

Social Network Analysis using Gephi

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Step 1: Importing Data

Gephi 0.9.2

File Workspace View Tools Window Help

- New Project Ctrl+Shift+N
- Open... Ctrl+O
- Open Recent... >
- Close Project
- Properties...
- Import spreadsheet...
- Import Database >
- Import... >
- Generate >
- Save Ctrl+S
- Save As...
- Export >
- Exit

laboratory Preview

Graph X

Dragging (Configure)



Layout X

---Choose a layout

Run

Select "File" → "Import spreadsheet.."

Gephi 0.9.2

File Workspace View Tools Window Help

Overview Data Laboratory Preview

Appearance x

Nodes Edges

Graph x

Dragging (Configure)

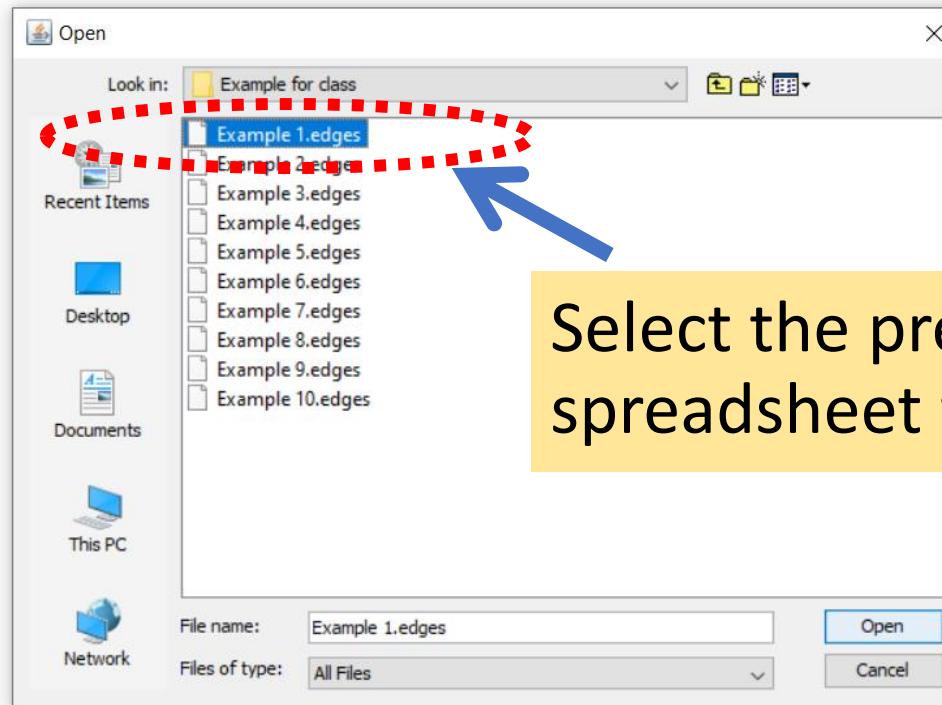
Layout x

---Choose a layout

1

Run

<No Properties>



Spreadsheet (CSV)...

Steps

1. General CSV options
2. Import settings

General CSV options (1 of 2)

CSV file to import:

F:\Summer 2021\ECON TU\EE 406\Lecture 3\Facebook -- Example Network Data\Example for class\Example 1.edges

Separator: Import as: Charset:

Space Adjacency list UTF-8

Preview:

236	186
122	285
24	346
271	304
176	9
130	329
204	213
252	332
82	65

< Back **Next >** Finish Cancel Help

An example of data within the selected file is displayed.

Click on the "Next" button.



Spreadsheet (CSV)...



Steps

1. General CSV options
2. **Import settings**

Import settings (2 of 2)

Time representation

Intervals
Timestamps
Intervals

Since we use only the static data, select "Timestamps".

Then, click on the "Finish" button.

< Back

Next >

Finish

Cancel

Help

Import report

Source: Stream ImporterSpreadsheetCSV

Issues Report

Graph Type: Mixed

of Nodes: Directed
of Edges: Undirected
Mixed

Dynamic Graph: no
Dynamic Attributes: no
Multi Graph: no

☒ New workspace
☐ Append to existing workspace

More options...

OK Cancel

Since this is a network of friend, each pair of data represents the pairwise friendship (not the flow). So, we specify that this is the “Undirected” network.

Then, click on the “Next” button.

