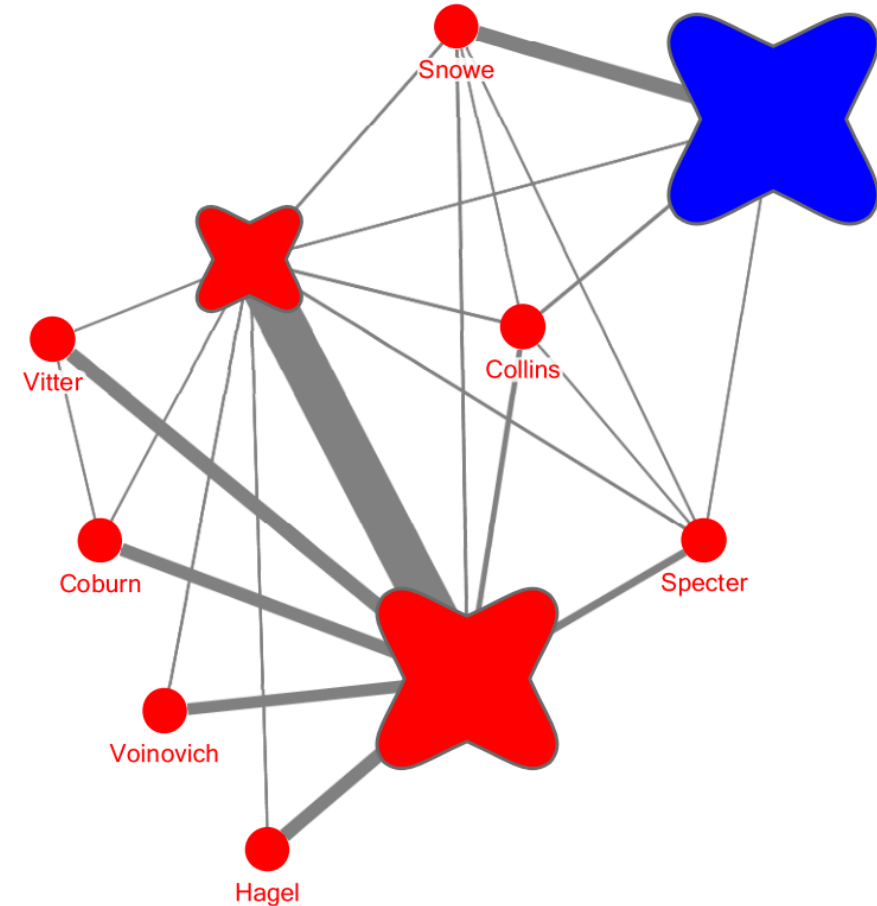
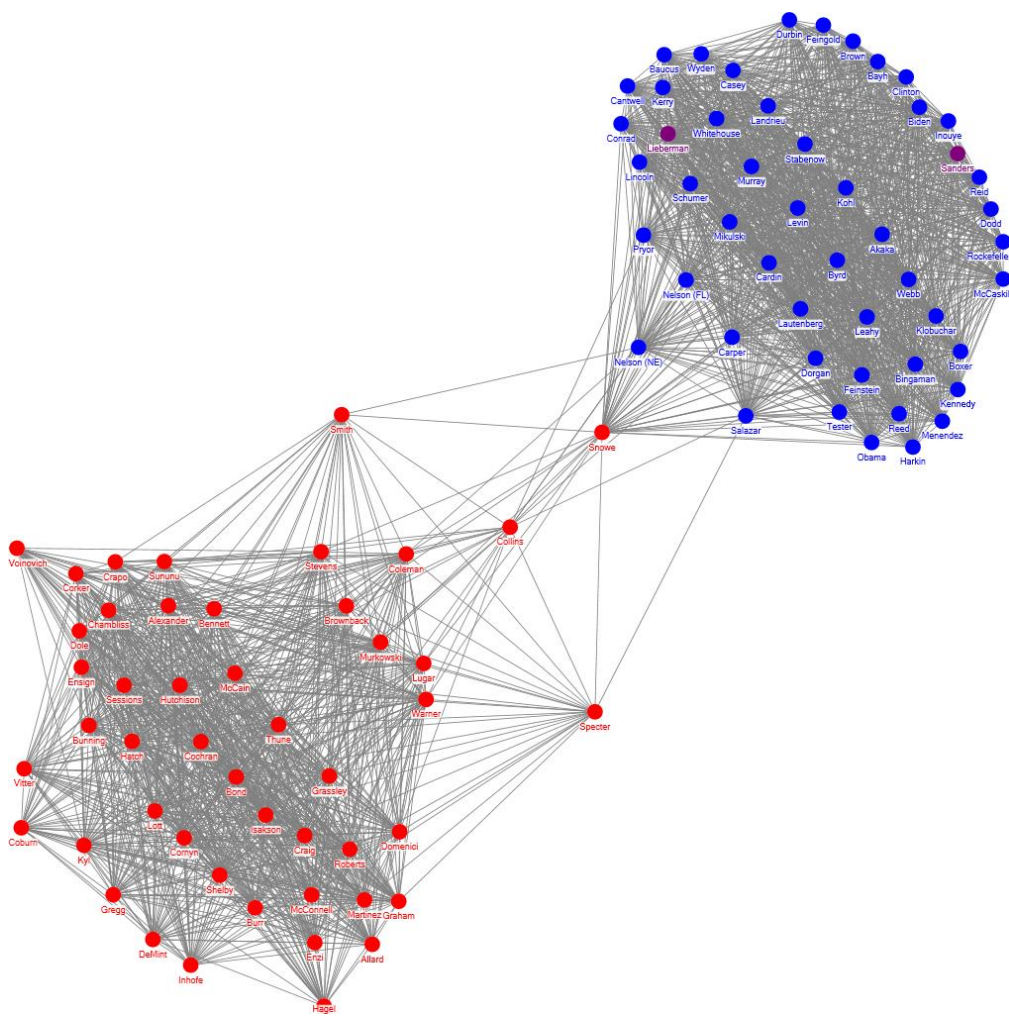


CS 7280-03 Special Topics on Visualization in Network Science

Lecture 7



Professor Cody Dunne

<https://codydunne.github.io/cs7280-f16/>
c.dunne@northeastern.edu

Homework 3

[https://codydunne.github.io/cs7280-f16/
hw/Homework-3-D3-spring-layout](https://codydunne.github.io/cs7280-f16/hw/Homework-3-D3-spring-layout)

Projects

<https://codydunne.github.io/cs7280-f16/project>

Projects

Graphika



DAGmaps⁺⁺

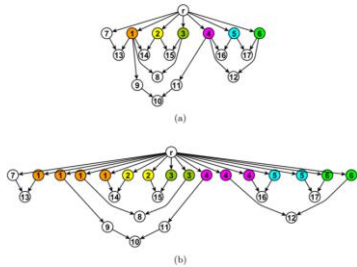


Fig. 7. Transformation of a galled network (a) to a galled tree (b).

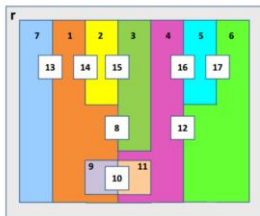


Fig. 8. The DAGmap drawing of the galled network of Figure 7(a) produced by Algorithm 3.

[Tollis & Kakoulis, 2016](#)

Alessio Arleo?

A Distributed Multilevel Force-directed Algorithm*

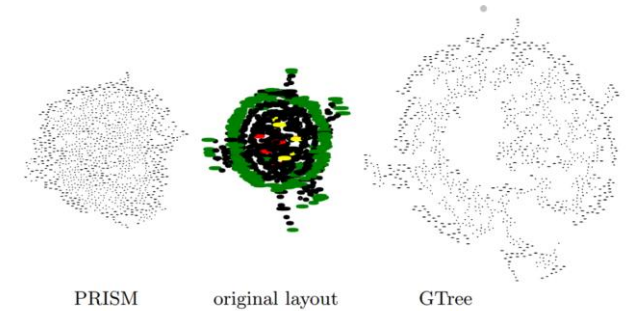
Alessio Arleo¹, Walter Didimo¹, Giuseppe Liotta¹, Fabrizio Montecchiani¹,

Università degli Studi di Perugia, Italy
alessio.arleo@studenti.unipg.it

{walter.didimo,giuseppe.liotta,fabrizio.montecchiani}@unipg.it

Abstract. The wide availability of powerful and inexpensive cloud computing services naturally motivates the study of distributed graph layout algorithms, able to scale to very large graphs. Nowadays, to process Big Data, companies are increasingly relying on PaaS infrastructures rather than buying and maintaining complex and expensive hardware. So far, only a few examples of *basic* force-directed algorithms that work in a distributed environment have been described. Instead, the design of a distributed *multilevel* force-directed algorithm is a much more challenging task, not yet addressed. We present the first multilevel force-directed algorithm based on a distributed vertex-centric paradigm, and its implementation on Giraph, a popular platform for distributed graph algorithms. Experiments show the effectiveness and the scalability of the approach. Using an inexpensive cloud computing service of Amazon, we draw graphs with ten million edges in about 60 minutes.

