Cohesion Lab

For this lab we will use three sets of data:

CAMPNET:

This is a dichotomous adjacency matrix of 18 participants in a qualitative methods class. Ties are directed and represent that the ego indicated that the nominated alter was one of the three people with which s/he spent the most time during the seminar.

KAPTAIL:

This is a stacked dataset containing four dichotomous matrices. There are two adjacency matrices each for social ties (indicating the pair had social interaction) and instrumental ties (indicated the pair had work-related interaction). The two pairs of matrices represent two different points in time. The names of the datasets encode the type of tie in the sixth letter, and the time period in the seventh. Thus, the dataset KAPFTS1 is social ties at time 1 and KAPFTI2 is instrumental ties at time 2, etc.

ZACKAR & ZACHATTR:

ZACKAR is another stacked dataset, containing a dichotomous adjacency matrix, ZACHE, which represents the simple presence or absence of ties between members of a Karate Club, and ZACHC, which contains valued data counting the number of interactions between actors. ZACHATTR is a rectangular matrix with three columns of attributes for each of the actors from the ZACKAR datasets.

EXERCISES:

1) Cohesion using UCINET with **CAMPNET**

a) Calculate the following measures of cohesion using Network | Dyadic Measures

Density
Distance
Maximum Flow
Point Connectivity

Density = .176. This directed network has 18 nodes, so a maximum of 306 (N*N-1) ties could potentially exist. The actual number of ties in the network is 54. Density is calculated by dividing 54 by 306. (See output below.)

```
DENSITY / AVERAGE MATRIX VALUE
--------------------------------------------------------------------------------

Input dataset:                          campnet (C:\”\Dropbox\UCINET Data
Files\Datafiles\campnet)
Output dataset:                         campnet-density (C:\Users\Paulo
Serodio\Dropbox\UCINET Data Files\Datafiles\campnet-density)



                    1      2      3      4
              Densit No. of Std De Avg De
                   y   Ties      v   gree
              ------ ------ ------ ------
    1 campnet  0.176     54  0.381      3


1 rows, 4 columns, 1 levels.

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```

Distance:

Note: The output below calculates geodesic distance by replacing undefined distances with the total number of nodes (N) in the network. Since the number of nodes in the network is 18, the distance for all unreachable pairs is 18. You can also choose to represent unreachable pairs in other ways (i.e., as missing values or by the largest distance + 1). The decision you make here is likely to affect the values you get. If you wish, you can also choose to transform the values as reciprocal distances, which converts all measures of distance to measures of nearness.

The geodesic distance routine begins by calculating the geodesic distance between all pairs of nodes. In the “Frequencies” section below, we see the number of pairs that are various distances from one another. For example, there are 54 nodes that are directly tied to one another (i.e., a distance of 1) and there are 49 pairs that are 2 steps removed from one another. The proportion of pairs at each distance is also given in this section.

Based on the data in the frequencies section, an average geodesic distance and standard deviation for the graph is given.

The final piece of output contains an adjacency matrix with the geodesic distance between all pairs of nodes.

```
GEODESIC DISTANCES
--------------------------------------------------------------------------------

Input dataset:                          campnet (C:\Users\Paulo Serodio\Dropbox\UCINET
Data Files\Datafiles\campnet
Output dataset:                         campnet-geo (C:\Users\Paulo
Serodio\Dropbox\UCINET Data Files\Datafiles\campnet-geo
Transformation:                         No transformation
Undefined distances:                    N (number of nodes)
```

```
Frequencies

                  1       2
               Freq    Prop
            ------- -------
    1  1        54   0.176
    2  2        49   0.160
    3  3        38   0.124
    4  4        27   0.088
    5  5        18   0.059
    6  6        12   0.039
    7  7         8   0.026
    8 18       100   0.327

8 rows, 2 columns, 1 levels.

Average: 7.8
Std Dev: 7.2


                  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18
                 HO BR CA PA PA JE PA AN MI BI LE DO JO HA GE ST BE RU
                 LL AZ RO  M  T NN UL  N CH LL  E  N HN RR RY EV RT SS
                  Y EY  L        IE IN    AE             Y     E
                                     E     L
                 -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
    1     HOLLY   0 18  2  1  1  2  2  2  2 18 18  1 18  2 18 18 18 18
    2    BRAZEY   5  0  7  6  6  7  7  7  4 18  1  5 18  5  3  1  1  2
    3     CAROL   2 18  0  1  1  2  1  2  4 18 18  3 18  4 18 18 18 18
    4       PAM   3 18  2  0  2  1  1  1  5 18 18  4 18  5 18 18 18 18
    5       PAT   1 18  1  2  0  1  2  2  3 18 18  2 18  3 18 18 18 18
    6    JENNIE   2 18  2  1  1  0  2  1  4 18 18  3 18  4 18 18 18 18
    7   PAULINE   2 18  1  1  1  2  0  2  4 18 18  3 18  4 18 18 18 18
    8       ANN   3 18  2  1  2  1  1  0  5 18 18  4 18  5 18 18 18 18
    9   MICHAEL   1 18  3  2  2  3  3  3  0 18 18  1 18  1 18 18 18 18
   10      BILL   2 18  4  3  3  4  4  4  1  0 18  1 18  1 18 18 18 18
   11       LEE   5  1  7  6  6  7  7  7  4 18  0  5 18  5  3  1  1  2
   12       DON   1 18  3  2  2  3  3  3  1 18 18  0 18  1 18 18 18 18
   13      JOHN   3  4  2  2  2  3  1  3  2 18  3  3  0  3  1  2  2  1
   14     HARRY   1 18  3  2  2  3  3  3  1 18 18  1 18  0 18 18 18 18
   15      GERY   2  3  4  3  3  4  4  4  1 18  2  2 18  2  0  1  2  1
   16     STEVE   4  2  6  5  5  6  6  6  3 18  1  4 18  4  2  0  1  1
   17      BERT   4  2  6  5  5  6  6  6  3 18  1  4 18  4  2  1  0  1
   18      RUSS   3  3  5  4  4  5  5  5  2 18  2  3 18  3  1  1  1  0

18 rows, 18 columns, 1 levels.

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```

See output for maximum flow and point connectivity below.

b) Compare the point connectivity values and the maximum flow values. (Ignore values on the diagonal.) What is the relationship between them? Why do you think that is? Can you find the edge-independent paths (maximum flow) and node independent paths (point connectivity) between Bill and Pat by visualizing Campnet in NetDraw?

MAXIMUM FLOW

Input dataset: campnet (C:\Users\Paulo Serodio\Dropbox\UCINET Data Files\Datafiles\campnet)

		1 H	2 B	3 C	4 P	5 P	6 J	7 P	8 A	9 M	10 B	11 L	12 D	13 J	14 H	15 G	16 S	17 B	18 R
1	HOLLY	0	0	2	2	2	2	2	2	1	0	0	1	0	1	0	0	0	0
2	BRAZEY	1	0	1	1	1	1	1	1	1	0	3	1	0	1	1	3	3	2
3	CAROL	1	0	0	3	3	3	3	2	1	0	0	1	0	1	0	0	0	0
4	PAM	1	0	2	0	3	3	3	2	1	0	0	1	0	1	0	0	0	0
5	PAT	1	0	2	3	0	3	3	2	1	0	0	1	0	1	0	0	0	0
6	JENNIE	1	0	2	3	3	0	3	2	1	0	0	1	0	1	0	0	0	0
7	PAULINE	1	0	2	3	3	3	0	2	1	0	0	1	0	1	0	0	0	0
8	ANN	1	0	2	3	3	3	3	0	1	0	0	1	0	1	0	0	0	0
9	MICHAEL	3	0	2	2	2	2	2	2	0	0	0	3	0	2	0	0	0	0
10	BILL	3	0	2	2	2	2	2	2	3	0	0	3	0	3	0	0	0	0
11	LEE	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	3	3	2
12	DON	3	0	2	2	2	2	2	2	2	0	0	0	0	2	0	0	0	0
13	JOHN	2	1	2	2	2	2	2	2	2	0	2	2	0	2	2	2	2	2
14	HARRY	3	0	2	2	2	2	2	2	2	0	0	3	0	0	0	0	0	0
15	GERY	1	1	1	1	1	1	1	1	1	0	2	1	0	1	0	2	2	2
16	STEVE	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	0	3	2
17	BERT	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	3	0	2
18	RUSS	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	3	3	0