Step 2: Computing Network Statistics and Centrality Indicators

Gephi 0.9.2 - Project 1

File Workspace View Tools Window Help

Overview Data Laboratory Preview

Workspace 1 X

Appearance X Graph X

Nodes Edges Unique Partition Ranking

#c0c0c0

Apply

Layout X

---Choose a layout

Run

<No Properties>

Statistics X

Filters Settings

Network Overview

Average Degree Run

Avg. Weighted Degree Run

Network Diameter Run

Graph Density Run

Modularity Run

PageRank Run

Connected Components Run

Node Overview

Avg. Clustering Coefficient Run

Eigenvector Centrality Run

Edge Overview

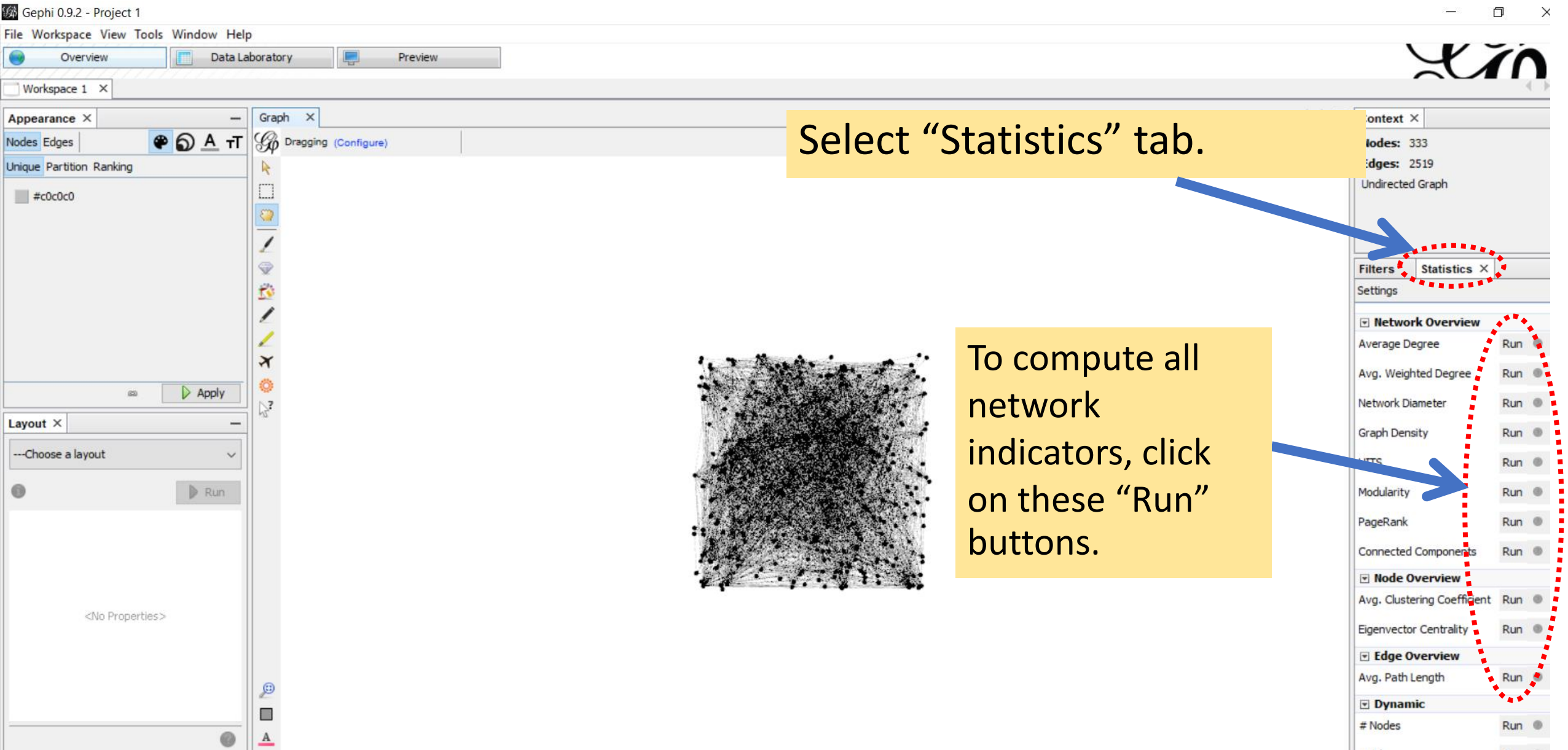
Avg. Path Length Run

Dynamic

Nodes Run

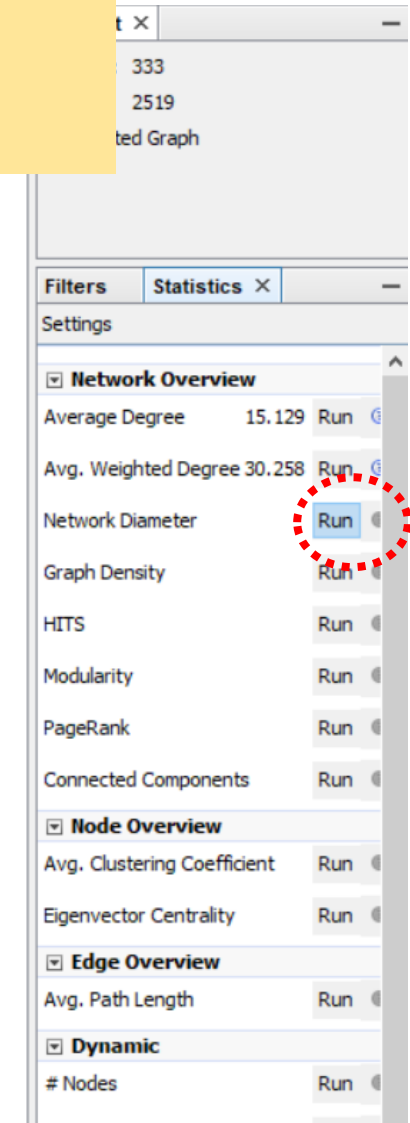
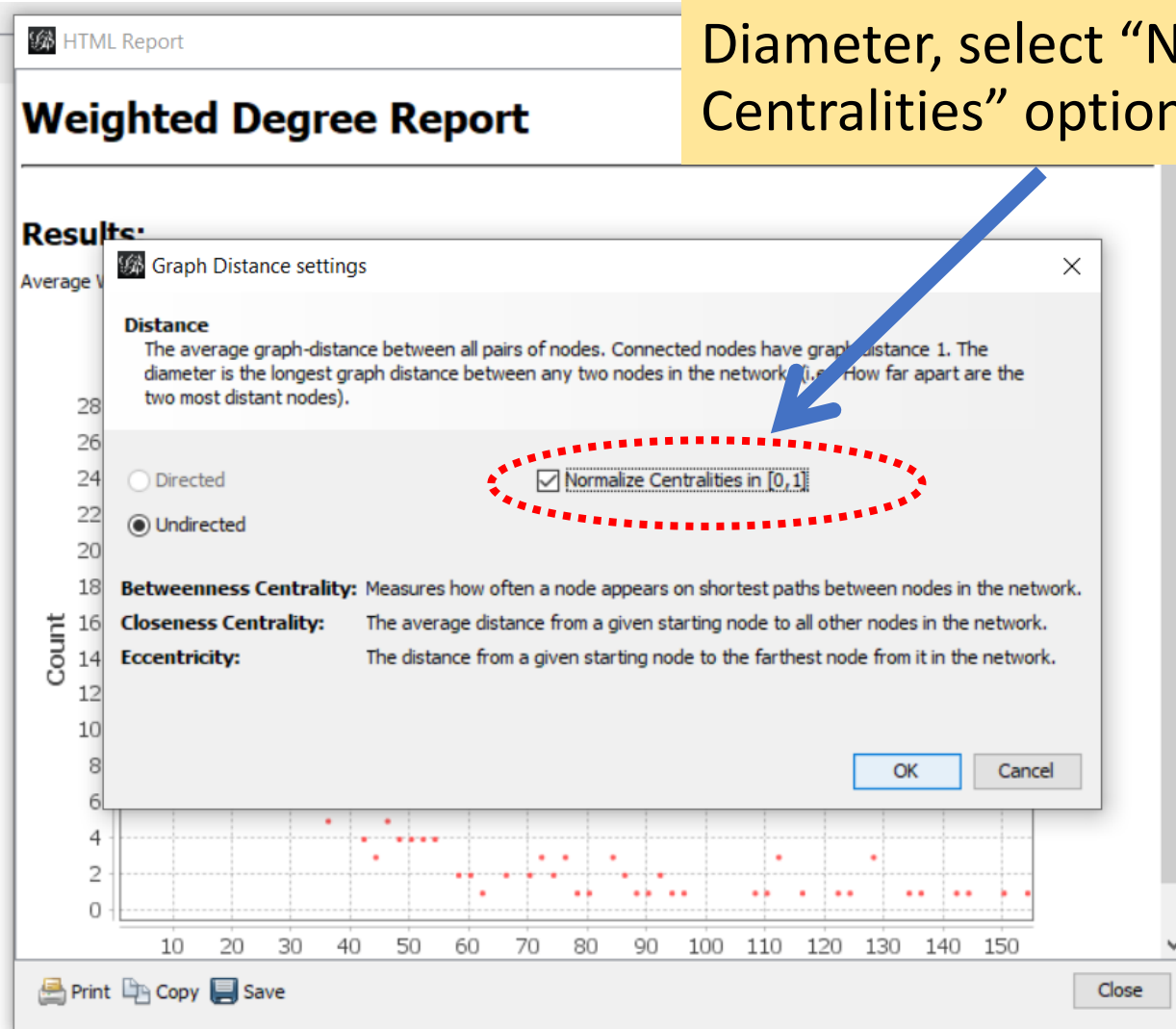
Select "Statistics" tab.

To compute all network indicators, click on these "Run" buttons.



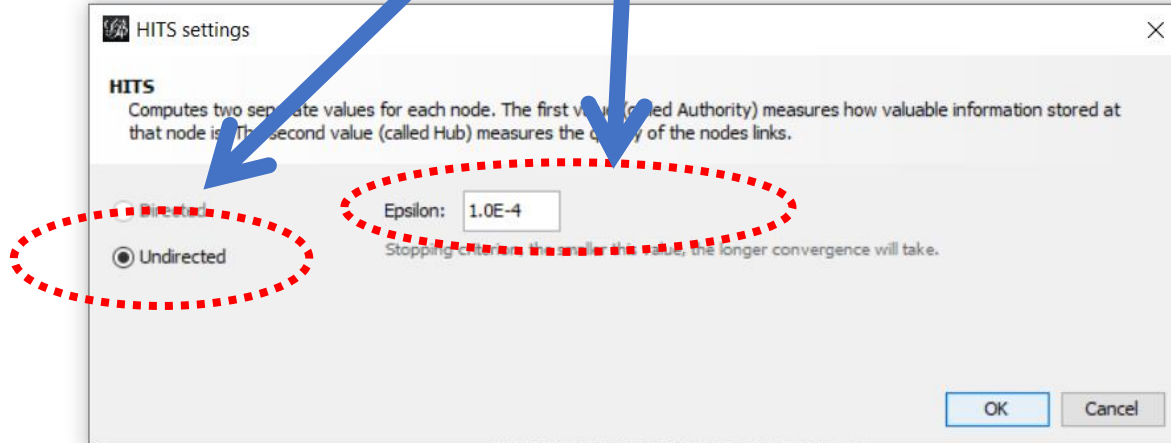
The screenshot displays the Gephi 0.9.2 software interface. The top menu bar includes 'File', 'Workspace', 'View', 'Tools', 'Window', and 'Help'. Below the menu is a toolbar with 'Overview', 'Data Laboratory', and 'Preview' tabs. The 'Overview' tab is active, showing a network graph with a dense cluster of nodes and edges. On the left, the 'Appearance' panel shows a color selection for nodes. The 'Layout' panel at the bottom left has a dropdown menu for selecting a layout and a 'Run' button. On the right, the 'Statistics' panel is open, showing a list of network indicators under the 'Network Overview' section. A yellow box highlights the 'Statistics' tab, and another yellow box highlights the 'Run' buttons for various network indicators. A red dashed circle encloses the 'Run' buttons for the Network Overview section. A blue arrow points from the 'Statistics' tab to the 'Run' buttons.

For computing the Network Diameter, select “Normalize Centralities” option.

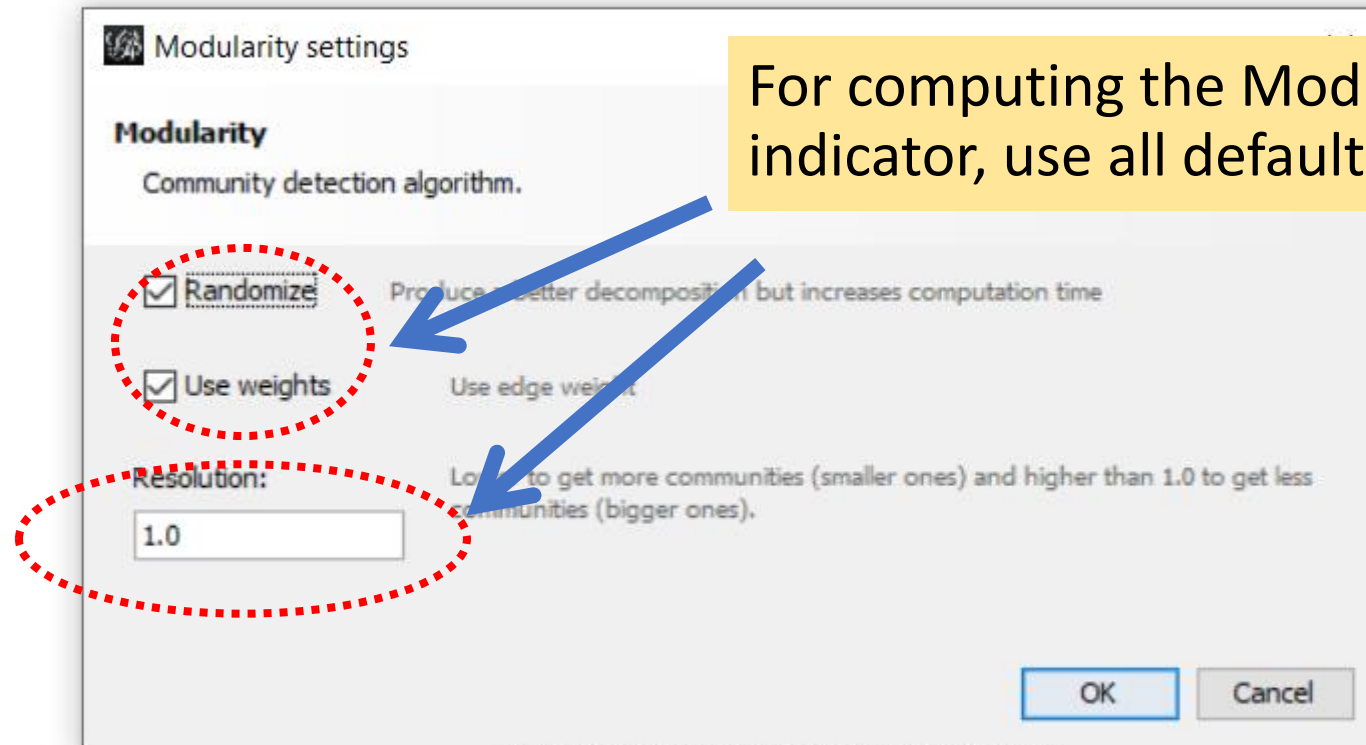


For computing the HITS (Hyperlink-Induced Topic Search) indicators, use all default values.

