

Compliance Graph Analysis Using Network Science and Structure Variations: Supplementary Materials

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TABLE I: Top 15 Nodes with Katz Centrality for the Automobile Network.

Base columns represent the top ranked nodes and their percentage of importance held relative to the entire network. Transitive Closure and Dominant Tree columns illustrate the difference in node rankings after the base network underwent a transformation.

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
314	0.13	0	9.09	1	4.88
377	0.10	1	8.26	3	3.47
346	0.10	3	7.39	7	0.60
376	0.10	7	6.34	0	0.52
374	0.10	15	5.27	42	0.45
378	0.10	27	4.37	314	0.15
380	0.10	42	3.61	27	0.08
381	0.10	60	2.71	250	0.05
382	0.10	87	2.02	15	0.04
262	0.10	130	1.48	187	0.04
370	0.10	2	1.31	130	0.04
379	0.10	4	1.19	87	0.04
418	0.08	5	1.19	60	0.04
459	0.08	6	1.19	2	0.04
467	0.08	187	1.08	4	0.04

TABLE II: Top 15 Nodes with K-path Edge Centrality for the Automobile Network.

Base columns represent the top ranked nodes and their percentage of importance held relative to the entire network. Transitive Closure and Dominant Tree columns illustrate the difference in node rankings after the base network underwent a transformation.

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
314	0.25	0	0.65	1	37.54
346	0.19	1	0.39	0	35.05
362	0.19	3	0.65	3	17.53
370	0.19	7	0.65	7	2.54
374	0.19	15	0.64	15	1.88
376	0.19	27	0.64	27	1.88
377	0.19	42	0.64	42	1.88
378	0.19	60	0.62	187	0.53
379	0.19	87	0.60	250	0.51
380	0.19	130	0.59	314	0.50
381	0.19	187	0.57	60	0.05
382	0.19	250	0.55	86	0.05
398	0.14	314	0.54	130	0.05
406	0.14	2	0.33	2	0.00
410	0.14	4	0.33	4	0.00

TABLE III: Top 15 Nodes with PageRank Centrality for the Automobile Network.

Base columns represent the top ranked nodes and their percentage of importance held relative to the entire network. Transitive Closure and Dominant Tree columns illustrate the difference in node rankings after the base network underwent a transformation.

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
2490	8.27	2490	19.92	314	0.17
1004	1.06	2479	1.58	250	0.15
1467	0.97	2480	1.58	187	0.13
2479	0.95	2481	1.58	130	0.10
2480	0.95	2482	1.58	42	0.10
2481	0.95	2483	1.58	87	0.07
2482	0.95	2484	1.4	27	0.07
2483	0.95	2485	1.4	1	0.07
667	0.92	2486	1.39	378	0.04
2484	0.83	2487	1.39	379	0.04
2485	0.83	2488	1.39	380	0.04
2486	0.83	2489	1.39	381	0.04
2487	0.83	2424	0.29	382	0.04
2488	0.83	2425	0.29	470	0.04
2489	0.83	2426	0.29	471	0.04

TABLE IV: Top 15 Nodes with Betweenness Centrality for the Automobile Network.

Base columns represent the top ranked nodes and their percentage of importance held relative to the entire network. Transitive Closure and Dominant Tree columns illustrate the difference in node rankings after the base network underwent a transformation.

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
42	0.43	0	0	1	24.71
27	0.40	1	0	3	24.68
60	0.39	2	0	7	9.20
87	0.36	3	0	42	9.00
15	0.36	4	0	27	7.55
130	0.33	5	0	15	6.08
7	0.31	6	0	314	3.69
187	0.29	7	0	250	3.49
50	0.28	8	0	187	3.28
70	0.28	9	0	130	3.04
104	0.27	10	0	87	2.78
156	0.26	11	0	60	2.50
1467	0.25	12	0	0	0.00
250	0.25	13	0	2	0.00
115	0.25	14	0	4	0.00

TABLE V: Top 15 HIPAA Nodes with Degree Centrality

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
1	0.05	0	0.09	0	94.96
4	0.05	1	0.08	1	3.58
5	0.05	2	0.08	2	0.04
6	0.05	6	0.08	3	0.04
11	0.05	4	0.07	4	0.04
12	0.05	5	0.07	5	0.04
13	0.05	11	0.07	8	0.04
15	0.05	15	0.07	10	0.04
16	0.05	24	0.07	11	0.04
18	0.05	33	0.07	15	0.04
24	0.05	45	0.07	20	0.04
25	0.05	61	0.07	23	0.04
26	0.05	76	0.07	24	0.04
28	0.05	101	0.07	33	0.04
29	0.05	119	0.07	40	0.04

TABLE VI: Top 15 HIPAA Nodes with Katz Centrality

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
250	0.07	0	0.12	0	8.70
1313	0.07	1	0.12	1	0.36
2194	0.07	2	0.11	2	0.04
396	0.07	11	0.11	3	0.04
2300	0.07	24	0.11	4	0.04
913	0.07	225	0.11	5	0.04
983	0.07	101	0.11	8	0.04
1048	0.07	45	0.11	10	0.04
2268	0.07	76	0.11	11	0.04
223	0.07	119	0.11	15	0.04
385	0.07	15	0.11	20	0.04
895	0.07	249	0.11	23	0.04
1390	0.07	313	0.11	24	0.04
1479	0.07	61	0.11	33	0.04
1621	0.07	340	0.11	40	0.04