Output actor-by-actor maximum flow matrix saved as dataset maximumflow

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POINT CONNECTIVITY

Input dataset: campnet (C:\Users\Paulo Serodio\Dropbox\UCINET Data Files\Datafiles\campnet)
Output connectivity: PointConnectivity (C:\Users\Paulo Serodio\Dropbox\UCINET Data Files\Datafiles\PointConnectivity)

		1 H	2 B	3 C	4 P	5 P	6 J	7 P	8 A	9 M	10 B	11 L	12 D	13 J	14 H	15 G	16 S	17 B	18 R
1	HOLLY	0	0	2	2	2	2	2	2	1	0	0	1	0	1	0	0	0	0
2	BRAZEY	1	0	1	1	1	1	1	1	1	0	3	1	0	1	1	3	3	2
3	CAROL	1	0	0	3	3	2	3	2	1	0	0	1	0	1	0	0	0	0
4	PAM	1	0	2	0	2	3	3	2	1	0	0	1	0	1	0	0	0	0
5	PAT	1	0	2	3	0	2	3	2	1	0	0	1	0	1	0	0	0	0
6	JENNIE	1	0	2	3	2	0	3	2	1	0	0	1	0	1	0	0	0	0
7	PAULINE	1	0	2	3	3	2	0	2	1	0	0	1	0	1	0	0	0	0
8	ANN	1	0	2	3	2	3	3	0	1	0	0	1	0	1	0	0	0	0
9	MICHAEL	3	0	1	1	1	1	1	1	0	0	0	3	0	2	0	0	0	0
10	BILL	3	0	1	1	1	1	1	1	3	0	0	3	0	3	0	0	0	0
11	LEE	1	1	1	1	1	1	1	1	1	0	0	1	0	1	1	3	3	2
12	DON	3	0	1	1	1	1	1	1	2	0	0	0	0	2	0	0	0	0
13	JOHN	2	1	2	2	2	2	2	2	2	0	2	2	0	2	2	2	2	2
14	HARRY	3	0	1	1	1	1	1	1	2	0	0	3	0	0	0	0	0	0
15	GERY	1	1	1	1	1	1	1	1	1	0	2	1	0	1	0	2	2	2
16	STEVE	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	0	3	2
17	BERT	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	3	0	2
18	RUSS	1	1	1	1	1	1	1	1	1	0	2	1	0	1	1	3	2	0

Output actor-by-actor point connectivity matrix saved as dataset PointConnectivity

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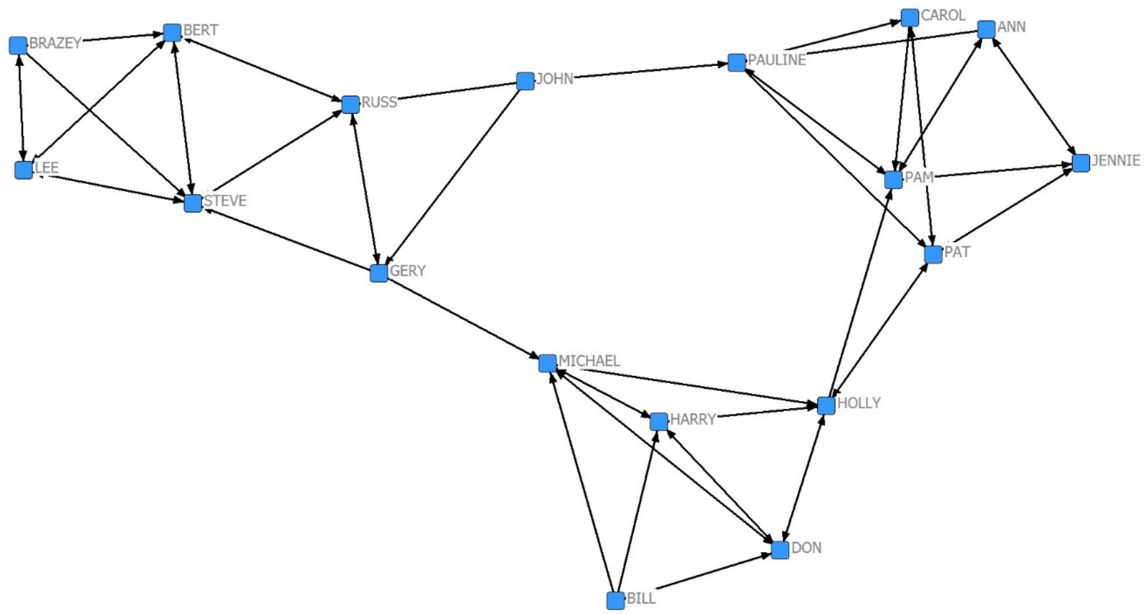
You should notice that these two matrices are very similar (the correlation between them is .955). This is because when we look at each dyad in the two matrices it is often the case that the number of edge independent paths and the number of node independent paths that connect them are highly correlated. For example, the number of edge independent paths from Holly to Carol is 2 and the number of node independent paths between from Holly to Carol is also 2.



When you examine the diagram above, you should find that the maximum flow from Bill to Pat is 2 while the point connectivity is only 1. This is because only one node (Holly) needs to be removed for Bill to not be able to reach Pat, but two ties (Holly→Pat; Holly→Pam) must be removed. (Remember that this is a directed graph so the directionality of ties matters!) Remember the Fun Fact For Math Geeks… Point Connectivity for any dyad MUST be less than or equal to Edge Connectivity (Maximum Flow) for those same two nodes.

c) Using your Netdraw visualization, verify a couple entries in the distance matrix produced (Campnet-Geo)

You should find, for example, that the geodesic distance from Holly to Carol is 2 and the geodesic distance from Bill to Gery is undefined (or 18 in the distance output above) because there is no path by which Bill can reach Gery (again, remember that the direction of the arrows matters).

2) Average Degree & Centralization using **KAPTAIL**

a) Run Network | Centrality | Degree on KAPTAIL. This will generate results for all four networks (matrices, levels) in the dataset. First it will show you node level data for each of the four networks, then appropriate centralization scores for the appropriate measures in each of the four networks. Why are there some zeroes in the Centralization scores? (Hint: Look at those measures for those networks in the previous output.)

You should get the following output, with node-level raw and normalized degree scores followed by graph centralization scores at the bottom:

```
FREEMAN DEGREE CENTRALITY
--------------------------------------------------------------------------------

Input dataset:                         kaptail (C:\Program Files\Analytic
Technologies\Datafiles\kaptail
Output degree dataset:                 kaptail-deg (C:\Program Files\Analytic
Technologies\Datafiles\kaptail-deg
Output centralization dataset:         kaptail-degcz (C:\Program Files\Analytic
Technologies\Datafiles\kaptail-degcz
Treat data as:                         Auto-detect
Output raw scores:                     YES
Output normalized scores:              YES
Allow edge weights:                    YES
Exclude diagonal:                      YES

Network KAPFTS1 is directed? NO
Network KAPFTS2 is directed? NO
Network KAPFTI1 is directed? YES
Network KAPFTI2 is directed? YES

Degree Measures

Matrix: KAPFTS1

                      1      2      3      4      5      6
                 Degree nDegre Outdeg  Indeg nOutde nIndeg
                             e                    g
                 ------ ------ ------ ------ ------ ------
    1   KAMWEFU   4.000  0.105                0.000  0.000
    2  NKUMBULA   5.000  0.132                0.000  0.000
    3   ABRAHAM  13.000  0.342                0.000  0.000
    4     SEAMS   9.000  0.237                0.000  0.000
    5   CHIPATA   5.000  0.132                0.000  0.000
    6    DONALD   6.000  0.158                0.000  0.000
    7   NKOLOYA   6.000  0.158                0.000  0.000
    8     MATEO   3.000  0.079                0.000  0.000
    9    CHILWA   9.000  0.237                0.000  0.000
   10   CHIPALO   1.000  0.026                0.000  0.000
   11    LYASHI  15.000  0.395                0.000  0.000
   12      ZULU  14.000  0.368                0.000  0.000
   13  HASTINGS  10.000  0.263                0.000  0.000
   14    LWANGA   8.000  0.211                0.000  0.000
   15  NYIRENDA   5.000  0.132                0.000  0.000
   16 CHISOKONE  24.000  0.632                0.000  0.000
   17     ENOCH   2.000  0.053                0.000  0.000
   18    PAULOS   7.000  0.184                0.000  0.000
   19   MUKUBWA  17.000  0.447                0.000  0.000
   20      SIGN   1.000  0.026                0.000  0.000
   21   KALAMBA   8.000  0.211                0.000  0.000
   22    ZAKEYO   1.000  0.026                0.000  0.000
   23       BEN   7.000  0.184                0.000  0.000
   24   IBRAHIM  11.000  0.289                0.000  0.000
   25    MESHAK   4.000  0.105                0.000  0.000
   26    ADRIAN   2.000  0.053                0.000  0.000
   27  KALUNDWE   5.000  0.132                0.000  0.000
   28    MPUNDU   9.000  0.237                0.000  0.000
   29      JOHN   9.000  0.237                0.000  0.000
   30    JOSEPH  10.000  0.263                0.000  0.000
   31   WILLIAM  10.000  0.263                0.000  0.000
   32     HENRY  14.000  0.368                0.000  0.000
```