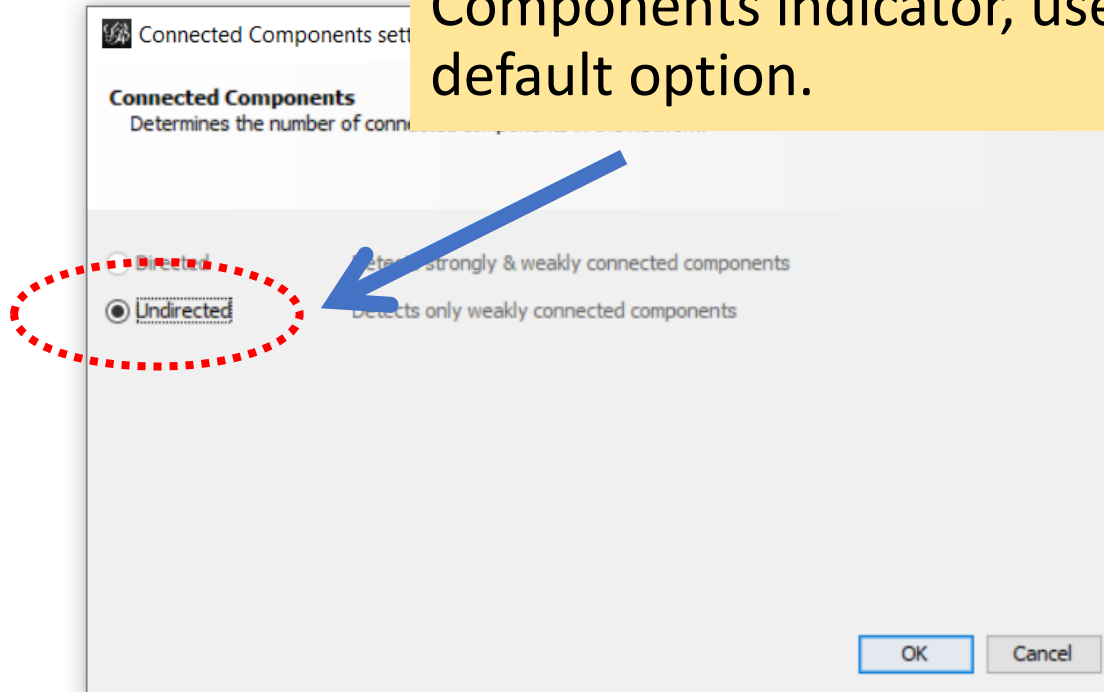
Dragging (Configure)



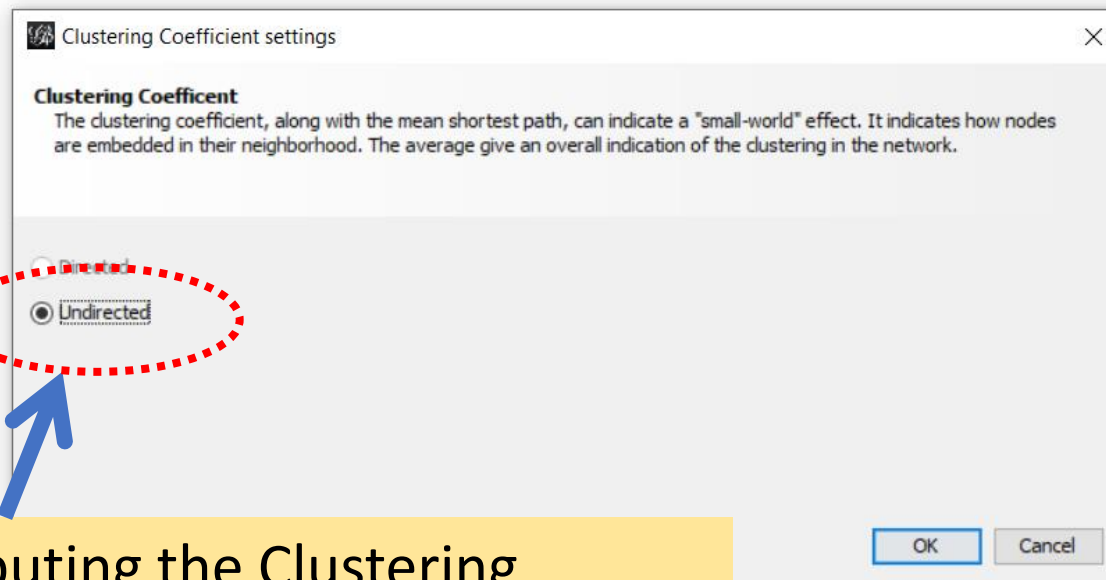
Nodes: 333	
Edges: 2519	
Undirected Graph	
Filters Statistics X	
Settings	
Network Overview	
Average Degree	15.129 Run
Avg. Weighted Degree	30.258 Run
Network Diameter	11 Run
Graph Density	0.046 Run
HITS	Run
Modularity	Run
PageRank	Run
Connected Components	Run
Node Overview	
Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run
Edge Overview	
Avg. Path Length	3.752 Run
Dynamic	
# Nodes	Run



For computing the Connected Components indicator, use the default option.

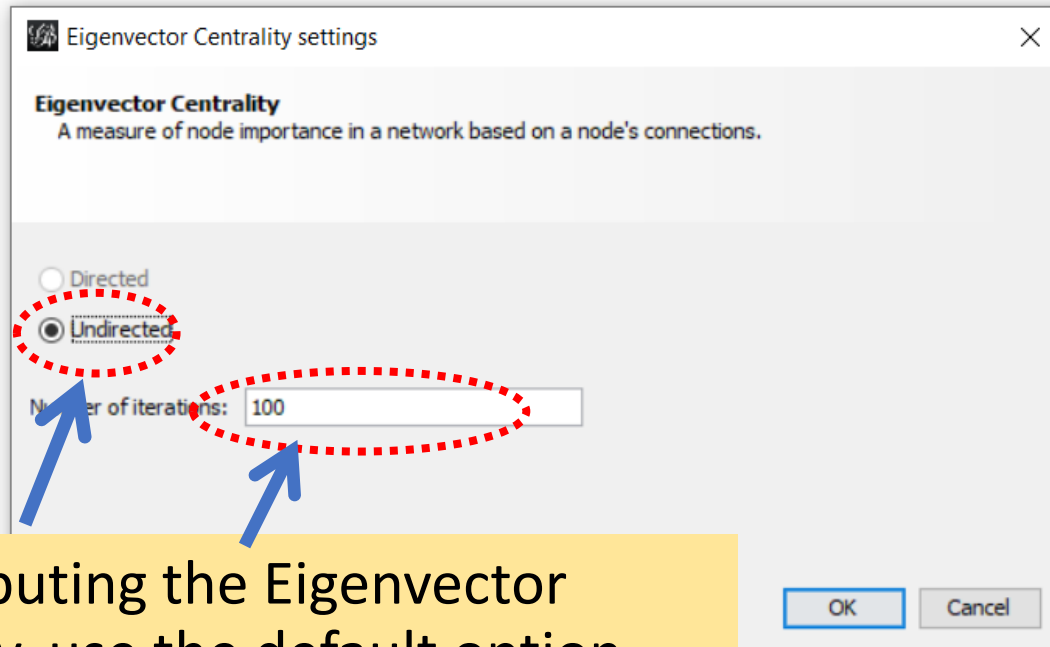


Edges: 2519	
Undirected Graph	
Filters	Statistics X
Settings	
Network Overview	
Average Degree	15.129 Run
Avg. Weighted Degree	30.258 Run
Network Diameter	11 Run
Graph Density	0.046 Run
HITS	Run
Modularity	0.463 Run
PageRank	Run
Connected Components	Run
Node Overview	
Avg. Clustering Coefficient	Run
Eigenvector Centrality	Run
Edge Overview	
Avg. Path Length	3.752 Run
Dynamic	
# Nodes	Run
# Edges	Run

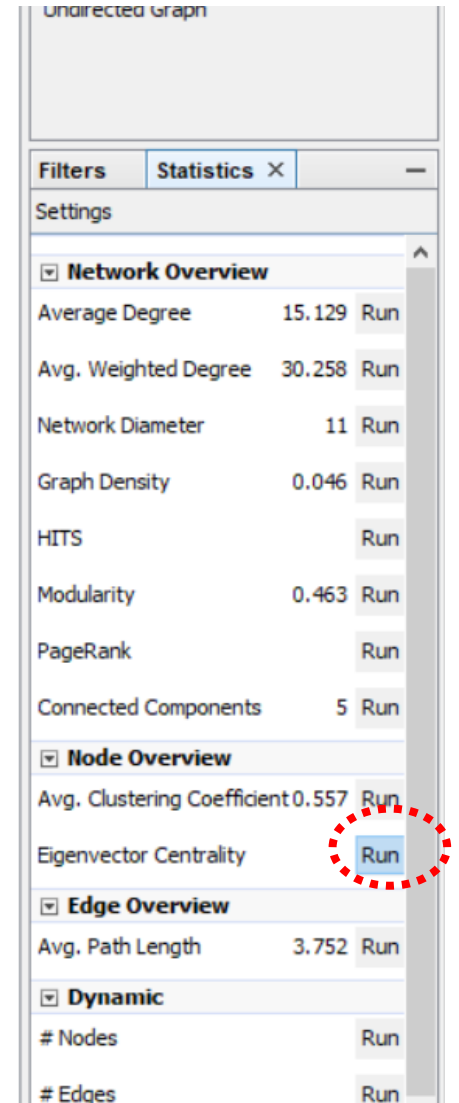


For computing the Clustering Coefficient, use the default option.

Undirected Graph		
Filters Statistics X		
Settings		
Network Overview		
Average Degree	15.129	Run
Avg. Weighted Degree	30.258	Run
Network Diameter	11	Run
Graph Density	0.046	Run
HITS		Run
Modularity	0.463	Run
PageRank		Run
Connected Components	5	Run
Node Overview		
Avg. Clustering Coefficient	0.957	Run
Eigenvector Centrality		Run
Edge Overview		
Avg. Path Length	3.752	Run
Dynamic		
# Nodes		Run



For computing the Eigenvector Centrality, use the default option.



