Name: Nadine Rasmy Soliman Id:2205203

Apply a layout to visualize each network clearly.

1.ForceAltas 2

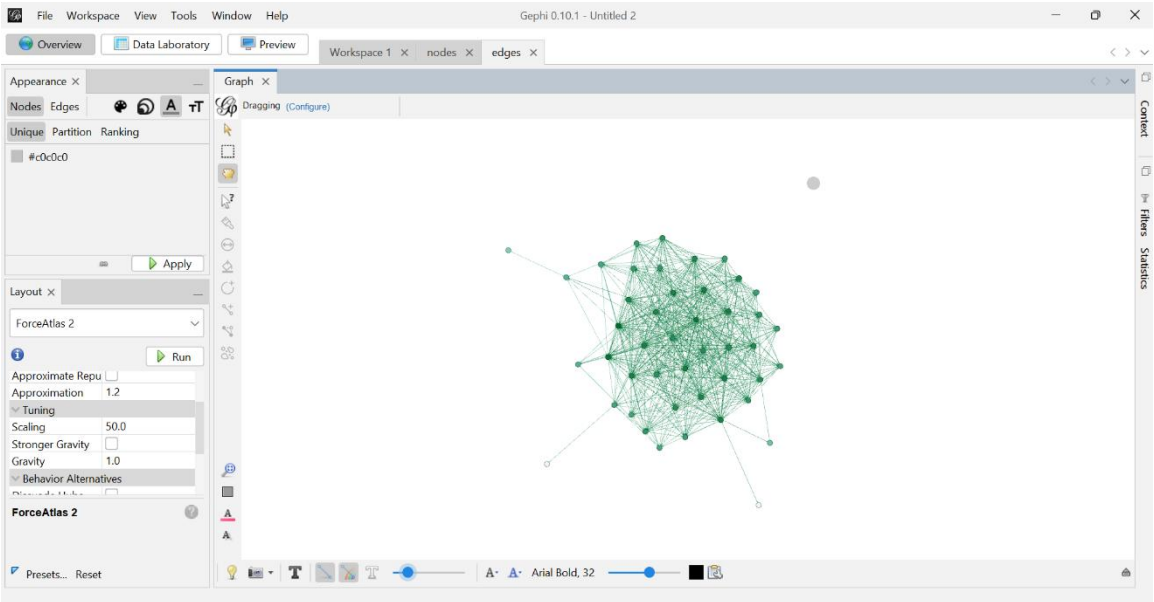
ForceAtlas2 is a graph layout algorithm commonly used in Gephi.
It positions nodes in a way that makes the structure of the network easy to understand.

How it works

- Nodes repel each other like charged particles.
- Edges attract nodes like springs pulling connected nodes together.

What you should observe

- Dense clusters = strong community structure
- Central nodes = important/highly connected accounts
- Outer nodes = less influential or isolated accounts



