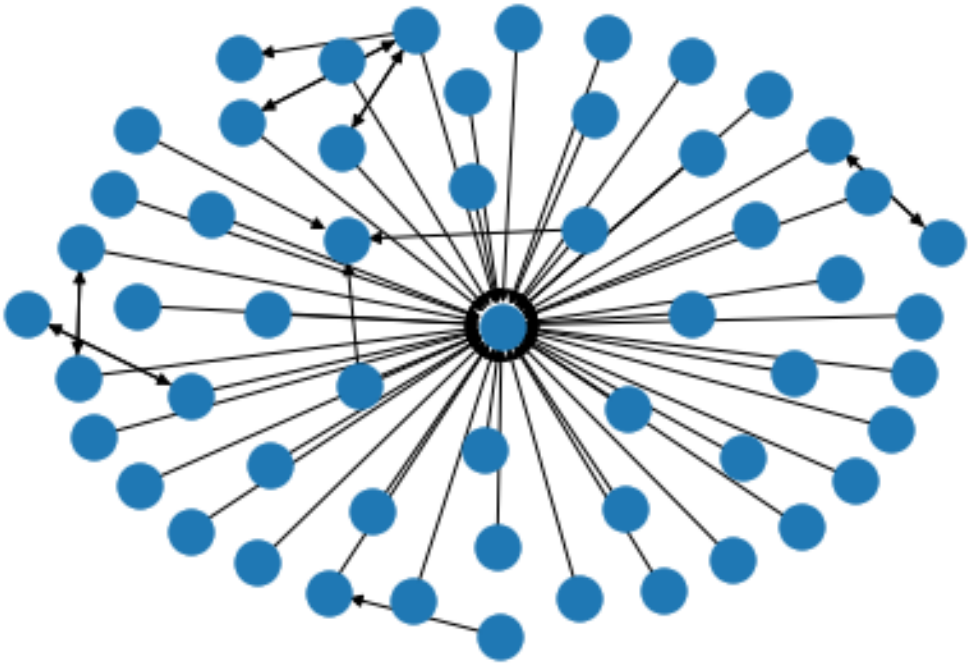
Social Networks Assignment Report

Analyze two real Twitter communities from the **WICO Graph Dataset**
one from the **5G_Conspiracy_Graphs** folder 5 (misinformation cluster) and one from the **Non_Conspiracy_Graphs** folder 50 (normal cluster).

Nodes (Dots): Represent individual **Twitter users.**

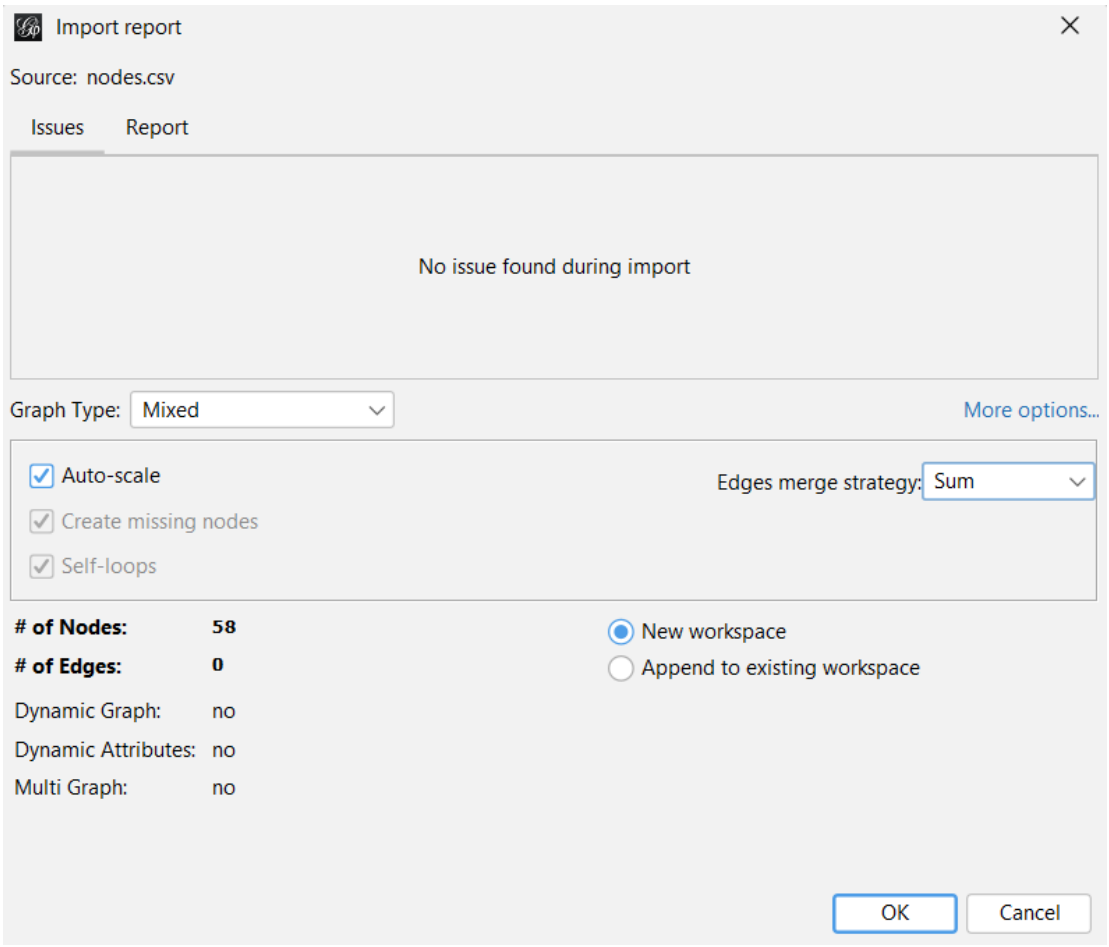
Edges (Lines): Represent **interactions** between those users (such as retweets, mentions, or follows).

1. **5G_Conspiracy_Graphs** folder 5
    a. This graph represents a **misinformation cluster**. It visualizes a group of users discussing **5G conspiracy theories**.

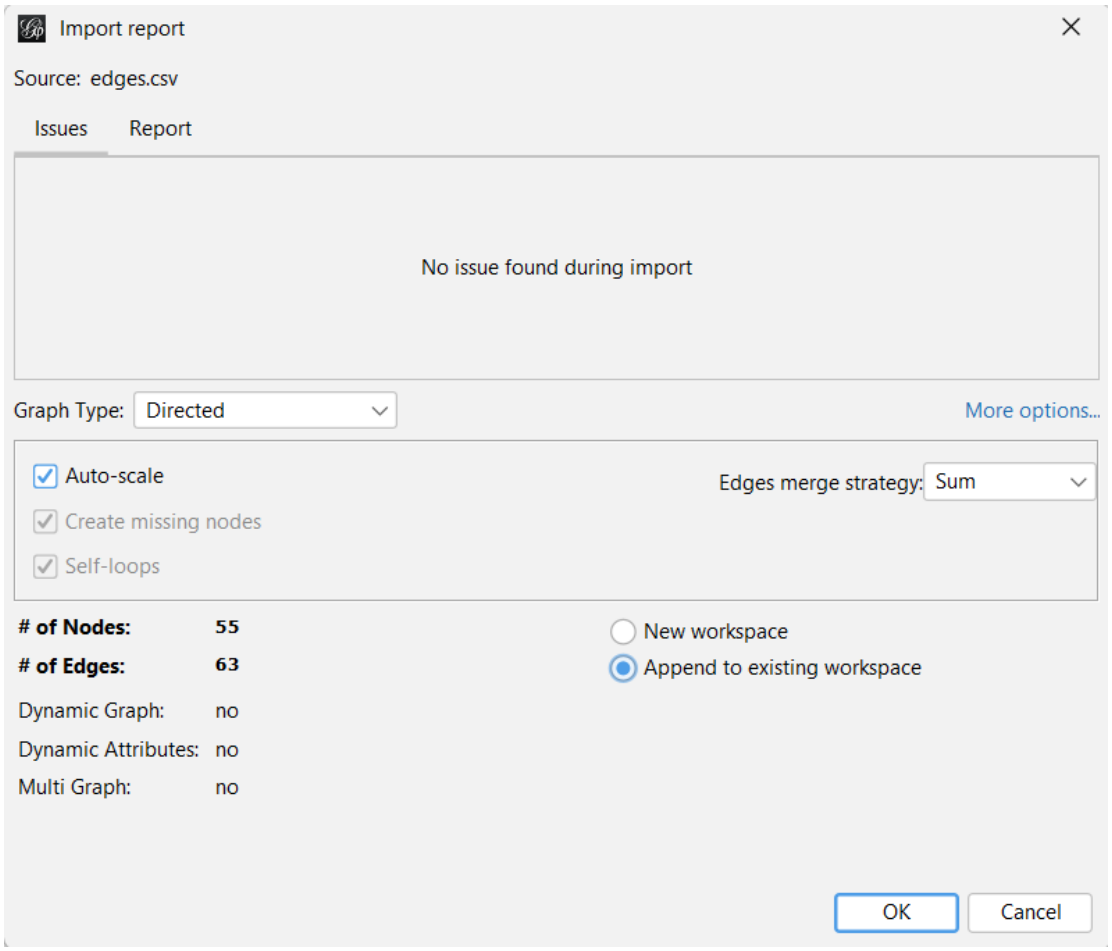


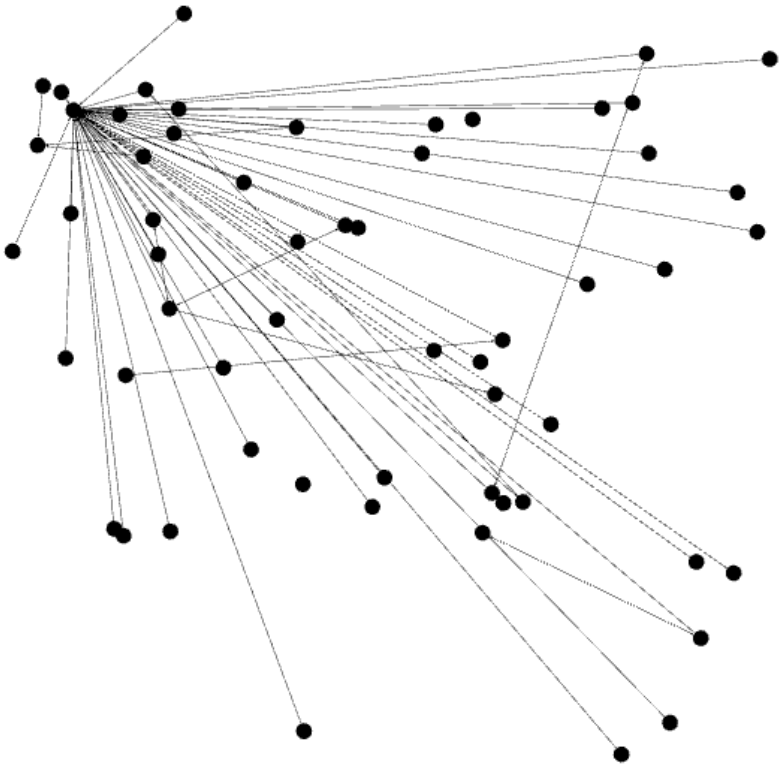
    b.

c.