GTree vs. PRSIM



PRISM

original layout

GTree

[Nachmanson et al., 2016](#)

NodeXL

20111010 - NodeXL - twitter-socialcom2011.xlsx - Microsoft Excel

Table Tools: Design

Home Insert Page Layout Formulas Data Review View Developer NodeXL Design

Import Export Prepare Data Data Refresh Graph Automate Graph

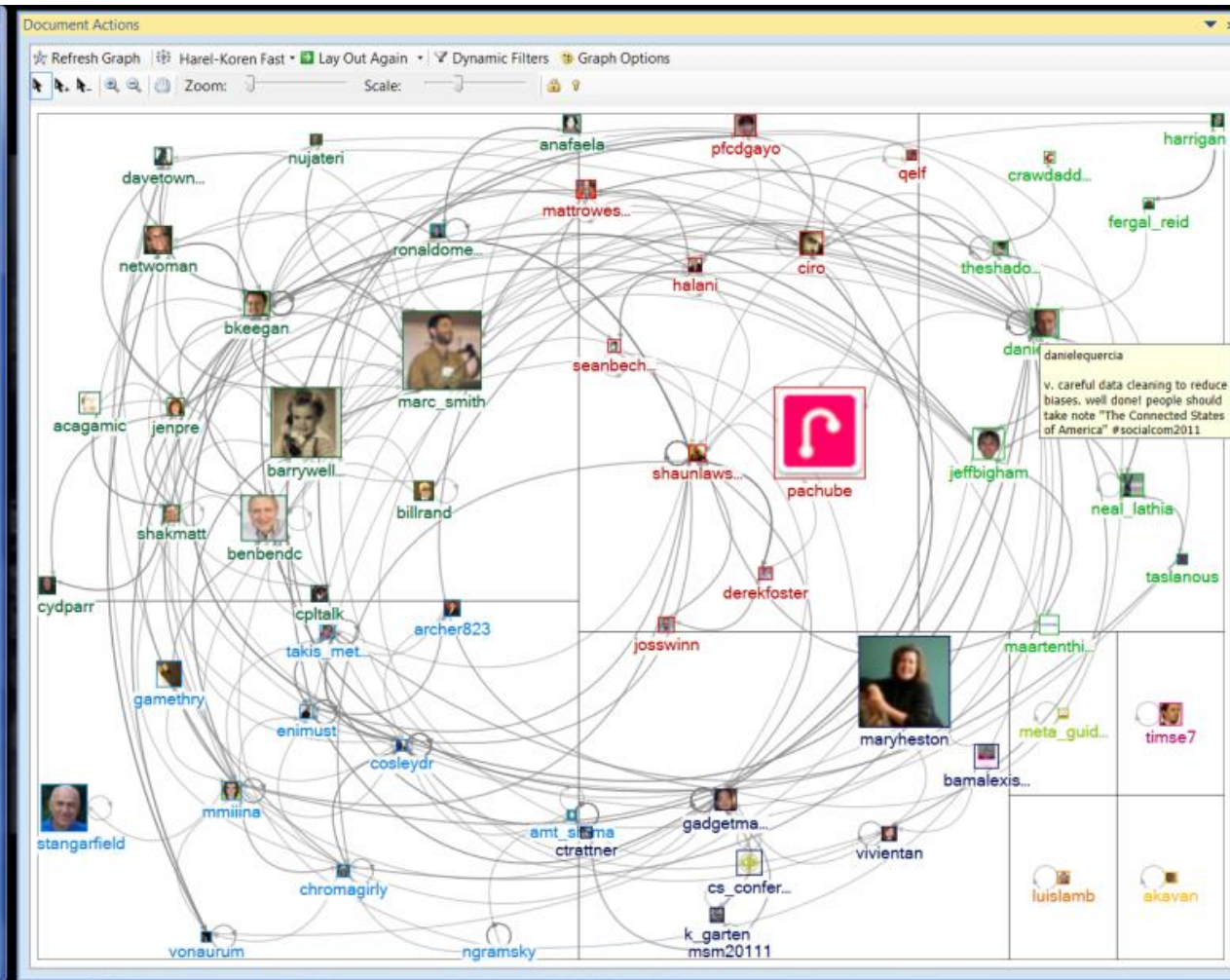
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Graph Metrics Subgraph Images Dynamic Filters Groups Use Current for New Export Reset All Workbook Columns Graph Elements Show Notifications Help

A2 Vertex

	A	B	C	D	E	F	G	H	I	AC	AD	AE
1	socialcom2011	Graph Metrics										
2	Vertex	Subgraph	In-Degree	Out-Degree	Betweenness Centrality	Closeness Centrality	Eigenvector Centrality	PageRank	Clustering Coefficient	Followed	Followers	Tweets
3	danielequercia		16	23	526.548	0.013	0.061	3.166	0.162	653	726	1804
4	gadgetman4u		13	17	452.814	0.012	0.052	2.710	0.190	474	450	2987
5	marc_smith		15	12	367.906	0.011	0.046	2.435	0.211	1388	2660	853
6	shaunlawson		14	10	318.831	0.011	0.036	2.137	0.167	154	258	1490
7	bkeegan		24	12	311.537	0.012	0.059	2.723	0.225	350	615	6540
8	mmilina		6	15	227.691	0.011	0.042	1.968	0.271	608	374	3511
9	cosleydr		14	4	209.135	0.011	0.034	1.738	0.231	0	78	80
10	ciro		8	9	128.983	0.010	0.029	1.422	0.311	563	550	569
11	theshadowhost		5	6	118.311	0.009	0.018	1.150	0.262	287	199	1792
12	ronaldomenezes		4	3	102.000	0.008	0.013	0.849	0.417	297	182	2577
13	benbendc		15	5	99.920	0.011	0.043	1.831	0.286	111	1377	282
14	jenpre		11	10	99.887	0.010	0.033	1.544	0.327	319	314	348
15	viviantan		5	3	98.877	0.009	0.015	1.038	0.267	152	171	398

Count: 40 90%



NodeXLGraph1 - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL DESIGN

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1		Visual Properties						Labels			
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Edges Vertices Groups Group ' ...

Document Actions

Show Graph Fruchterman-Reingo Lay Out Again Dynamic Filters

Zoom: Scale:



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- Import ▾ Show Graph Type: Undirected ▾
- From UCINET Full Matrix DL File...
 - From GraphML file...
 - From GraphML files...
 - From Pajek File...
 - From Open Matrix Workbook...
 - From Open Workbook...
 - From NodeXL Graph Gallery
 - From Email Network...
 - From Flickr Related Tags Network...
 - From Flickr User's Network...
 - From Twitter List Network...
 - From Twitter Search Network...
 - From Twitter User's Network...
 - From YouTube User's Network...
 - From YouTube Video Network...
 - From NodeXL Workbook Created on Another Computer...
 - Get Third-Party Graph Data Importers ▾
 - Import Options...

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Document Actions

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Import from Twitter Search Network

[Why this might take a long time: Twitter rate limiting](#)

Add a vertex for each person who tweeted this search term, or who was replied to or mentioned in those tweets:

NSA

[Advanced search help](#)

Add an edge for each:

- "Replies-to" relationship in tweet
- "Mentions" relationship in tweet
- Tweet that is not a "replies-to" or "mentions"
- Follows relationship (very slow!)

Limit to tweets

- Add a Tweet column to the Edges worksheet
- Expand URLs in tweets (slower)
- Add statistic columns to the Vertices worksheet

Your Twitter account

- I don't have a Twitter account. (Twitter discontinued this option in June 2013.)
- I have a Twitter account, but I have not yet authorized NodeXL to use my account to import Twitter networks. Take me to Twitter's authorization Web page.
- I have a Twitter account, and I have authorized NodeXL to use my account to import Twitter networks.

OK Cancel


Sign in

Options Show/Hide

Document Actions

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Zoom: Scale:



Network Graphs
The Social Media Research Foundation

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B I U Merge & Center

Conditional Formatting Format as Table Cell Styles Insert Delete Format AutoSum Fill Clear Sort & Find & Filter Select

A3 : X ✓ fx trancegemini

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4	icij					http://abs.twimg.com/sticky/default_profile_im					
5	miopepensativo					http://a0.twimg.com/profile_images/137001969					
6	luisperse					http://a0.twimg.com/profile_images/247503650					
7	mott_15					http://a0.twimg.com/profile_images/378800000					
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9	anselmvalter					http://a0.twimg.com/profile_images/109388983					
10	dilmabr					http://a0.twimg.com/profile_images/378800000					
11	marcelobranco					http://a0.twimg.com/profile_images/378800000					
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13	ngalbreath					http://a0.twimg.com/profile_images/203213373					
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18	akwasi07					http://a0.twimg.com/profile_images/378800000					
19	guardian					http://a0.twimg.com/profile_images/281461316					
20	cnni					http://a0.twimg.com/profile_images/840325508					
21	sharkowicz					http://a0.twimg.com/profile_images/378800000					
22	frogsc25					http://a0.twimg.com/profile_images/378800000					
23	jahfarini					http://pbs.twimg.com/profile_images/378800000					
24	yahoonews					http://a0.twimg.com/profile_images/378800000					
25	pehanok					http://a0.twimg.com/profile_images/378800000					
26	actualidadrt					http://a0.twimg.com/profile_images/156359800					
27	projectcounsel					http://a0.twimg.com/profile_images/378800000					
28	sharonnelsonesq					http://a0.twimg.com/profile_images/124029806					
29	posselist					http://a0.twimg.com/profile_images/571813688					
30	bbsutton					http://a0.twimg.com/profile_images/479311327					
31	max_ec					http://a0.twimg.com/profile_images/188163446					
32	zaitsevjr					http://a0.twimg.com/profile_images/307910032					
33	think_alien					http://a0.twimg.com/profile_images/135596907					
34	opexxx					http://a0.twimg.com/profile_images/374935590					
35	iamdcarlo21					http://a0.twimg.com/profile_images/378800000					
36	thegre8_1					http://a0.twimg.com/profile_images/199341181					
37	jerome_corsi					http://a0.twimg.com/profile_images/746200926					