Step 3: Displaying Centrality Indicators

To display all computed centrality indicators, click on the “Data Laboratory” tab.

Gephi 0.9.2 - Project 1

File Workspace View Tools Window Help

Overview Data Laboratory Preview

Workspace 1 X

Data Table X

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

Id	Label	Timestamp	Degree	Weighted Deg...	Eccentricity	Closeness Centr...	Harmonic Closeness Centr...	Betweenness Centr...	Authority	Hub	Modularity Cl...	PageRank	Componen...	Clustering Coeffi...	Number of trian...	Eigenvector Centr...
236	236		36	72.0	8.0	0.330266	0.436614	0.003643	0.092263	0.092263	6	0.004901	0	0.37619	237	0.470259
186	186		43	86.0	7.0	0.355336	0.458263	0.005513	0.128598	0.128598	6	0.005583	0	0.473976	428	0.647614
122	122		62	124.0	7.0	0.372979	0.498924	0.022754	0.165014	0.165014	6	0.00811	0	0.365415	691	0.835744
285	285		46	92.0	7.0	0.364972	0.472608	0.01369	0.130247	0.130247	6	0.006306	0	0.407729	422	0.659482
24	24		15	30.0	8.0	0.268719	0.325431	0.000107	0.003443	0.003443	7	0.002618	0	0.885714	93	0.043657
346	346		26	52.0	8.0	0.292043	0.374576	0.004653	0.009051	0.009051	7	0.004287	0	0.492308	160	0.083651
271	271		72	144.0	7.0	0.378664	0.513939	0.014974	0.193679	0.193679	6	0.009036	0	0.369718	945	0.976698
304	304		54	108.0	7.0	0.369565	0.485405	0.013548	0.145028	0.145028	6	0.007071	0	0.364081	521	0.735611
176	176		13	26.0	8.0	0.315738	0.388781	0.000163	0.043848	0.043848	6	0.001995	0	0.679487	53	0.220484
9	9		56	112.0	7.0	0.368301	0.486437	0.009853	0.148705	0.148705	6	0.007264	0	0.375325	578	0.752307
130	130		15	30.0	7.0	0.341077	0.408779	0.009981	0.022321	0.022321	7	0.002731	0	0.266667	28	0.125214
329	329		29	58.0	8.0	0.336809	0.435088	0.031935	0.044679	0.044679	1	0.005226	0	0.169951	69	0.239477
204	204		21	42.0	7.0	0.330604	0.399749	0.016254	0.01238	0.01238	7	0.003494	0	0.547619	115	0.093188
213	213		38	76.0	7.0	0.362514	0.459502	0.017893	0.075079	0.075079	5	0.005504	0	0.266003	187	0.39695
252	252		64	128.0	7.0	0.371264	0.498666	0.010658	0.177162	0.177162	6	0.008129	0	0.384425	775	0.892228
332	332		42	84.0	7.0	0.370413	0.472298	0.011706	0.11587	0.11587	6	0.005786	0	0.392567	338	0.589893
82	82		33	66.0	8.0	0.324623	0.424642	0.004084	0.077478	0.077478	10	0.004579	0	0.380682	201	0.391023
65	65		11	22.0	8.0	0.306743	0.372372	0.000826	0.027955	0.027955	10	0.001792	0	0.4	22	0.14192
276	276		17	34.0	8.0	0.314202	0.392083	0.000201	0.057794	0.057794	6	0.002454	0	0.720588	98	0.290847
26	26		67	134.0	7.0	0.37471	0.504135	0.00957	0.186402	0.186402	6	0.008381	0	0.393487	870	0.93815
280	280		42	84.0	7.0	0.365798	0.467396	0.013313	0.117272	0.117272	6	0.006012	0	0.441347	380	0.596153
272	272		44	88.0	7.0	0.367882	0.472298	0.021563	0.105133	0.105133	6	0.006042	0	0.323467	306	0.541563
211	211		29	58.0	8.0	0.322677	0.417522	0.001418	0.080339	0.080339	10	0.003879	0	0.571429	232	0.403372
199	199		46	92.0	8.0	0.345455	0.459509	0.005483	0.130276	0.130276	10	0.005989	0	0.448309	464	0.656179
84	84		12	24.0	7.0	0.322034	0.380481	0.003889	0.023031	0.023031	5	0.002264	0	0.318182	21	0.118386
133	133		17	34.0	8.0	0.319802	0.393565	0.006542	0.045158	0.045158	6	0.0029	0	0.536765	73	0.229947
62	62		25	50.0	8.0	0.317289	0.405241	0.001572	0.073347	0.073347	6	0.003456	0	0.483333	145	0.368845
239	239		58	116.0	7.0	0.370413	0.489687	0.014664	0.163003	0.163003	6	0.007693	0	0.398064	658	0.820018
172	172		40	80.0	7.0	0.350706	0.446499	0.006208	0.102886	0.102886	10	0.005263	0	0.432051	337	0.517934

By double clicking on the top row of a specific indicator, all data will be sorted by based on the value of such centrality index.

Gephi 0.9.2 - Project 1

File Workspace View Tools Window Help

Overview Data Laboratory Preview

Workspace 1

Data Table

Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table

Filter: Id

Id	Label	Timestamp	Degree	Weighted Deg...	Eccentricity	Closeness Centr...	Harmonic Closeness Centr...	Betweenness Centr...	Authority	Hub	Modularity Cl...	PageRank	Componen...	Clustering Coeff...	Number of trian...	Eigenvector Centr...
277	277		64	128.0	6.0	0.425	0.528431	0.265858	0.000000	0.000000	6	0.008967	0	0.325893	657	0.825511
175	175		16	32.0	6.0	0.358093	0.400258	0.246075	0.004446	0.004446	0	0.005762	0	0.35	42	0.033551
19	19		15	30.0	7.0	0.290207	0.336046	0.178843	0.000127	0.000127	4	0.006401	0	0.180952	19	0.015094
23	23		16	32.0	7.0	0.306452	0.352455	0.130223	0.000803	0.000803	0	0.006653	0	0.058333	7	0.014272
25	25		68	136.0	7.0	0.391515	0.516777	0.085363	0.154776	0.154776	6	0.010074	0	0.26734	609	0.788739
119	119		61	122.0	7.0	0.381346	0.503361	0.077334	0.135513	0.135513	1	0.009585	0	0.263388	482	0.690702
339	339		26	52.0	7.0	0.348436	0.427097	0.06546	0.037015	0.037015	5	0.004441	0	0.2	65	0.196128
40	40		43	86.0	7.0	0.374276	0.470028	0.053318	0.11366	0.11366	6	0.006168	0	0.376523	340	0.57772
152	152		4	8.0	8.0	0.262388	0.298857	0.051432	0.001	0.001	3	0.001518	0	0.5	3	0.007909
230	230		8	16.0	7.0	0.273961	0.309671	0.047896	0.000107	0.000107	4	0.004763	0	0.071429	2	0.006431
115	115		20	40.0	8.0	0.23997	0.297195	0.045137	0.000006	0.000006	4	0.006573	0	0.484211	92	0.023974
322	322		71	142.0	7.0	0.386826	0.518893	0.043159	0.159751	0.159751	6	0.009796	0	0.27163	675	0.819621
41	41		23	46.0	7.0	0.245254	0.307025	0.040924	0.000009	0.000009	4	0.007018	0	0.418972	106	0.026592
307	307		3	6.0	6.0	0.307912	0.334107	0.040117	0.003069	0.003069	4	0.001688	0	0.333333	1	0.01662
245	245		4	8.0	8.0	0.236977	0.261849	0.034397	0.000022	0.000022	0	0.002258	0	0.5	3	0.002745
21	21		64	128.0	7.0	0.375581	0.502071	0.0331	0.160469	0.160469	6	0.008485	0	0.328373	662	0.816579
315	315		55	110.0	7.0	0.378664	0.492577	0.032432	0.130111	0.130111	6	0.007485	0	0.290909	432	0.672627
329	329		29	58.0	8.0	0.336809	0.435088	0.031935	0.044679	0.044679	1	0.005226	0	0.169951	69	0.239477
170	170		45	90.0	7.0	0.373843	0.473176	0.029085	0.130921	0.130921	6	0.006282	0	0.447475	443	0.659525
192	192		4	8.0	9.0	0.194813	0.224821	0.029065	0.0	0.0	4	0.004134	0	0.0	0	0.002609
116	116		16	32.0	8.0	0.250971	0.300962	0.028049	0.000024	0.000024	4	0.004674	0	0.616667	74	0.02098
312	312		25	50.0	8.0	0.240327	0.303903	0.026179	0.000006	0.000006	4	0.007797	0	0.38	114	0.027683
144	144		14	28.0	8.0	0.250388	0.29735	0.023405	0.000024	0.000024	4	0.004152	0	0.659341	60	0.01871
122	122		62	124.0	7.0	0.372979	0.498924	0.022754	0.165014	0.165014	6	0.00811	0	0.365415	691	0.835744
272	272		44	88.0	7.0	0.367882	0.472298	0.021563	0.105133	0.105133	6	0.006042	0	0.323467	306	0.541563
83	83		6	12.0	6.0	0.333678	0.368885	0.020444	0.006602	0.006602	5	0.001718	0	0.8	12	0.036183
237	237		6	12.0	6.0	0.333678	0.368885	0.020444	0.006602	0.006602	5	0.001718	0	0.8	12	0.036183
51	51		6	12.0	6.0	0.333678	0.368885	0.020444	0.006602	0.006602	5	0.001718	0	0.8	12	0.036183
56	56		77	154.0	7.0	0.379553	0.520131	0.019714	0.198146	0.198146	6	0.009884	0	0.331511	970	1.0

Similarly, in this case, all data is sorted by the value of PageRank after double clicking on the top row of PageRank column.