2.Modularity class Apperance

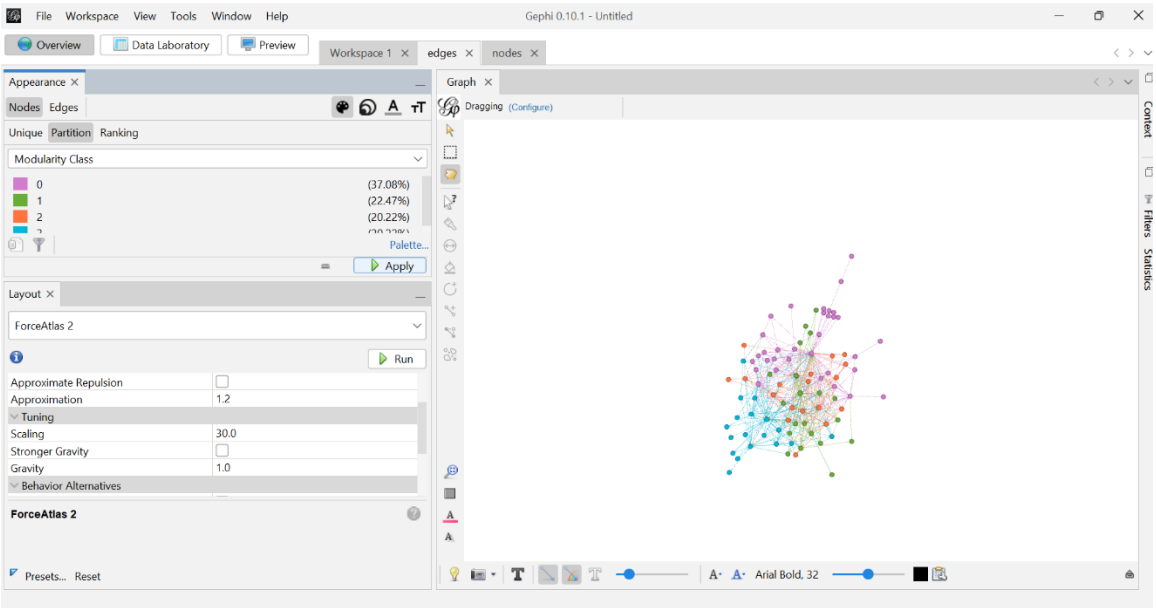
Modularity class is a community detection technique that groups nodes based on how densely connected they are to each other.

Key idea

- Nodes that have many internal connections form a community.
- Modularity assigns each node a class number representing its community.

Modularity (Q) Value

- Q ranges from 0 to 1
- Higher Q = stronger community structure
- Q > 0.3 is usually considered good

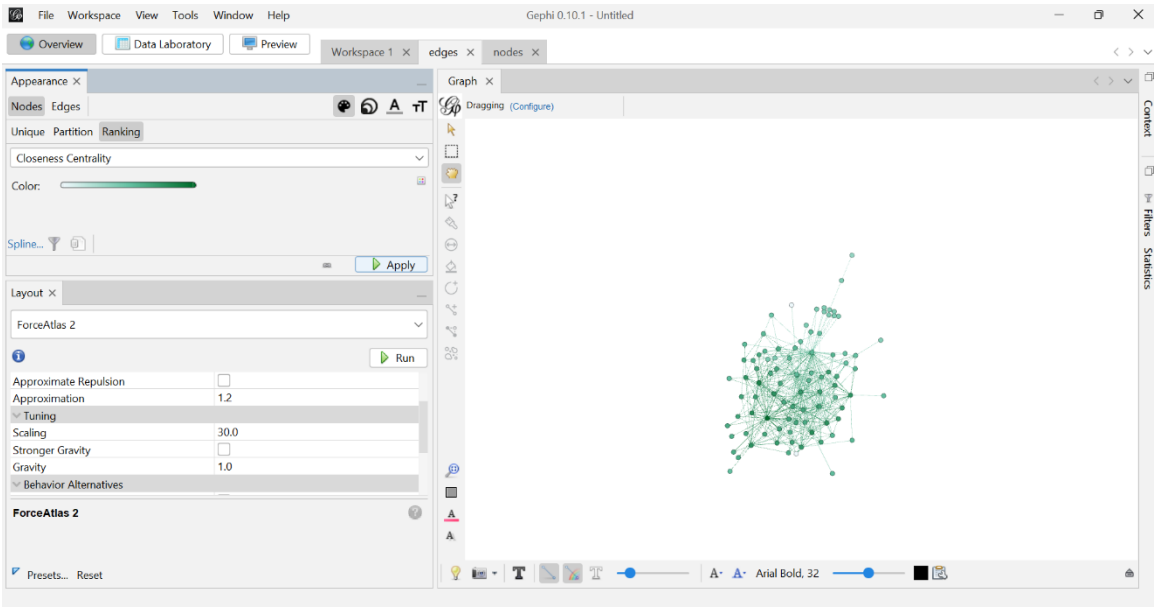


3. closeness centrality

Closeness centrality measures how close a node is to all other nodes in the network.

