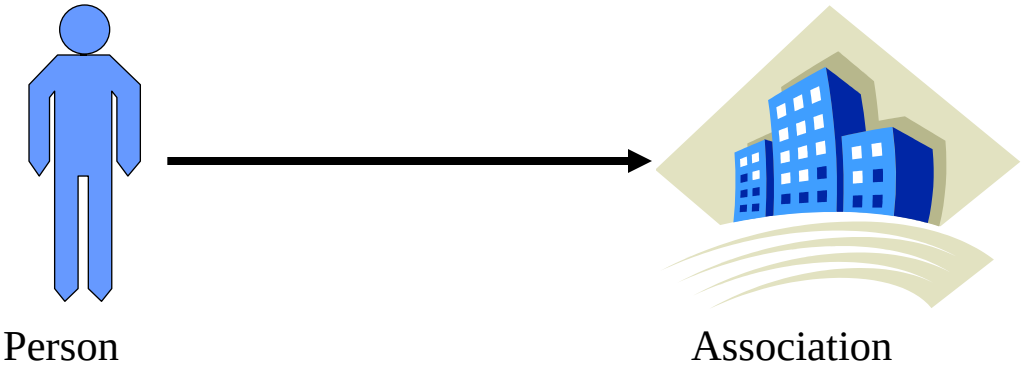
UCINET Two-Mode Network Tutorial

Conducting an Organizational Network Analysis

- Types of 2-mode networks
- Visual analysis of 2-mode networks
- Quantitative analysis of 2-mode networks
- Transforming 2-mode networks to 1-mode

Types of 2-Mode Network



- People – Associations
- People – Databases
- People – Patents
- People – Organizations

Conducting an Organizational Network Analysis

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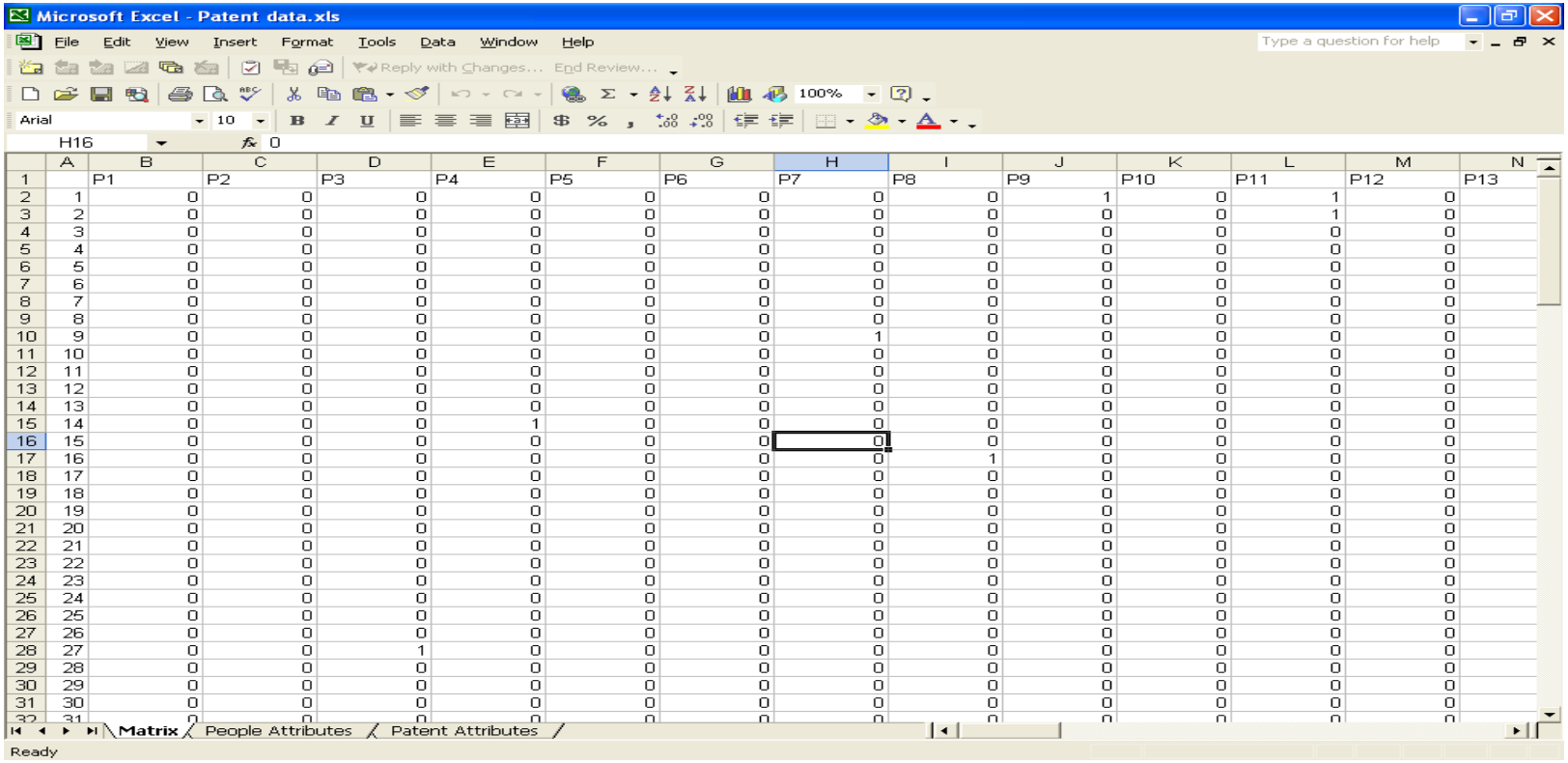
- Transforming 2-mode networks to 1-mode

2-Mode Data


Microsoft Excel - Patent data.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

Reply with Changes... End Review...