Gephi 0.9.2 - Project 1

File Workspace View Tools Window Help

Overview Data Laboratory Preview

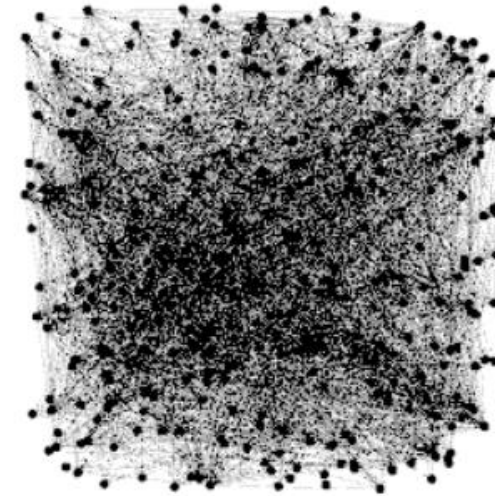
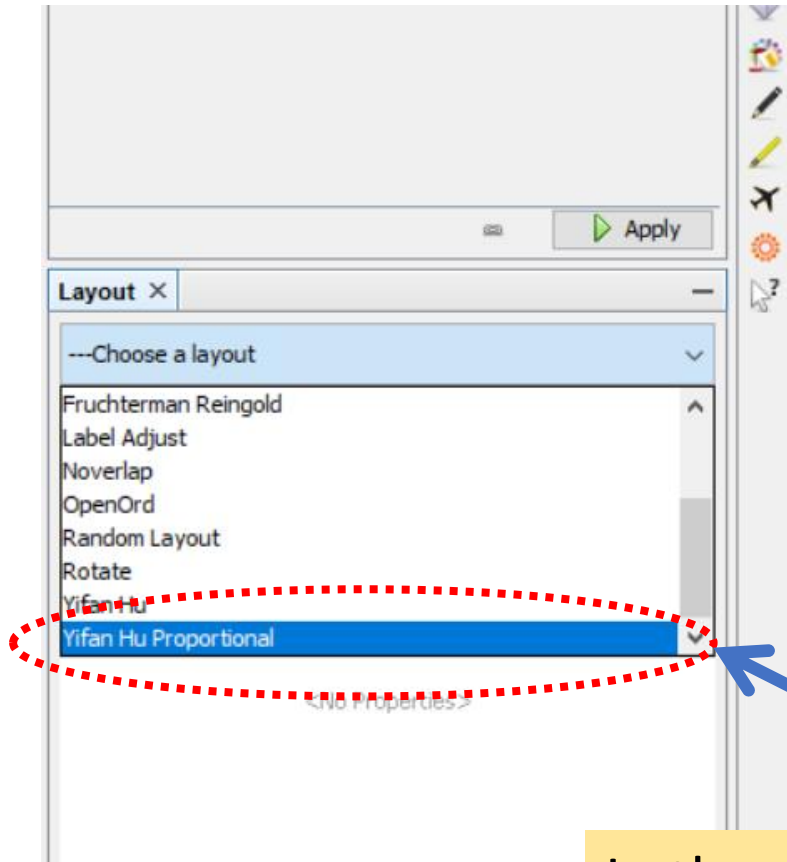
Workspace 1 X

Data Table X

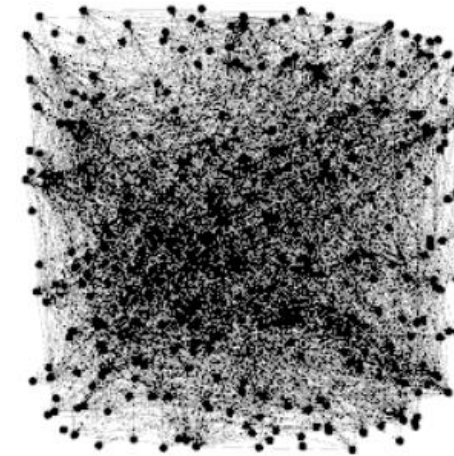
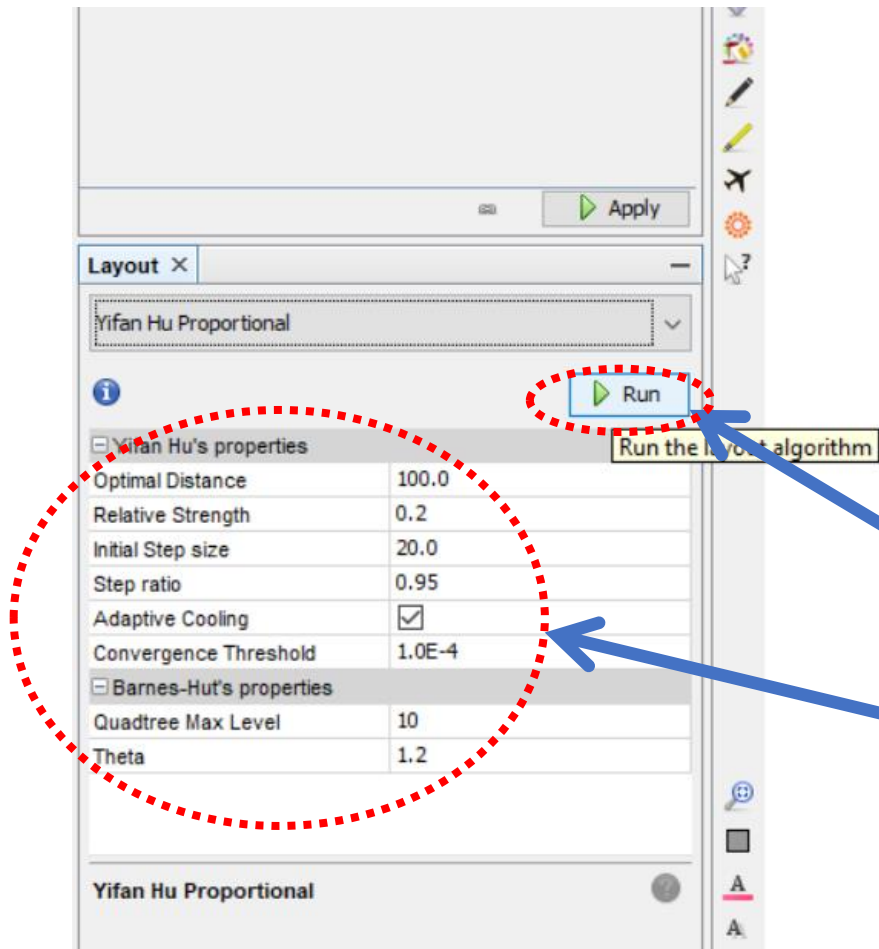
Nodes Edges Configuration Add node Add edge Search/Replace Import Spreadsheet Export table More actions Filter: Id

Id	Label	Timestamp	Degree	Weighted Deg...	Eccentricity	Closeness Centr...	Harmonic Closeness Centr...	Betweenness Centr...	Authority	Hub	Modularity	PageRank	Component...	Clustering Coeff...	Number of trian...	Eigenvector Centr...
25	25		68	136.0	7.0	0.391515	0.516777	0.085363	0.154776	0.154776	6	0.010074	0	0.26734	609	0.788739
56	56		77	154.0	7.0	0.379553	0.520131	0.019714	0.198146	0.198146	6	0.009884	0	0.331511	970	1.0
322	322		71	142.0	7.0	0.386826	0.518893	0.043159	0.159751	0.159751	6	0.009796	0	0.27163	675	0.819621
119	119		61	122.0	7.0	0.381346	0.503361	0.077334	0.135513	0.135513	1	0.009585	0	0.263388	482	0.690702
67	67		75	150.0	7.0	0.382701	0.521421	0.017708	0.197438	0.197438	6	0.009476	0	0.344144	955	0.997183
271	271		72	144.0	7.0	0.378664	0.513939	0.014974	0.193679	0.193679	6	0.009036	0	0.369718	945	0.976698
277	277		64	128.0	6.0	0.425	0.528431	0.265858	0.162029	0.162029	6	0.008967	0	0.325893	657	0.825511
21	21		64	128.0	7.0	0.375581	0.502071	0.0331	0.160469	0.160469	6	0.008485	0	0.328373	662	0.816579
26	26		67	134.0	7.0	0.37471	0.504135	0.00957	0.186402	0.186402	6	0.008381	0	0.393487	870	0.93815
252	252		64	128.0	7.0	0.371264	0.498666	0.010658	0.177162	0.177162	6	0.008129	0	0.384425	775	0.892228
122	122		62	124.0	7.0	0.372979	0.498924	0.022754	0.165014	0.165014	6	0.00811	0	0.365415	691	0.835744
312	312		25	50.0	8.0	0.240327	0.303903	0.026179	0.000006	0.000006	4	0.007797	0	0.38	114	0.027683
239	239		58	116.0	7.0	0.370413	0.489687	0.014664	0.163003	0.163003	6	0.007693	0	0.398064	658	0.820018
315	315		55	110.0	7.0	0.378664	0.492577	0.032432	0.130111	0.130111	6	0.007485	0	0.290909	432	0.672627
203	203		56	112.0	7.0	0.371692	0.488913	0.011606	0.156836	0.156836	10	0.007322	0	0.407792	628	0.79075
9	9		56	112.0	7.0	0.368301	0.486437	0.009853	0.148705	0.148705	6	0.007264	0	0.375325	578	0.752307
200	200		56	112.0	7.0	0.369989	0.486849	0.007417	0.158997	0.158997	6	0.007148	0	0.413636	637	0.800082
304	304		54	108.0	7.0	0.369565	0.485405	0.013548	0.145028	0.145028	6	0.007071	0	0.364081	521	0.735611
41	41		23	46.0	7.0	0.245254	0.307025	0.040924	0.000009	0.000009	4	0.007018	0	0.418972	106	0.026592
23	23		16	32.0	7.0	0.306452	0.352455	0.130223	0.000803	0.000803	0	0.006653	0	0.058333	7	0.014272
115	115		20	40.0	8.0	0.23997	0.297195	0.045137	0.000006	0.000006	4	0.006573	0	0.484211	92	0.023974
19	19		15	30.0	7.0	0.290207	0.336046	0.178843	0.000127	0.000127	4	0.006401	0	0.180952	19	0.015094
285	285		46	92.0	7.0	0.364972	0.472608	0.01369	0.130247	0.130247	6	0.006306	0	0.407729	422	0.659482
170	170		45	90.0	7.0	0.373843	0.473176	0.029085	0.130921	0.130921	6	0.006282	0	0.447475	443	0.659525
40	40		43	86.0	7.0	0.374276	0.470028	0.053318	0.11366	0.11366	6	0.006168	0	0.376523	340	0.57772
188	188		47	94.0	7.0	0.362514	0.470544	0.006199	0.132789	0.132789	6	0.006151	0	0.432007	467	0.670122
272	272		44	88.0	7.0	0.367882	0.472298	0.021563	0.105133	0.105133	6	0.006042	0	0.323467	306	0.541563
280	280		42	84.0	7.0	0.365798	0.467396	0.013313	0.117272	0.117272	6	0.006012	0	0.441347	380	0.596153
98	98		48	96.0	7.0	0.362514	0.471576	0.003777	0.147219	0.147219	10	0.006003	0	0.504433	569	0.739718