Interpretation

- High closeness = the node can reach all others very quickly
- Low closeness = the node is far from many nodes



Run Statistics for the following metrics on graph

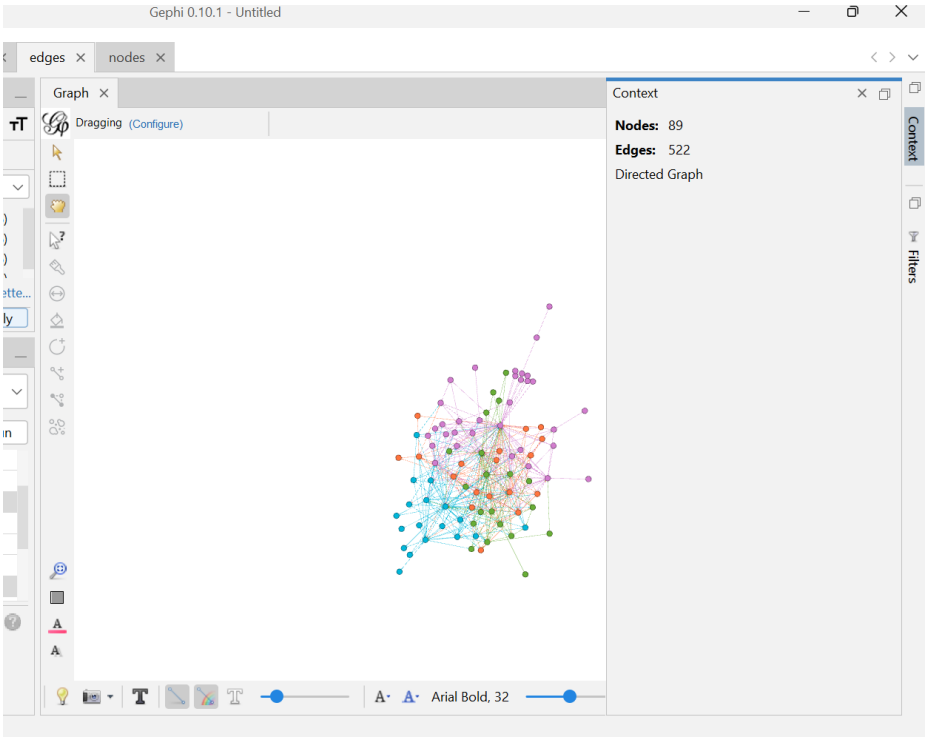
1.Number of nodes and edges

Represent Twitter users.

Edges

Represent interactions such as:

- Retweets
- Mentions
- Replies
- Follows



2.Average degree /Graph density/Average clustering coefficient/Modularity (Q) and number of communities / Connected components

Average degree = average number of connections per node.

Interpretation

- High average degree → highly interactive community
- Low average degree → sparse, disconnected network

Graph density tells you how many edges exist compared to how many *could* exist.

Meaning

- High density → many nodes are interconnected
- Low density → network is sparse

Clustering coefficient measures how likely a node's neighbors are to also be connected to each other.