Import report
Source: nodes.csv
Issues
Report
No issue found during import
Graph Type: Mixed
More options...
Auto-scale
Edges merge strategy: Sum
Create missing nodes
Self-loops
# of Nodes: 58
# of Edges: 0
Dynamic Graph: no
Dynamic Attributes: no
Multi Graph: no
New workspace
Append to existing workspace
OK
Cancel

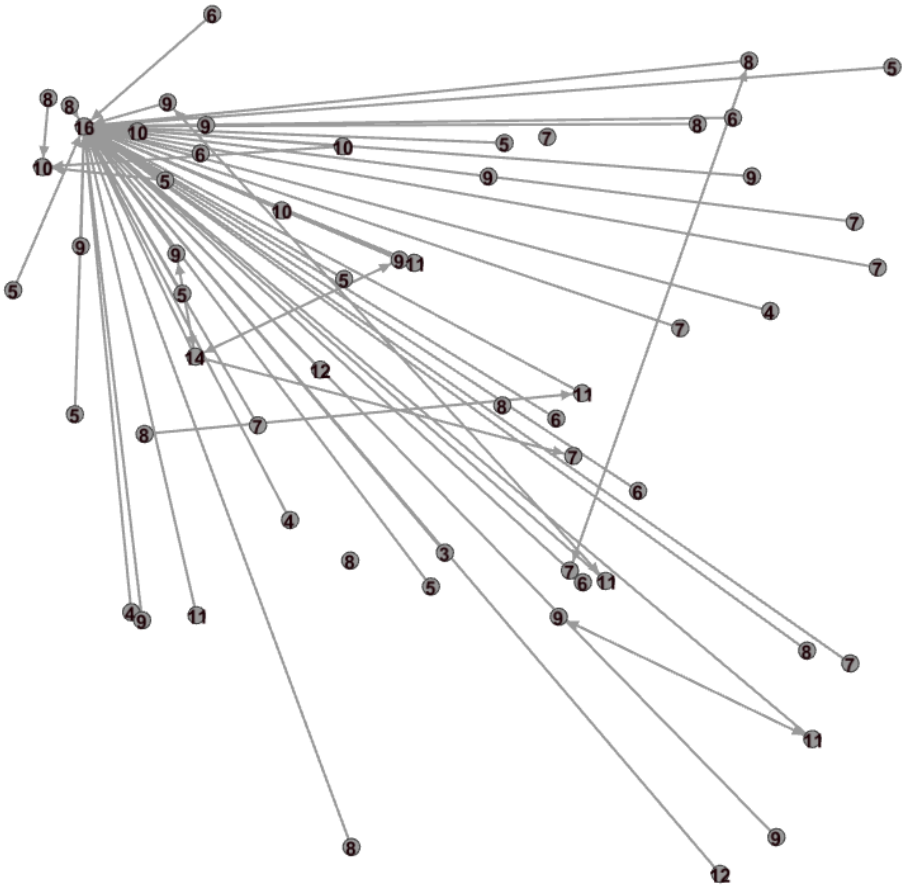
d.


Import report
Source: edges.csv
Issues
Report
No issue found during import
Graph Type: Directed
More options...
Auto-scale
Create missing nodes
Self-loops
Edges merge strategy: Sum
# of Nodes: 55
# of Edges: 63
Dynamic Graph: no
Dynamic Attributes: no
Multi Graph: no
New workspace
Append to existing workspace
OK
Cancel



e.

f.



g.

Data Table

Nodes | Edges | Configuration | Add node | Add edge | Search/Replace | Import Spreadsheet | Export table | More actions | Filter: | Id

Id	Label	Interval	time	friends	followers
127759828			0	8	16
14725222			76570	14	14
51851073			2379	8	12
152481993			1270	12	12
152788468			49	12	11
152604227			13000	11	11
17308973			82009	10	11
147911719			1233	11	11
136602858			55451	12	11
152578933			1982	10	10
152532146			38543	7	10
58294711			1709	11	10
152734644			55574	11	10
152729609			8527	9	9
581394711			1398	8	9
152519941			82084	9	9
90573128			6162	9	9

h.

Nodes: 58

Edges: 63

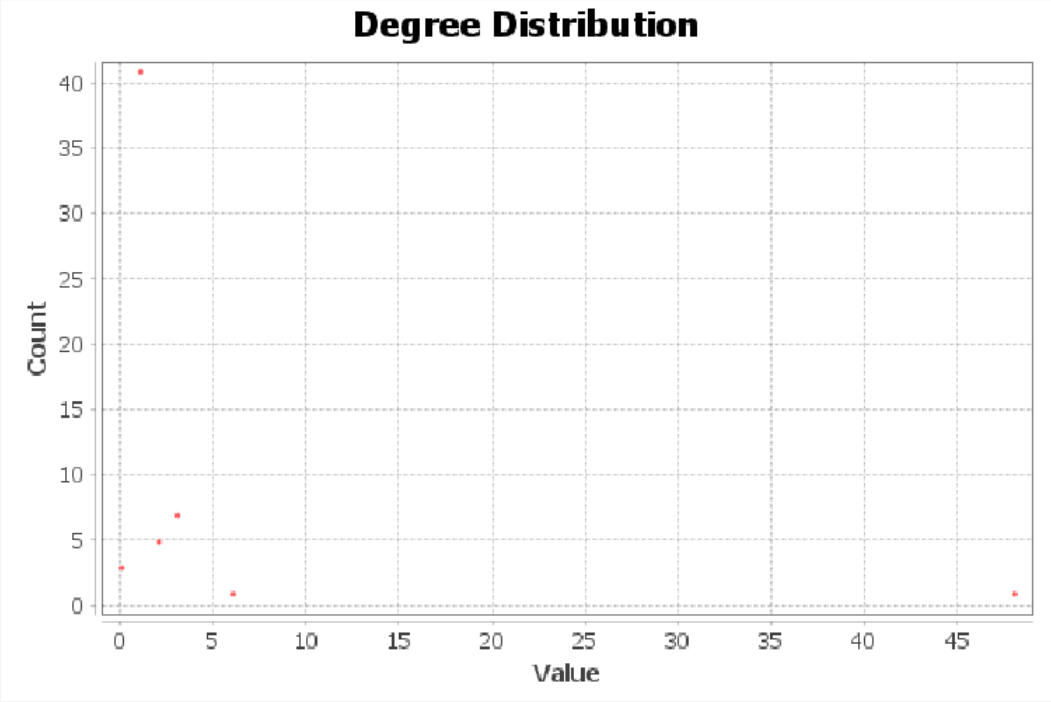
Directed Graph

i.

Average Degree 1.086 Run

Results:

Average Degree: 1.086



Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree
14725222			76570	14	14	2	4
90573128			6162	9	9	1	2
152604227			13000	11	11	1	2
17308973			82009	10	11	1	2
42123433			2914	11	9	1	2
152911924			976	9	8	1	2
65393165			28862	11	9	1	2
58294711			1709	11	10	0	2
421476976			20	6	5	0	2
152820950			10698	8	7	1	1
152519941			82084	9	9	1	1
147911719			1233	11	11	1	1
758015761			28830	5	5	0	1
152820237			2460	8	7	0	1
152523030			76281	6	3	0	1

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree
127759828			0	8	16	48	0	48
14725222			76570	14	14	2	4	6
90573128			6162	9	9	1	2	3
152604227			13000	11	11	1	2	3
17308973			82009	10	11	1	2	3
42123433			2914	11	9	1	2	3
152911924			976	9	8	1	2	3
65393165			28862	11	9	1	2	3
152532146			38543	7	10	3	0	3
58294711			1709	11	10	0	2	2
421476976			20	6	5	0	2	2
152820950			10698	8	7	1	1	2
152519941			82084	9	9	1	1	2
147911719			1233	11	11	1	1	2
758015761			28830	5	5	0	1	1
152820237			2460	8	7	0	1	1
152523030			76281	6	3	0	1	1
152729609			8527	9	9	0	1	1
4305315			21561	11	8	0	1	1
152447167			61920	7	4	0	1	1
36281620			31195	10	8	0	1	1
581394711			1398	8	9	0	1	1
152788468			49	12	11	0	1	1

j.

Graph Density Report

Parameters:

Network Interpretation: directed

Results:

Density: 0.019

Graph Density Report

Parameters:

Network Interpretation: undirected

Results:

Density: 0.035

k.

Clustering Coefficient Metric Report

Parameters:

Network Interpretation: directed

Results:

Average Clustering Coefficient: 0.037
The Average Clustering Coefficient is the mean value of individual coefficients.

Clustering Coefficient Metric Report

Parameters:

Network Interpretation: undirected

Results:

Average Clustering Coefficient: 0.361
Total triangles: 3
The Average Clustering Coefficient is the mean value of individual coefficients.

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree	Clustering Coefficient
90573128			6162	9	9	1	2	3	0.5
152604227			13000	11	11	1	2	3	0.5
42123433			2914	11	9	1	2	3	0.5
65393165			28862	11	9	1	2	3	0.5
14725222			76570	14	14	2	4	6	0.166667
127759828			0	8	16	48	0	48	0.00266
758015761			28830	5	5	0	1	1	0.0
152820237			2460	8	7	0	1	1	0.0
152523030			76281	6	3	0	1	1	0.0
152729609			8527	9	9	0	1	1	0.0
152820950			10698	8	7	1	1	2	0.0
4305315			21561	11	8	0	1	1	0.0

l.

