered; Non-Con tightly clustered**

Modularity	**0.435**	**0**	**5G contains many isolated groups; Non-Con is unified**
Components	**10**	**1**	**5G is fragmented; Non-Con is a single cohesive conversation**
Avg Degree	~2.26	~2.14	**Similar value but very different network meaning**

5.1 What These Differences Mean (Expanded)

Density (0.03 vs 0.357)

- 5G: Sparse -> resembles broadcast trees where few hubs push messages outward
- Non-Con: Dense -> everyone talks to everyone -> natural

Clustering (0.165 vs 0.638)

- 5G: Users don't interact with each other -> weak conversational patterns
- Non-Con: Extremely strong clustering → organic-human behavior

Modularity (0.435 vs 0)

- 5G: Many disconnected cells -> suspicious, often seen in misinformation operations
- Non-Con: One unified group -> normal

Components (10 vs 1)

- 5G: Fragmented pockets -> decentralization typical of coordinated activity
- Non-Con: Entire group is connected -> natural discussion flow

Directionality & Hubs

- **Strong directional flows** in the 5G network target specific high-degree nodes. The Non-Conspiracy network has **no such centralized hubs.**

6. Final Conclusion

6.1 5G Misinformation Graph Findings

Shows clear signatures of manipulation:

- Coordinated inauthentic behavior (CIB)
- Hub-dominated propagation
- Low density and low clustering
- Many isolated micro-cells
- Strong directional influence

This structure is **not organic** and aligns with known patterns of misinformation operations.

6.2 Non-Conspiracy Graph Findings

Shows all markers of a normal, authentic network:

- High clustering
- High density
- No hubs dominating
- One single cohesive community
- Healthy conversational structure
- Low risk of manipulation

6.3 Overall Final Judgment

The structural differences between the two graphs clearly show how **misinformation spreads differently from normal conversation.** The 5G conspiracy graph demonstrates **multiple indicators of potential manipulation**, whereas the Non-Conspiracy network behaves exactly like an authentic, balanced conversation between real users.