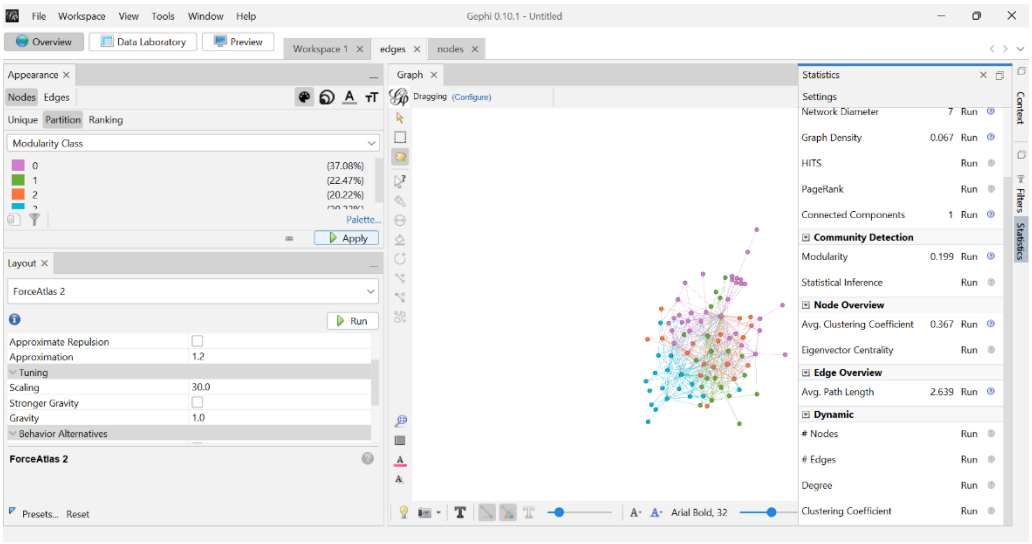
Interpretation

- High coefficient → tightly-knit clusters (echo chambers)
- Low coefficient → loosely connected nodes

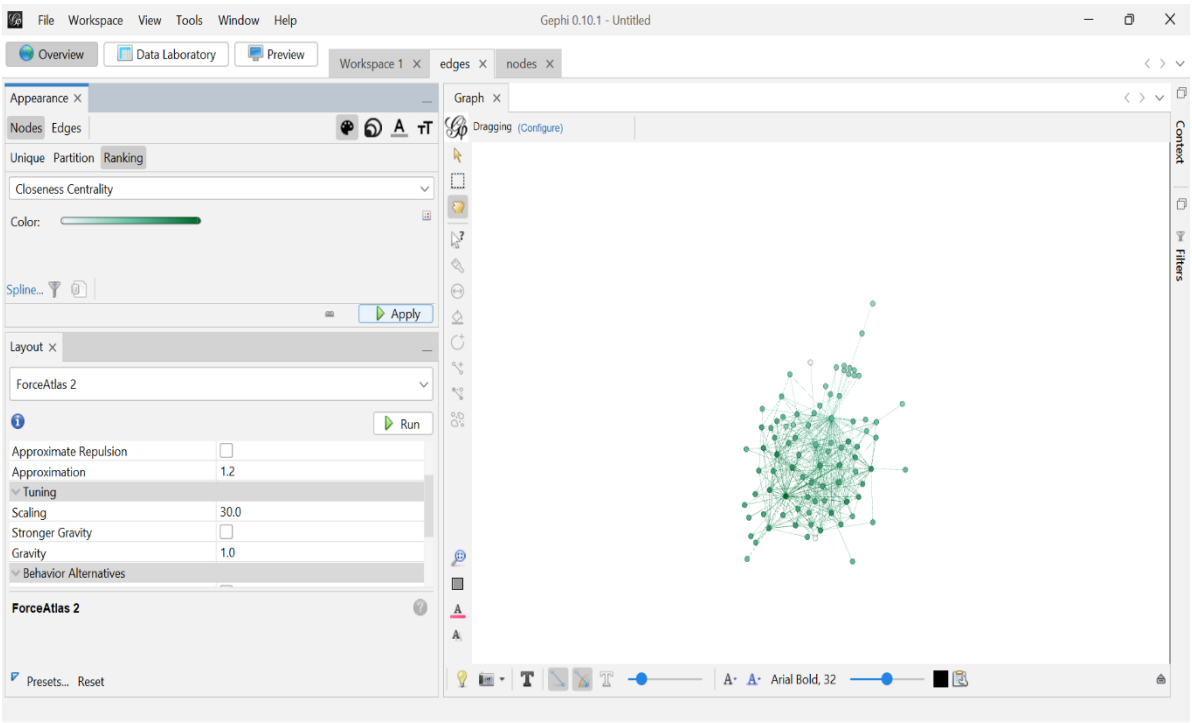
Connected component is a subgraph where all nodes can reach each other.