Modularity Report

Parameters:

Randomize: On
Use edge weights: On
Resolution: 1.0

Results:

Modularity: 0.264
Modularity with resolution: 0.264
Number of Communities: 10

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree	Clustering Coefficient	Number of triangles	Modularity Class
144835023			63513	8	8	0	0	0	0.0	0	9
152604227			13000	11	11	1	2	3	0.5	1	8
42123433			2914	11	9	1	2	3	0.5	1	8
147911719			1233	11	11	1	1	2	0.0	0	7
152580962			10142	10	8	0	1	1	0.0	0	7
152504399			50291	9	8	0	1	1	0.0	0	6
152532146			38543	7	10	3	0	3	0.0	0	6
58294711			1709	11	10	0	2	2	0.0	0	6
421476976			20	6	5	0	2	2	0.0	0	6
152519941			82084	9	9	1	1	2	0.0	0	5
17308973			82009	10	11	1	2	3	0.0	0	5
758015761			28830	5	5	0	1	1	0.0	0	4
152820237			2460	8	7	0	1	1	0.0	0	4
152523030			76281	6	3	0	1	1	0.0	0	4
152729609			8527	9	9	0	1	1	0.0	0	4
4305315			21561	11	8	0	1	1	0.0	0	4
152447167			61920	7	4	0	1	1	0.0	0	4
36281620			31195	10	8	0	1	1	0.0	0	4
581394711			1398	8	9	0	1	1	0.0	0	4
152788468			49	12	11	0	1	1	0.0	0	4
51851073			2379	8	12	0	1	1	0.0	0	4
634016064			19878	10	8	0	1	1	0.0	0	4
833312122			67087	7	6	0	1	1	0.0	0	4
758005371			74983	9	7	0	1	1	0.0	0	4

m. Gephi calculates Betweenness and Closeness Centrality inside the "Network Diameter" function

Graph Distance Report

Parameters:

Network Interpretation: directed

Results:

Diameter: 2
Radius: 0
Average Path length: 1.1

Graph Distance Report

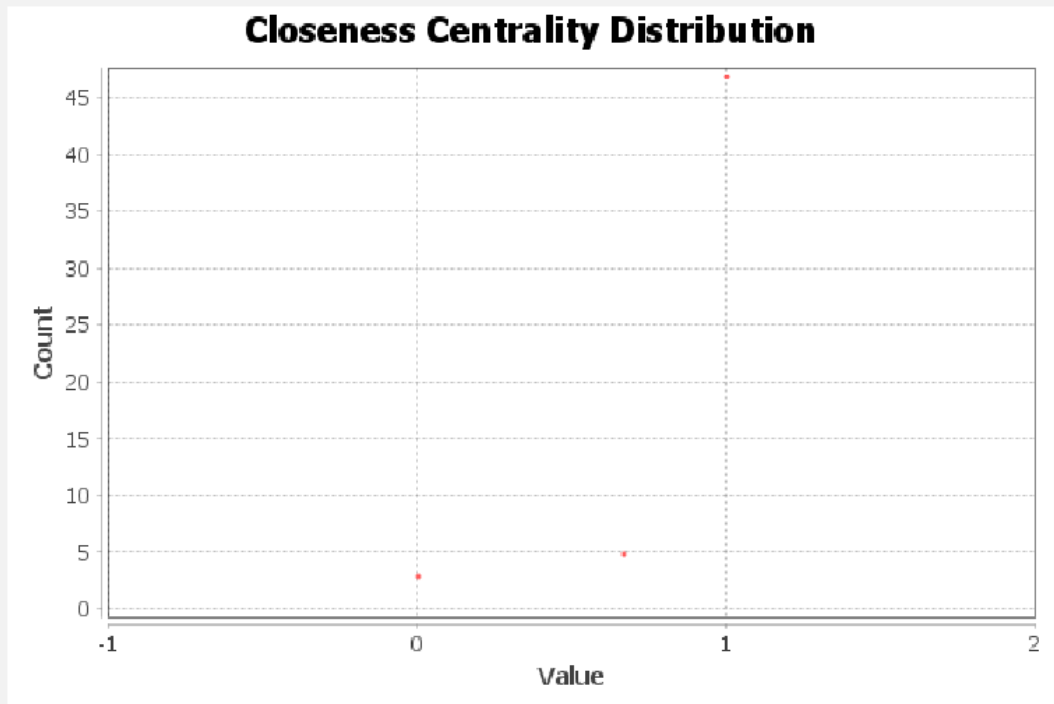
Parameters:

Network Interpretation: undirected

Results:

Diameter: 5
Radius: 0
Average Path length: 2.2013468013468014

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree	Clustering Coefficie...	...	...	Eigenvector Centrality	...	Closeness Centrality	Harmonic Closeness Centrality	Betweenness Centrality
127759828			0	8	16	48	0	48	0.00266	3	4	1.0	...	0.885246	0.941358	1416.0
14725222			76570	14	14	2	4	6	0.166667	2	2	0.177955	...	0.490909	0.520062	53.5
152532146			38543	7	10	3	0	3	0.0	0	6	0.033715	...	0.339623	0.367284	53.5
17308973			82009	10	11	1	2	3	0.0	0	5	0.054507	...	0.482143	0.501543	53.0
147911719			1233	11	11	1	1	2	0.0	0	7	0.011238	...	0.482143	0.501543	53.0
152911924			976	9	8	1	2	3	0.0	0	0	0.054507	...	0.482143	0.501543	53.0
58294711			1709	11	10	0	2	2	0.0	0	6	0.0	...	0.490909	0.506173	51.0
421476976			20	6	5	0	2	2	0.0	0	6	0.0	...	0.490909	0.506173	51.0
90573128			6162	9	9	1	2	3	0.5	1	2	0.125356	...	0.482143	0.501543	0.0
65393165			28862	11	9	1	2	3	0.5	1	2	0.125356	...	0.482143	0.501543	0.0
152604227			13000	11	11	1	2	3	0.5	1	8	0.054507	...	0.477876	0.498457	0.0
42123433			2914	11	9	1	2	3	0.5	1	8	0.054507	...	0.477876	0.498457	0.0
758015761			28830	5	5	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
152820237			2460	8	7	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
152523030			76281	6	3	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
152729609			8527	9	9	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
4305315			21561	11	8	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
152447167			61920	7	4	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
36281620			31195	10	8	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0
581394711			1398	8	9	0	1	1	0.0	0	4	0.0	...	0.473684	0.489198	0.0



n.

Connected Components Report

Parameters:

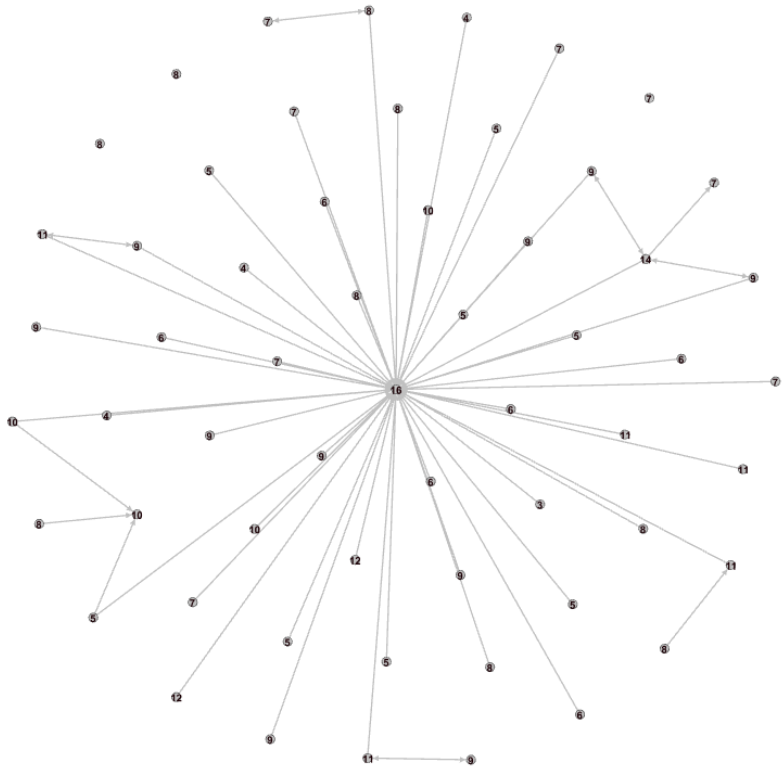
Network Interpretation: directed

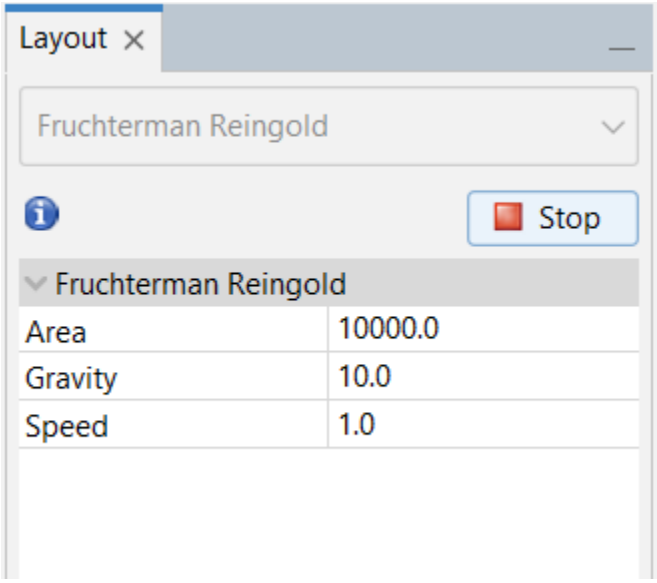
Results:

Number of Weakly Connected Components: 4
Number of Strongly Connected Components: 53