33	CHOBE	10.000	0.263			0.000	0.000
34	MUBANGA	14.000	0.368			0.000	0.000
35	CHRISTIAN	8.000	0.211			0.000	0.000
36	KALONGA	10.000	0.263			0.000	0.000
37	ANGEL	6.000	0.158			0.000	0.000
38	CHILUFYA	9.000	0.237			0.000	0.000
39	MABANGE	5.000	0.132			0.000	0.000

Matrix: KAPFTS2

		1 Degree	2 nDegre e	3 Outdeg	4 Indeg	5 nOutde g	6 nIndeg
1	KAMWEFU	12.000	0.316			0.000	0.000
2	NKUMBULA	12.000	0.316			0.000	0.000
3	ABRAHAM	17.000	0.447			0.000	0.000
4	SEAMS	3.000	0.079			0.000	0.000
5	CHIPATA	14.000	0.368			0.000	0.000
6	DONALD	2.000	0.053			0.000	0.000
7	NKOLOYA	14.000	0.368			0.000	0.000
8	MATEO	6.000	0.158			0.000	0.000
9	CHILWA	9.000	0.237			0.000	0.000
10	CHIPALO	7.000	0.184			0.000	0.000
11	LYASHI	19.000	0.500			0.000	0.000
12	ZULU	14.000	0.368			0.000	0.000
13	HASTINGS	18.000	0.474			0.000	0.000
14	LWANGA	12.000	0.316			0.000	0.000
15	NYIRENDA	8.000	0.211			0.000	0.000
16	CHISOKONE	22.000	0.579			0.000	0.000
17	ENOCH	8.000	0.211			0.000	0.000
18	PAULOS	9.000	0.237			0.000	0.000
19	MUKUBWA	25.000	0.658			0.000	0.000
20	SIGN	2.000	0.053			0.000	0.000
21	KALAMBA	16.000	0.421			0.000	0.000
22	ZAKEYO	7.000	0.184			0.000	0.000
23	BEN	7.000	0.184			0.000	0.000
24	IBRAHIM	21.000	0.553			0.000	0.000
25	MESHAK	18.000	0.474			0.000	0.000
26	ADRIAN	10.000	0.263			0.000	0.000
27	KALUNDWE	4.000	0.105			0.000	0.000
28	MPUNDU	11.000	0.289			0.000	0.000
29	JOHN	13.000	0.342			0.000	0.000
30	JOSEPH	16.000	0.421			0.000	0.000
31	WILLIAM	10.000	0.263			0.000	0.000
32	HENRY	12.000	0.316			0.000	0.000
33	CHOBE	10.000	0.263			0.000	0.000
34	MUBANGA	16.000	0.421			0.000	0.000
35	CHRISTIAN	9.000	0.237			0.000	0.000
36	KALONGA	12.000	0.316			0.000	0.000
37	ANGEL	6.000	0.158			0.000	0.000
38	CHILUFYA	9.000	0.237			0.000	0.000
39	MABANGE	6.000	0.158			0.000	0.000

Matrix: KAPFTI1

		1 Degree	2 nDegre e	3 Outdeg	4 Indeg	5 nOutde g	6 nIndeg
1	KAMWEFU			1.000	3.000	0.026	0.079
2	NKUMBULA			1.000	2.000	0.026	0.053
3	ABRAHAM			8.000	9.000	0.211	0.237
4	SEAMS			1.000	3.000	0.026	0.079
5	CHIPATA			1.000	1.000	0.026	0.026
6	DONALD			1.000	2.000	0.026	0.053
7	NKOLOYA			4.000	2.000	0.105	0.053
8	MATEO			0.000	0.000	0.000	0.000
9	CHILWA			2.000	5.000	0.053	0.132
10	CHIPALO			0.000	0.000	0.000	0.000
11	LYASHI			9.000	8.000	0.237	0.211

12	ZULU			7.000	4.000	0.184	0.105
13	HASTINGS			3.000	2.000	0.079	0.053
14	LWANGA			5.000	2.000	0.132	0.053
15	NYIRENDA			3.000	3.000	0.079	0.079
16	CHISOKONE			12.000	6.000	0.316	0.158
17	ENOCH			1.000	1.000	0.026	0.026
18	PAULOS			0.000	0.000	0.000	0.000
19	MUKUBWA			12.000	2.000	0.316	0.053
20	SIGN			1.000	2.000	0.026	0.053
21	KALAMBA			2.000	2.000	0.053	0.053
22	ZAKEYO			2.000	0.000	0.053	0.000
23	BEN			1.000	3.000	0.026	0.079
24	IBRAHIM			4.000	5.000	0.105	0.132
25	MESHAK			2.000	0.000	0.053	0.000
26	ADRIAN			0.000	0.000	0.000	0.000
27	KALUNDWE			1.000	3.000	0.026	0.079
28	MPUNDU			1.000	4.000	0.026	0.105
29	JOHN			3.000	4.000	0.079	0.105
30	JOSEPH			3.000	4.000	0.079	0.105
31	WILLIAM			0.000	2.000	0.000	0.053
32	HENRY			5.000	7.000	0.132	0.184
33	CHOBE			1.000	2.000	0.026	0.053
34	MUBANGA			4.000	4.000	0.105	0.105
35	CHRISTIAN			1.000	3.000	0.026	0.079
36	KALONGA			1.000	2.000	0.026	0.053
37	ANGEL			3.000	4.000	0.079	0.105
38	CHILUFYA			1.000	1.000	0.026	0.026
39	MABANGE			2.000	2.000	0.053	0.053

Matrix: KAPFTI2

		1 Degree	2 nDegree	3 Outdeg	4 Indeg	5 nOutdeg	6 nIndeg
1	KAMWEFU			5.000	2.000	0.132	0.053
2	NKUMBULA			4.000	4.000	0.105	0.105
3	ABRAHAM			10.000	10.000	0.263	0.263
4	SEAMS			2.000	2.000	0.053	0.053
5	CHIPATA			9.000	8.000	0.237	0.211
6	DONALD			1.000	1.000	0.026	0.026
7	NKOLOYA			7.000	8.000	0.184	0.211
8	MATEO			4.000	3.000	0.105	0.079
9	CHILWA			2.000	3.000	0.053	0.079
10	CHIPALO			2.000	2.000	0.053	0.053
11	LYASHI			21.000	12.000	0.553	0.316
12	ZULU			5.000	3.000	0.132	0.079
13	HASTINGS			5.000	3.000	0.132	0.079
14	LWANGA			5.000	5.000	0.132	0.132
15	NYIRENDA			2.000	2.000	0.053	0.053
16	CHISOKONE			10.000	4.000	0.263	0.105
17	ENOCH			3.000	4.000	0.079	0.105
18	PAULOS			2.000	2.000	0.053	0.053
19	MUKUBWA			7.000	3.000	0.184	0.079
20	SIGN			1.000	3.000	0.026	0.079
21	KALAMBA			2.000	4.000	0.053	0.105
22	ZAKEYO			0.000	2.000	0.000	0.053
23	BEN			2.000	1.000	0.053	0.026
24	IBRAHIM			6.000	8.000	0.158	0.211
25	MESHAK			6.000	2.000	0.158	0.053
26	ADRIAN			0.000	0.000	0.000	0.000
27	KALUNDWE			0.000	0.000	0.000	0.000
28	MPUNDU			2.000	5.000	0.053	0.132
29	JOHN			2.000	7.000	0.053	0.184
30	JOSEPH			2.000	5.000	0.053	0.132
31	WILLIAM			1.000	2.000	0.026	0.053
32	HENRY			4.000	5.000	0.105	0.132
33	CHOBE			2.000	2.000	0.053	0.053
34	MUBANGA			6.000	7.000	0.158	0.184
35	CHRISTIAN			1.000	2.000	0.026	0.053
36	KALONGA			1.000	3.000	0.026	0.079

```
   37     ANGEL                 2.000   6.000  0.053  0.158
   38   CHILUFYA                0.000   1.000  0.000  0.026
   39    MABANGE                1.000   1.000  0.026  0.026


39 rows, 6 columns, 4 levels.

Graph Centralization -- as proportion, not percentage

                   1      2      3
              Degree Outdeg  Indeg
              ------ ------ ------
    1 KAPFTS1 0.4410 0.0000 0.0000
    2 KAPFTS2 0.3762 0.0000 0.0000
    3 KAPFTI1 0.0000 0.2486 0.1676
    4 KAPFTI2 0.0000 0.4654 0.2223

4 rows, 3 columns, 1 levels.
```