Arial 10

H16 0

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
2	1	0	0	0	0	0	0	0	0	1	0	1	0	
3	2	0	0	0	0	0	0	0	0	0	0	1	0	
4	3	0	0	0	0	0	0	0	0	0	0	0	0	
5	4	0	0	0	0	0	0	0	0	0	0	0	0	
6	5	0	0	0	0	0	0	0	0	0	0	0	0	
7	6	0	0	0	0	0	0	0	0	0	0	0	0	
8	7	0	0	0	0	0	0	0	0	0	0	0	0	
9	8	0	0	0	0	0	0	0	0	0	0	0	0	
10	9	0	0	0	0	0	0	1	0	0	0	0	0	
11	10	0	0	0	0	0	0	0	0	0	0	0	0	
12	11	0	0	0	0	0	0	0	0	0	0	0	0	
13	12	0	0	0	0	0	0	0	0	0	0	0	0	
14	13	0	0	0	0	0	0	0	0	0	0	0	0	
15	14	0	0	0	1	0	0	0	0	0	0	0	0	
16	15	0	0	0	0	0	0	0	0	0	0	0	0	
17	16	0	0	0	0	0	0	0	1	0	0	0	0	
18	17	0	0	0	0	0	0	0	0	0	0	0	0	
19	18	0	0	0	0	0	0	0	0	0	0	0	0	
20	19	0	0	0	0	0	0	0	0	0	0	0	0	
21	20	0	0	0	0	0	0	0	0	0	0	0	0	
22	21	0	0	0	0	0	0	0	0	0	0	0	0	
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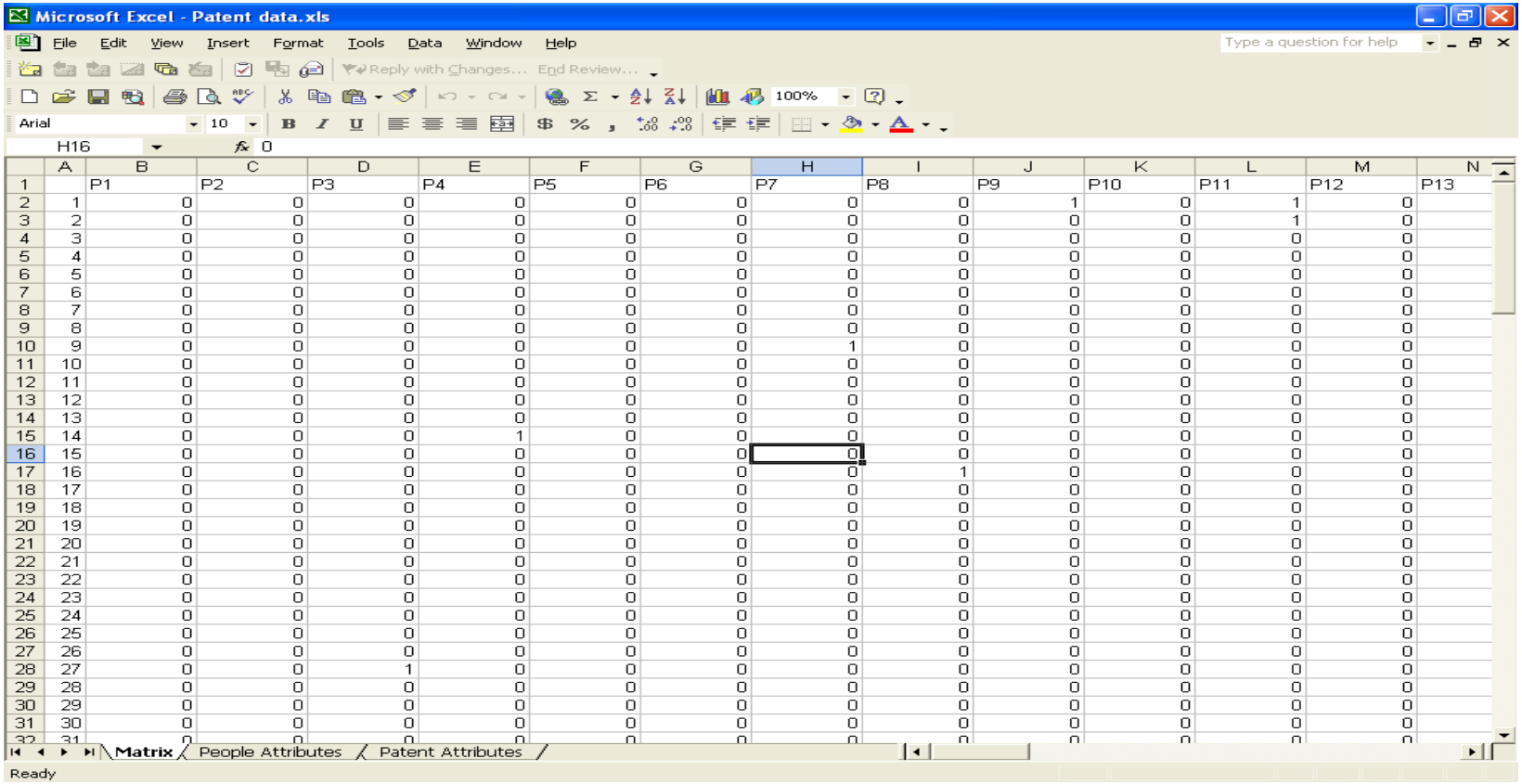
28	27	0	0	1	0	0	0	0	0	0	0	0	0	
29	28	0	0	0	0	0	0	0	0	0	0	0	0	
30	29	0	0	0	0	0	0	0	0	0	0	0	0	
31	30	0	0	0	0	0	0	0	0	0	0	0	0	
32	31	0	0	0	0	0	0	0	0	0	0	0	0	

Matrix | People Attributes | Patent Attributes

Ready

- The data for people are in the rows and for patents the data are in the columns.