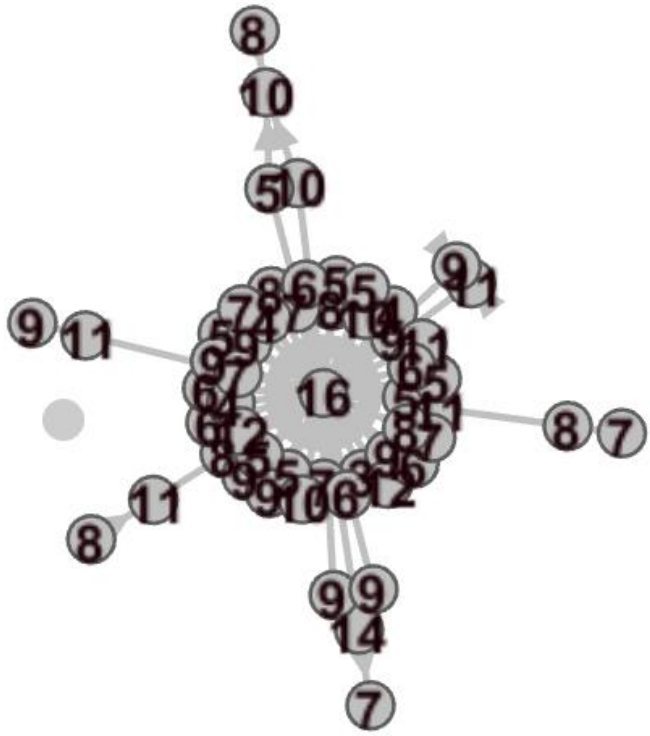
Id	Label	Interval	time	friends	followers	In-Degree	Out-Degr...	Degree	Clustering Coeffi...	Number of tria...	Modularity ...	Eigenvector Cent...	Eccentrici...	Closeness Centr...	Harmonic Closeness Ce...	...	...	Strongly-Connected ID
22433354...			34619	8	6	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	52
15273464...			55574	11	10	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	51
3340889			1902	9	7	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	50
13660285...			55451	12	11	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	49
15248199...			1270	12	12	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	48
41677186			4981	9	6	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	47
15257564...			70	8	9	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	46
14483502...			63513	8	8	0	0	0	0.0	0	9	0.0	0.0	0.0	0.0	...	3	45
42147697...			20	6	5	0	2	2	0.0	0	6	0.0	3.0	0.490909	0.506173	...	0	44
42148030...			137532	7	4	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	43
81779618...			96822	9	8	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	42
58294711			1709	11	10	0	2	2	0.0	0	6	0.0	3.0	0.490909	0.506173	...	0	41
42154163...			1986	7	5	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	40
15266037...			33686	7	6	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	39
42145602...			55	9	7	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	38
15258096...			10142	10	8	0	1	1	0.0	0	7	0.0	5.0	0.327273	0.340123	...	0	37
58380028			2618	8	5	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	36
83420026...			125187	6	7	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	35
14791171...			1233	11	11	1	1	2	0.0	0	7	0.011238	4.0	0.482143	0.501543	...	0	34
15292825...			136645	7	5	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	33
42146889...			17530	9	9	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	32
83332623...			2658	5	4	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	31
15280869...			626	9	9	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	30
42153415...			1246	9	6	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	29
42148045...			154592	7	6	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	28
42162779...			10775	8	5	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	27
15247388...			69339	10	9	0	1	1	0.0	0	4	0.0	4.0	0.473684	0.489198	...	0	26
15260422...			13000	11	11	1	2	3	0.5	1	8	0.054507	4.0	0.477876	0.498457	...	0	25
42123433			2914	11	9	1	2	3	0.5	1	8	0.054507	4.0	0.477876	0.498457	...	0	25

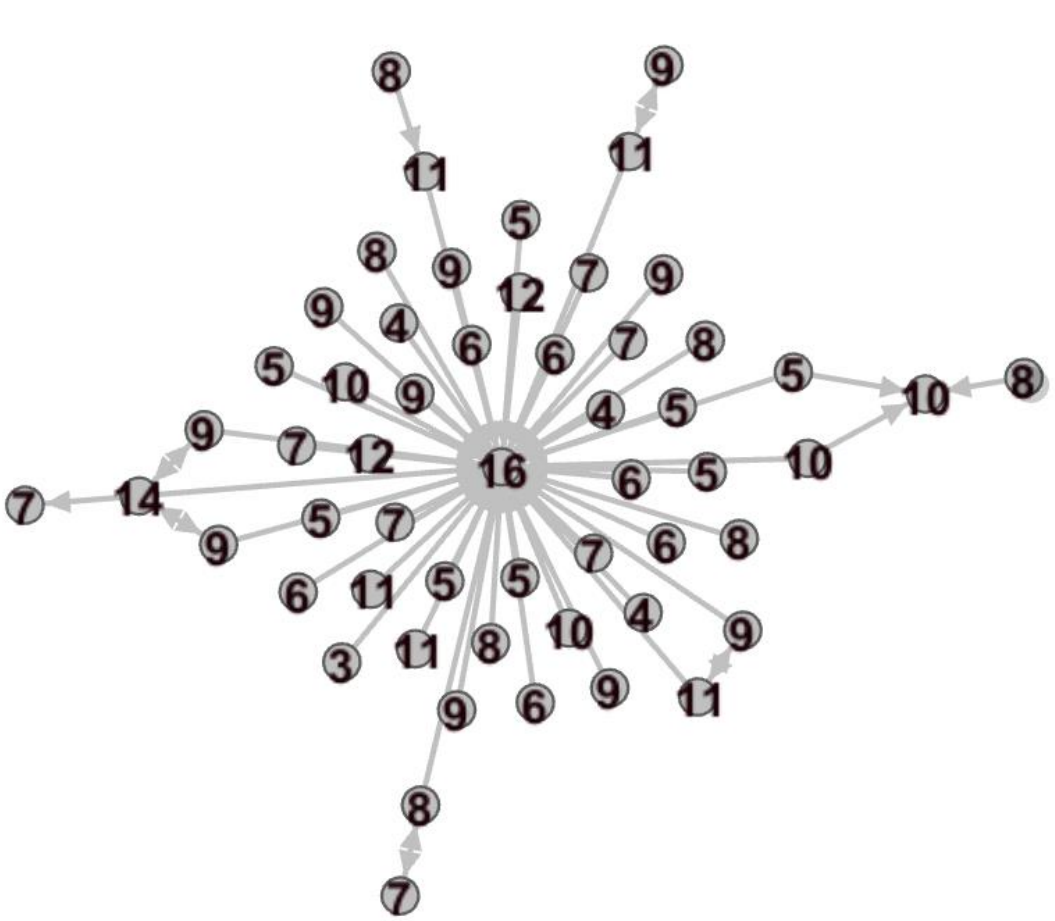
o. Fruchterman Reingold: It creates very pleasing, symmetric, spherical shapes.





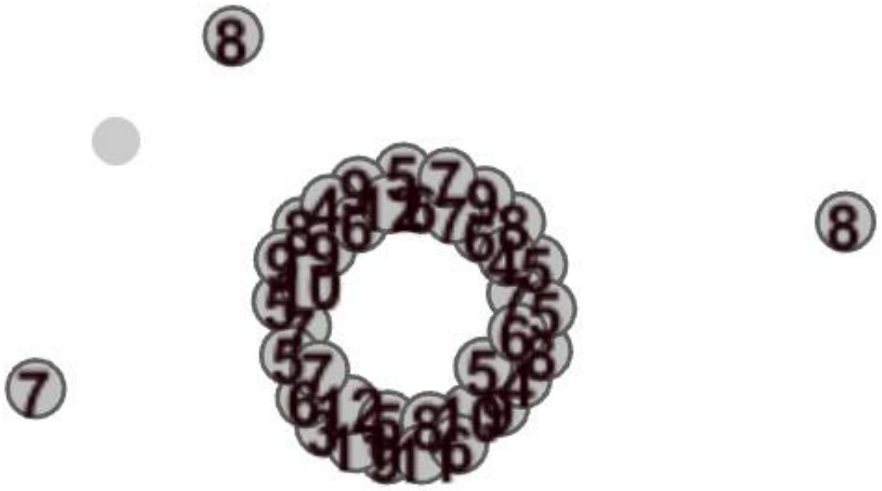
p. ForceAtlas 2:This is the industry standard for social networks. It simulates a physical system where nodes repulse each other like charged particles, but edges attract connected nodes.It is excellent at visualizing "communities" (clustering) and works well with medium-to-large datasets like Twitter graphs.


16

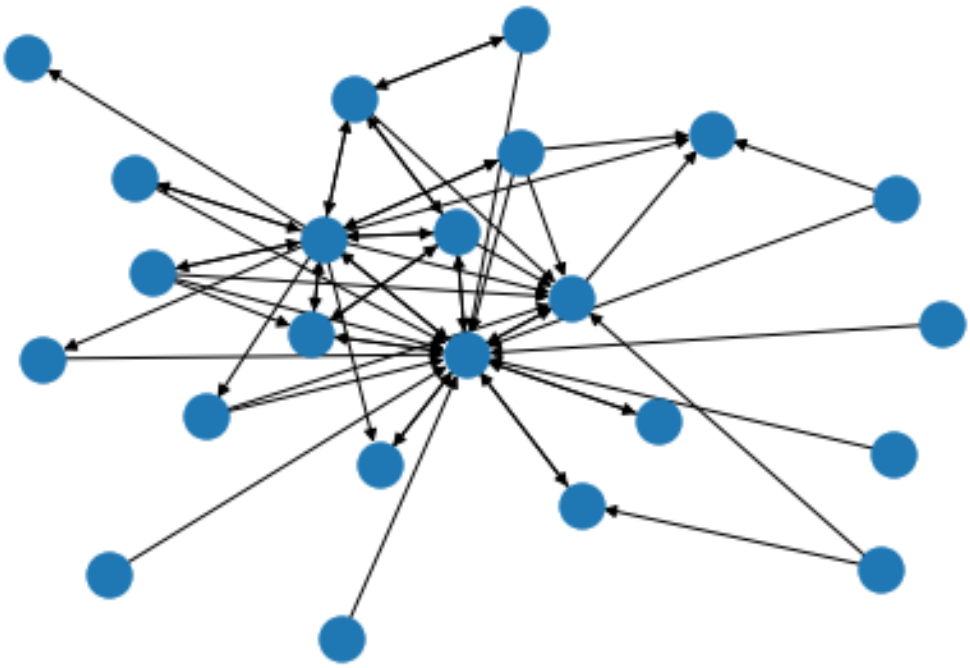


q. This graph represents very low clustering coefficient which means that there are an articulate node which acts as central node which are nearly connected to all other nodes and other nodes are rarely connected to each other which this is highly a botnet doing sybil attack and the central node may be the real one , and the other nodes are fake nodes , we call the central node with very high degree (id = 127795828) is Bot Master, as we have seen by ForceAtlas2 there is central central node surrounded by the rest of nodes it is in the center, there are rarely interactions between other nodes , they are all connected to central node , this is Botnet with fake identities and fake followers,by using ForceAtlas2 then using **Filters** > **Topology** > **Degree** Range and set min to 1 and max to 1 this will appear the fake bots that doesn't interact with each other this appears the whole graph and it deltets

bot master(center node)