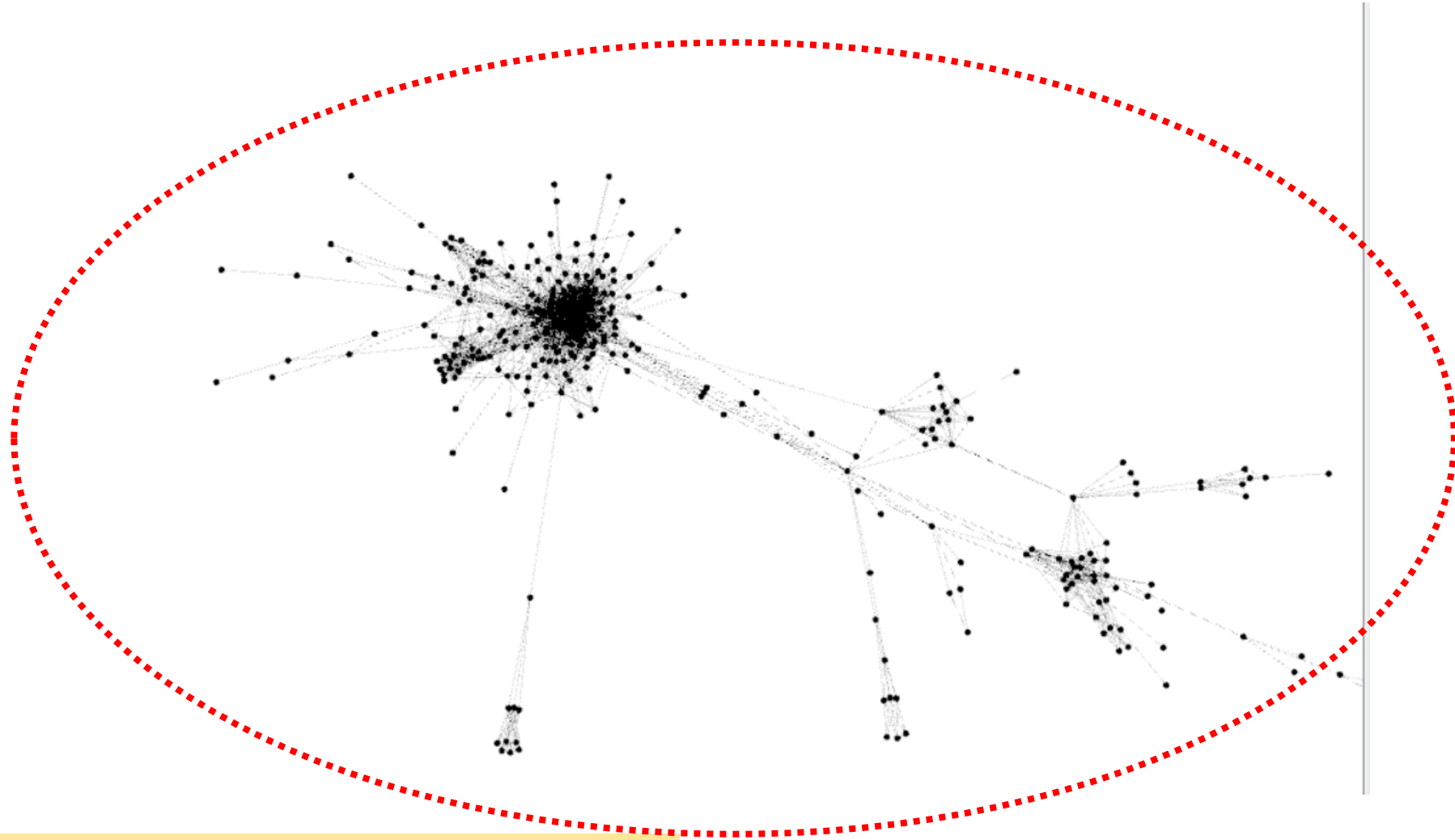
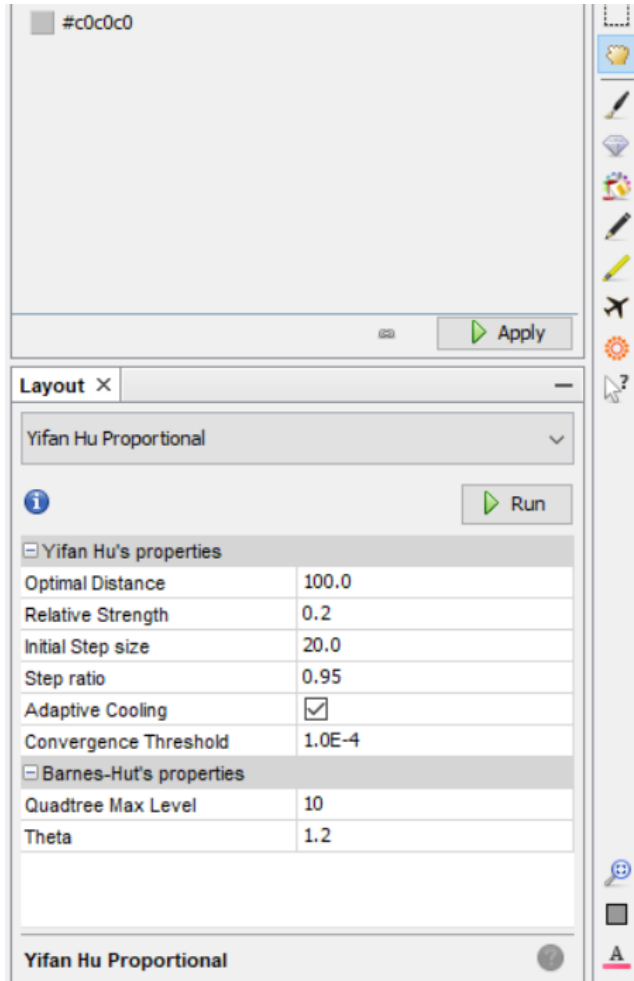
Step 4: Adjusting and exporting the network chart



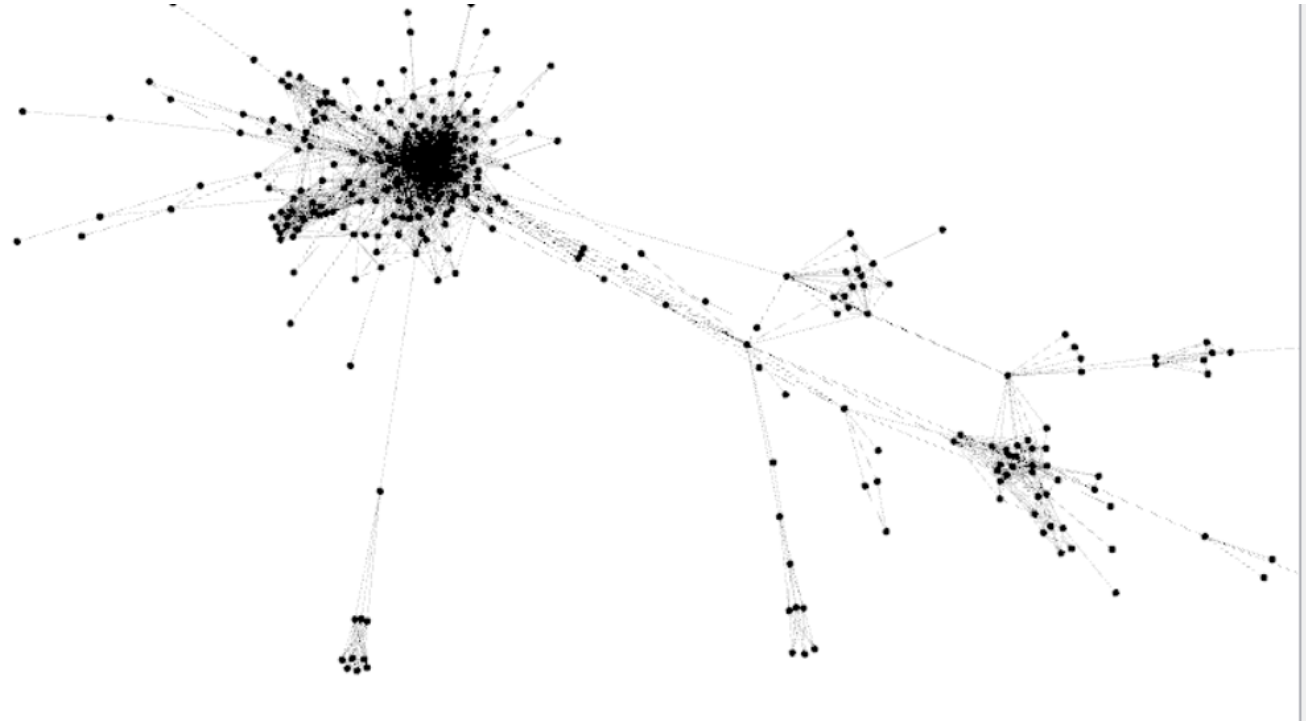
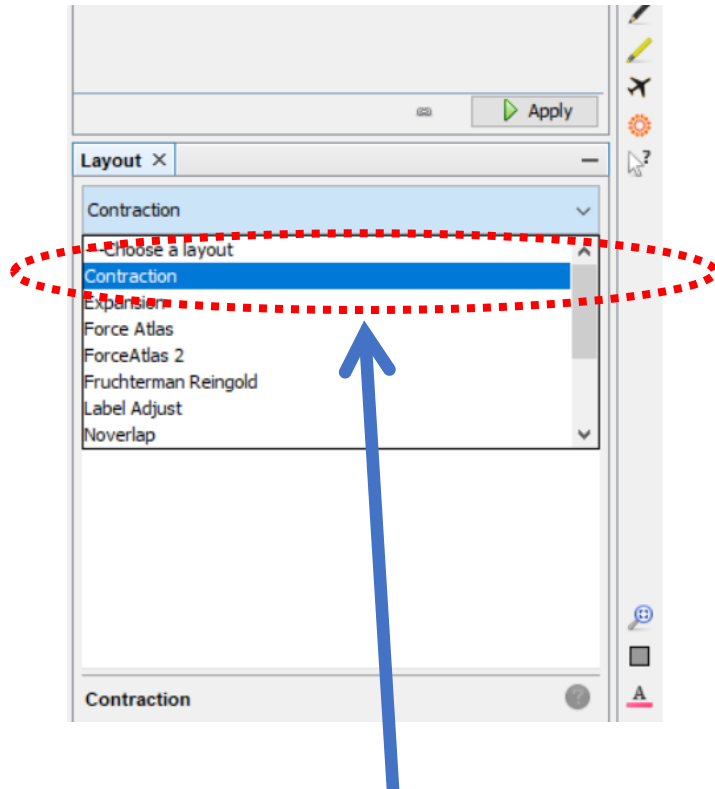
In the case of friend network, there are many embedded subgroups (i.e. sub networks). Thus, “YiFan Hu Proportional” is the most appropriate method for adjusting the network chart.