Transferring Excel Matrix Data into UCINET



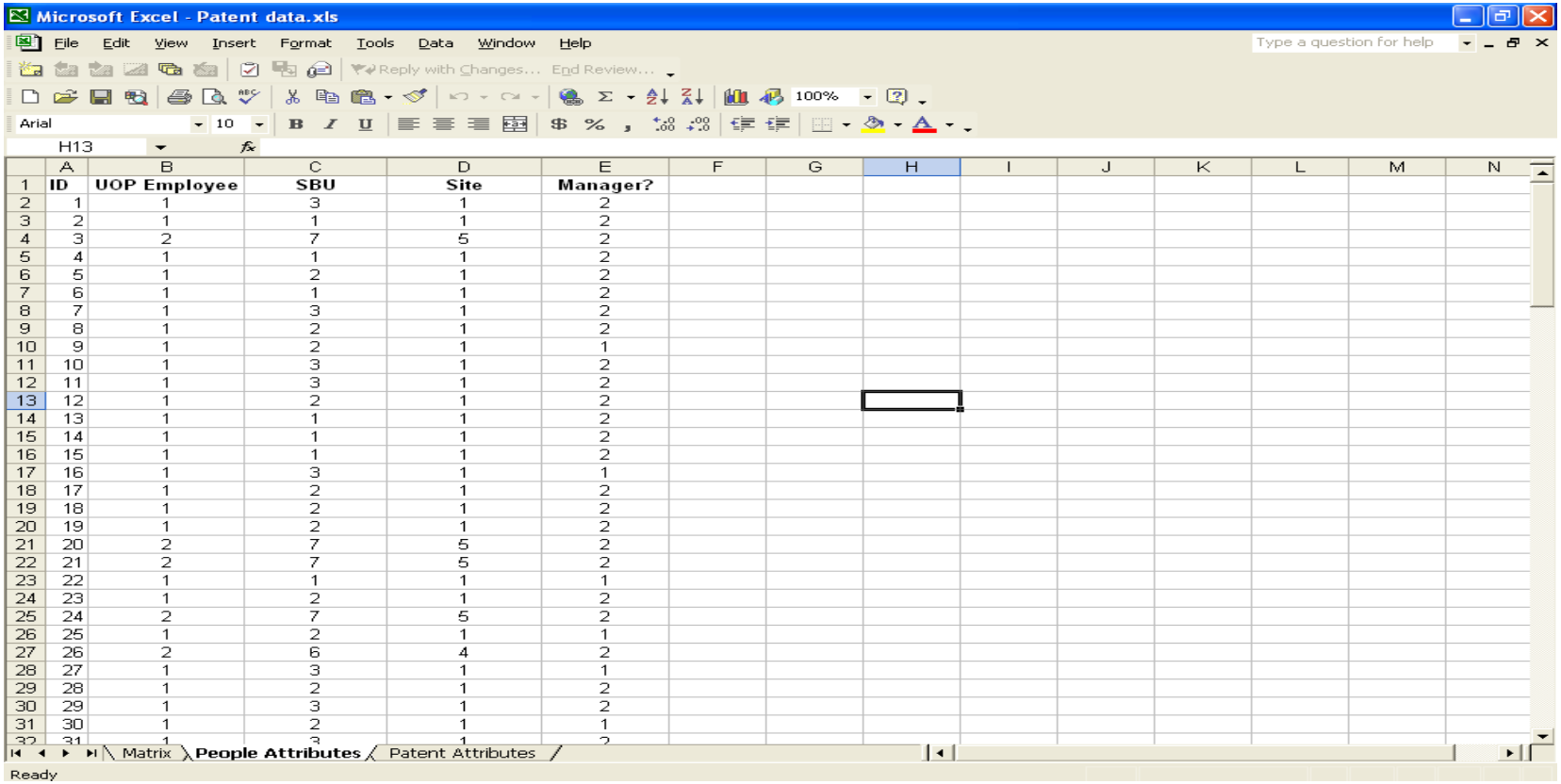
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
2	1	0	0	0	0	0	0	0	0	1	0	1	0	
3	2	0	0	0	0	0	0	0	0	0	0	1	0	
4	3	0	0	0	0	0	0	0	0	0	0	0	0	
5	4	0	0	0	0	0	0	0	0	0	0	0	0	
6	5	0	0	0	0	0	0	0	0	0	0	0	0	
7	6	0	0	0	0	0	0	0	0	0	0	0	0	
8	7	0	0	0	0	0	0	0	0	0	0	0	0	
9	8	0	0	0	0	0	0	0	0	0	0	0	0	
10	9	0	0	0	0	0	0	1	0	0	0	0	0	
11	10	0	0	0	0	0	0	0	0	0	0	0	0	
12	11	0	0	0	0	0	0	0	0	0	0	0	0	
13	12	0	0	0	0	0	0	0	0	0	0	0	0	
14	13	0	0	0	0	0	0	0	0	0	0	0	0	
15	14	0	0	0	1	0	0	0	0	0	0	0	0	
16	15	0	0	0	0	0	0	0	0	0	0	0	0	
17	16	0	0	0	0	0	0	0	1	0	0	0	0	
18	17	0	0	0	0	0	0	0	0	0	0	0	0	
19	18	0	0	0	0	0	0	0	0	0	0	0	0	
20	19	0	0	0	0	0	0	0	0	0	0	0	0	
21	20	0	0	0	0	0	0	0	0	0	0	0	0	
22	21	0	0	0	0	0	0	0	0	0	0	0	0	
23	22	0	0	0	0	0	0	0	0	0	0	0	0	
24	23	0	0	0	0	0	0	0	0	0	0	0	0	
25	24	0	0	0	0	0	0	0	0	0	0	0	0	
26	25	0	0	0	0	0	0	0	0	0	0	0	0	
27	26	0	0	0	0	0	0	0	0	0	0	0	0	
28	27	0	0	1	0	0	0	0	0	0	0	0	0	
29	28	0	0	0	0	0	0	0	0	0	0	0	0	
30	29	0	0	0	0	0	0	0	0	0	0	0	0	
31	30	0	0	0	0	0	0	0	0	0	0	0	0	

Step 1. Copy data from Excel

Step 2. Paste into spreadsheet editor in UCINET

Step 3. Save as “patentdata.”