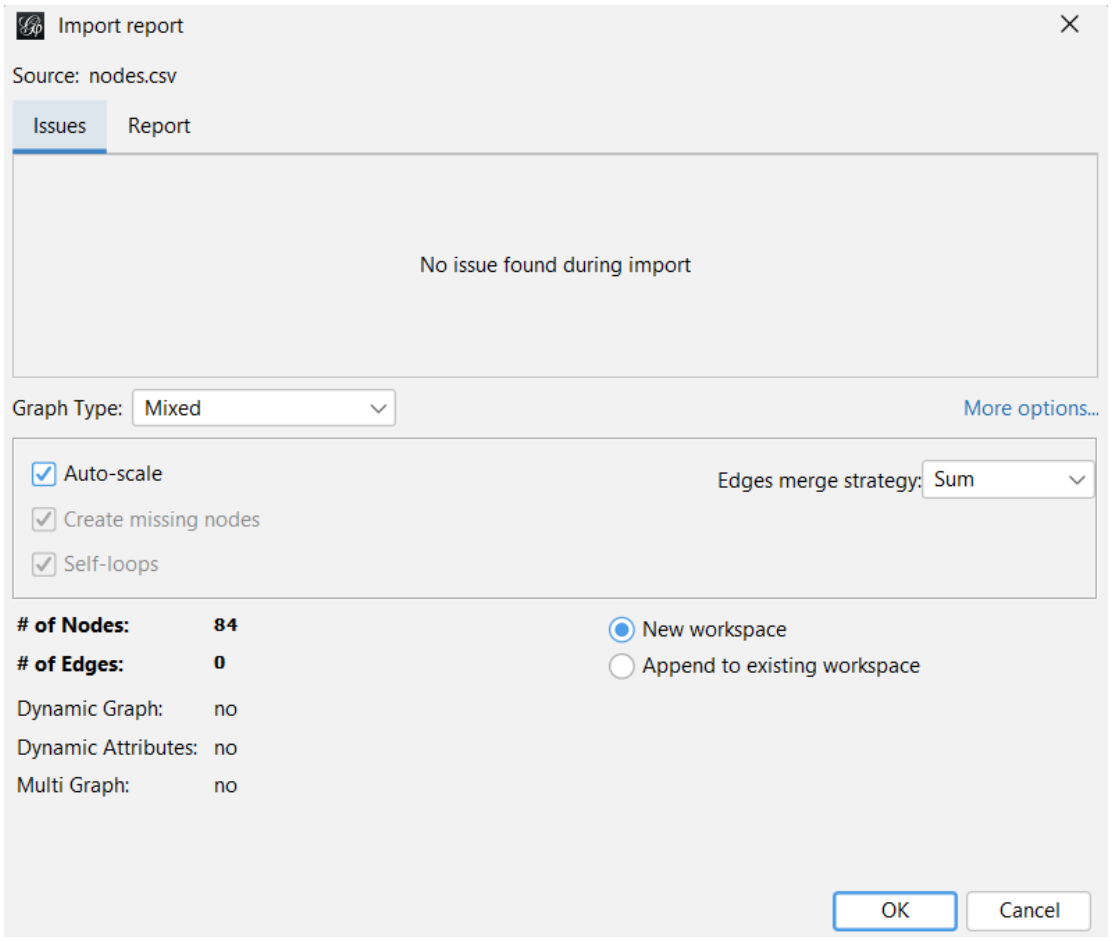


2. **Non_Conspiracy_Graphs** folder 50
    a. This graph represents a **normal cluster**. It visualizes a group of users discussing general, non-conspiracy topics.

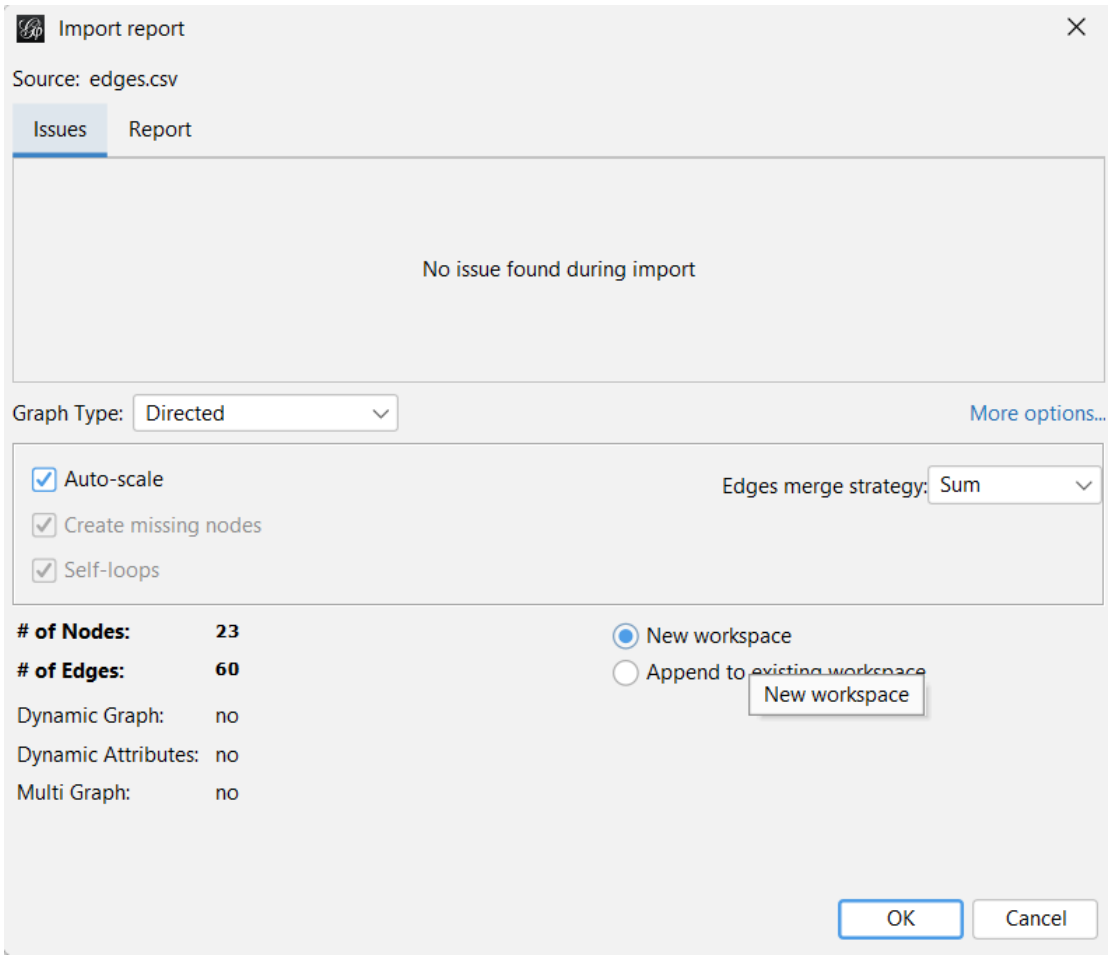


    b.

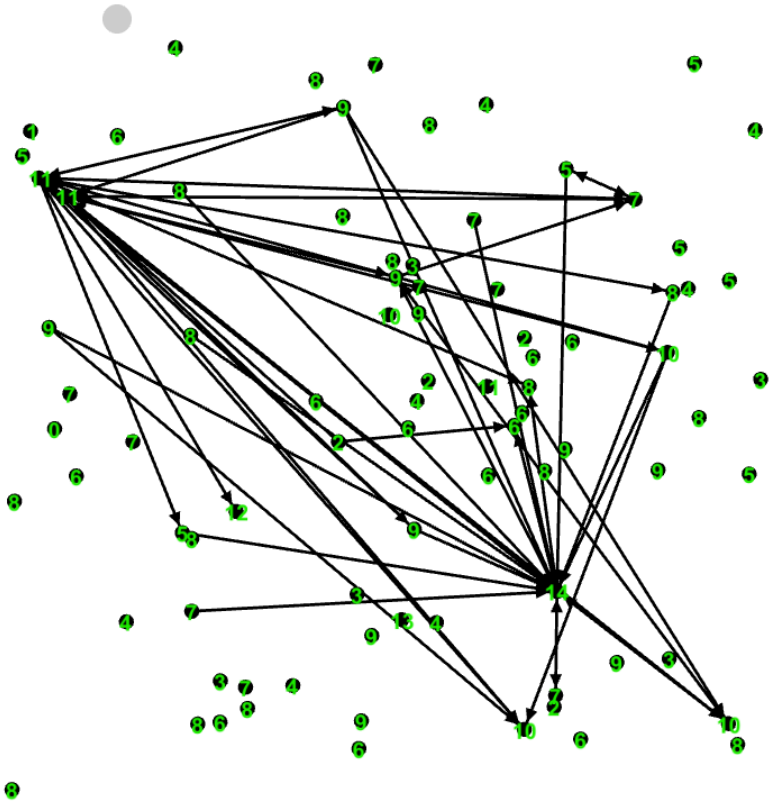
c.


Import report
Source: nodes.csv
Issues
Report
No issue found during import
Graph Type: Mixed
More options...
Auto-scale
Create missing nodes
Self-loops
Edges merge strategy: Sum
# of Nodes: 84
# of Edges: 0
Dynamic Graph: no
Dynamic Attributes: no
Multi Graph: no
New workspace
Append to existing workspace
OK
Cancel

d.


Import report
Source: edges.csv
Issues
Report
No issue found during import
Graph Type: Directed
More options...
Auto-scale
Create missing nodes
Self-loops
Edges merge strategy: Sum
# of Nodes: 23
# of Edges: 60
Dynamic Graph: no
Dynamic Attributes: no
Multi Graph: no
New workspace
Append to existing workspace
New workspace
OK
Cancel

e.



f.

Context ×

Nodes: 84

Edges: 60

Directed Graph

g.

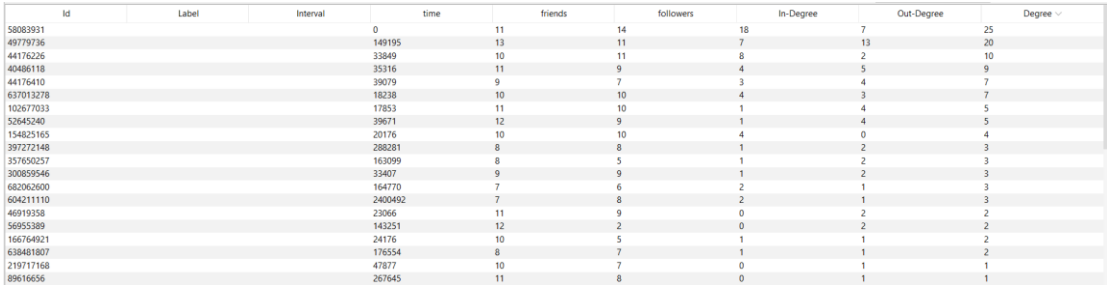
Id	Label	Interval	time	friends	followers
58083931			0	11	14
128359157			49748	9	13
138958176			17376	13	12
24573300			27792	11	11
49779736			149195	13	11
44176226			33849	10	11
236032453			45391	10	10
637013278			18238	10	10
102677033			17853	11	10
154825165			20176	10	10
135176053			33419	6	9
46919358			23066	11	9
39662177			71420	9	9
536330787			17058	9	9
40486118			35316	11	9
300859546			33407	9	9
45078403			22724	9	9
51129656			15534	10	9
52645240			39671	12	9
143136442			139780	11	9
630329394			82359	9	8
397272148			288281	8	8
504820676			18257	8	8
134469270			45613	8	8
271703604			42474	9	8

h.