You will see that there are some zeros in the Graph Centralization section. This is because UCINET automatically determines whether each graph is directed or not and calculates degree & centralization accordingly. For example, KAPFTS1 is not directed, so we only see values in the Degree and nDegree columns (and nothing in the Outdeg and Indeg columns). Accordingly, the centralization score for KAPFTS1 is .4410 for Degree and 0 for both Outdeg and Indeg. KAPFTI1, on the other hand, is directed. We therefore get Indeg and Oudeg values for the graph and no values in the Degree column. Consequently, we get Outdeg (.2486) and Indeg (.1676) centralization scores for KAPFTI1 and a 0 for Degree.

(BTW: The nDegree column is just a normalized measure of Degree. We will discuss that Wednesday afternoon, but, in general, just ignore the measures with the "n" before then.)

b) To find average degree, you can run descriptive statistics on the node level data. By default running degree centrality created a dataset called KAPTAIL-deg with the node level degree measures for it (and another one called KAPTAIL-degcz for the centralization scores). Use the menu Tools | Univariate statistics to run Univariate statistics on the degree scores by node and find the appropriate average degree scores.

Be sure to select "columns" as the dimensions to analyze. You should get the following output:

```
UNIVARIATE STATISTICS
--------------------------------------------------------------------------------

Input dataset:                          kaptail-deg (C:\Users\Paulo
Serodio\Documents\UCINET data\kaptail-deg
Output dataset:                         kaptail-deg-uni (C:\Users\Paulo
Serodio\Documents\UCINET data\kaptail-deg-uni
Dimension to analyze:                   Columns
Diagonal valid:                         YES

Statistics

                                1        2        3        4        5        6
```

		Degree	nDegree	Outdeg	Indeg	nOutdeg	nIndeg
1	Observations	39	39	0	0	39	39
2	Missing	0	0	39	39	0	0
3	Minimum	1	0.026			0	0
4	Maximum	24	0.632			0	0
5	Sum	316	8.316			0	0
6	Average	8.103	0.213			0	0
7	SSQ	3448	2.388			0	0
8	Standard Deviation	4.771	0.126			0	0
9	Variance	22.759	0.016			0	0
10	MCSSQ	887.590	0.615			0	0
11	Euclidean Norm	58.720	1.545			0	0

11 rows, 6 columns, 1 levels.

Statistics

		1 Degree	2 nDegree	3 Outdeg	4 Indeg	5 nOutdeg	6 nIndeg
1	Observations	39	39	0	0	39	39
2	Missing	0	0	39	39	0	0
3	Minimum	2	0.053			0	0
4	Maximum	25	0.658			0	0
5	Sum	446	11.737			0	0
6	Average	11.436	0.301			0	0
7	SSQ	6254	4.331			0	0
8	Standard Deviation	5.439	0.143			0	0
9	Variance	29.579	0.020			0	0
10	MCSSQ	1153.590	0.799			0	0
11	Euclidean Norm	79.082	2.081			0	0

11 rows, 6 columns, 1 levels.

Statistics

		1 Degree	2 nDegree	3 Outdeg	4 Indeg	5 nOutdeg	6 nIndeg
1	Observations	0	0	39	39	39	39
2	Missing	39	39	0	0	0	0
3	Minimum			0	0	0	0
4	Maximum			12	9	0.316	0.237
5	Sum			109	109	2.868	2.868
6	Average			2.795	2.795	0.074	0.074
7	SSQ			659	481	0.456	0.333
8	Standard Deviation			3.014	2.127	0.079	0.056
9	Variance			9.086	4.522	0.006	0.003
10	MCSSQ			354.359	176.359	0.245	0.122
11	Euclidean Norm			25.671	21.932	0.676	0.577

11 rows, 6 columns, 1 levels.

Statistics

		1 Degree	2 nDegree	3 Outdeg	4 Indeg	5 nOutdeg	6 nIndeg
1	Observations	0	0	39	39	39	39
2	Missing	39	39	0	0	0	0
3	Minimum			0	0	0	0
4	Maximum			21	12	0.553	0.316
5	Sum			147	147	3.868	3.868
6	Average			3.769	3.769	0.099	0.099
7	SSQ			1139	841	0.789	0.582
8	Standard Deviation			3.873	2.712	0.102	0.071
9	Variance			14.998	7.357	0.010	0.005
10	MCSSQ			584.923	286.923	0.405	0.199
11	Euclidean Norm			33.749	29	0.888	0.763

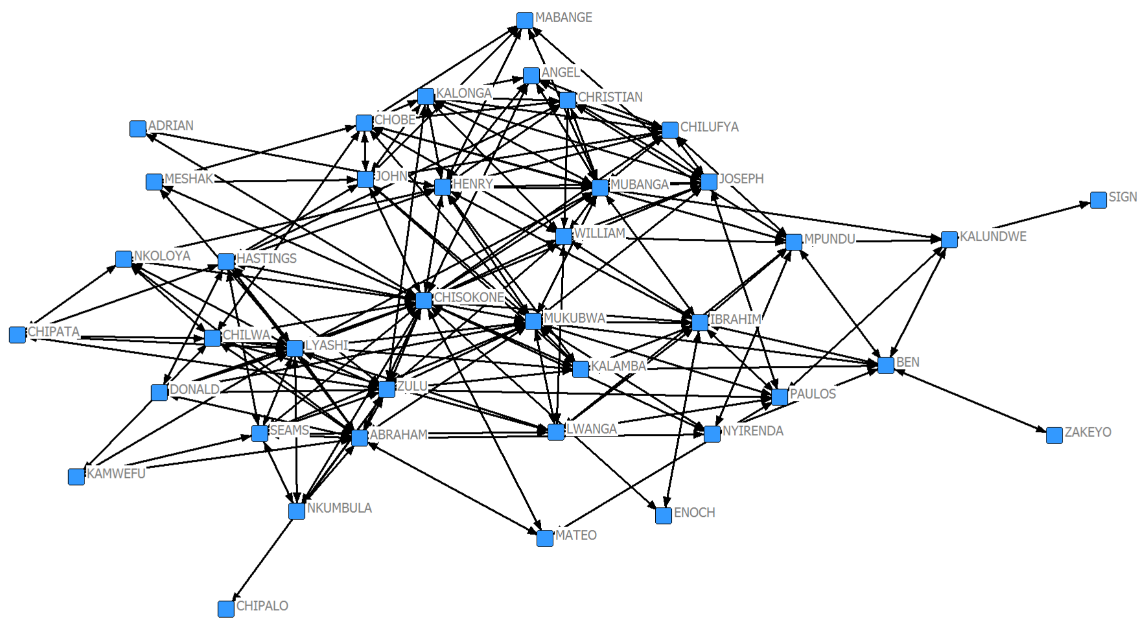
```
11 rows, 6 columns, 1 levels.
```

As you can see, the average degree centrality in the KAPFTS1 (the first set of output) is 8.103. As you also probably noticed, the univariate statistics routine can calculate a number of other statistics besides average….