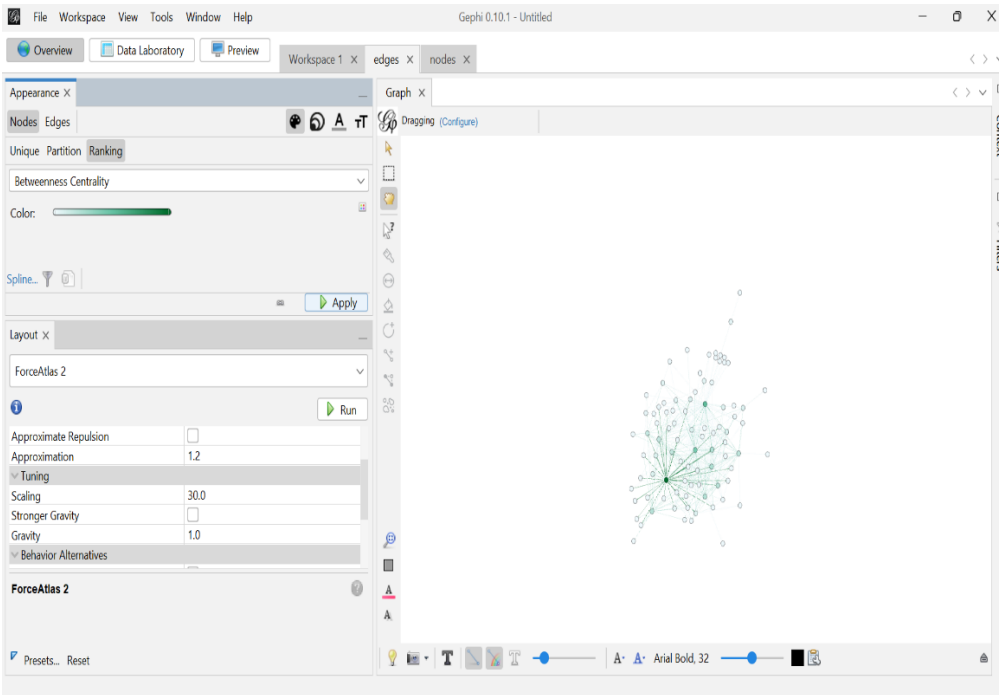
Meaning

- 1 connected component = everyone is connected somehow
- Many components = isolated subgraphs



3.Betweenness and closeness centrality





Fake follower/several node

Betweenness centrality measures how often a node lies on the shortest path between other nodes.