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FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL TABLE TOOLS DESIGN

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	A	B	C	D	E	F	G	H
1			Visual Properties					Labels
2	Vertex 1	Vertex 2	Color	Width	Style	Opacity	Visibility	Label
3	trancegemini	icij						
4	miopepensativo	luisperse						
5	mott_15	high_times_mag						
6	anselmovalter	dilmabr						
7	anselmovalter	marcelobranco						
8	ashok	ngalbreath						
9	milady_toons	wikileaksactu						
10	kittyhunal	icij						
11	tweetamiracle	tweetamiracle						
12	akwasi07	guardian						
13	akwasi07	cnni						
14	sharkowictz	sharkowictz						
15	frogsc25	high_times_mag						
16	jahfarini	yahoonews						
17	pehanok	actualidadrt						
18	projectcounsel	sharonnelsonesq						
19	posselist	sharonnelsonesq						
20	bbsutton	bbsutton						
21	max_ec	max_ec						
22	zaitsevjr	zaitsevjr						
23	think_alien	opexxx						
24	iamdjcarlo21	iamdjcarlo21						
25	thegre8_1	jerome_corsi						
26	okipra_	securityweek						
27	tenshinokawaii	asdfghjaderene						
28	jewelisaneym	bunjingaj						
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30	rk70534	guardian						
31	stray_cat	stray_cat						
32	alenoir	alenoir						
33	kingletas	feedly						
34	queenclarysa	atebeyb						
35	ciellah_m	djbabzy						
36	z3ndrag0n	ngalbreath						
37	aubindfrance	aubindfrance						

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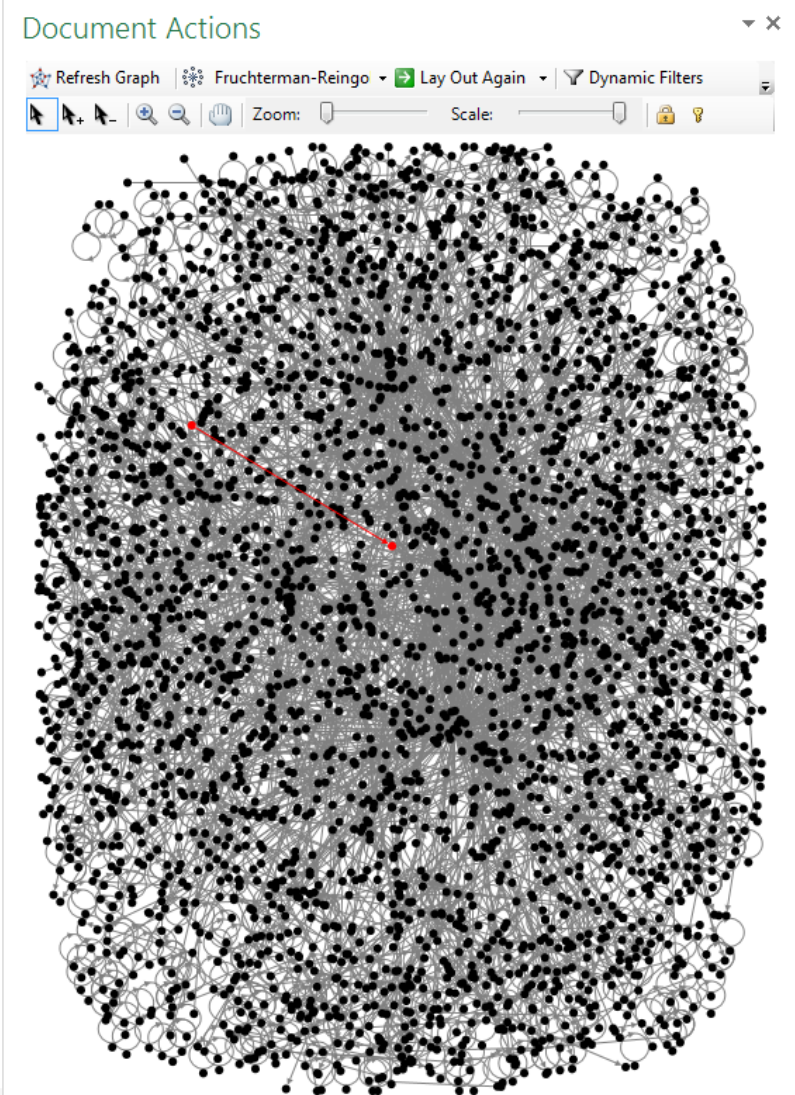
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A3 : X ✓ fx trancegemini

	A	B	C	D	E	F	G	H
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2	Vertex 1	Vertex 2	Color	Width	Style	Opacity	Visibility	Label
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9	milady_toons	wikileaksactu						
10	kittyhunal	icij						
11	tweetamiracle	tweetamiracle						
12	akwasi07	guardian						
13	akwasi07	cnni						
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15	frogsc25	high_times_mag						
16	jahfarini	yahoonews						
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23	think_alien	opexxx						
24	iamdjcarlo21	iamdjcarlo21						
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26	okipra_	securityweek						
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28	jewelisaneym	bunjingaj						
29	elpunkerrox	high_times_mag						
30	rk70534	guardian						
31	stray_cat	stray_cat						
32	alenoir	alenoir						
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36	z3ndrag0n	ngalbreath						
37	aubindfrance	aubindfrance						



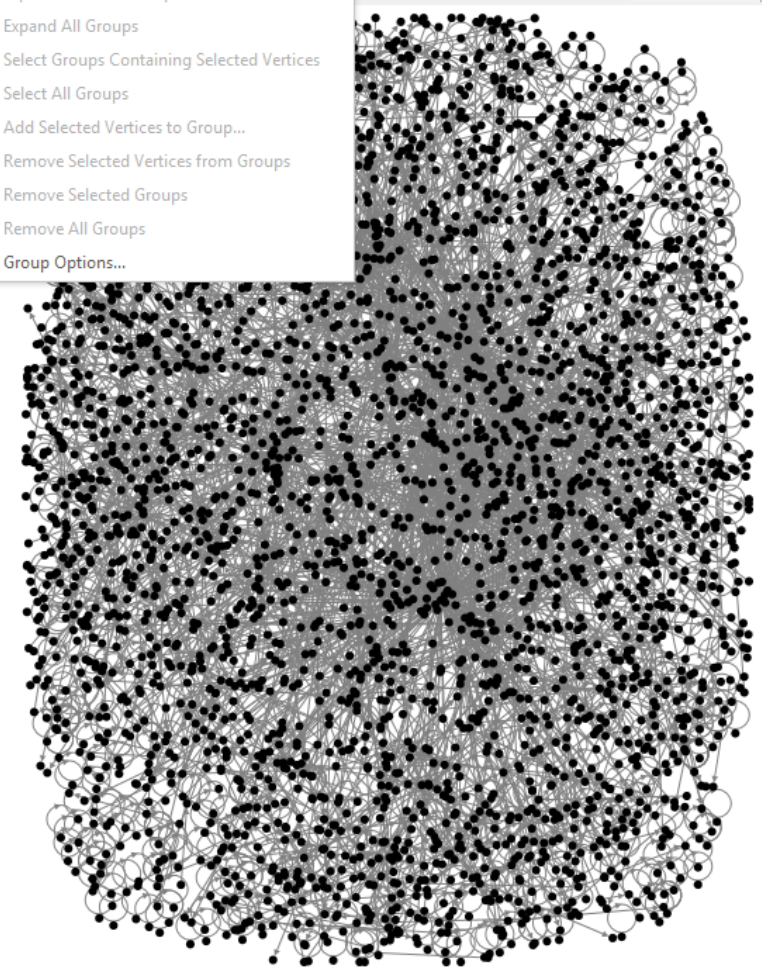
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2	Vertex 1	Vertex 2	Color	Width	Style	Opacity	Visibility	Label
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4	miopepensativo	luisperse						
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10	kittyhunal	icij						
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13	akwasi07	cnni						
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29	elpunkerrox	high_times_mag						
30	rk70534	guardian						
31	stray_cat	stray_cat						
32	alenoir	alenoir						
33	kingletas	feedly						
34	queenclarysa	atebeyb						
35	ciellah_m	djbabzy						
36	z3ndrag0n	ngalbreath						
37	aubindfrance	aubindfrance						

- Group by Vertex Attribute...
- Group by Connected Component
- Group by Cluster...
- Group by Motif...
- Collapse Selected Groups
- Collapse All Groups
- Expand Selected Groups
- Expand All Groups
- Select Groups Containing Selected Vertices
- Select All Groups
- Add Selected Vertices to Group...
- Remove Selected Vertices from Groups
- Remove Selected Groups
- Remove All Groups
- Group Options...