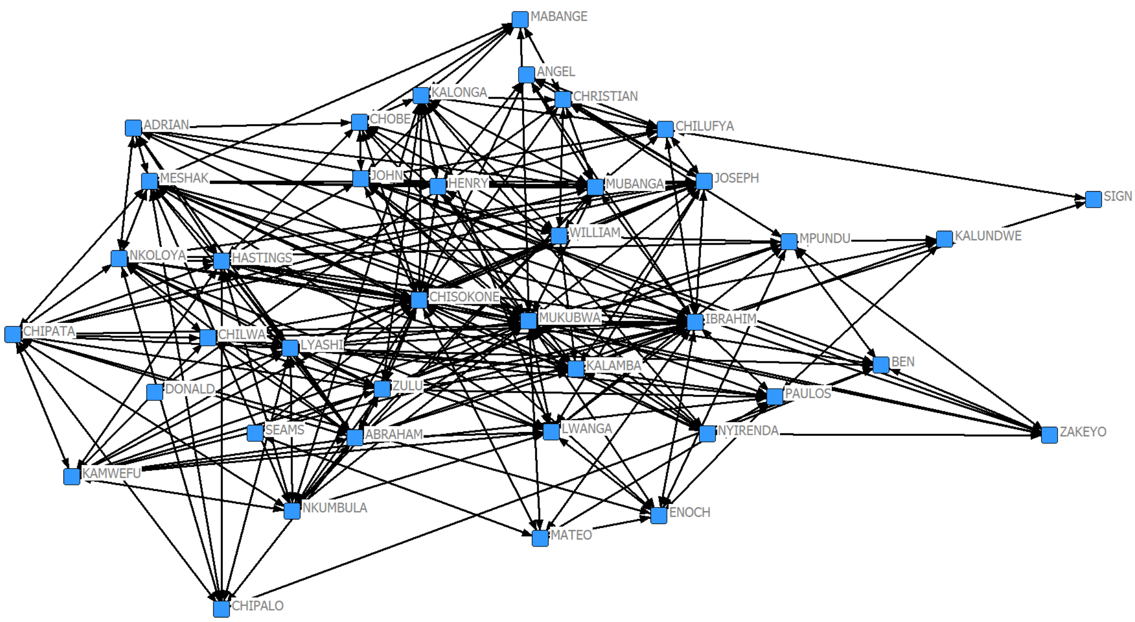
c) Compare the results for KAPFTS1 and KAPTFTS2 (the social ties at time 1 and time 2). What happened to average degree? What happened to network centralization? Does this make sense?

Average degree increased from 8.103 to 11.436. At the same time, centralization decreased from .441 to .376. What this tells us is that, on average, people added social ties between time 1 and time 2, and the ties that they added tended to be to people who were less central in the network. Centralization decreased as the average number of ties increased. In other words, the additional social ties added between time 1 and time 2 made the network more diffuse instead of more centralized. To see this graphically look at the visualizations on the next page. See, for example, how people who were on the periphery of the network at time 1 (e.g., Chipalo, Enoch, Zakeyo) gain many ties at time 2.

KAPFTS1



KAPFTS2



d) Compare the results for KAPFTI1 and KAPFTI2 (the instrumental/work ties at time 1 and time 2). What happened to average degree and centralization here? Does this make sense? Why do you think the results differ across type of relationships?

We see that the average number of outgoing instrumental ties increased from 2.795 at time 1 to 3.769 at time 2. The outdegree centralization in this network also increased from .2486 to .4654. People also added ties in this network, but they tended to add ties to others who were already in central positions. The instrumental tie network therefore became more centralized over time instead of becoming more diffuse. This highlights a potential difference between social ties and instrumental ties. Social ties appear to be distributed in a more "democratic" way, whereas instrumental ties are distributed in a centralized manner. One possible explanation for this is that individuals tend to form social ties based on homophily, but people form instrumental ties with prominent experts in the organization. Thus, while social ties are widely distributed based on who is similar to whom, instrumental ties become focused on the relatively few prominent experts in the network.

3) Fragmentation using UCINET and **KAPTAIL**

a. Using the **KAPFTS1** dataset (you may have to unpack **KAPTAIL** if you have not already done so using Data | Unpack), calculate its fragmentation under Network | Centrality using the default options. This reports both "Fragmentation" and "Distance Weighted Fragmentation." Why are the numbers different? Which one is more useful for this network? When would you choose to use one or the other?

```
FRAGMENTATION CENTRALITY
--------------------------------------------------------------------------------

Input network:                          KAPFTS1 (C:\Users\Paulo Serodio\Documents\UCINET
data\KAPFTS1)
Output measures:                        Fragmentation (C:\Users\Paulo
Serodio\Documents\UCINET data\Fragmentation)
Method:                                 Removal

NOTE: This procedure binarizes but does NOT symmetrize data.

Network Fragmentation Prior to Removing Any Nodes

    Fragmentation: 0.000
    Distance-Weighted Fragmentation: 0.433
```

Fragmentation for KAPFTS1 is 0.0. This is because the network is composed of one component (i.e., all nodes are connected). The normal fragmentation measure is not particularly useful in a connected network. The distance-weighted fragmentation (.433), however, is more useful because it is one minus the average reciprocal distance between all pairs of nodes. Distance-weighted fragmentation therefore provides a more nuanced measure of that is useful even for connected networks. Distance-weighted fragmentation is particularly useful if the network relationship attenuates with distance (e.g., the value of gossip deteriorates as distance grows since the gossip is no longer "fresh" by the time it travels multiple steps). The regular fragmentation measure is more useful in networks that consist of multiple components or in applications in which distance does not attenuate the quality of the relationship (e.g., digital copies of software are perfect no matter how many people they pass through, so the effects of software piracy may be better modeled with fragmentation instead of distance weighted fragmentation).

b. Based on the results from Exercise 2 above, what do you think will happen to each of the fragmentation measures if you run them for **KAPFTS2.** Run them to check your answers. Were you surprised? By which measure(s)? Why are the results what they are?

```
FRAGMENTATION CENTRALITY
--------------------------------------------------------------------------------

Input network:                          KAPFTS2 (C:\Users\Paulo Serodio\Documents\UCINET
data\KAPFTS2)
Output measures:                        Fragmentation (C:\Users\Paulo
Serodio\Documents\UCINET data\Fragmentation)
Method:                                 Removal

NOTE: This procedure binarizes but does NOT symmetrize data.

Network Fragmentation Prior to Removing Any Nodes

    Fragmentation: 0.000
    Distance-Weighted Fragmentation: 0.362
```

The fragmentation value for KAPFTS2 is also 0.0 because the network is connected (i.e., one component). The distance-weighted fragmentation value decreased to .362. This shouldn't be too surprising since we already know that the number of ties in this network increased between time 1 and time 2 and the new ties were relatively well distributed throughout the network. Thus, it makes sense that fragmentation decreased.

c. Running Fragmentation also gives you node level scores. We did not cover this in the lecture, but what do you think this may mean? (For a hint, go back to the dialog box for running Fragmentation and look at the option given.)

The node-level fragmentation scores tell us how much the fragmentation score goes up when a given node is removed from the network. In other words, it tells us how much each node contributes to non-fragmentation in the network. In the partial output from KAPFTS2 below, we see that the distance-weighted fragmentation of the network goes up to .363 (column 2) when Kamwefu is removed from the network. This equates to a .001 change (column 4) in distance-weighted fragmentation when this node is removed. The percentage change that this represents is found in column 6.

```
Node-Level Fragmentation Measures

                     1        2        3        4        5        6
                  Frag   DwFrag  FragDif  DwFragD  PctFrag  PctDwFr
               -------- -------- -------- -------- -------- --------
  1   KAMWEFU    0.000    0.363    0.000    0.001    0.000    0.002
```

4) Core-Periphery using UCINET with **KAPTAIL**

a. Run Network | Core/Periphery | Categorical on **KAPFTS1** and **KAPFTS2**. How do the results differ? During which time period was there a more clear core/periphery structure to the social ties? What happened to the core between time 1 and time 2?