Degree Report

Results:

Average Degree: 0.714



Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree
58083931			0	11	14	18	7	25
49779736			149195	13	11	7	13	20
44176226			33849	10	11	8	2	10
40486118			35316	11	9	4	5	9
44176410			39079	9	7	3	4	7
637013278			18238	10	10	4	3	7
102677033			17853	11	10	1	4	5
52645240			39671	12	9	1	4	5
154825165			20176	10	10	4	0	4
397272148			288281	8	8	1	2	3
357650257			163099	8	5	1	2	3
300859546			33407	9	9	1	2	3
682062600			164770	7	6	2	1	3
604211110			2400492	7	8	2	1	3
46919358			23066	11	9	0	2	2
56955389			143251	12	2	0	2	2
166764921			24176	10	5	1	1	2
638481807			176554	8	7	1	1	2
219717168			47877	10	7	0	1	1
89616656			267645	11	8	0	1	1

i.

Graph Density Report

Parameters:

Network Interpretation: directed

Results:

Density: 0.009

Graph Density Report

Parameters:

Network Interpretation: undirected

Results:

Density: 0.013

Modularity Report

Parameters:

Randomize: On
Use edge weights: On
Resolution: 1.0

Results:

Modularity: 0.213
Modularity with resolution: 0.213
Number of Communities: 65

j.

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree	Modularity Class
128359157			49748	9	13	0	0	0	64
458160749			163251	6	3	0	0	0	63
836611258			42175	7	6	0	0	0	62
347308247			76500	6	4	0	0	0	61
268778651			39339	10	3	0	0	0	60
80944874			28121	9	8	0	0	0	59
291787073			58117	6	5	0	0	0	58
43694212			46760	9	7	0	0	0	57
634194399			33245	6	7	0	0	0	56
833046544			91951	5	4	0	0	0	55
182588116			15884	9	6	0	0	0	54
57408447			46414	10	7	0	0	0	53
695201177			33137	7	6	0	0	0	52
143136442			139780	11	9	0	0	0	51
262243137			18175	9	5	0	0	0	50
197026756			39984	8	6	0	0	0	49
235841121			725448	5	8	0	0	0	48
24127684			19457	7	5	0	0	0	47
564588393			180485	6	3	0	0	0	46
225130619			35705	8	6	0	0	0	45
679738897			46501	5	1	0	0	0	44

k. Gephi calculates Betweenness and Closeness Centrality inside the "Network Diameter" function

Graph Distance Report

Parameters:

Network Interpretation: directed

Results:

Diameter: 5
Radius: 0
Average Path length: 2.236842105263158

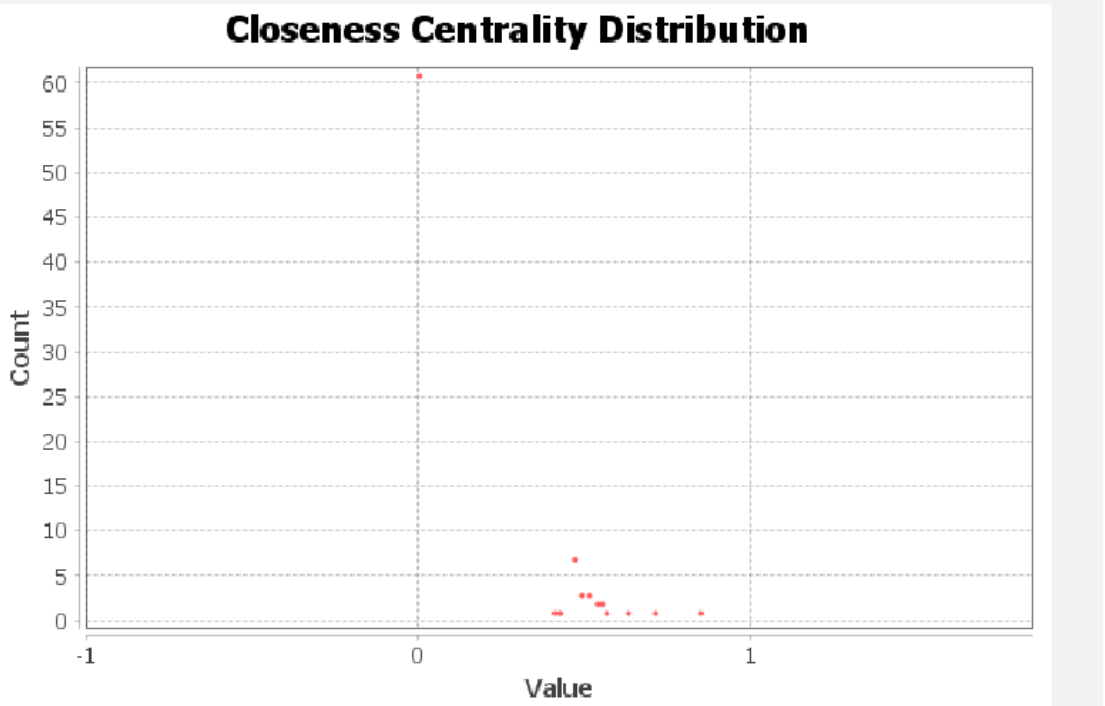
Graph Distance Report

Parameters:

Network Interpretation: undirected

Results:

Diameter: 3
Radius: 0
Average Path length: 1.9604743083003953



Id	Label	Interval	time	friends	followers	In-Degree	Out-Degr...	Degree	Clustering Coeffi...	Number of tria...	...	...	Ecce...	Closeness Centrality
75801576...			28830	5	5	0	1	1	0.0	0	4	...	1.0	1.0
15282023...			2460	8	7	0	1	1	0.0	0	4	...	1.0	1.0
15252303...			76281	6	3	0	1	1	0.0	0	4	...	1.0	1.0
15272960...			8527	9	9	0	1	1	0.0	0	4	...	1.0	1.0
4305315			21561	11	8	0	1	1	0.0	0	4	...	1.0	1.0
15244716...			61920	7	4	0	1	1	0.0	0	4	...	1.0	1.0
36281620			31195	10	8	0	1	1	0.0	0	4	...	1.0	1.0
58139471...			1398	8	9	0	1	1	0.0	0	4	...	1.0	1.0
15278846...			49	12	11	0	1	1	0.0	0	4	...	1.0	1.0
51851073			2379	8	12	0	1	1	0.0	0	4	...	1.0	1.0
63401606...			19878	10	8	0	1	1	0.0	0	4	...	1.0	1.0
83331212...			67087	7	6	0	1	1	0.0	0	4	...	1.0	1.0
75800537...			74983	9	7	0	1	1	0.0	0	4	...	1.0	1.0
15257893...			1982	10	10	0	1	1	0.0	0	4	...	1.0	1.0
14725222			76570	14	14	2	4	6	0.166667	2	2	...	1.0	1.0
75801144...			2920	7	5	0	1	1	0.0	0	4	...	1.0	1.0
15250439...			50291	9	8	0	1	1	0.0	0	6	...	1.0	1.0

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degr...	Degree	Clustering Coeffi...	Number of tria...	...	...	Ecce...	Clo...	...	Betweenness Centrality
14725222			76570	14	14	2	4	6	0.166667	2		2	...	1.0	1.0	...	4.0
17308973			82009	10	11	1	2	3	0.0	0		5	...	1.0	1.0	...	1.0
14791171...			1233	11	11	1	1	2	0.0	0		7	...	1.0	1.0	...	1.0
15291192...			976	9	8	1	2	3	0.0	0		0	...	1.0	1.0	...	1.0
75801576...			28830	5	5	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15282023...			2460	8	7	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15252303...			76281	6	3	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15272960...			8527	9	9	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
4305315			21561	11	8	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15244716...			61920	7	4	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
36281620			31195	10	8	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
58139471...			1398	8	9	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15278846...			49	12	11	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
51851073			2379	8	12	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
63401606...			19878	10	8	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
83331212...			67087	7	6	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
75800537...			74983	9	7	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15257893...			1982	10	10	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
75801144...			2920	7	5	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15250439...			50291	9	8	0	1	1	0.0	0		6	...	1.0	1.0	...	0.0
34965239...			700877	7	5	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
15260422...			13000	11	11	1	2	3	0.5	1		8	...	1.0	1.0	...	0.0
15247388...			69339	10	9	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
42162779...			10775	8	5	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
42148045...			154592	7	6	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0
42153415...			1246	9	6	0	1	1	0.0	0		4	...	1.0	1.0	...	0.0

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degr...	Degree	Clustering Coeffi...	Number of tria...	...	...	Ecce...	Clo...	...	...	Com...	Strongly-Connected ID
22433354...			34619	8	6	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	52
15273464...			55574	11	10	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	51
3340889			1902	9	7	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	50
13660285...			55451	12	11	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	49
15248199...			1270	12	12	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	48
41677186			4981	9	6	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	47
15257564...			70	8	9	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	46
42147697...			20	6	5	0	2	2	0.0	0	6	...	1.0	1.0	...	...	0	44
42148030...			137532	7	4	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	43
81779618...			96822	9	8	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	42
58294711			1709	11	10	0	2	2	0.0	0	6	...	1.0	1.0	...	...	0	41
42154163...			1986	7	5	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	40
15266037...			33686	7	6	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	39
42145602...			55	9	7	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	38
15258096...			10142	10	8	0	1	1	0.0	0	7	...	2.0	0.6...	...	...	0	37
58380028			2618	8	5	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	36
83420026...			125187	6	7	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	35
14791171...			1233	11	11	1	1	2	0.0	0	7	...	1.0	1.0	...	...	0	34
15292825...			136645	7	5	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	33
42146889...			17530	9	9	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	32
83332623...			2658	5	4	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	31
15280869...			626	9	9	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	30
42153415...			1246	9	6	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	29
42148045...			154592	7	6	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	28
42162779...			10775	8	5	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	27
15247388...			69339	10	9	0	1	1	0.0	0	4	...	1.0	1.0	...	...	0	26

l.

Clustering Coefficient Metric Report

Parameters:

Network Interpretation: directed

Results:

Average Clustering Coefficient: 0.092
The Average Clustering Coefficient is the mean value of individual coefficients.

Clustering Coefficient Metric Report

Parameters:

Network Interpretation: undirected

Results:

Average Clustering Coefficient: 0.524
Total triangles: 27
The Average Clustering Coefficient is the mean value of individual coefficients.