Transferring Attribute Data into UCINET



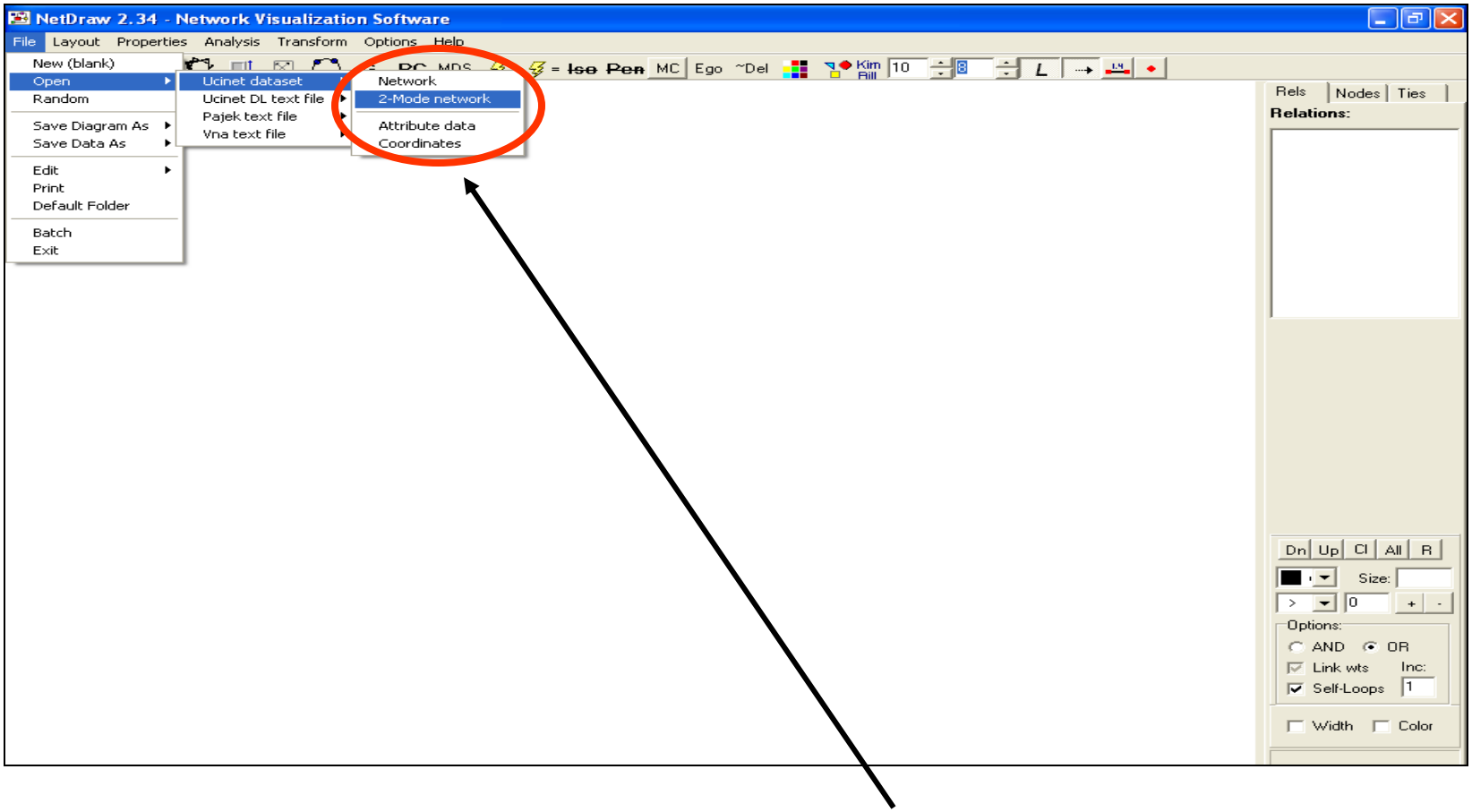
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	ID	UOP Employee	SBU	Site	Manager?									
2	1	1	3	1	2									
3	2	1	1	1	2									
4	3	2	7	5	2									
5	4	1	1	1	2									
6	5	1	2	1	2									
7	6	1	1	1	2									
8	7	1	3	1	2									
9	8	1	2	1	2									
10	9	1	2	1	1									
11	10	1	3	1	2									
12	11	1	3	1	2									
13	12	1	2	1	2									
14	13	1	1	1	2									
15	14	1	1	1	2									
16	15	1	1	1	2									
17	16	1	3	1	1									
18	17	1	2	1	2									
19	18	1	2	1	2									
20	19	1	2	1	2									
21	20	2	7	5	2									
22	21	2	7	5	2									
23	22	1	1	1	1									
24	23	1	2	1	2									
25	24	2	7	5	2									
26	25	1	2	1	1									
27	26	2	6	4	2									
28	27	1	3	1	1									
29	28	1	2	1	2									
30	29	1	3	1	2									
31	30	1	2	1	1									
32	31	1	3	1	2									

Step 1. Copy data from Excel

Step 2. Paste into spreadsheet editor in UCINET

Step 3. Save as “people_attrib”