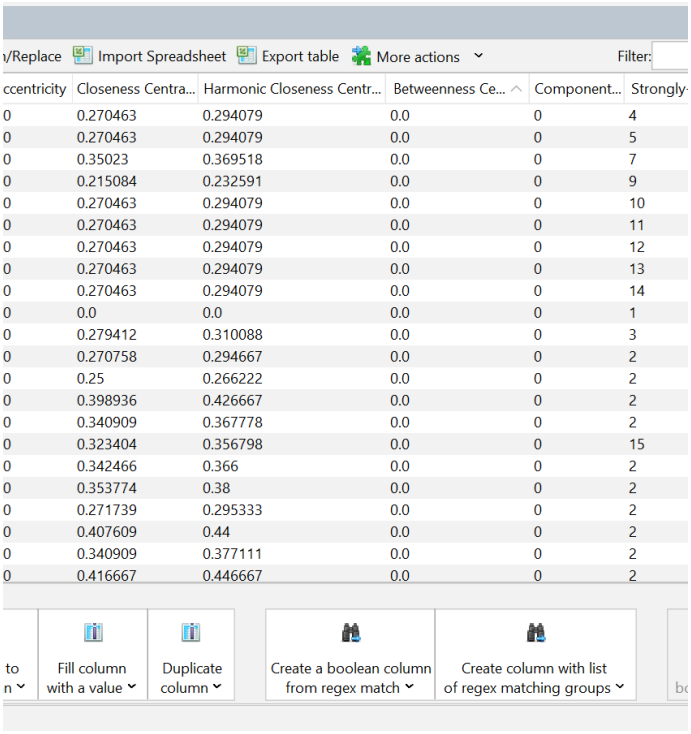
High betweenness

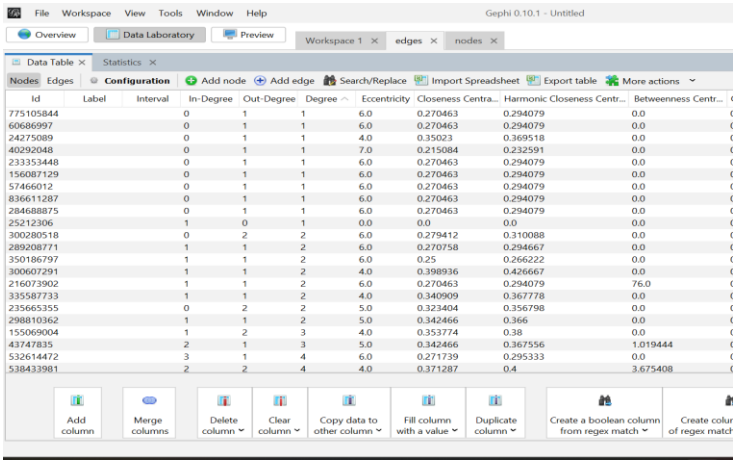
- Acts as a bridge between communities
- Influential in spreading information

Low betweenness

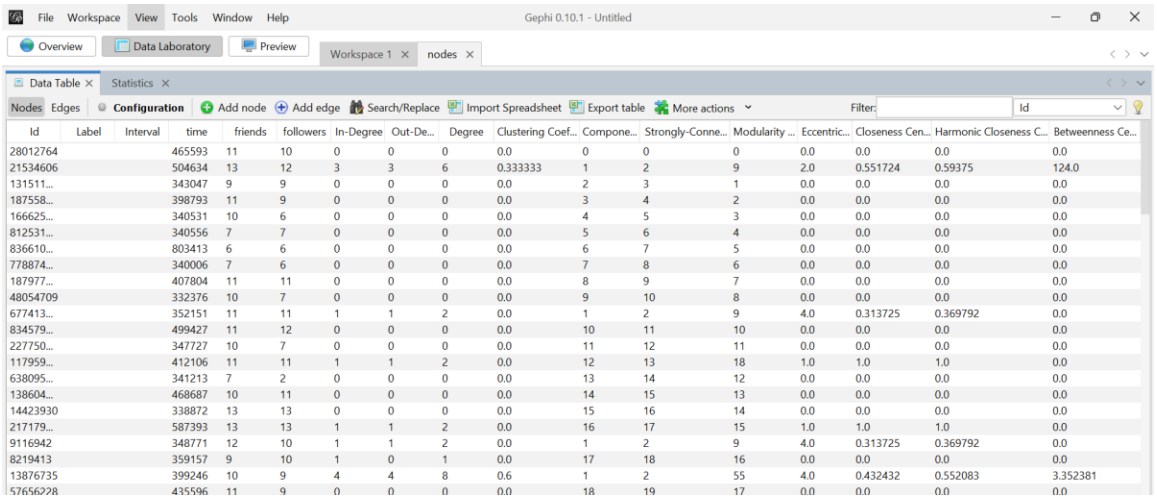
- Not a connector
- More isolated or irrelevant