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degree	Degree	...	Ec...	Clos...	...	...	Clustering Coefficient
397272148			288281	8	8	1	2	3	...	3.0	0.51...	...	...	1.0
300859546			33407	9	9	1	2	3	...	2.0	0.53...	...	...	1.0
166764921			24176	10	5	1	1	2	...	3.0	0.51...	...	...	1.0
604211110			2400492	7	8	2	1	3	...	3.0	0.51...	...	...	1.0
637013278			18238	10	10	4	3	7	...	3.0	0.53...	...	...	0.833333
102677033			17853	11	10	1	4	5	2	2.0	0.55	...	...	0.833333
52645240			39671	12	9	1	4	5	...	2.0	0.55	...	...	0.833333
40486118			35316	11	9	4	5	9	...	2.0	0.56...	...	...	0.7
44176410			39079	9	7	3	4	7	...	3.0	0.46...	...	...	0.5
154825165			20176	10	10	4	0	4	2	3.0	0.46...	...	...	0.5
44176226			33849	10	11	8	2	10	...	2.0	0.62...	...	...	0.361111
49779736			149195	13	11	7	13	20	...	2.0	0.70...	...	...	0.24359
58083931			0	11	14	18	7	25	...	2.0	0.84...	...	...	0.098039
135176053			33419	6	9	0	0	0	0	0.0	0.0	...	...	0.0
177535904			24804	9	5	0	0	0	1	0.0	0.0	...	...	0.0
46919358			23066	11	9	0	2	2	2	3.0	0.48...	...	...	0.0
30375341			16829	9	7	0	0	0	3	0.0	0.0	...	...	0.0
630329394			82359	9	8	0	0	0	4	0.0	0.0	...	...	0.0
138958176			17376	13	12	1	0	1	...	3.0	0.42...	...	...	0.0
39662177			71420	9	9	0	0	0	5	0.0	0.0	...	...	0.0
296371795			58665	9	6	0	0	0	6	0.0	0.0	...	...	0.0
504820676			18257	8	8	0	0	0	7	0.0	0.0	...	...	0.0
830224546			71859	6	5	0	0	0	8	0.0	0.0	...	...	0.0
836610961			27660	6	6	0	0	0	9	0.0	0.0	...	...	0.0
783825022			62171	6	2	0	0	0	...	0.0	0.0	...	...	0.0
206514046			16207	7	7	0	0	0	...	0.0	0.0	...	...	0.0

m.

Connected Components Report

Parameters:

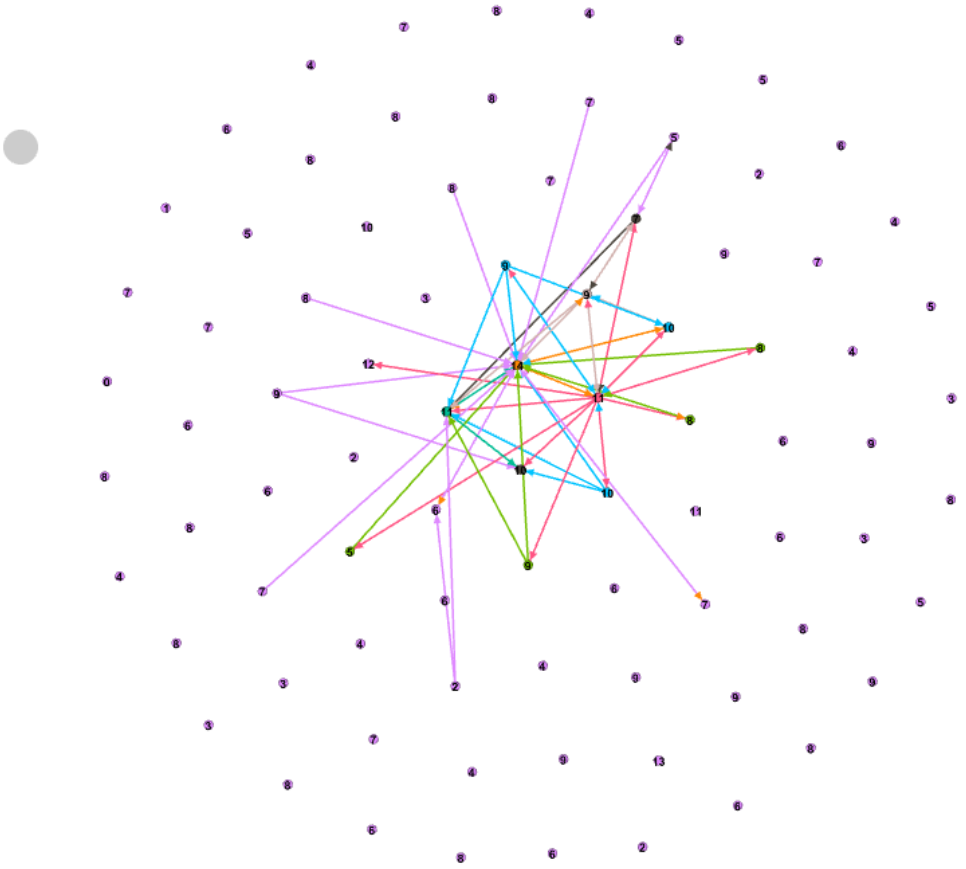
Network Interpretation: directed

Results:

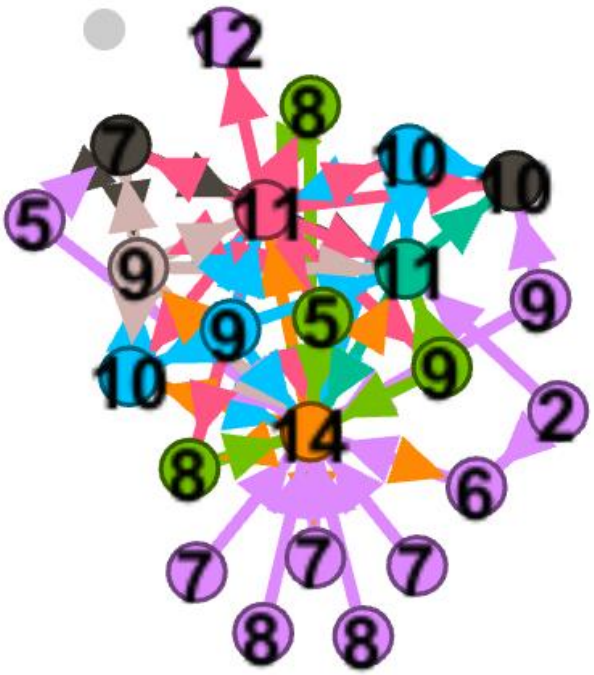
Number of Weakly Connected Components: 62
Number of Strongly Connected Components: 70

Id	Label	Interval	time	friends	followers	In-Degree	Out-Degr...	Degree	Modularity Cl...	...	C...	Har...	Betweenn...	Clustering Coef...	Number of tri...	Component ID	Strongly-Connected ID
128359157			49748	9	13	0	0	0	64	...	0.0	0.0	0.0	0.0	0	61	68
458160749			163251	6	3	0	0	0	63	...	0.0	0.0	0.0	0.0	0	60	67
836611258			42175	7	6	0	0	0	62	...	0.0	0.0	0.0	0.0	0	59	66
347308247			76500	6	4	0	0	0	61	...	0.0	0.0	0.0	0.0	0	58	65
268778651			39339	10	3	0	0	0	60	...	0.0	0.0	0.0	0.0	0	57	64
80944874			28121	9	8	0	0	0	59	...	0.0	0.0	0.0	0.0	0	56	63
291787073			58117	6	5	0	0	0	58	...	0.0	0.0	0.0	0.0	0	55	62
43694212			46760	9	7	0	0	0	57	...	0.0	0.0	0.0	0.0	0	54	61
634194399			33245	6	7	0	0	0	56	...	0.0	0.0	0.0	0.0	0	53	60
833046544			91951	5	4	0	0	0	55	...	0.0	0.0	0.0	0.0	0	52	59
182588116			15884	9	6	0	0	0	54	...	0.0	0.0	0.0	0.0	0	51	57
57408447			46414	10	7	0	0	0	53	...	0.0	0.0	0.0	0.0	0	50	56
695201177			33137	7	6	0	0	0	52	...	0.0	0.0	0.0	0.0	0	49	55
143136442			139780	11	9	0	0	0	51	...	0.0	0.0	0.0	0.0	0	48	54
262243137			18175	9	5	0	0	0	50	...	0.0	0.0	0.0	0.0	0	47	53
197026756			39984	8	6	0	0	0	49	...	0.0	0.0	0.0	0.0	0	46	52
235841121			725448	5	8	0	0	0	48	...	0.0	0.0	0.0	0.0	0	45	51
24127684			19457	7	5	0	0	0	47	...	0.0	0.0	0.0	0.0	0	44	50
564588393			180485	6	3	0	0	0	46	...	0.0	0.0	0.0	0.0	0	43	49
225130619			35705	8	6	0	0	0	45	...	0.0	0.0	0.0	0.0	0	42	48
679738897			46501	5	1	0	0	0	44	...	0.0	0.0	0.0	0.0	0	41	47
771972154			40938	7	4	0	0	0	42	...	0.0	0.0	0.0	0.0	0	40	46
51129656			15534	10	9	0	0	0	41	...	0.0	0.0	0.0	0.0	0	39	45
675278608			20020	7	8	0	0	0	40	...	0.0	0.0	0.0	0.0	0	38	44
77603178			25490	8	6	0	0	0	39	...	0.0	0.0	0.0	0.0	0	37	43
682374643			35963	8	6	0	0	0	38	...	0.0	0.0	0.0	0.0	0	36	42
643903496			19680	5	2	0	0	0	37	...	0.0	0.0	0.0	0.0	0	35	41
581582364			46566	9	8	0	0	0	36	...	0.0	0.0	0.0	0.0	0	34	40
184620904			24541	8	6	0	0	0	35	...	0.0	0.0	0.0	0.0	0	33	39

n. Fruchterman Reingold: It creates very pleasing, symmetric, spherical shapes.