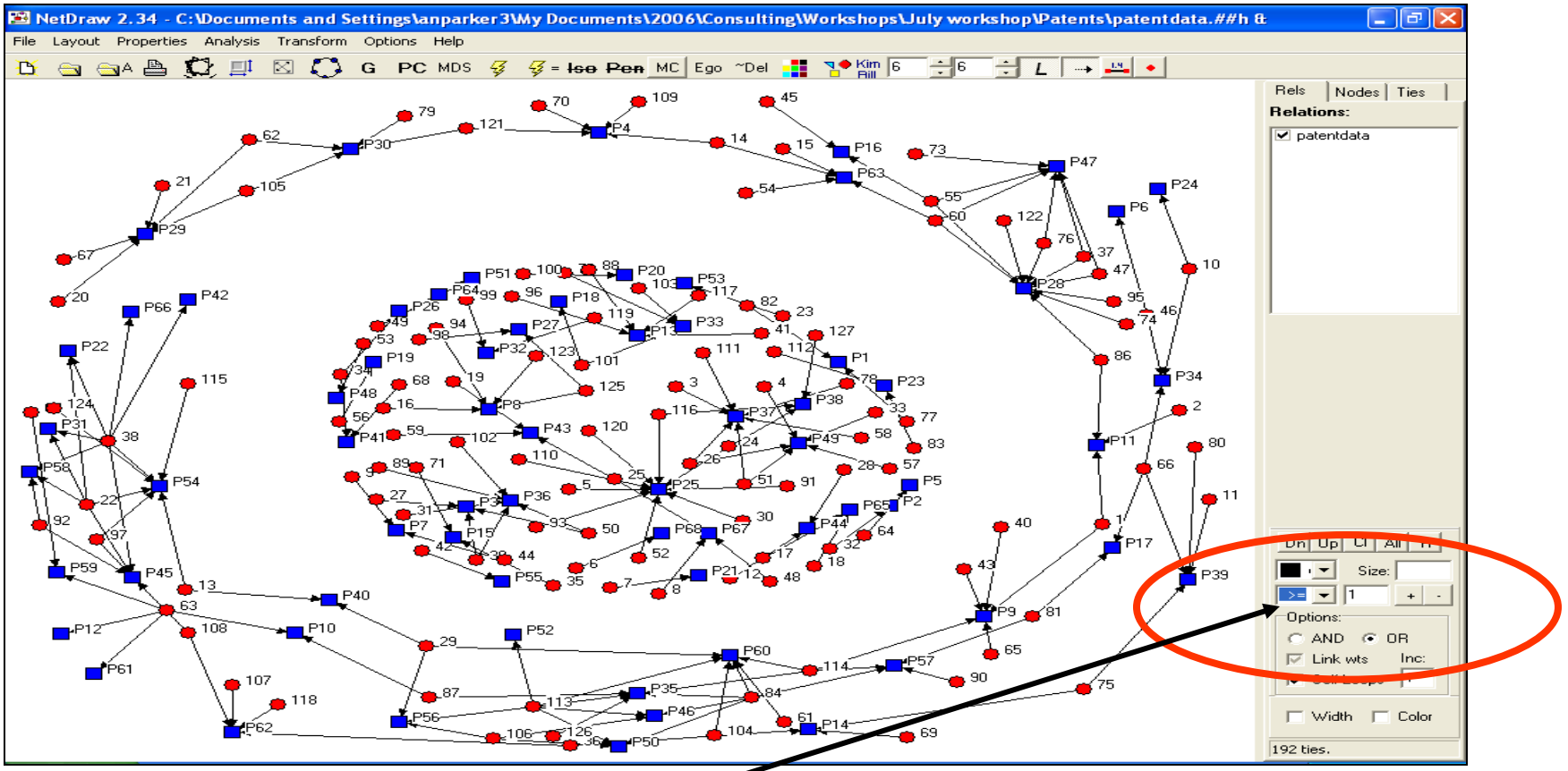
Opening Data in NetDraw



Step 1. File > Open > Ucinet dataset > 2-Mode Network

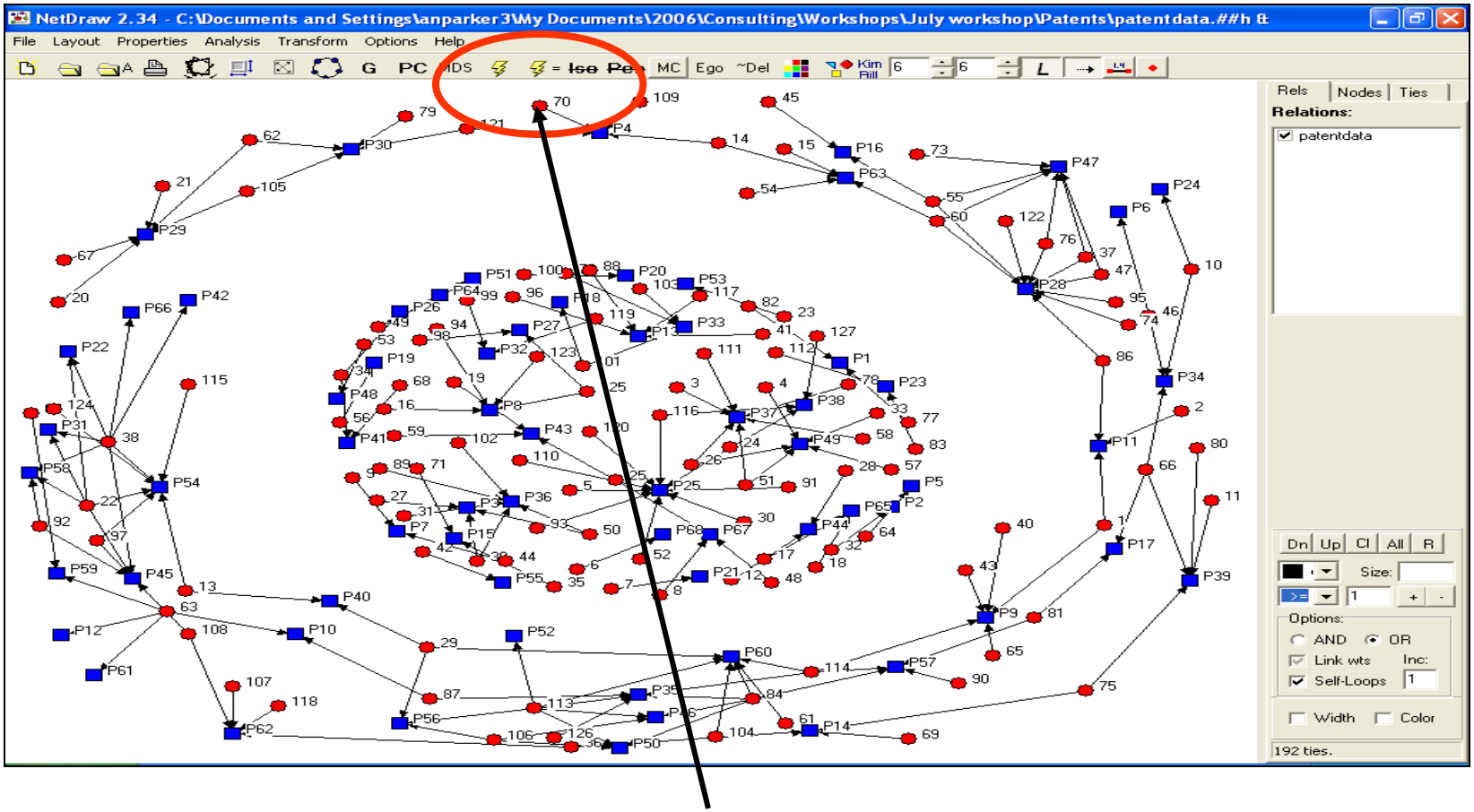
Step 2. Choose network dataset (patentdata.##h)

Dichotomizing in NetDraw



Step 1. Choose “>=” and “1”