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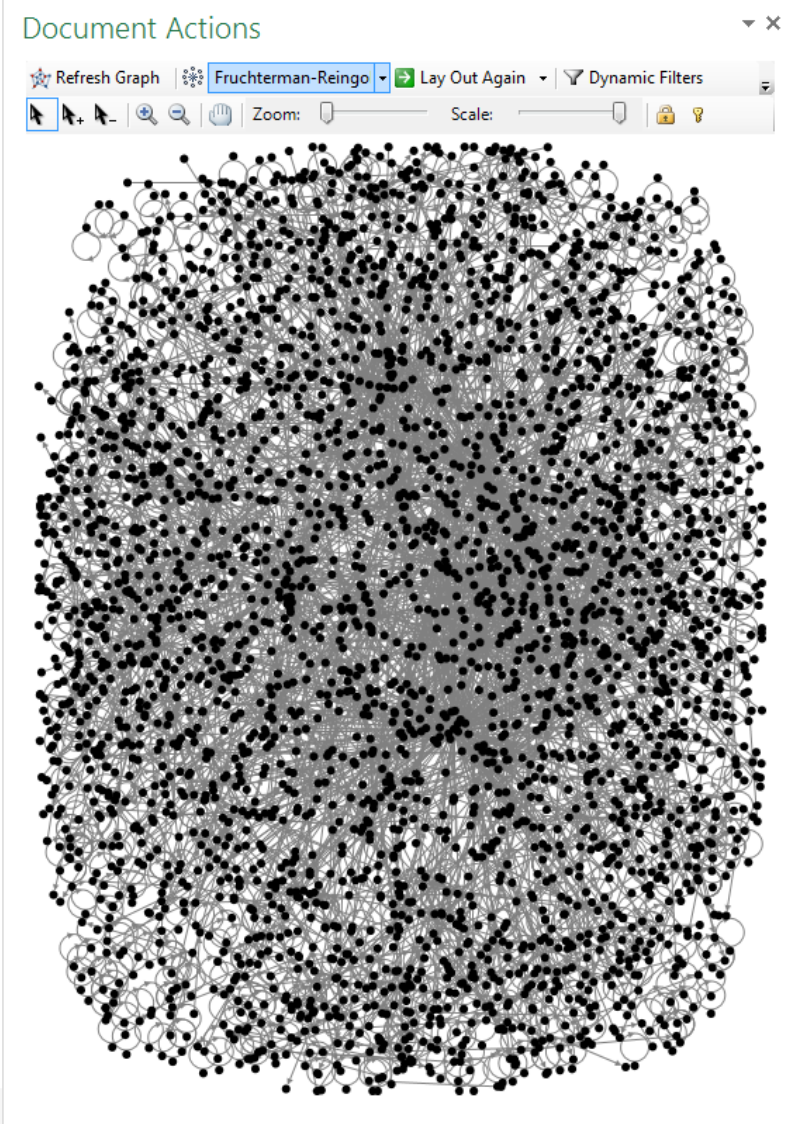
FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Fruchterman... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Graph Metrics Subgraph Images Groups Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

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2	Group	Vertex Color	Vertex Shape	Visibility	Collapsed?	Label	Vertices	Unique Edges
3	G1	0, 12, 96	Disk					
4	G2	0, 136, 227	Disk					
5	G3	0, 100, 50	Disk					
6	G4	0, 176, 22	Disk					
7	G5	191, 0, 0	Disk					
8	G6	230, 120, 0	Disk					
9	G7	255, 191, 0	Disk					
10	G8	150, 200, 0	Disk					
11	G9	200, 0, 120	Disk					
12	G10	77, 0, 96	Disk					
13	G11	91, 0, 191	Disk					
14	G12	0, 98, 130	Disk					
15	G13	0, 12, 96	Solid Square					
16	G14	0, 136, 227	Solid Square					
17	G15	0, 100, 50	Solid Square					
18	G16	0, 176, 22	Solid Square					
19	G17	191, 0, 0	Solid Square					
20	G18	230, 120, 0	Solid Square					
21	G19	255, 191, 0	Solid Square					
22	G20	150, 200, 0	Solid Square					
23	G21	200, 0, 120	Solid Square					
24	G22	77, 0, 96	Solid Square					
25	G23	91, 0, 191	Solid Square					
26	G24	0, 98, 130	Solid Square					
27	G25	0, 12, 96	Solid Diamond					
28	G26	0, 136, 227	Solid Diamond					
29	G27	0, 100, 50	Solid Diamond					
30	G28	0, 176, 22	Solid Diamond					
31	G29	191, 0, 0	Solid Diamond					
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33	G31	255, 191, 0	Solid Diamond					
34	G32	150, 200, 0	Solid Diamond					
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36	G34	77, 0, 96	Solid Diamond					
37	G35	91, 0, 191	Solid Diamond					

Edges Vertices **Groups** Group ' ...

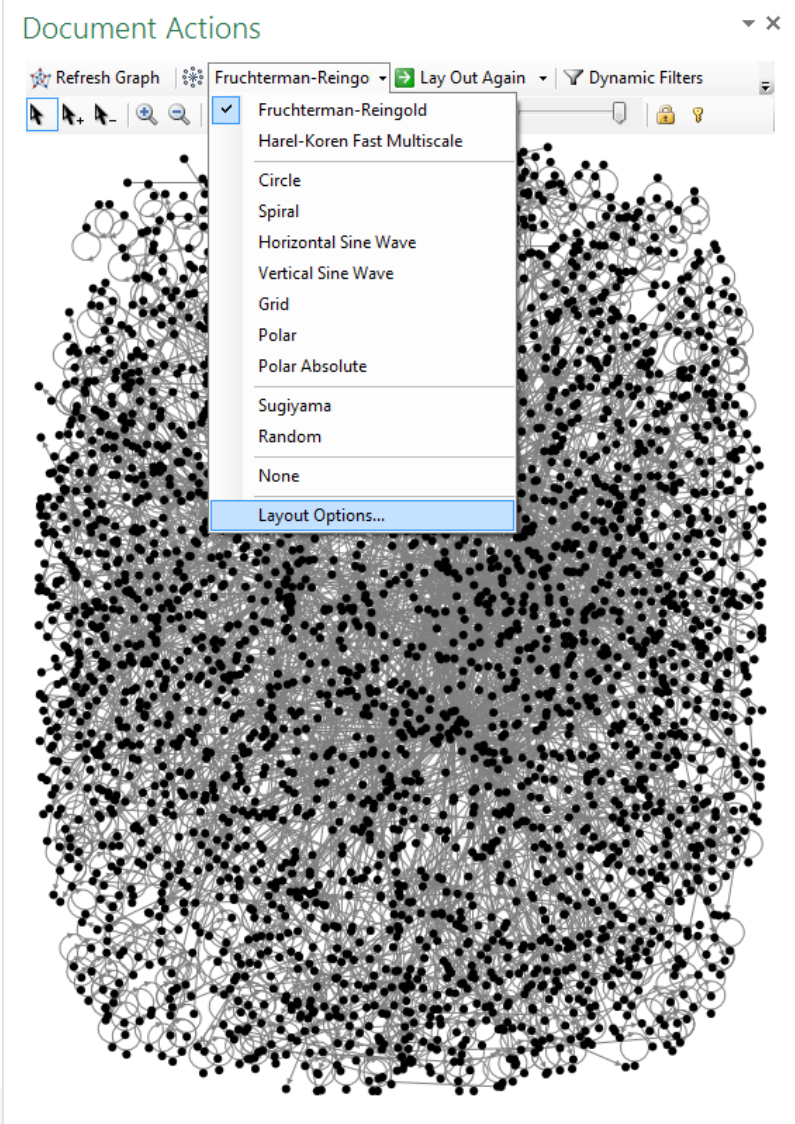


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2	Group	Vertex Color	Vertex Shape	Visibility	Collapsed?	Label	Vertices	Unique Edges
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4	G2	0, 136, 227	Disk					
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6	G4	0, 176, 22	Disk					
7	G5	191, 0, 0	Disk					
8	G6	230, 120, 0	Disk					
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10	G8	150, 200, 0	Disk					
11	G9	200, 0, 120	Disk					
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20	G18	230, 120, 0	Solid Square					
21	G19	255, 191, 0	Solid Square					
22	G20	150, 200, 0	Solid Square					
23	G21	200, 0, 120	Solid Square					
24	G22	77, 0, 96	Solid Square					
25	G23	91, 0, 191	Solid Square					
26	G24	0, 98, 130	Solid Square					
27	G25	0, 12, 96	Solid Diamond					
28	G26	0, 136, 227	Solid Diamond					
29	G27	0, 100, 50	Solid Diamond					
30	G28	0, 176, 22	Solid Diamond					
31	G29	191, 0, 0	Solid Diamond					
32	G30	230, 120, 0	Solid Diamond					
33	G31	255, 191, 0	Solid Diamond					
34	G32	150, 200, 0	Solid Diamond					
35	G33	200, 0, 120	Solid Diamond					
36	G34	77, 0, 96	Solid Diamond					
37	G35	91, 0, 191	Solid Diamond					



1	Visual Properties
2	Group Vertex Color Vertex Shape
3	G1 0, 12, 96 Disk
4	G2 0, 136, 227 Disk
5	G3 0, 100, 50 Disk
6	G4 0, 176, 22 Disk
7	G5 191, 0, 0 Disk
8	G6 230, 120, 0 Disk
9	G7 255, 191, 0 Disk
10	G8 150, 200, 0 Disk
11	G9 200, 0, 120 Disk
12	G10 77, 0, 96 Disk
13	G11 91, 0, 191 Disk
14	G12 0, 98, 130 Disk
15	G13 0, 12, 96 Solid Square
16	G14 0, 136, 227 Solid Square
17	G15 0, 100, 50 Solid Square
18	G16 0, 176, 22 Solid Square
19	G17 191, 0, 0 Solid Square
20	G18 230, 120, 0 Solid Square
21	G19 255, 191, 0 Solid Square
22	G20 150, 200, 0 Solid Square
23	G21 200, 0, 120 Solid Square
24	G22 77, 0, 96 Solid Square
25	G23 91, 0, 191 Solid Square
26	G24 0, 98, 130 Solid Square
27	G25 0, 12, 96 Solid Diamond
28	G26 0, 136, 227 Solid Diamond
29	G27 0, 100, 50 Solid Diamond
30	G28 0, 176, 22 Solid Diamond
31	G29 191, 0, 0 Solid Diamond
32	G30 230, 120, 0 Solid Diamond
33	G31 255, 191, 0 Solid Diamond
34	G32 150, 200, 0 Solid Diamond
35	G33 200, 0, 120 Solid Diamond
36	G34 77, 0, 96 Solid Diamond
37	G35 91, 0, 191 Solid Diamond