KAPFTS1 Output (keep all options to their default settings):

```
SIMPLE CORE/PERIPHERY MODEL
--------------------------------------------------------------------------------

Input dataset:                         KAPFTS1 (C:\Users\Paulo Serodio\Documents\UCINET
data\KAPFTS1)
Type of data:                          Positive
Fitness measure:                       CORR
Density of core-to-periphery ties:
Number of iterations:                  50
Population size:                       100
Output partition:                      CorePartition (C:\Users\Paulo
Serodio\Documents\UCINET data\CorePartition)
Output clusters:                       CoreClasses (C:\Users\Paulo
Serodio\Documents\UCINET data\CoreClasses)

Starting fitness: 0.482
Final fitness: 0.486

Core/Periphery Class Memberships:
```

```
    1:  ABRAHAM SEAMS LYASHI ZULU HASTINGS CHISOKONE MUKUBWA IBRAHIM JOSEPH WILLIAM HENRY
CHOBE MUBANGA KALONGA CHILUFYA
    2:  KAMWEFU NKUMBULA CHIPATA DONALD NKOLOYA MATEO CHILWA CHIPALO LWANGA NYIRENDA
ENOCH PAULOS SIGN KALAMBA ZAKEYO BEN MESHAK ADRIAN KALUNDWE MPUNDU JOHN CHRISTIAN ANGEL
MABANGE


Density matrix

            1     2
        ----- -----
    1   0.514 0.228
    2   0.228 0.080
```

KAPFTS2 Output:

```
SIMPLE CORE/PERIPHERY MODEL
--------------------------------------------------------------------------------

Input dataset:                          KAPFTS2 (C:\Users\Paulo Serodio\Documents\UCINET
data\KAPFTS2)
Type of data:                           Positive
Fitness measure:                        CORR
Density of core-to-periphery ties:
Number of iterations:                   50
Population size:                        100
Output partition:                       CorePartition (C:\Users\Paulo
Serodio\Documents\UCINET data\CorePartition)
Output clusters:                        CoreClasses (C:\Users\Paulo
Serodio\Documents\UCINET data\CoreClasses)

Starting fitness: 0.548
Final fitness: 0.548

Core/Periphery Class Memberships:

    1:  KAMWEFU NKUMBULA ABRAHAM CHIPATA NKOLOYA LYASHI ZULU HASTINGS CHISOKONE MUKUBWA
KALAMBA IBRAHIM MESHAK JOSEPH MUBANGA
    2:  SEAMS DONALD MATEO CHILWA CHIPALO LWANGA NYIRENDA ENOCH PAULOS SIGN ZAKEYO BEN
ADRIAN KALUNDWE MPUNDU JOHN WILLIAM HENRY CHOBE CHRISTIAN KALONGA ANGEL CHILUFYA MABANGE

Density matrix

            1     2
        ----- -----
    1   0.752 0.267
    2   0.267 0.174
```

First, we see that the model fitness increased from .486 to .548 between time 1 and time 2, so the time 2 network has more of a core/periphery structure to it. Second, we can see that there were 15 people in the core at each time period.

- Core members at time 1: ABRAHAM SEAMS LYASHI ZULU HASTINGS CHISOKONE MUKUBWA IBRAHIM JOSEPH WILLIAM HENRY CHOBE MUBANGA KALONGA CHILUFYA
- Core members at time 2: KAMWEFU NKUMBULA ABRAHAM CHIPATA NKOLOYA LYASHI ZULU HASTINGS CHISOKONE MUKUBWA KALAMBA IBRAHIM MESHAK JOSEPH MUBANGA

Upon inspection of the core membership at each time period, we can conclude that there was some churn in core membership. Some individuals were members at time 1 but not time 2 (e.g., Seams, William, Henry, Chobe, Kalonga, & Chilufya). Conversely, there were some individuals who were on the periphery at time 1 but in the core at time 2 (e.g., Kamwefu, Nkumbula, Chipata, Nkoloya, etc…).

Third, we can see that the density of ties within the core increased from .514 to .752 (see the Density Matrix at each time point).

b. Run Network | Core/Periphery | Continuous on **KAPFTS1**. Find the line where it recommends how many nodes should be in the core. Does that match the size of the core found from the Categorical procedure? How might you determine which one better captures the core/periphery nature of the data?

Output (keeping all options at their default settings):

```
CONTINUOUS CORENESS MODEL
--------------------------------------------------------------------------------

Input dataset:                        KAPFTS1 (C:\Users\Paulo Serodio\Documents\UCINET
data\KAPFTS1)
Algorithm                             MINRES

Multiplicative Coreness

                    1
               Corene
               ------
  16  CHISOKONE   0.409
  19    MUKUBWA   0.290
  11     LYASHI   0.255
  32      HENRY   0.238
  12       ZULU   0.238
  34    MUBANGA   0.238
   3    ABRAHAM   0.221
  24    IBRAHIM   0.187
  31    WILLIAM   0.170
  33      CHOBE   0.170
  13   HASTINGS   0.170
  36    KALONGA   0.170
  30     JOSEPH   0.170
  29       JOHN   0.153
  38   CHILUFYA   0.153
   4      SEAMS   0.153
   9     CHILWA   0.153
  28     MPUNDU   0.153
  21    KALAMBA   0.136
  35  CHRISTIAN   0.136
  14     LWANGA   0.136
  23        BEN   0.119
  18     PAULOS   0.119
   7    NKOLOYA   0.102
   6     DONALD   0.102
  37      ANGEL   0.102
  15   NYIRENDA   0.085
   5    CHIPATA   0.085
  39    MABANGE   0.085
  27   KALUNDWE   0.085
   2   NKUMBULA   0.085
   1    KAMWEFU   0.068
  25     MESHAK   0.068
   8      MATEO   0.051
  26     ADRIAN   0.034
  17      ENOCH   0.034
  22     ZAKEYO   0.017
```

10	CHIPALO	0.017
20	SIGN	0.017

Descriptive Statistics

		1 Corene
1	Mean	0.138
2	Std Dev	0.081
3	Sum	5.382
4	Variance	0.007
5	SSQ	1.000
6	MCSSQ	0.257
7	Euc Norm	1.000
8	Minimum	0.017
9	Maximum	0.409
10	N of Obs	39.000
11	N Missing	0.000

Correlation: 0.445

Gini Coefficient: 0.320
Composite "gini-based core/peripheriness": 0.142
Heterogeneity: 0.009

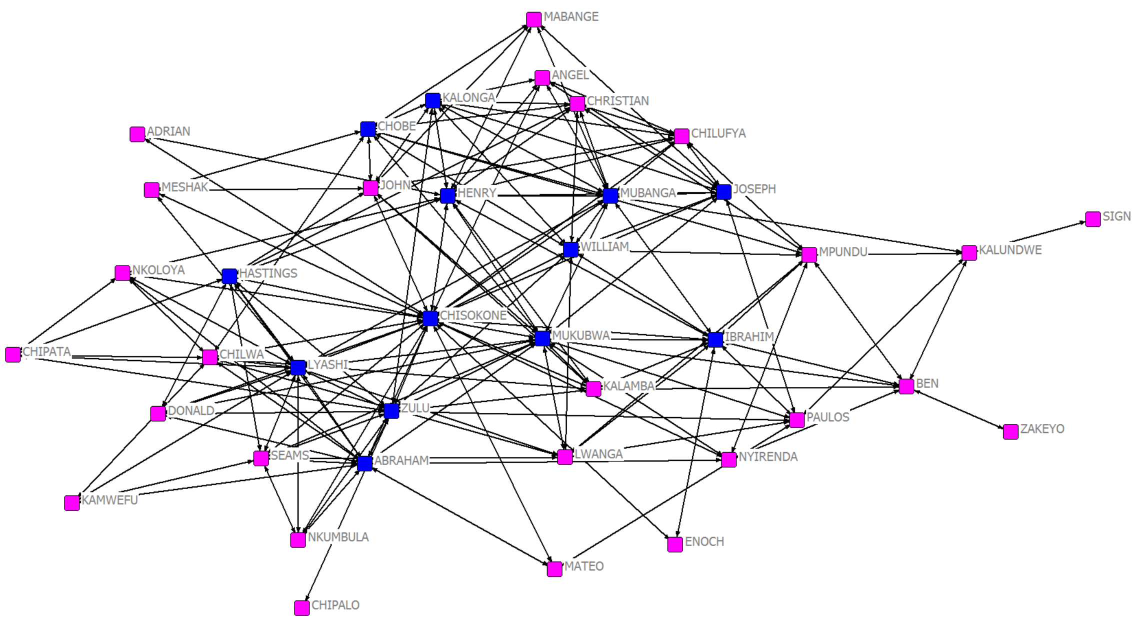
Concentration scores for different sizes of core