TABLE VII: Top 15 HIPAA Nodes with K-path Edge Centrality

Base		Transitive Closure		Dominant Tree	
Node	% Value	Node	% Value	Node	% Value
1	0.05	0	0.09	0	92.83
4	0.05	1	0.08	1	3.52
5	0.05	2	0.08	2	0.12
6	0.05	6	0.08	3	0.12
11	0.05	4	0.07	4	0.12
12	0.05	5	0.07	5	0.12
13	0.05	11	0.07	8	0.12
15	0.05	15	0.07	10	0.12
16	0.05	24	0.07	11	0.12
18	0.05	33	0.07	15	0.12
24	0.05	45	0.07	20	0.12
25	0.05	61	0.07	23	0.12
26	0.05	76	0.07	24	0.12
28	0.05	101	0.07	33	0.12
29	0.05	119	0.07	40	0.12

TABLE IX: Top 15 HIPAA Nodes with Betweenness Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
57	0.10	0	0	1	13.36
98	0.10	1	0	45	3.37
150	0.09	2	0	61	3.37
88	0.09	3	0	70	3.37
95	0.09	4	0	75	3.37
141	0.09	5	0	24	3.24
152	0.09	6	0	33	3.24
97	0.09	7	0	40	3.24
218	0.09	8	0	44	3.24
207	0.09	9	0	76	3.24
220	0.09	10	0	101	3.24
131	0.09	11	0	112	3.24
304	0.09	12	0	118	3.24
147	0.09	13	0	11	2.83
138	0.09	14	0	15	2.83

TABLE VIII: Top 15 HIPAA Nodes with PageRank Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
98	0.16	98	0.11	440	0.22
150	0.15	141	0.11	450	0.22
141	0.15	150	0.11	340	0.21
152	0.15	152	0.11	421	0.21
218	0.14	198	0.11	330	0.21
207	0.14	207	0.11	339	0.21
220	0.14	209	0.11	249	0.20
304	0.14	218	0.11	313	0.20
198	0.14	220	0.11	240	0.20
209	0.13	222	0.11	248	0.20
222	0.13	271	0.11	176	0.19
410	0.13	280	0.11	225	0.19
291	0.13	282	0.11	168	0.19
537	0.13	291	0.11	175	0.19
306	0.13	293	0.11	119	0.17

TABLE X: Top 15 PCI DSS Nodes with Degree Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
1	2.45	0	5.96	0	71.67
4	2.45	1	4.67	1	13.33
7	2.45	4	3.57	2	1.67
11	2.45	11	3.57	3	1.67
14	2.45	22	3.57	4	1.67
22	2.45	2	3.08	7	1.67
25	2.45	3	3.08	8	1.67
38	2.45	7	3.08	10	1.67
0	1.84	8	2.38	11	1.67
2	1.84	10	2.38	19	1.67
3	1.84	14	2.38	21	1.67
5	1.84	19	2.38	5	0.00
6	1.84	21	2.38	6	0.00
8	1.84	25	2.38	9	0.00
10	1.84	33	2.38	12	0.00

TABLE XI: Top 15 PCI DSS Nodes with Katz Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
0	17.28	0	23.08	0	8.04
1	11.51	1	10.82	1	2.71
4	11.51	4	10.46	2	1.65
11	11.51	11	10.46	3	1.65
22	11.51	22	10.46	4	1.65
3	3.85	2	3.80	8	1.65
10	3.85	3	3.80	10	1.65
21	3.85	8	3.67	7	1.64
35	3.85	19	3.67	11	1.64
2	3.85	33	3.67	19	1.64
8	3.85	10	3.67	21	1.64
19	3.85	21	3.67	5	1.49
33	3.85	35	3.67	6	1.49
38	0.64	7	0.56	9	1.49
25	0.64	38	0.54	12	1.49

TABLE XIII: Top 15 PCI DSS Nodes with PageRank Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
55	18.44	55	22.66	33	4.23
59	18.08	59	22.66	35	4.23
60	17.62	60	22.66	22	3.51
43	3.05	43	2.07	19	3.42
52	2.77	52	2.07	21	3.42
56	2.56	56	2.07	11	2.57
26	2.11	44	1.19	18	2.57
39	1.87	45	1.19	8	2.47
48	1.73	53	1.19	10	2.47
44	1.31	54	1.19	4	1.47
45	1.31	57	1.19	7	1.47
53	1.16	58	1.19	14	1.47
54	1.16	26	0.84	25	1.47
57	1.07	39	0.84	29	1.47
58	1.07	48	0.84	38	1.47

TABLE XII: Top 15 PCI DSS Nodes with K-path Edge Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
1	3.48	0	6.24	0	67.86
4	3.33	1	4.89	1	13.10
11	3.33	4	3.64	2	3.57
22	3.33	11	3.64	3	3.57
0	3.18	22	3.64	4	2.38
7	2.88	2	3.22	8	2.38
14	2.73	3	3.22	10	2.38
25	2.73	7	3.22	7	1.19
38	2.73	5	2.39	11	1.19
2	2.27	6	2.39	19	1.19
3	2.27	8	2.39	21	1.19
5	2.12	10	2.39	5	0.00
6	2.12	14	2.39	6	0.00
8	2.12	19	2.39	9	0.00
10	2.12	21	2.39	12	0.00

TABLE XIV: Top 15 PCI DSS Nodes with Betweenness Centrality

Base		Transitive Closure		Dominant Tree	
Node	Value	Node	Value	Node	Value
43	3.53	0	0	1	27.50
27	3.39	1	0	4	10.00
28	3.39	2	0	8	10.00
26	3.33	3	0	10	10.00
12	3.26	4	0	2	7.50
13	3.26	5	0	3	7.50
52	3.04	6	0	11	7.50
14	3.03	7	0	19	7.50
40	2.76	8	0	21	7.50
41	2.76	9	0	7	5.00
39	2.74	10	0	0	0.00
23	2.47	11	0	5	0.00
24	2.47	12	0	6	0.00
4	2.34	13	0	9	0.00
56	2.32	14	0	12	0.00