Layout Options

Margin: 6

Layout style

- Lay out the entire graph in the entire graph pane (typical case)
- Lay out each of the graph's groups in its own box and sort the boxes by group size
- Lay out the graph's smaller connected components in boxes at the bottom of the graph pane

Width of the box outlines: 1

Intergroup edges: Show

Use the Grid layout for groups that don't have many edges

Maximum size of the connected components to lay out in boxes: 3 vertices

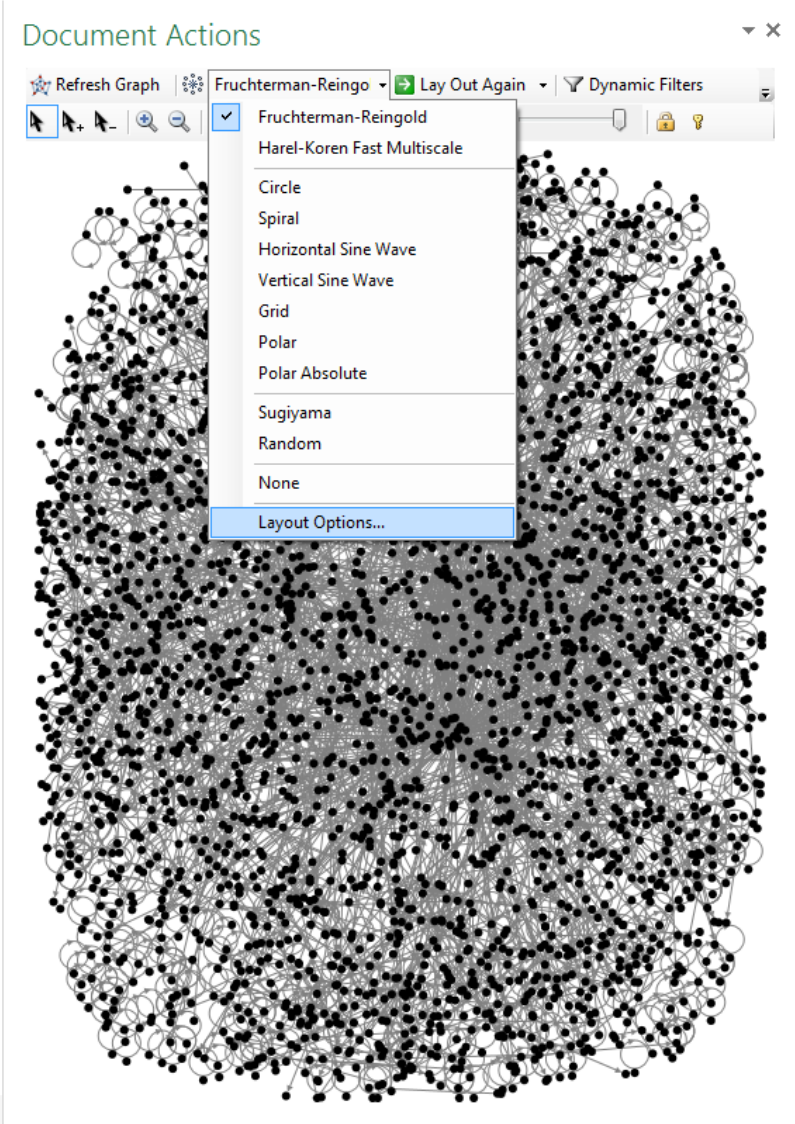
Box size: 16

Fruchterman-Reingold layout

Strength of the repulsive force between vertices: 3.0

Iterations per layout: 10

Reset All OK Cancel



FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL Sign in

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Fruchterma... Autofill Columns Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

Data Graph Visual Properties Analysis Options Show/Hide

A1

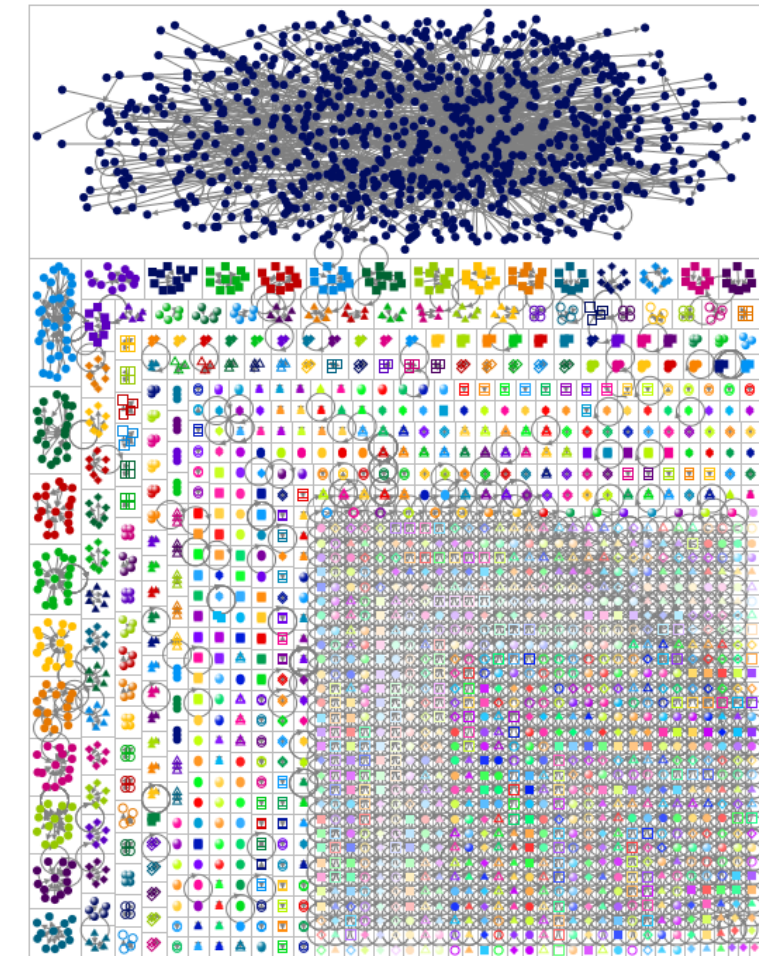
	A	B	C	D	E	F	K	L
1		Visual Properties				Labels	Graph Metrics	
2	Group	Vertex Color	Vertex Shape	Visibility	Collapsed?	Label	Vertices	Unique Edges
3	G1	0, 12, 96	Disk					
4	G2	0, 136, 227	Disk					
5	G3	0, 100, 50	Disk					
6	G4	0, 176, 22	Disk					
7	G5	191, 0, 0	Disk					
8	G6	230, 120, 0	Disk					
9	G7	255, 191, 0	Disk					
10	G8	150, 200, 0	Disk					
11	G9	200, 0, 120	Disk					
12	G10	77, 0, 96	Disk					
13	G11	91, 0, 191	Disk					
14	G12	0, 98, 130	Disk					
15	G13	0, 12, 96	Solid Square					
16	G14	0, 136, 227	Solid Square					
17	G15	0, 100, 50	Solid Square					
18	G16	0, 176, 22	Solid Square					
19	G17	191, 0, 0	Solid Square					
20	G18	230, 120, 0	Solid Square					
21	G19	255, 191, 0	Solid Square					
22	G20	150, 200, 0	Solid Square					
23	G21	200, 0, 120	Solid Square					
24	G22	77, 0, 96	Solid Square					
25	G23	91, 0, 191	Solid Square					
26	G24	0, 98, 130	Solid Square					
27	G25	0, 12, 96	Solid Diamond					
28	G26	0, 136, 227	Solid Diamond					
29	G27	0, 100, 50	Solid Diamond					
30	G28	0, 176, 22	Solid Diamond					
31	G29	191, 0, 0	Solid Diamond					
32	G30	230, 120, 0	Solid Diamond					
33	G31	255, 191, 0	Solid Diamond					
34	G32	150, 200, 0	Solid Diamond					
35	G33	200, 0, 120	Solid Diamond					
36	G34	77, 0, 96	Solid Diamond					
37	G35	91, 0, 191	Solid Diamond					

Edges Vertices Groups Group' ...