	1 Diff	2 nDiff	3 Corr	4 Ident	5 CoreDen	6 PerDen	7 DenDiff
1	0.507	0.507	0.541	0.313		0.191	
2	0.328	0.463	0.604	0.458	1.000	0.177	0.823
3	0.271	0.469	0.639	0.549	1.000	0.167	0.833
4	0.228	0.455	0.666	0.611	0.833	0.156	0.677
5	0.217	0.485	0.699	0.661	0.800	0.146	0.654
6	0.233	0.571	0.736	0.702	0.800	0.136	0.664
7	0.249	0.659	0.760	0.729	0.762	0.127	0.635
8	0.217	0.614	0.761	0.740	0.714	0.120	0.594
9	0.186	0.557	0.754	0.743	0.667	0.115	0.552
10	0.178	0.564	0.751	0.745	0.600	0.106	0.494
11	0.173	0.574	0.751	0.748	0.582	0.101	0.481
12	0.169	0.587	0.754	0.750	0.561	0.094	0.467
13	0.189	0.681	0.760	0.752	0.551	0.089	0.462
14	0.164	0.612	0.757	0.749	0.527	0.083	0.444
15	0.161	0.624	0.756	0.746	0.514	0.080	0.435
16	0.160	0.639	0.758	0.744	0.500	0.075	0.425
17	0.159	0.657	0.762	0.742	0.471	0.061	0.410
18	0.181	0.769	0.767	0.740	0.444	0.043	0.402
19	0.159	0.691	0.764	0.734	0.439	0.042	0.396
20	0.158	0.708	0.763	0.729	0.437	0.047	0.390
21	0.181	0.828	0.764	0.725	0.429	0.046	0.383
22	0.158	0.742	0.756	0.717	0.407	0.029	0.378
23	0.180	0.863	0.750	0.710	0.391	0.017	0.375
24	0.157	0.768	0.735	0.701	0.377	0.010	0.367
25	0.156	0.780	0.722	0.692	0.367	0.011	0.356
26	0.178	0.908	0.711	0.684	0.357	0.013	0.344
27	0.155	0.805	0.690	0.674	0.345	0.015	0.330
28	0.155	0.818	0.670	0.664	0.333	0.018	0.315
29	0.155	0.835	0.653	0.655	0.323	0.022	0.300
30	0.157	0.859	0.637	0.646	0.310	0.000	0.310
31	0.182	1.012	0.623	0.638	0.301	0.000	0.301
32	0.162	0.915	0.598	0.628	0.290	0.000	0.290
33	0.187	1.075	0.575	0.618	0.280	0.000	0.280
34	0.189	1.101	0.539	0.607	0.269	0.000	0.269
35	0.166	0.982	0.486	0.594	0.257	0.000	0.257
36	0.189	1.134	0.430	0.582	0.246	0.000	0.246
37	0.163	0.990	0.346	0.568	0.234	0.000	0.234
38	0.158	0.977	0.242	0.555	0.223		-1.0E+0038

```
Recommended core membership: top 18 nodes (concentration = 0.767).
```

As you can see directly above, this model recommends placing 18 nodes in the core. This is slightly higher than the 15 node recommended by the categorical model.

Another way to determine which cutoff point matches the core/periphery nature of the data would be to visualize KAPFTS1 in Netdraw and load "KAPFTS1-Coreness" as an attribute file. The KAPFTS1-Coreness file contains node-level coreness values for each node in the network. With these data you can see what cutoff value makes the most sense in terms of face validity. One way to explore potential coreness solutions would be to color core/periphery nodes different colors and choose the solution that looks like it is the best. For example, in the graph below the top 13 nodes are retained in the core (blue nodes) and all others are in the periphery.



5) Transitivity and Simmelian ties with ZACKAR

a. Unpack ZACKAR to get ZACHE and ZACHC (get rid of the prefix if there is one by default, to keep the file names simple).

b. Run Network | Cohesion | Simmelian /Embedded Ties on ZACHE

Output:

Simmelian (Embedded) Ties

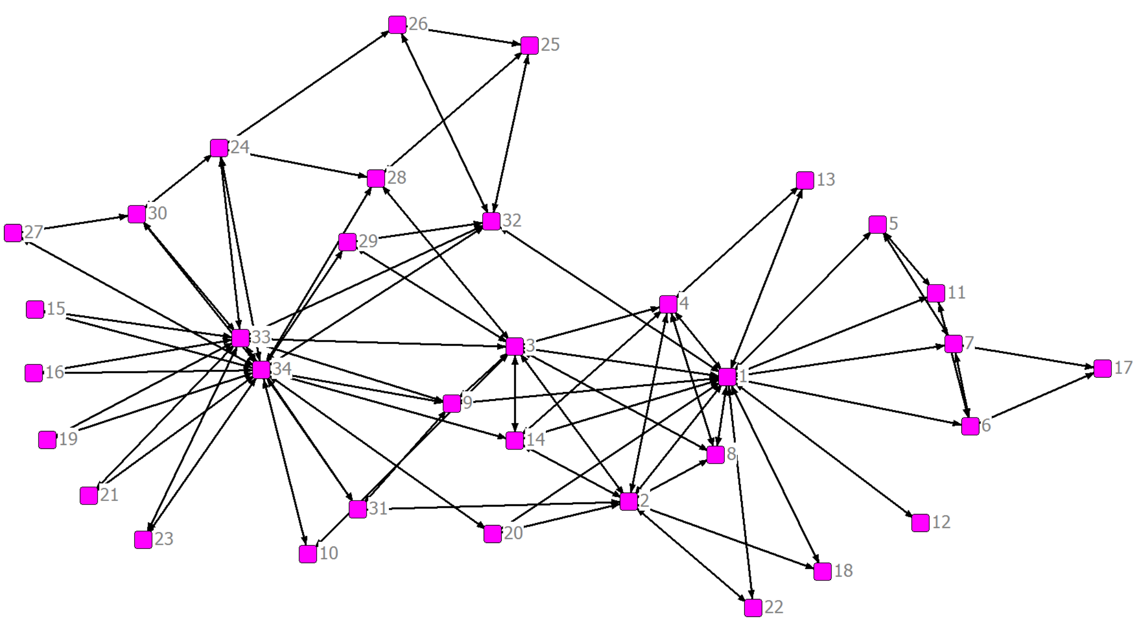
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1	0	7	5	5	2	2	2	3	1	0	2	0	1	3	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
2	7	0	4	4	0	0	0	3	0	0	0	0	0	3	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
3	5	4	0	4	0	0	0	3	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
4	5	4	4	0	0	0	0	3	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	2	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	2	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	3	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
17	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
20	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
22	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	2	3
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	2	3
31	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	2
33	0	0	1	0	0	0	0	0	3	0	0	0	0	0	1	1	0	0	1	0	1	0	1	2	0	0	0	0	0	2	2	1	0	10
34	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	1	0	0	1	0	1	0	1	3	0	0	1	1	1	3	2	2	10	0

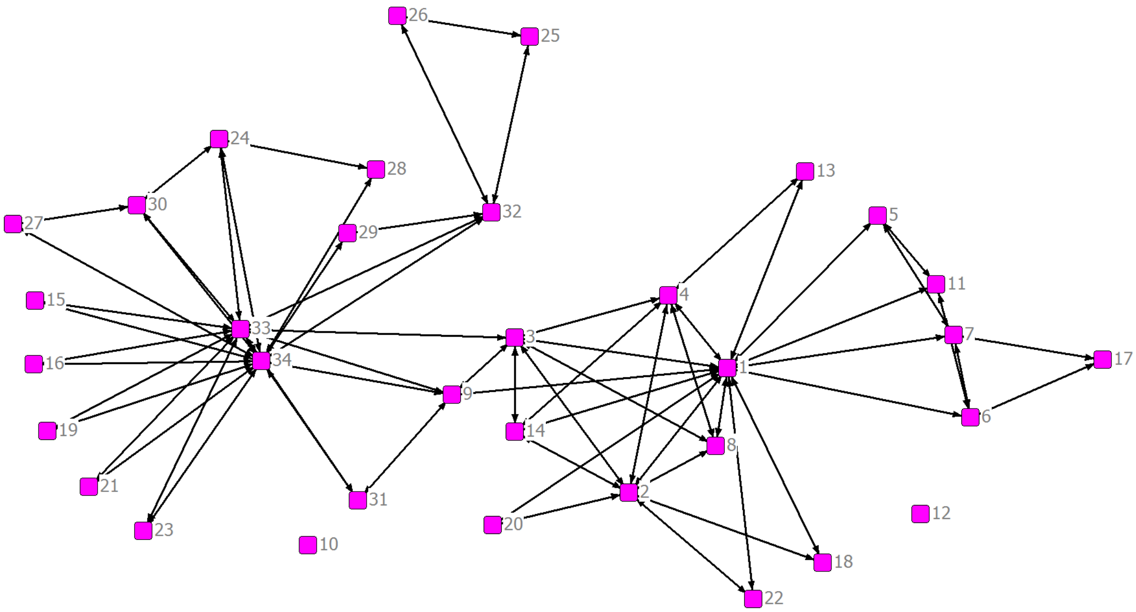
These data show, for each dyad, HOW MANY simmelean ties they are embedded in. Actors 33 and 34 are in 10 sets of simmelean ties. They are tightly bound to each other through many mutual interactions. It is going to be hard for them to break from each other.