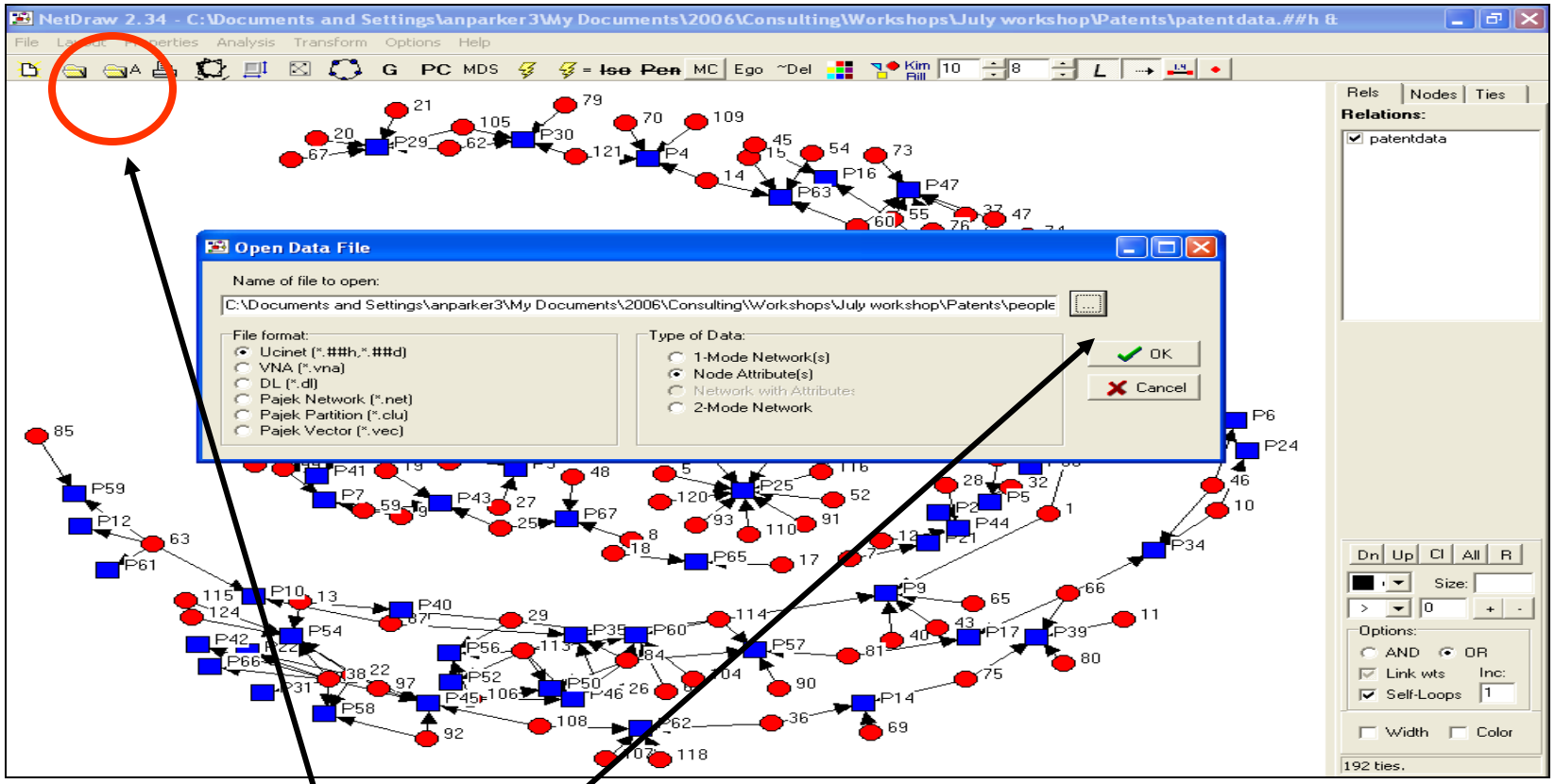
Using Drawing Algorithm in NetDraw



Step 1. Choose ⚡ option on tool bar

Step 2. Choose ⚡ = option on tool bar

Using Attribute Data in NetDraw

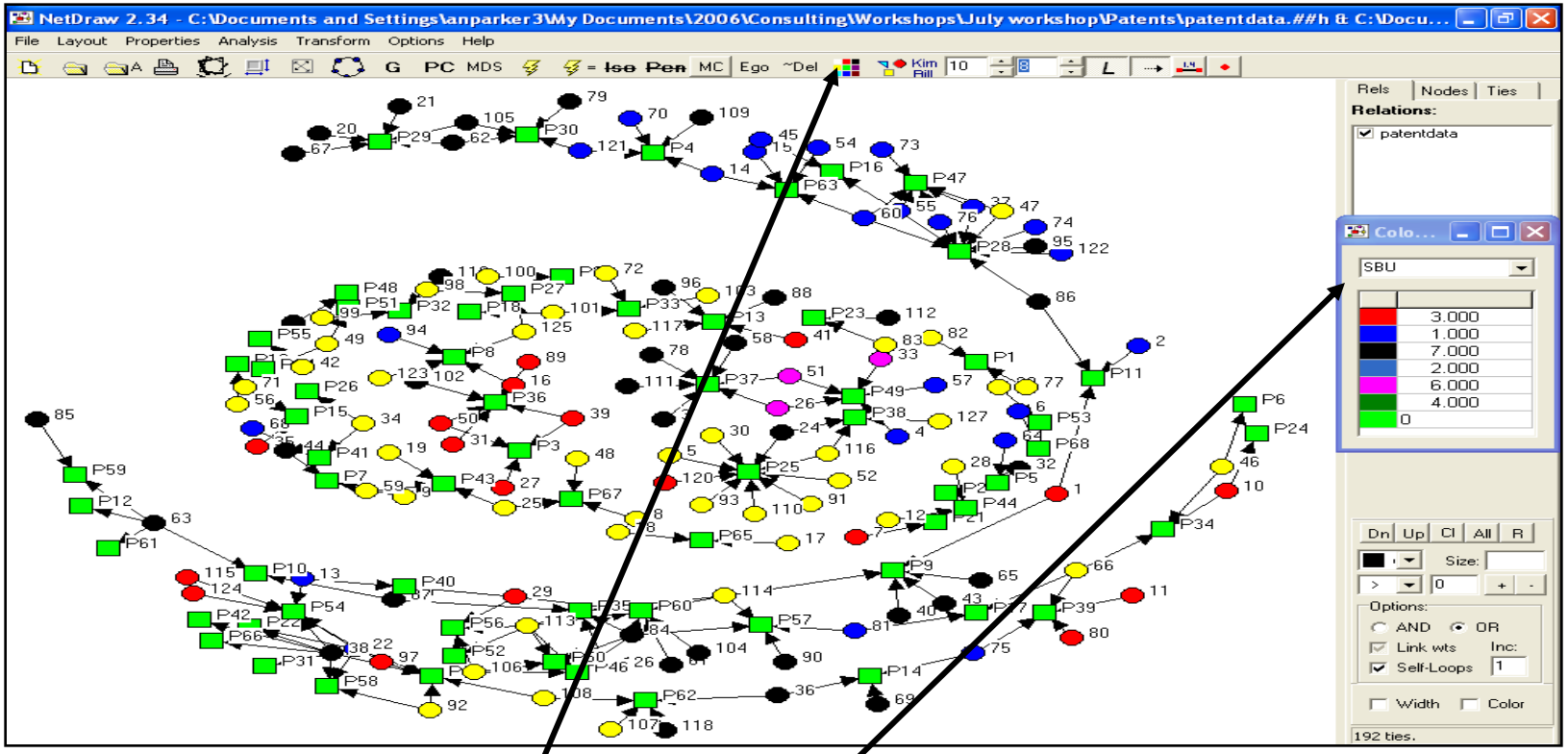


Step 1. Click - open folder icon A