Document Actions

Refresh Graph Fruchterman-Reingo Lay Out Again Dynamic Filters

Zoom: Scale:



NSA 2013-10-16.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Fruchterma... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

A1

	A	B	C	D	E	F	K	L
1		Visual Properties				Labels	Graph Metrics	
2	Group	Vertex Color	Vertex Shape	Visibility	Collapsed?	Label	Vertices	Unique Edges
3	G1	0, 12, 96	Disk					
4	G2	0, 136, 227	Disk					
5	G3	0, 100, 50	Disk					
6	G4	0, 176, 22	Disk					
7	G5	191, 0, 0	Disk					
8	G6	230, 120, 0	Disk					
9	G7	255, 191, 0	Disk					
10	G8	150, 200, 0	Disk					
11	G9	200, 0, 120	Disk					
12	G10	77, 0, 96	Disk					
13	G11	91, 0, 191	Disk					
14	G12	0, 98, 130	Disk					
15	G13	0, 12, 96	Solid Square					
16	G14	0, 136, 227	Solid Square					
17	G15	0, 100, 50	Solid Square					
18	G16	0, 176, 22	Solid Square					
19	G17	191, 0, 0	Solid Square					
20	G18	230, 120, 0	Solid Square					
21	G19	255, 191, 0	Solid Square					
22	G20	150, 200, 0	Solid Square					
23	G21	200, 0, 120	Solid Square					
24	G22	77, 0, 96	Solid Square					
25	G23	91, 0, 191	Solid Square					
26	G24	0, 98, 130	Solid Square					
27	G25	0, 12, 96	Solid Diamond					
28	G26	0, 136, 227	Solid Diamond					
29	G27	0, 100, 50	Solid Diamond					
30	G28	0, 176, 22	Solid Diamond					
31	G29	191, 0, 0	Solid Diamond					
32	G30	230, 120, 0	Solid Diamond					
33	G31	255, 191, 0	Solid Diamond					
34	G32	150, 200, 0	Solid Diamond					
35	G33	200, 0, 120	Solid Diamond					
36	G34	77, 0, 96	Solid Diamond					
37	G35	91, 0, 191	Solid Diamond					

Edges Vertices Groups Group' ...

Document Actions

Refresh Graph Fruchterman-Reingold Lay Out Again Dynamic Filters

- Fruchterman-Reingold
- Harel-Koren Fast Multiscale
- Circle
- Spiral
- Horizontal Sine Wave
- Vertical Sine Wave
- Grid
- Polar
- Polar Absolute
- Sugiyama
- Random
- None
- Layout Options...

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

Data Graph Visual Properties Analysis Options Show/Hide

A1

	A	B	C	D	E	F	K	L	
1		Visual Properties				Labels	Graph Metrics		
2	Group	Vertex Color	Vertex Shape	Visibility	Collapsed?	Label	Vertices	Unique Edges	Edge Dup
3	G1	0, 12, 96	Disk						
4	G2	0, 136, 227	Disk						
5	G3	0, 100, 50	Disk						
6	G4	0, 176, 22	Disk						
7	G5	191, 0, 0	Disk						
8	G6	230, 120, 0	Disk						
9	G7	255, 191, 0	Disk						
10	G8	150, 200, 0	Disk						
11	G9	200, 0, 120	Disk						
12	G10	77, 0, 96	Disk						
13	G11	91, 0, 191	Disk						
14	G12	0, 98, 130	Disk						
15	G13	0, 12, 96	Solid Square						
16	G14	0, 136, 227	Solid Square						
17	G15	0, 100, 50	Solid Square						
18	G16	0, 176, 22	Solid Square						
19	G17	191, 0, 0	Solid Square						
20	G18	230, 120, 0	Solid Square						
21	G19	255, 191, 0	Solid Square						
22	G20	150, 200, 0	Solid Square						
23	G21	200, 0, 120	Solid Square						
24	G22	77, 0, 96	Solid Square						
25	G23	91, 0, 191	Solid Square						
26	G24	0, 98, 130	Solid Square						
27	G25	0, 12, 96	Solid Diamond						
28	G26	0, 136, 227	Solid Diamond						
29	G27	0, 100, 50	Solid Diamond						
30	G28	0, 176, 22	Solid Diamond						
31	G29	191, 0, 0	Solid Diamond						
32	G30	230, 120, 0	Solid Diamond						
33	G31	255, 191, 0	Solid Diamond						
34	G32	150, 200, 0	Solid Diamond						
35	G33	200, 0, 120	Solid Diamond						
36	G34	77, 0, 96	Solid Diamond						
37	G35	91, 0, 191	Solid Diamond						

Edges Vertices Groups Group' ...

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

NSA 2013-10-16.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Graph Metrics Subgraph Images Groups Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

	A	B	C	D	E	F	G	H	I	J	
1		Visual Properties					Labels				
2	Vertex	Color	Shape	Size	Opacity	Image	File	Visibility	Label	Color	Position
3	trancegemini					http://a0.twimg.com/profile_images/378800000					
4	icij					http://abs.twimg.com/sticky/default_profile_im					
5	miopepensativo					http://a0.twimg.com/profile_images/137001969					
6	luisperse					http://a0.twimg.com/profile_images/247503650					
7	mott_15					http://a0.twimg.com/profile_images/378800000					
8	high_times_mag					http://a0.twimg.com/profile_images/378800000					
9	anselmovalter					http://a0.twimg.com/profile_images/109388983					
10	dilmabr					http://a0.twimg.com/profile_images/378800000					
11	marcelobranco					http://a0.twimg.com/profile_images/378800000					
12	ashok					http://a0.twimg.com/profile_images/116259884					
13	ngalbreath					http://a0.twimg.com/profile_images/203213373					
14	milady_toons					http://a0.twimg.com/profile_images/378800000					
15	wikileaksactu					http://a0.twimg.com/profile_images/378800000					
16	kittyhunal					http://a0.twimg.com/profile_images/356965882					
17	tweetamiracle					http://a0.twimg.com/profile_images/370604928					
18	akwasi07					http://a0.twimg.com/profile_images/378800000					
19	guardian					http://a0.twimg.com/profile_images/281461316					
20	cnni					http://a0.twimg.com/profile_images/840325508					
21	sharkowicz					http://a0.twimg.com/profile_images/378800000					
22	frogsc25					http://a0.twimg.com/profile_images/378800000					
23	jahfarini					http://pbs.twimg.com/profile_images/378800000					
24	yahoonews					http://a0.twimg.com/profile_images/378800000					
25	pehanok					http://a0.twimg.com/profile_images/378800000					
26	actualidadrt					http://a0.twimg.com/profile_images/156359800					
27	projectcounsel					http://a0.twimg.com/profile_images/378800000					
28	sharonnelsonesq					http://a0.twimg.com/profile_images/124029806					
29	posselist					http://a0.twimg.com/profile_images/571813688					
30	bbsutton					http://a0.twimg.com/profile_images/479311327					
31	max_ec					http://a0.twimg.com/profile_images/188163446					
32	zaitsevjr					http://a0.twimg.com/profile_images/307910032					
33	think_alien					http://a0.twimg.com/profile_images/135596907					
34	opexxx					http://a0.twimg.com/profile_images/374935390					
35	iamdjcarlo21					http://a0.twimg.com/profile_images/378800000					
36	thegre8_1					http://a0.twimg.com/profile_images/199341181					
37	jerome_corsi					http://a0.twimg.com/profile_images/746200926					

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

NSA 2013-10-16.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

	A	B	C	D	E	F	G	H	I	J	
1		Visual Properties					Labels				
2	Vertex	Color	Shape	Size	Opacity	Image	File	Visibility	Label	Color	Position
3	trancegemini					http://a0.twimg.com/profile_images/378800000					
4	icij					http://abs.twimg.com/sticky/default_profile_im					
5	miopepensativo					http://a0.twimg.com/profile_images/137001969					
6	luisperse					http://a0.twimg.com/profile_images/247503650					
7	mott_15					http://a0.twimg.com/profile_images/378800000					
8	high_times_mag					http://a0.twimg.com/profile_images/378800000					
9	anselmovalter					http://a0.twimg.com/profile_images/109388983					
10	dilmabr					http://a0.twimg.com/profile_images/378800000					
11	marcelobranco					http://a0.twimg.com/profile_images/378800000					
12	ashok					http://a0.twimg.com/profile_images/116259884					
13	ngalbreath					http://a0.twimg.com/profile_images/203213373					
14	milady_toons					http://a0.twimg.com/profile_images/378800000					
15	wikileaksactu					http://a0.twimg.com/profile_images/378800000					
16	kittyhunal					http://a0.twimg.com/profile_images/356965882					
17	tweetamiracle					http://a0.twimg.com/profile_images/370604928					
18	akwasi07					http://a0.twimg.com/profile_images/378800000					
19	guardian					http://a0.twimg.com/profile_images/281461316					
20	cnni					http://a0.twimg.com/profile_images/840325508					
21	sharkowicz					http://a0.twimg.com/profile_images/378800000					
22	frogsc25					http://a0.twimg.com/profile_images/378800000					
23	jahfarini					http://pbs.twimg.com/profile_images/378800000					
24	yahoonews					http://a0.twimg.com/profile_images/378800000					
25	pehanok					http://a0.twimg.com/profile_images/378800000					
26	actualidadrt					http://a0.twimg.com/profile_images/156359800					
27	projectcounsel					http://a0.twimg.com/profile_images/378800000					
28	sharonnelsonesq					http://a0.twimg.com/profile_images/124029806					
29	posselist					http://a0.twimg.com/profile_images/571813688					
30	bbsutton					http://a0.twimg.com/profile_images/479311327					
31	max_ec					http://a0.twimg.com/profile_images/188163446					
32	zaitsevjr					http://a0.twimg.com/profile_images/307910032					
33	think_alien					http://a0.twimg.com/profile_images/135596907					
34	opexxx					http://a0.twimg.com/profile_images/374935390					
35	iamdjcarlo21					http://a0.twimg.com/profile_images/378800000					
36	thegre8_1					http://a0.twimg.com/profile_images/199341181					
37	jerome_corsi					http://a0.twimg.com/profile_images/746200926					