c. Open ZACHE in NETDRAW, then open (AS A NETWORK) ZACHE-Simmel. Because it has the same actors, they should both be present on the relations tab. Switch between them and see the difference.

Zache Network:

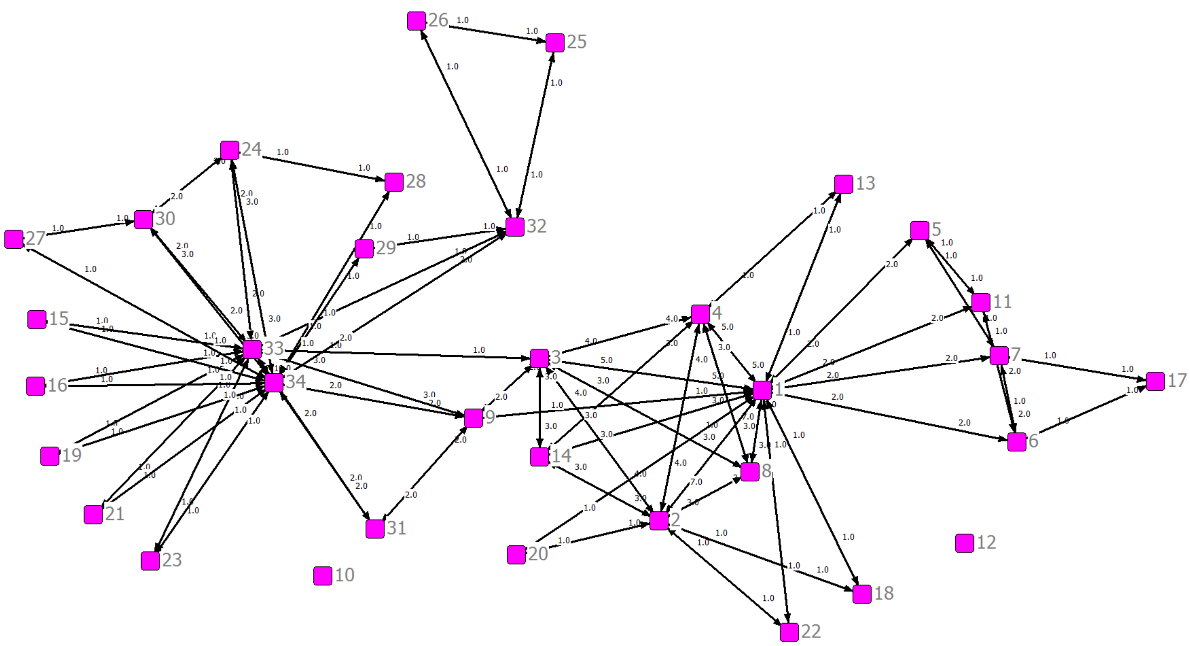


Zache-Simmel Network:



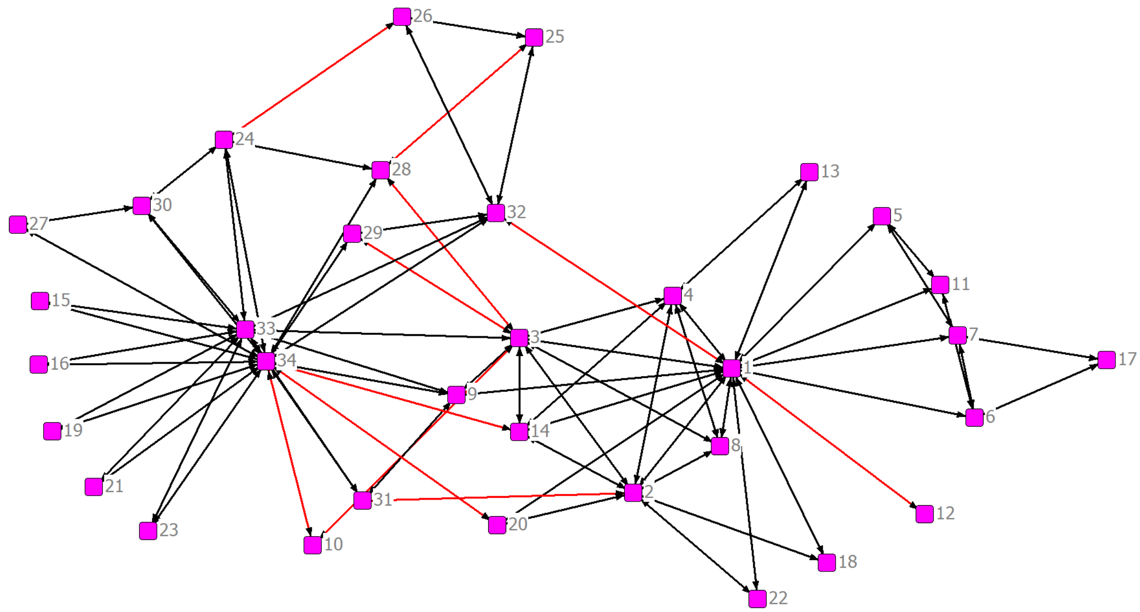
The two networks are quite similar. The Zache network contains 156 ties and the Zache-Simmel contains 134 ties, all of which overlap with the Zache network. Thus, the Zache network contains 22 pairs that do not have Simmelian ties with one another.

d. Select only ZACHE-Simmel relation. The output from the Simmelian tie analysis is a network with the COUNT of how many Simmelian ties each pair of actors share. Turn on the link weights to see those counts. Which actors have the MOST sets of embedded ties?



Although it is difficult to see here, the link weight between nodes 1 and 2 is 7. These two nodes are therefore in 7 distinct Simmelian triangles. Note that we can also see this in the matrix above.

e. Turn off the link weights and check both relations. Go to Properties | Lines | Color Relations. Choose a different color for ZACHE, ZACHE-Simmel, and "Multiplex" (which is when a line represents more than on relationship, in this case both ZACHE and ZACHE-Simmel). How much of this network is embedded in Simmelian ties?



Multiplex ties are black and Zache ties are red (there are no purely Zache-Simmel ties). You should be able to count 11 bi-directional red lines, meaning that there 22 non-Simmelian ties in the network. There are a total of 156 ties and 134 of them are Simmelian, so about 86% of the dyads in this network share Simmelian ties.

f. Back in UCINET, run Network | Cohesion | Transitivity to see the score. Does it surprise you based on the previous analysis in NetDraw?

Below is the output for transitivity on the Zache network using triplets as the method:

```
TRANSITIVITY
--------------------------------------------------------------------------------

Input Network dataset:                zache (C:\Users\Paulo Serodio\Documents\UCINET
data\zache
Output Measures:                      zache-transit (C:\Users\Paulo
Serodio\Documents\UCINET data\zache-transit
Method:                               Triplets (C:\Users\Paulo Serodio\Documents\UCINET
data\Triplets

Triplet Transitivity

            1
        -----
      1 0.256

1 rows, 1 columns, 1 levels.
```

We see that transitivity is .256, or 25.6% of the triples in the network are transitive. This may seem low compared to your intuition based on the visualization. There are, however, many sets of two legs that do not contain a third (i.e., open triads) that do not seem obvious from visual inspection.