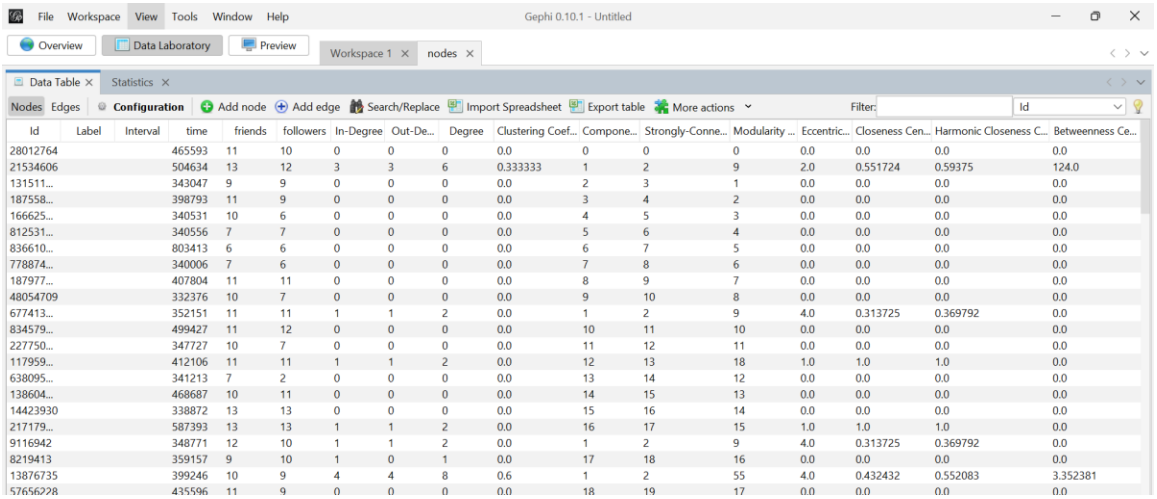
Closeness Centrality is the same metric mentioned earlier but now inside statistical analysis—you must run it and collect numbers.

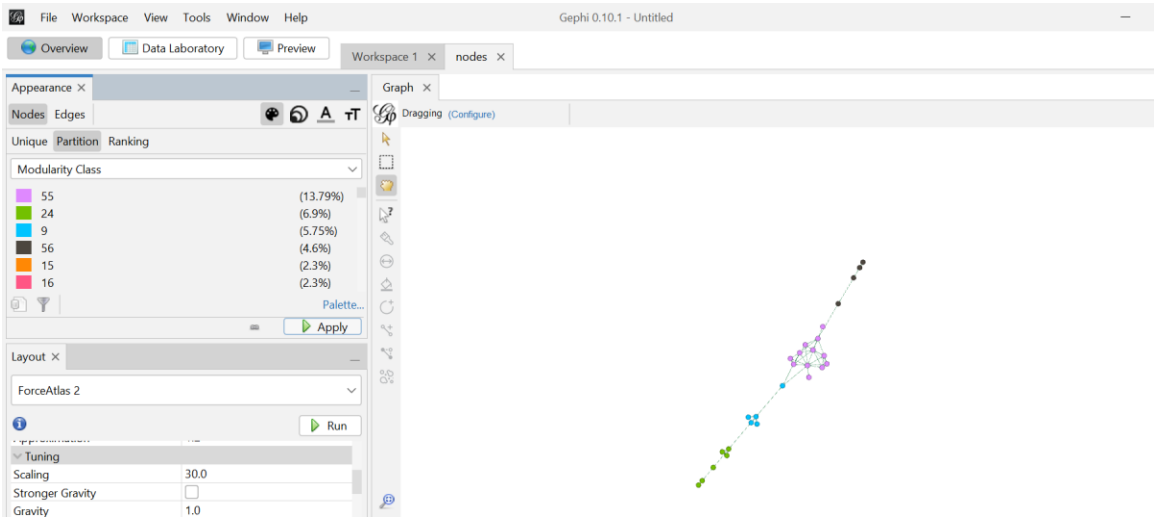




5G_Conspiracy_Graphs







1. 5G Conspiracy Graph (Misinformation Network)

- The network depends on a few key influencer accounts.
- Most users are not connected to each other (low clustering).
- The graph is highly modular with many small groups.
- Betweenness is very high for a small number of nodes → they control information flow.
- Overall structure is centralized and coordinated.

2. Non-Conspiracy Graph (Normal Network)

- Users interact more naturally with each other.
- Higher clustering → real conversations and circles of users.
- Degree is more evenly distributed (no single dominant influencers).
- Betweenness is spread across many nodes.
- Structure is more connected, organic, and balanced.

3. Comparison

Metric	5G (Misinformation)	Normal
Connectivity	Low	High
Clustering	Low	High
Influence distribution	Few nodes dominate	Distributed
Structure	Centralized	Networked
Communities	Many fragmented groups	Natural communities

4. Conclusion

Misinformation networks are centralized, fragmented, and controlled by a few accounts, while normal networks are healthy, well-connected, and organically formed.