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

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FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL DESIGN

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

A16 kittyhunal

	A	B	C	D	E	F	G	H	I	J	
1		Visual Properties					Image	Labels	Label Fill	Label	
2	Vertex	Color	Shape	Size	Opacity	File	Visibility	Label	Color	Positic	
3	trancegemini					http://a0.twimg.com/profile_images/378800000					
4	icij					http://abs.twimg.com/sticky/default_profile_im					
5	miopepensativo					http://a0.twimg.com/profile_images/137001969					
6	luisperse					http://a0.twimg.com/profile_images/247503650					
7	mott_15					http://a0.twimg.com/profile_images/378800000					
8	high_times_mag					http://a0.twimg.com/profile_images/378800000					
9	anselmovalter					http://a0.twimg.com/profile_images/109388983					
10	dilmabr					http://a0.twimg.com/profile_images/378800000					
11	marcelobranco					http://a0.twimg.com/profile_images/378800000					
12	ashok					http://a0.twimg.com/profile_images/116259884					
13	ngalbreath					http://a0.twimg.com/profile_images/203213373					
14	milady_toons					http://a0.twimg.com/profile_images/378800000					
15	wikileaksactu					http://a0.twimg.com/profile_images/378800000					
16	kittyhunal					http://a0.twimg.com/profile_images/356965882					
17	tweetamiracle					http://a0.twimg.com/profile_images/370604928					
18	akwasi07					http://a0.twimg.com/profile_images/378800000					
19	guardian					http://a0.twimg.com/profile_images/281461316					
20	cnni					http://a0.twimg.com/profile_images/840325508					
21	sharkowicz					http://a0.twimg.com/profile_images/378800000					
22	frogsc25					http://a0.twimg.com/profile_images/378800000					
23	jahfarini					http://pbs.twimg.com/profile_images/378800000					
24	yahoonews					http://a0.twimg.com/profile_images/378800000					
25	pehanok					http://a0.twimg.com/profile_images/378800000					
26	actualidadrt					http://a0.twimg.com/profile_images/156359800					
27	projectcounsel					http://a0.twimg.com/profile_images/378800000					
28	sharonnelsonesq					http://a0.twimg.com/profile_images/124029806					
29	posselist					http://a0.twimg.com/profile_images/571813688					
30	bbsutton					http://a0.twimg.com/profile_images/479311327					
31	max_ec					http://a0.twimg.com/profile_images/188163446					
32	zaitsevjr					http://a0.twimg.com/profile_images/307910033					
33	think_alien					http://a0.twimg.com/profile_images/135596907					
34	opexxx					http://a0.twimg.com/profile_images/374935590					
35	iamdjcarlo21					http://a0.twimg.com/profile_images/378800000					
36	thegre8_1					http://a0.twimg.com/profile_images/199341181					
37	jerome_corsi					http://a0.twimg.com/profile_images/746200926					

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

NSA 2013-10-16.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL DESIGN

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

A16 : kittyhunal

	A	B	C	D	E	F	I	J	
1		Visual Properties							
2	Vertex	Color	Shape	Size	Opacity	Image	Label	Label Fill	
3	trancegemini					http://a0.twimg.com/profile_images/378800000			
4	icij					http://abs.twimg.com/sticky/default_profile_im			
5	miopepensativo					http://a0.twimg.com/profile_images/137001969			
6	luisperse					http://a0.twimg.com/profile_images/247503650			
7	mott_15					http://a0.twimg.com/profile_images/378800000			
8	high_times_mag					http://a0.twimg.com/profile_images/378800000			
9	anselmovalter					http://a0.twimg.com/profile_images/109388983			
10	dilmabr					http://a0.twimg.com/profile_images/378800000			
11	marcelobranco					http://a0.twimg.com/profile_images/378800000			
12	ashok					http://a0.twimg.com/profile_images/116259884			
13	ngalbreath					http://a0.twimg.com/profile_images/203213373			
14	milady_toons					http://a0.twimg.com/profile_images/378800000			
15	wikileaksactu					http://a0.twimg.com/profile_images/378800000			
16	kittyhunal					http://a0.twimg.com/profile_images/356965882			
17	tweetamiracle					http://a0.twimg.com/profile_images/370604928			
18	akwasi07					http://a0.twimg.com/profile_images/378800000			
19	guardian					http://a0.twimg.com/profile_images/281461316			
20	cnni					http://a0.twimg.com/profile_images/840325508			
21	sharkowicz					http://a0.twimg.com/profile_images/378800000			
22	frogsc25					http://a0.twimg.com/profile_images/378800000			
23	jahfarini					http://pbs.twimg.com/profile_images/378800000			
24	yahoonews					http://a0.twimg.com/profile_images/378800000			
25	pehanok					http://a0.twimg.com/profile_images/378800000			
26	actualidadrt					http://a0.twimg.com/profile_images/156359800			
27	projectcounsel					http://a0.twimg.com/profile_images/378800000			
28	sharonnelsonesq					http://a0.twimg.com/profile_images/124029806			
29	posselist					http://a0.twimg.com/profile_images/571813688			
30	bbsutton					http://a0.twimg.com/profile_images/479311327			
31	max_ec					http://a0.twimg.com/profile_images/188163446			
32	zaitsevjr					http://a0.twimg.com/profile_images/307910032			
33	think_alien					http://a0.twimg.com/profile_images/135596907			
34	opexxx					http://a0.twimg.com/profile_images/374935590			
35	iamdjcarlo21					http://a0.twimg.com/profile_images/378800000			
36	thegre8_1					http://a0.twimg.com/profile_images/199341181			
37	jerome_corsi					http://a0.twimg.com/profile_images/746200926			

Show if in an Edge
Skip
Hide
Show

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

NSA 2013-10-16.xlsx - Excel

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW NodeXL

Import Export Prepare Data Refresh Graph Summary Automate Type: Directed Layout: Harel-Koren... Color Opacity Visibility Vertex Shape Vertex Size Edge Width Dynamic Filters Groups Graph Metrics Subgraph Images Use Current for New Import Export Reset All Workbook Columns Graph Elements Show Notifications Help

	A	B	C	D	E	F	G	H	I	J	
1		Visual Properties					Labels				
2	Vertex	Color	Shape	Size	Opacity	Image File	Visibility	Label	Color	Position	
3	trancegemini					http://a0.twimg.com/profile_images/378800000	Skip				
4	icij					http://a0.twimg.com/profile_images/378800000	Skip				
5	miopepensativo					http://a0.twimg.com/profile_images/109388983	Skip				
6	luisperse					http://a0.twimg.com/profile_images/378800000	Skip				
7	mott_15					http://a0.twimg.com/profile_images/378800000	Skip				
8	high_times_mag					http://a0.twimg.com/profile_images/378800000	Skip				
9	anselmovalter					http://a0.twimg.com/profile_images/116259884	Skip				
10	dilmabr					http://a0.twimg.com/profile_images/203213373	Skip				
11	marcelobranco					http://a0.twimg.com/profile_images/378800000	Skip				
12	ashok					http://a0.twimg.com/profile_images/378800000	Skip				
13	ngalbreath					http://a0.twimg.com/profile_images/378800000	Skip				
14	milady_toons					http://a0.twimg.com/profile_images/281461316	Skip				
15	wikileaksactu					http://a0.twimg.com/profile_images/840325508	Skip				
16	kittyhunal					http://a0.twimg.com/profile_images/378800000	Skip				
17	tweetamiracle					http://a0.twimg.com/profile_images/378800000	Skip				
18	akwasi07					http://a0.twimg.com/profile_images/378800000	Skip				
19	guardian					http://a0.twimg.com/profile_images/378800000	Skip				
20	cnni					http://a0.twimg.com/profile_images/378800000	Skip				
21	sharkowictz					http://a0.twimg.com/profile_images/378800000	Skip				
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24	yahoonews					http://a0.twimg.com/profile_images/378800000	Skip				
25	pehanok					http://a0.twimg.com/profile_images/378800000	Skip				
26	actualidadrt					http://a0.twimg.com/profile_images/378800000	Skip				
27	projectcounsel					http://a0.twimg.com/profile_images/124029806	Skip				
28	sharonnelsonesq					http://a0.twimg.com/profile_images/571813688	Skip				
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31	max_ec					http://a0.twimg.com/profile_images/378800000	Skip				
32	zaitsevjr					http://a0.twimg.com/profile_images/378800000	Skip				
33	think_alien					http://a0.twimg.com/profile_images/378800000	Skip				
34	opexxx					http://a0.twimg.com/profile_images/378800000	Skip				
35	iamdjcarlo21					http://a0.twimg.com/profile_images/378800000	Skip				
36	thegre8_1					http://a0.twimg.com/profile_images/378800000	Skip				
37	jerome_corsi					http://a0.twimg.com/profile_images/378800000	Skip				

Document Actions

Refresh Graph Harel-Koren Fast Mul Lay Out Again Dynamic Filters

Zoom: Scale:

Type:

Analysis Options Show/Hide

- 1 Graph Metric
- 2 Graph Type
- 3
- 4 Vertices
- 5
- 6 Unique Edges
- 7 Edges With Duplicates
- 8 Total Edges
- 9
- 10 Self-Loops
- 11
- 12 Reciprocated Vertex Pair Ratio
- 13 Reciprocated Edge Ratio
- 14
- 15 Connected Components
- 16 Single-Vertex Connected Components
- 17 Maximum Vertices in a Connected Component
- 18 Maximum Edges in a Connected Component
- 19
- 20 Maximum Geodesic Distance
- 21 Average Geodesic Distance
- 22
- 23 Graph Density
- 24 Modularity
- 25
- 26 NodeXL Version
- 27
- 28
- 29 Readability Metric
- 30
- 31
- 32
- 33
- 34
- 35
- 36
- 37
- 38