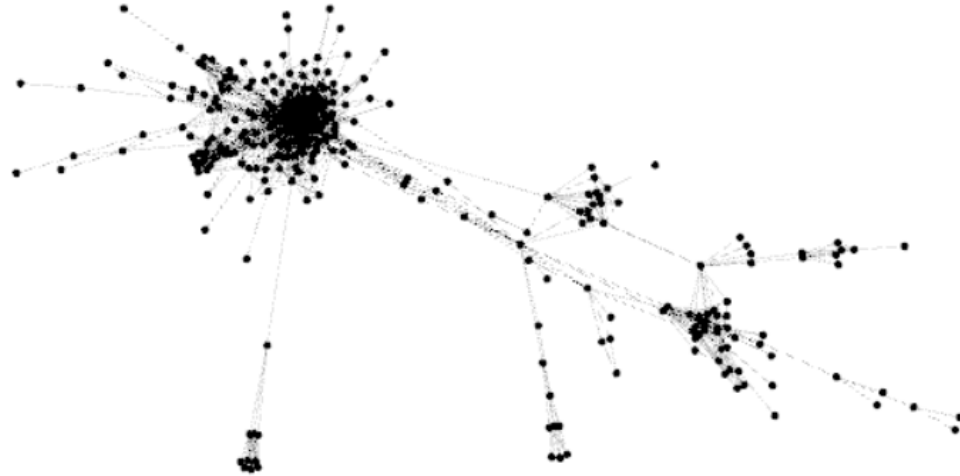
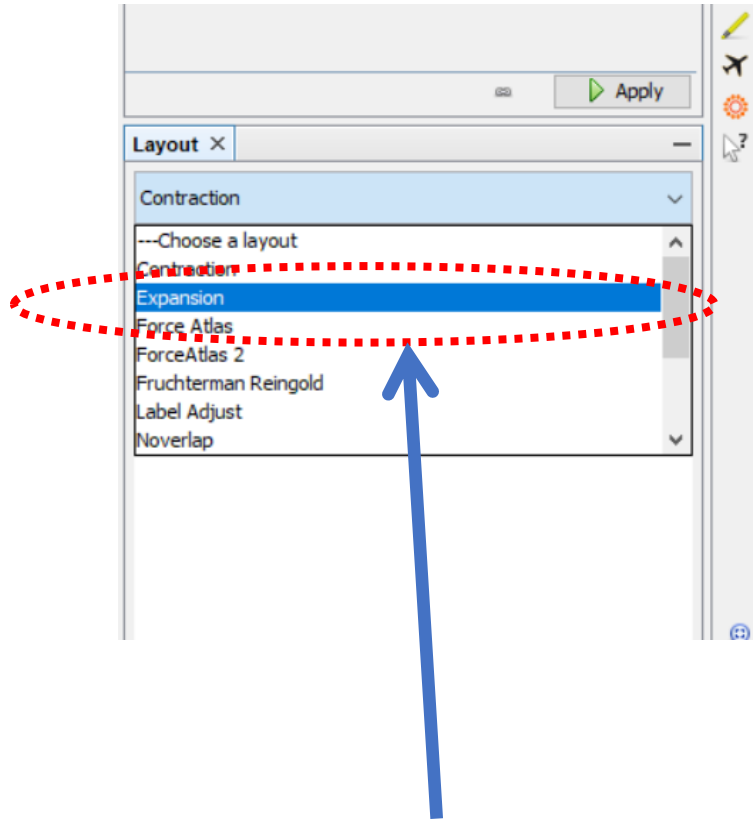
Use all default values, and then click on the 'Run' button.



The network chart will be continuously adjusted. Click on the 'Stop' button if the network chart shows sufficient details of connectivity among subgroups.



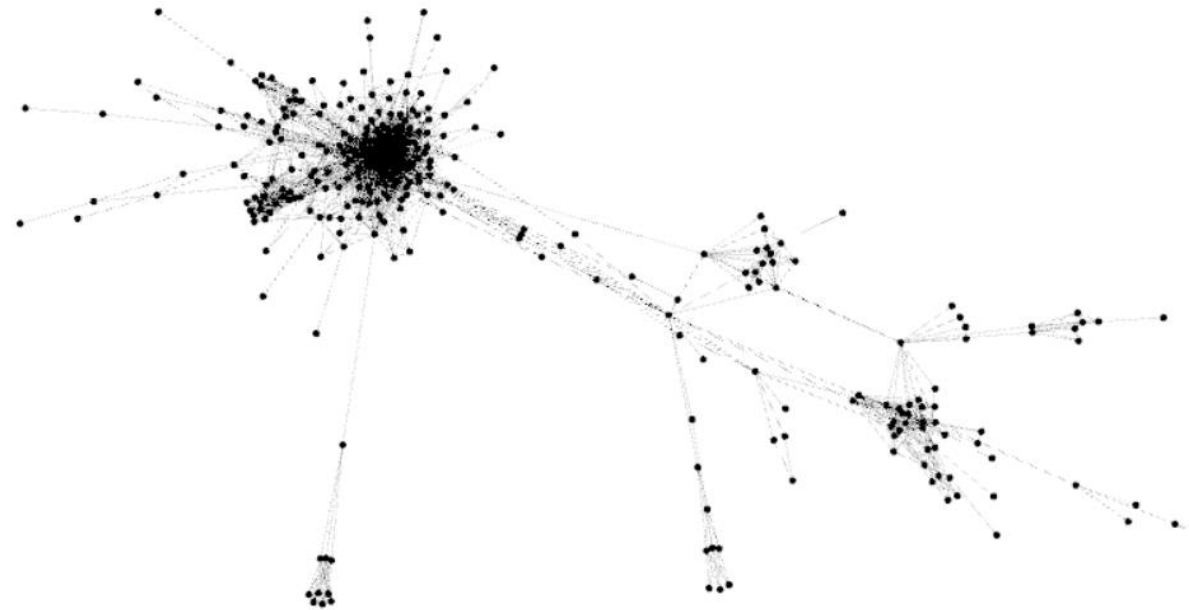
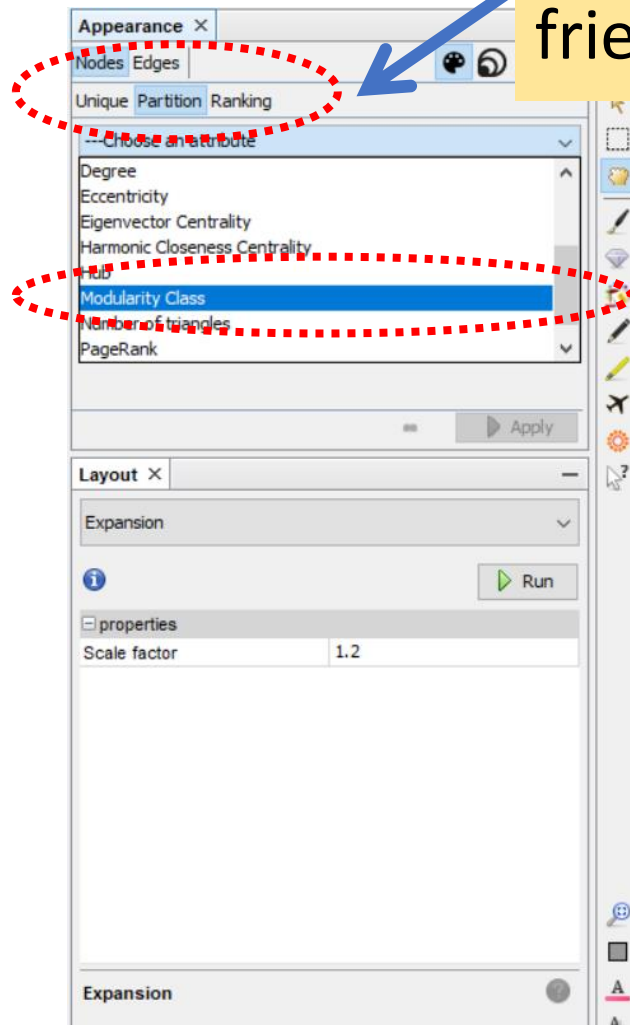
If the network chart is too large, use “Contraction” tool to shrink the size of network chart.