Step 2. Click - box

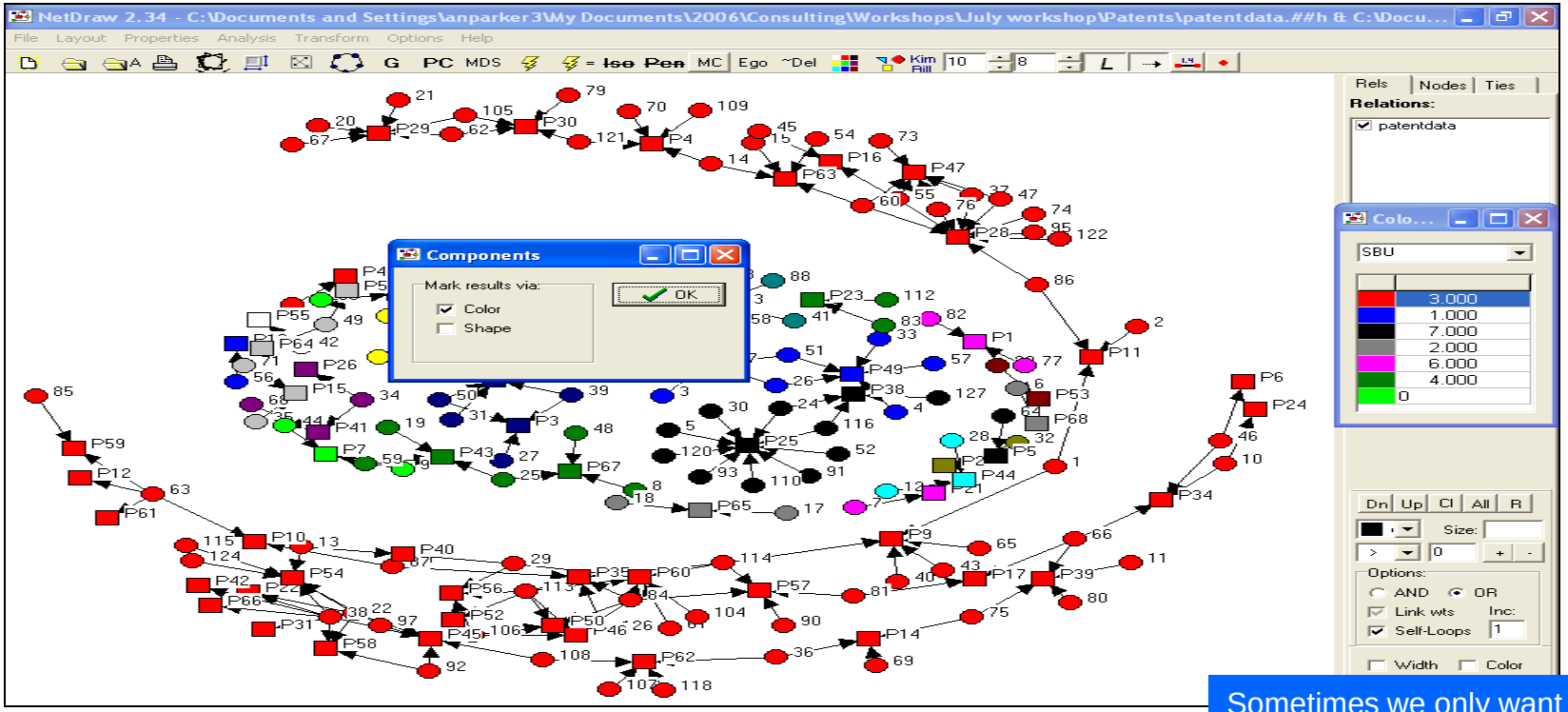
Step 3. Choose attribute dataset (peopleattrib.##h), then click OK.

Choosing Color Attribute in NetDraw



Step 1. Select “paint pallet” icon
Step 2. Select attribute, e.g. “SBU”