Dynamic Filters

Edge Filters

Relationship Date (UTC):

Tweet Date (UTC):

Vertex Filters

Size:

X:

Y:

Followed:

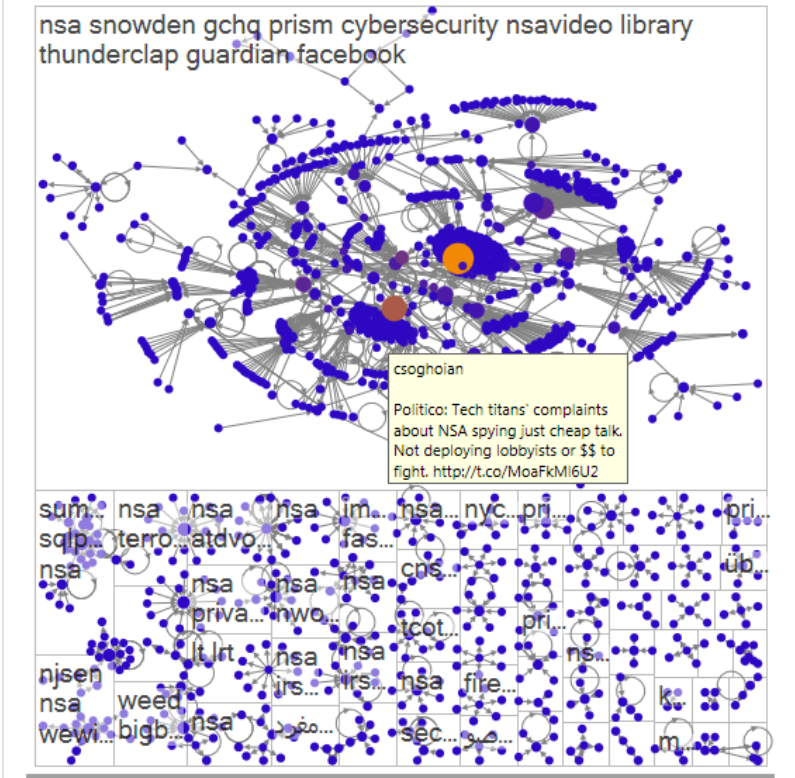
Followers:

Tweets:

Show edges and vertices if cells are empty

Filter opacity: %

Document Actions



Vertex Properties	Value	Color	Size
Betweenness Centrality	0.000	434627.424	
In-Degree	0	140	

Clipboard: Cut, Copy, Paste, Format Painter

Font: Calibri, 11, Bold, Italic, Underline, Text Color, Background Color

Alignment: Wrap Text, Merge & Center

Number: General, Currency, Percentage, Decimals

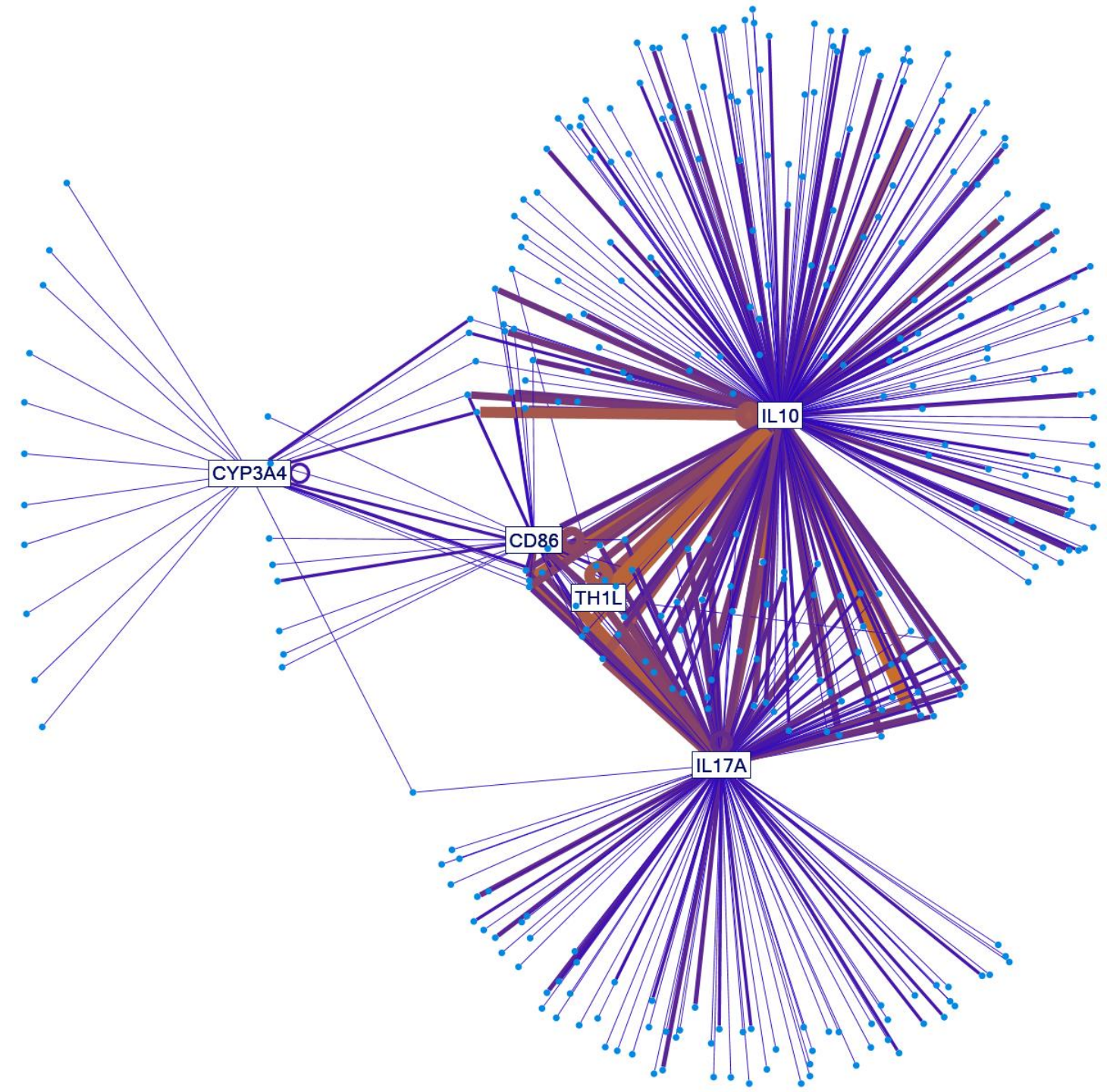
Styles: NodeXL Requir..., Normal, Bad, Good, Neutral, Calculation

Cells: Insert, Delete, Format

Editing: AutoSum, Fill, Clear, Sort & Find & Filter, Select

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
1	Src	Tar	EdgeWeight	SrcType	TarType																
2	IL10	COLITIS	48	GENE	CONDITION																
3	IL10	INFECTION	34	GENE	CONDITION																
4	IL10	INFLAMMATORY RESPON	32	GENE	CONDITION																
5	IL10	TH1L	31	GENE	CONDITION																
6	IL10	NEOPLASM	28	GENE	CONDITION																
7	IL17A	PATHOGENESIS	26	GENE	CONDITION																
8	IL17A	NEOPLASM	22	GENE	CONDITION																
9	IL10	HUMAN IMMUNODEFICIE	20	GENE	CONDITION																
10	IL10	ARTHRITIS	17	GENE	CONDITION																
11	IL17A	ARTHRITIS, RHEUMATOID	15	GENE	CONDITION																
12	IL10	INFILTRATION	15	GENE	CONDITION																
13	IL10	DIABETES NOS	14	GENE	CONDITION																
14	IL10	PATHOGENESIS	14	GENE	CONDITION																
15	IL17A	ARTHRITIS	13	GENE	CONDITION																
16	IL17A	INFILTRATION	12	GENE	CONDITION																
17	IL17A	INFECTION	11	GENE	CONDITION																
18	IL10	IRRITABLE BOWEL SYNDRO	11	GENE	CONDITION																
19	IL10	ENTEROCOLITIS	10	GENE	CONDITION																
20	IL10	ASTHMA NOS	9	GENE	CONDITION																
21	IL17A	INFLAMMATORY RESPON	9	GENE	CONDITION																
22	IL17A	TH1L	9	GENE	CONDITION																
23	IL17A	AUTOIMMUNE	8	GENE	CONDITION																
24	IL17A	AUTOIMMUNE DISEASES	8	GENE	CONDITION																
25	IL10	ENCEPHALOMYELITIS	8	GENE	CONDITION																
26	IL10	FIBROSIS	8	GENE	CONDITION																
27	CD86	NEOPLASM	8	GENE	CONDITION																
28	IL10	ACUTE GRAFT-VERSUS-HO	7	GENE	CONDITION																
29	IL10	HYPERALGESIA	7	GENE	CONDITION																
30	IL10	IMPAIRMENT	7	GENE	CONDITION																
31	IL10	INFLAMMATORY BOWEL D	7	GENE	CONDITION																
32	IL10	NEOPLASMS	7	GENE	CONDITION																

Query genes
Conditions



Query genes

Conditions,
some in motifs