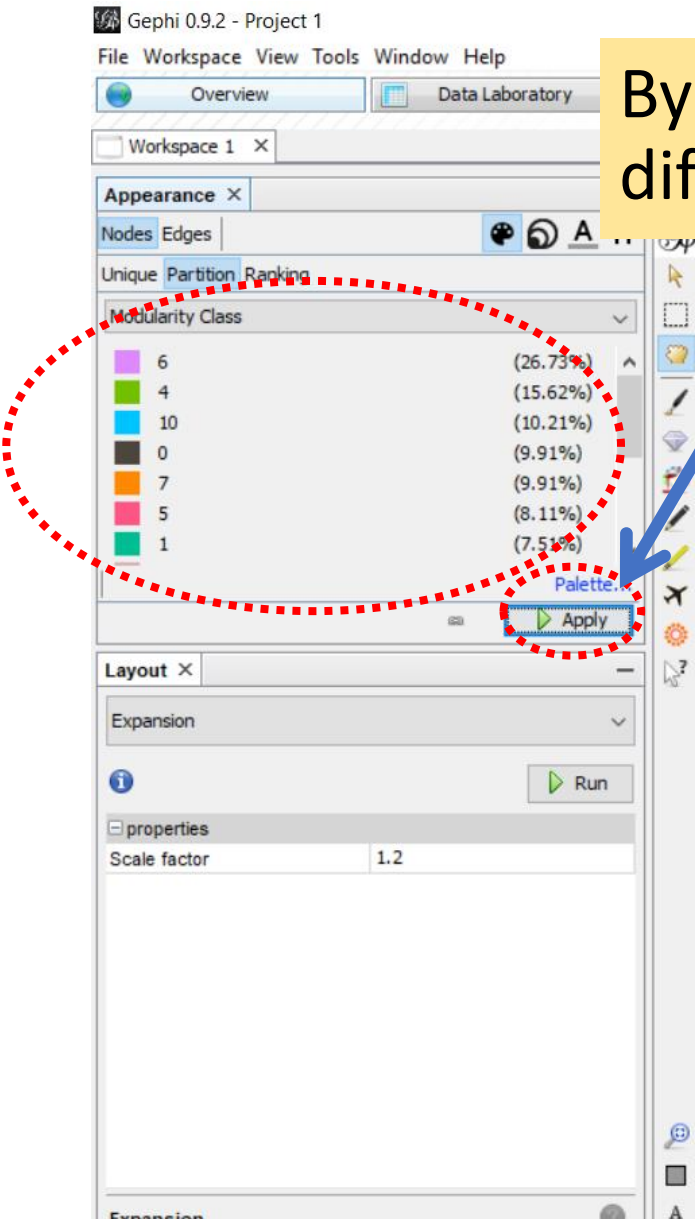


On the other hand, if the network chart is too small, use “Expansion” tool to enlarge the size of network chart.

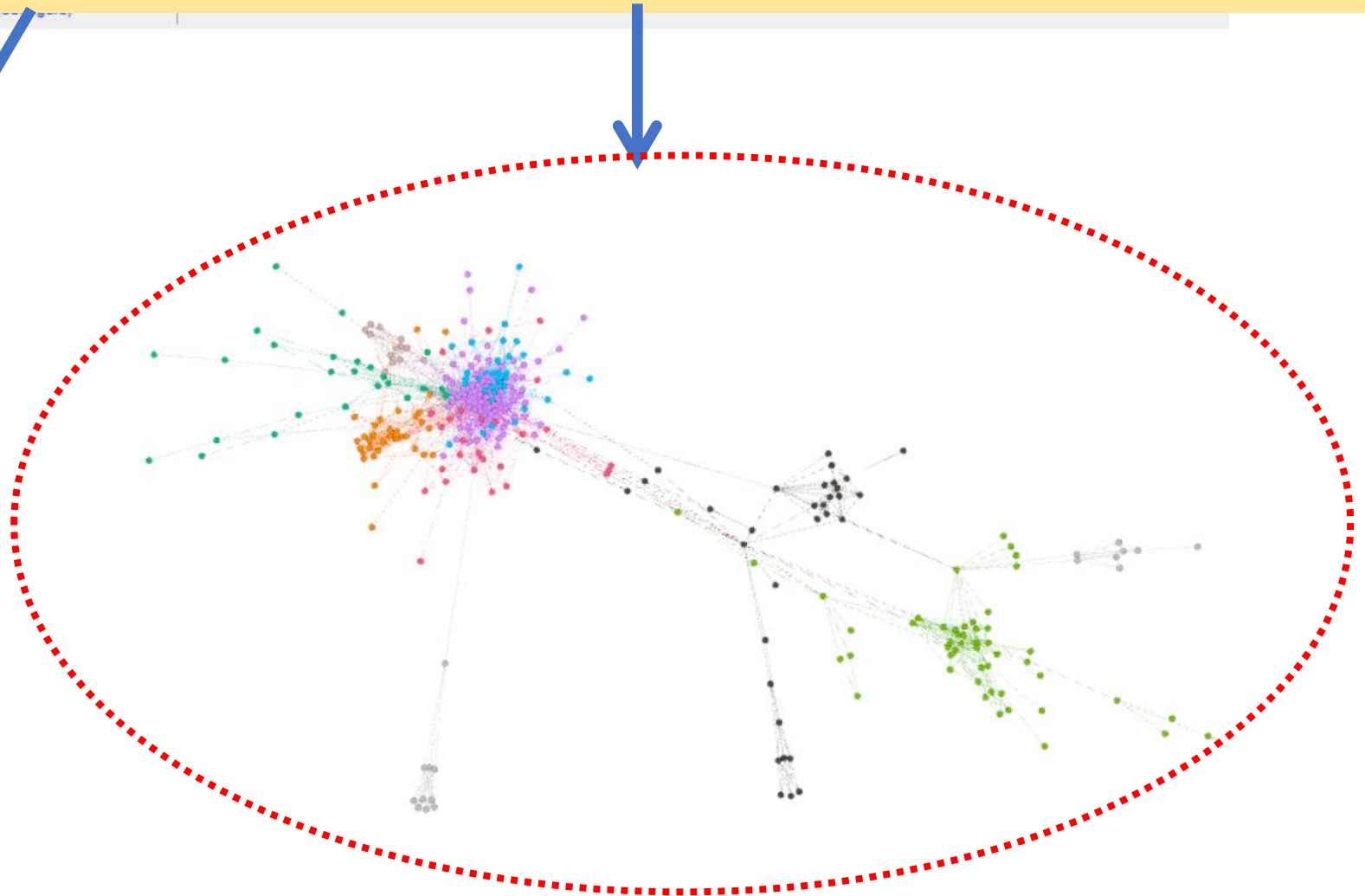
To enrich the graphical details of subgroups in this friend network, select “Node” → “Partition”.

Then, select “Modularity Class”.





By clicking on the “Apply” button, all subgroups will be differentiated with colors.



By clicking on the “Preview” tab, the network chart can be further adjusted and exported in the

The screenshot displays the Gephi 0.9.2 interface. At the top, the 'Preview' tab is selected and highlighted with a red dashed circle and a blue arrow pointing to it. Below the tab, the 'Preview Settings' panel is visible. It contains sections for 'Nodes' and 'Edges'. The 'Edges' section is expanded, and the 'Rescale weight' checkbox is checked and highlighted with a red dashed circle and a blue arrow. The 'Refresh' button at the bottom of the settings panel is also highlighted with a red dashed circle and a blue arrow. The main preview area on the right is currently empty.

Preview Settings

Presets: Default

Settings | Manage renderers

Nodes

- Border Width: 1.0
- Border Color: custom [0,0,0]
- Opacity: 100.0
- Per-Node Opacity: ☐

Node Labels

- Show Labels: ☐
- Font: Arial 12 Plain
- Proportional size: ☒
- Color: custom [0,0,0]
- Shorten label: ☐
- Max characters: 30
- Outline size: 0.0
- Outline color: custom [255,255,255]
- Outline opacity: 80.0
- Box: ☐
- Box color: parent
- Box opacity: 100.0

Edges

- Show Edges: ☒
- Thickness: 1.0
- Rescale weight: ☒
- Min. rescaled weight: 0.1
- Max. rescaled weight: 1.0
- Color: mixed
- Opacity: 100.0
- Curved: ☒
- Radius: 0.0

Preview ratio: 100%

Export: SVG/PDF/PNG

Background Reset zoom - +

Refresh

The edges can be adjusted by modifying options.

The network chart will be generated by clicking on the “Refresh” button.

Border Width 1.0

Border Color custom [0,0,0]

Opacity 100.0

Per-Node Opacity ☐Show Labels ☐

Font Arial 12 Plain

Proportional size ☒

Color custom [0,0,0]

Shorten label ☐

Max characters 30

Outline size 0.0

Outline color custom [255,255,255]

Outline opacity 80.0

Box ☐

Box color parent

Box opacity 100.0

Show Edges ☒

Thickness 1.0

Rescale weight ☒

Min. rescaled weight 0.1

Max. rescaled weight 1.0

Color mixed

Opacity 100.0

Curved ☒

Radius 0.0

Preview ratio: 100%

Refresh

Details of nodes can also be adjusted by selecting these options.



Again, the modified network chart will be re-created by clicking on the “Refresh” button.

Presets

Default

Settings Manage renderers

Nodes

Border Width 1.0

Border Color custom [0,0,0]

Opacity 100.0

Per-Node Opacity ☐

Node Labels

Show Labels ☒

Font Arial 12 Plain

Proportional size ☒ true

Color custom [0,0,0]

Shorten label ☐

Max characters 30

Outline size 0.0

Outline color custom [255,255,255]

Outline opacity 80.0

Box ☐

Box color parent

Box opacity 100.0

Edges

Show Edges ☒

Thickness 1.0

Rescale weight ☒

Min. rescaled weight 0.1

Max. rescaled weight 1.0

Color mixed

Opacity 100.0

Curved ☒

Radius 0.0

Preview ratio: 100%

Export: SVG/PDF/PNG

Refresh



By clicking on “Export”, the finalized network chart can be exported as a picture file.