o. ForceAtlas 2:This is the industry standard for social networks. It simulates a physical system where nodes repulse each other like charged particles, but edges attract connected nodes.It is excellent at visualizing "communities" (clustering) and works well with medium-to-large datasets like Twitter graphs.it pushes the isolated nodes away.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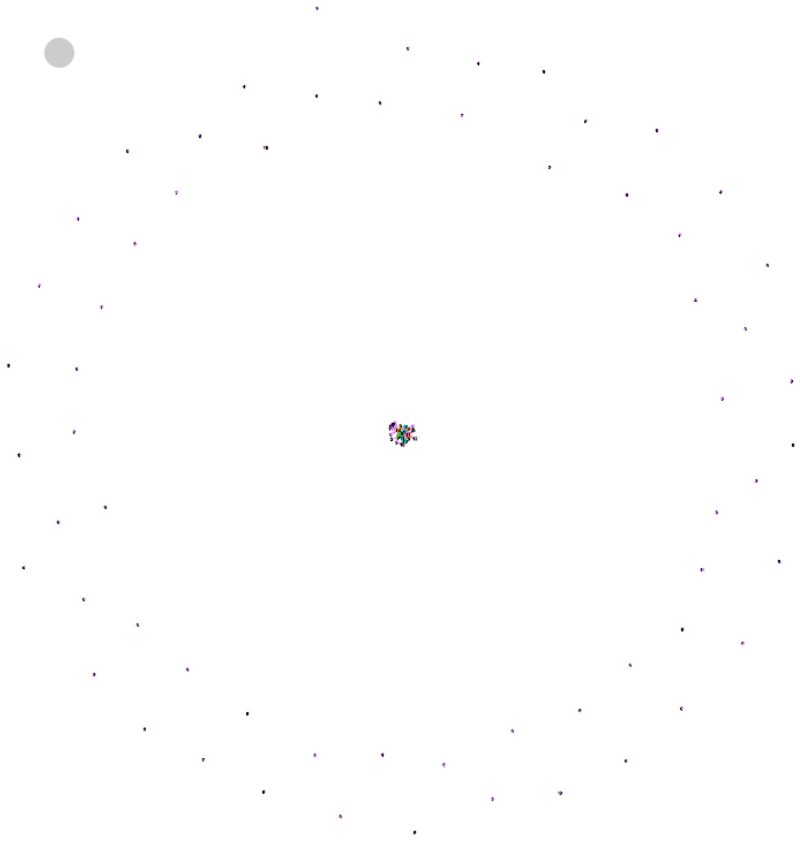
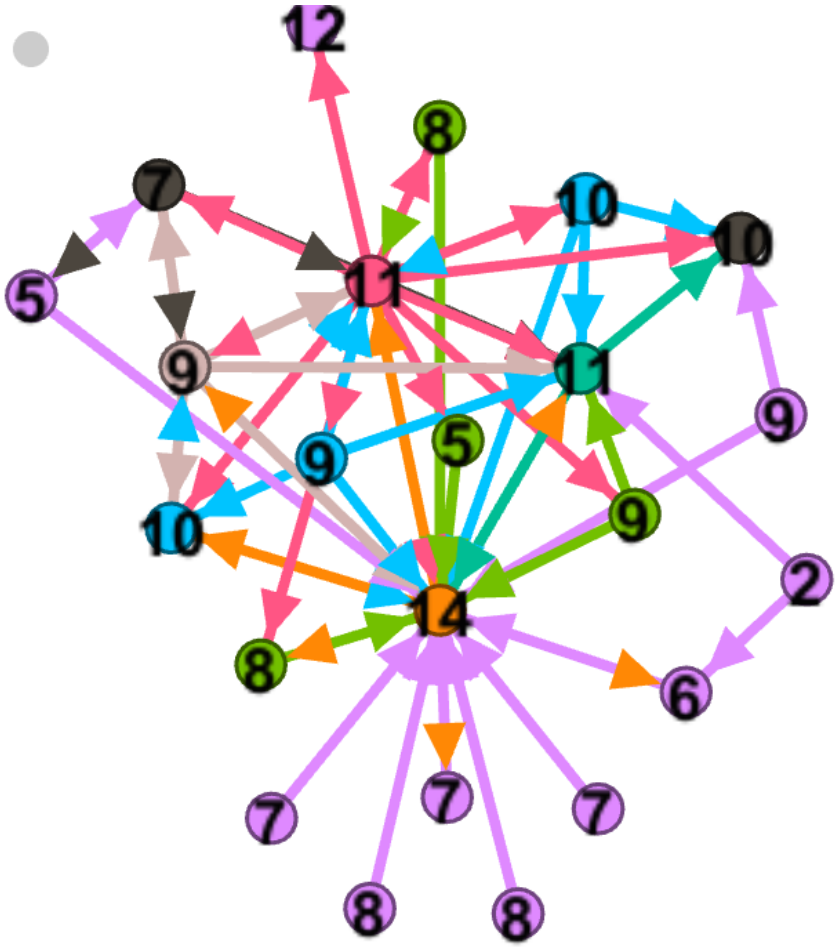
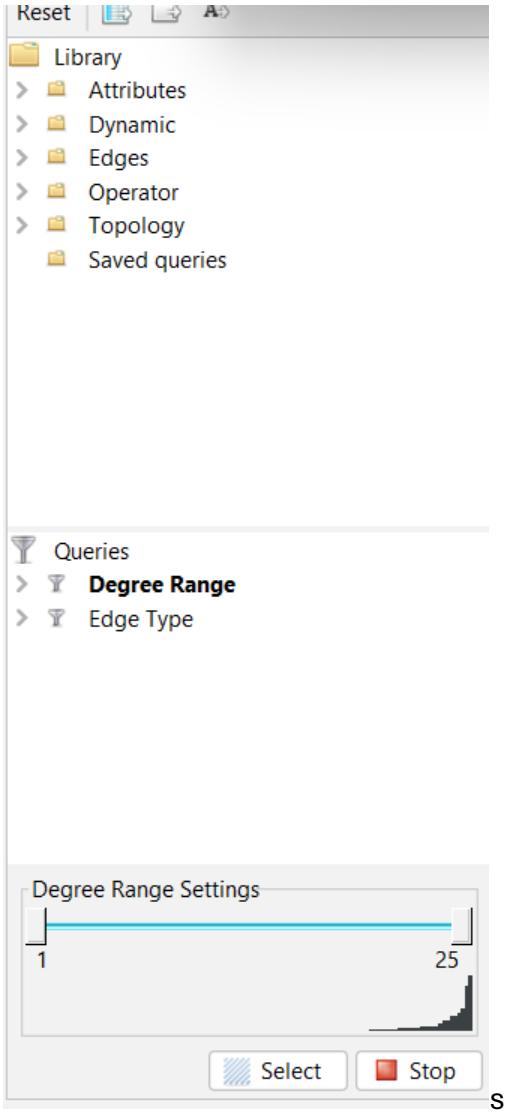




p. This graph represents very normal action of real followers because they have relation for each other's and number of degrees for each connected nodes are highly closes so there is no node act as central point, the have interactions between them, if i apply the same filter i will get thi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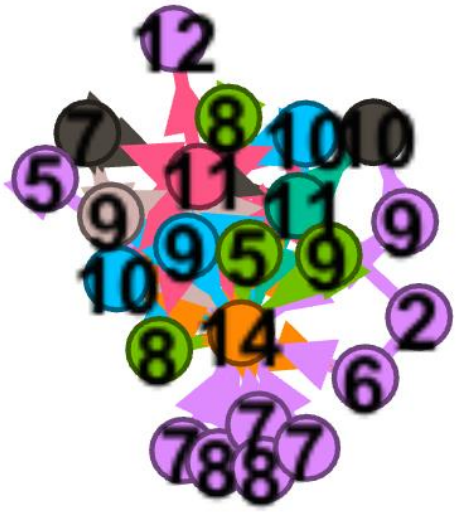
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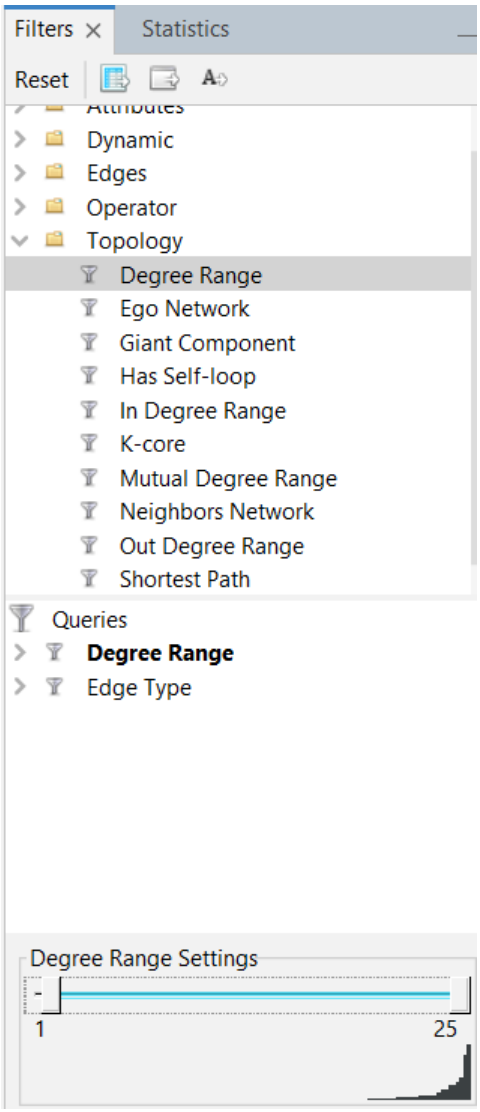

Which means that there are nodes connected to each other by removing isolated nodes which have degree 0, from 1 to 25 there are more connections than another graph of botnet, there is no broker or central node which represents the real social network, that there are interactions between the nodes and there are nodes which can represent the nodes like commenting on post but not following the post owner.

	Non-Conspiracy (Benign)	*5G Conspiracy (Malicious)*
#Nodes	84	58
#Edges	60	63
AVG Degree	0.714	1.086
Network Diameter	3	2
Graph Density	0.009	0.021
Connected components	62	4
Modularity	0.213	0.264
AVG Cluster Coefficient	0.334	0.039
Number of Communities	65	10
Network Diameter	5	2

****5G_Conspiracy_Graphs** folder 5 --> This graph represents very low clustering coefficient which means that there are an articulate node which acts as central node which are nearly connected to all other nodes and other nodes are rarely connected to each other which this is highly a botnet doing sybil attack and the central node may be the real one , and the other nodes are fake nodes , we call the central node with very high degree (id = 127795828) is Bot Master, as we have seen by ForceAtlas2 there is central central node surrounded by the rest of nodes it is in the center, there are rarely interactions between other nodes , they are all connected to central node , this is Botnet with fake identities and fake followers,by using ForceAtlas2 then using **Filters** > **Topology** > **Degree** Range and set min to 1 and max to 1 this will appear the fake bots that doesn't interact with each other this appears the whole graph and it deltets bot master(center node).

****Non_Conspiracy_Graphs** folder 50 --> This graph represents very normal action of real followers because they have relation for each other's and number of degrees for each connected nodes are highly closes so there is no node act as central point, the have interactions between them, if i apply the same filter i will get this filtering Which means that there are nodes connected to each other by removing isolated nodes which have degree 0, from 1 to 25 there are more connections than another graph of botnet, there is no broker or central node which represents the real social network, that there are interactions between the nodes and there are nodes which can

represent the nodes like commenting on post but not following the post owner.