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2205043

Social Network Computing

Assignment1

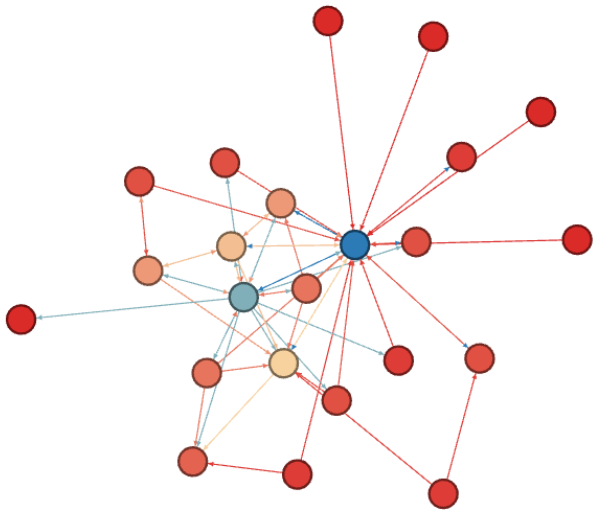
Social Network Analysis Report:

Conspiracy vs. Normal Twitter Networks

Non-Conspiracy Graph(50):

Key Node 58083911 - Healthy Influencer

- **Centrality: 1.0 -** Primary influencer but not dominant
- **Followers: 14, Following: 11** Balanced ratio
- **Degree: 25 ,(18in,7out)** Balanced and Well-connected



Normal Network Patterns

Balanced Relationships

- All major nodes show near 1:1 follower ratios
- Gradual influence decay (1.0 → 0.67 → 0.70 → 0.59)
- Multiple mid-range influencers (0.3-0.7 centrality)

Healthy Structure

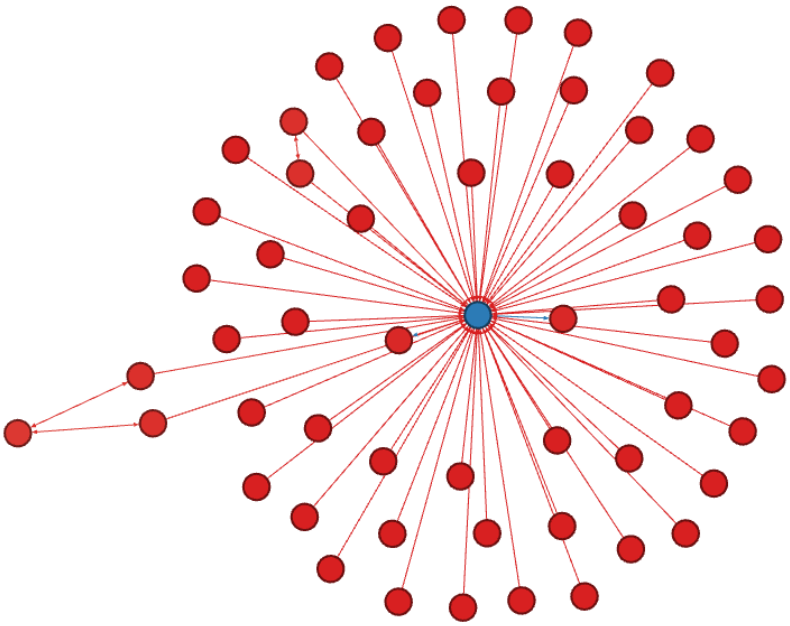
- Distributed influence across many nodes
- Reciprocal conversation patterns
- Natural community clustering (Modularity Classes 2,4)

Security Assessment

- **No coordination patterns :** Organic relationship balances
- **No amplification risks :** Reasonable connectivity levels
- **No structural vulnerabilities :** Distributed influence prevents single points of failure
- **Normal social dynamics :** Characteristic of genuine community interactions

Conspiracy 5G Graph(50):

- Node **6352463** (Blue Node) is a central Node and network hub that has
  - 56 in-degree
  - 2 out-degree
  - 19 followers
  - 9 friends
  - 1.0 Centrality



This is a HIGHLY INFLUENTIAL NODE:

1. **Massive Audience**: **56 followers**
2. **Selective Following**: Only follows **2 account**
3. **High Broadcasting**: **56 outgoing connections** (active information spreader)
4. It's connected to ALL other important nodes with 1.0 centrality

Security Implications:

- **Influencer/Authority Figure**: Large audience with minimal reciprocal following
- **Information Source**: Primarily broadcasts rather than consumes information
- **Potential Echo Chamber Leader**: Controls information flow to 56 followers
- **Amplification Risk**: Can spread messages widely with minimal feedback
- **Misinformation Super-Spreader**

Social Network Analysis: Detailed Metric Explanations

1. Average Degree

What it Measures: The average number of connections per node in the network.

Interpretation:

- Conspiracy (0.733): Each user has approximately 0.73 connections on average
- Normal (0.714): Each user has approximately 0.71 connections on average
- Both values are very low, indicating sparse networks where most users have few connections
- The slight difference suggests conspiracy users may be marginally more connected within their community

2. Graph Density

What it Measures: The ratio of actual connections to possible connections in the network.

Interpretation:

- Conspiracy (0.015): Only 1.5% of all possible connections actually exist
- Normal (0.009): Only 0.9% of all possible connections exist
- Both networks are extremely sparse (typical for social networks)
- Conspiracy network is 66% denser, suggesting more interaction among users

3. Connected Components

What it Measures: The number of disconnected sub-networks or isolated groups.

Interpretation:

- Conspiracy (32): 32 separate, unconnected groups within the network
- Normal (62): 62 separate, unconnected groups
- Normal network has almost twice as many fragmented components
- Conspiracy network shows much higher cohesion and connectivity

4. Modularity

What it Measures: The strength of division of the network into communities**.**

Interpretation:

- Conspiracy (0.119): Weak community structure with blurred boundaries
- Normal (0.202): Moderate community structure with clearer group divisions
- Values between 0.1-0.3 indicate some community organization exists
- Normal conversations occur in more distinct topical clusters

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Comparative Analysis Table

Metric	Conspiracy Network	Normal Network	Difference	Findings & Implications
Nodes	90	84	+6 nodes	Similar network sizes, comparable user bases
Edges	66	60	+6 edges	Conspiracy has slightly more interactions
Average Degree	0.733	0.714	+0.019	Conspiracy users marginally more connected
Graph Density	0.015	0.009	+0.006	Conspiracy 66% denser - more interconnected
Connected Components	32	62	-30 components	Critical finding: Conspiracy much more cohesive
Modularity	0.119	0.202	-0.083	Normal has clearer community boundaries

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Major Structural Differences

1. Cohesion Gap

- Conspiracy: 32 components → Tightly connected, resistant to fragmentation
- Normal: 62 components → Highly fragmented, decentralized discussions
- Implication: Misinformation networks maintain structural integrity that normal conversations lack

2. Density Disparity

- Conspiracy network is significantly denser (0.015 vs 0.009)
- Implication: More cross-talk and interaction within conspiracy communities
- May facilitate faster information spread and reinforcement

3. Community Structure Paradox

- Normal network shows higher modularity (0.202 vs 0.119)
- Implication: Conspiracy discussions are more homogenized across the network
- Normal conversations occur in more distinct topical clusters

4. Scale Similarity

- Nearly identical node counts (90 vs 84) and edge counts (66 vs 60)
- Implication: Structural differences aren't due to size but to connection patterns