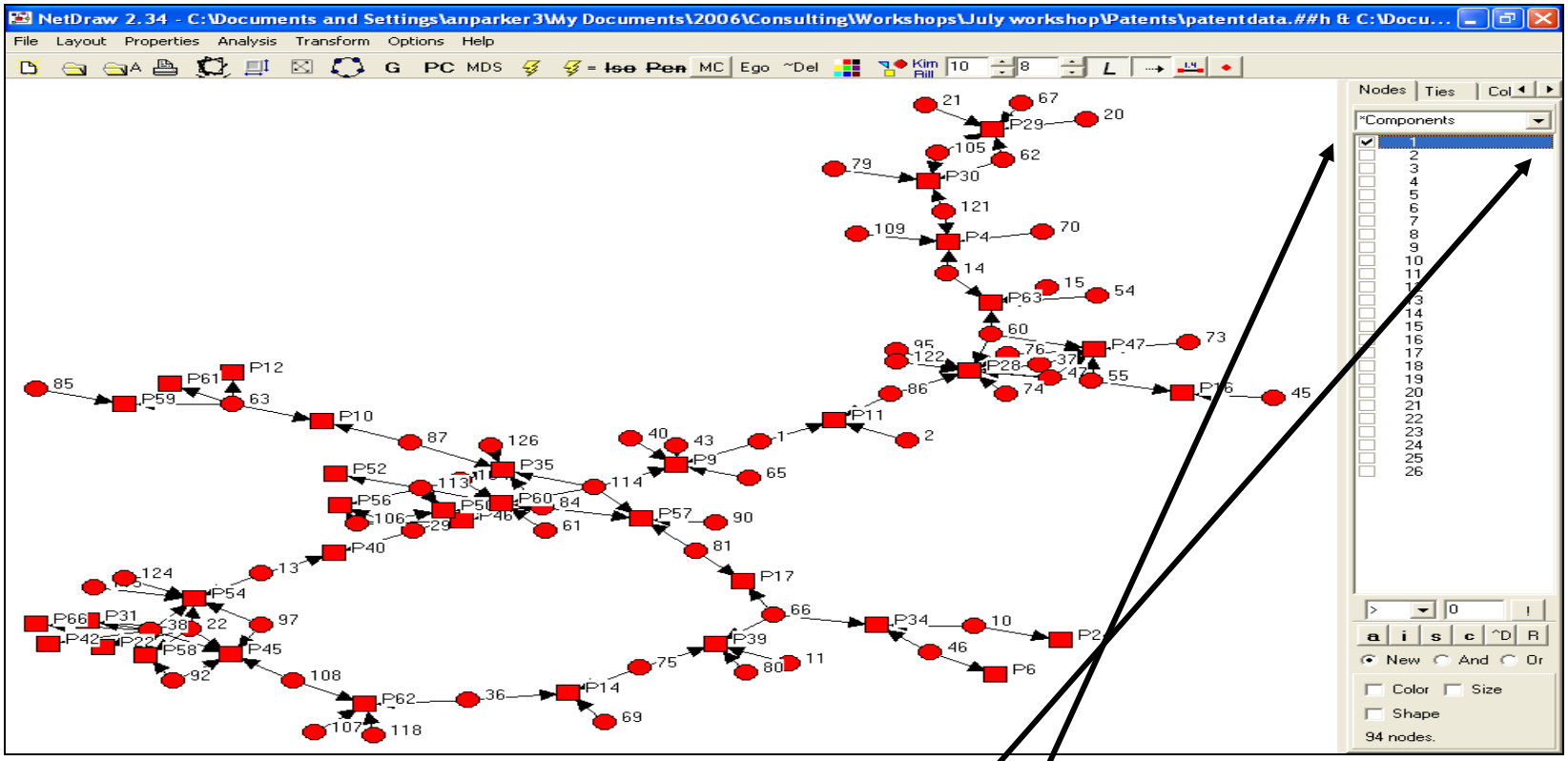
Selecting the Main Component



Step 1. Analysis > Components
Step 2. Select “color”

Sometimes we only want to see the largest connected part of a network. We can do this by looking at components.

Viewing the Main Component

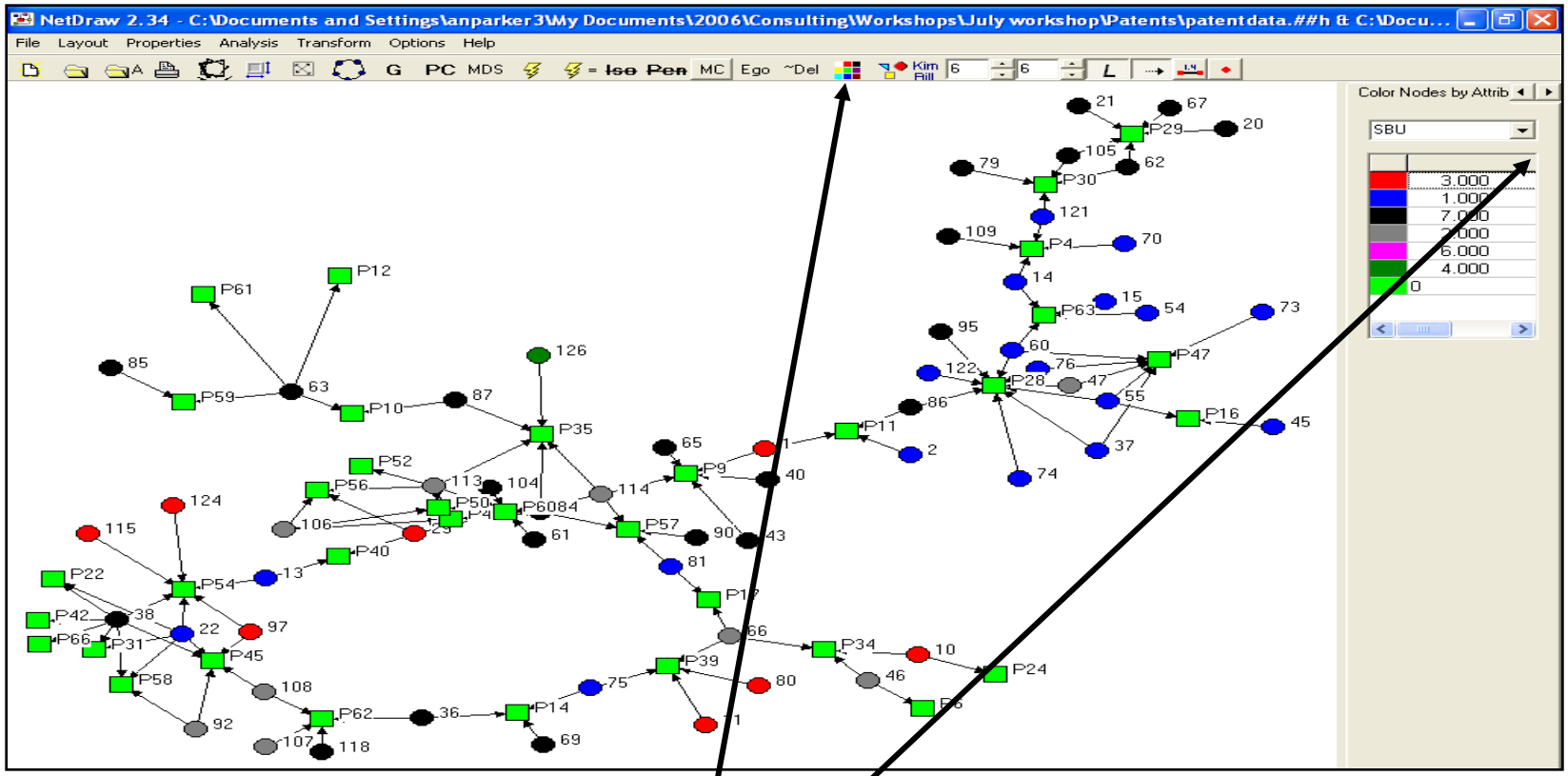


Step 1. Nodes > select attributes “component”

Step 2. Analysis > Deselect all boxes except #1

Step 3. Redraw using drawing algorithm. Choose option on tool bar

Viewing Main Component by Attribute



Conducting an Organizational Network Analysis

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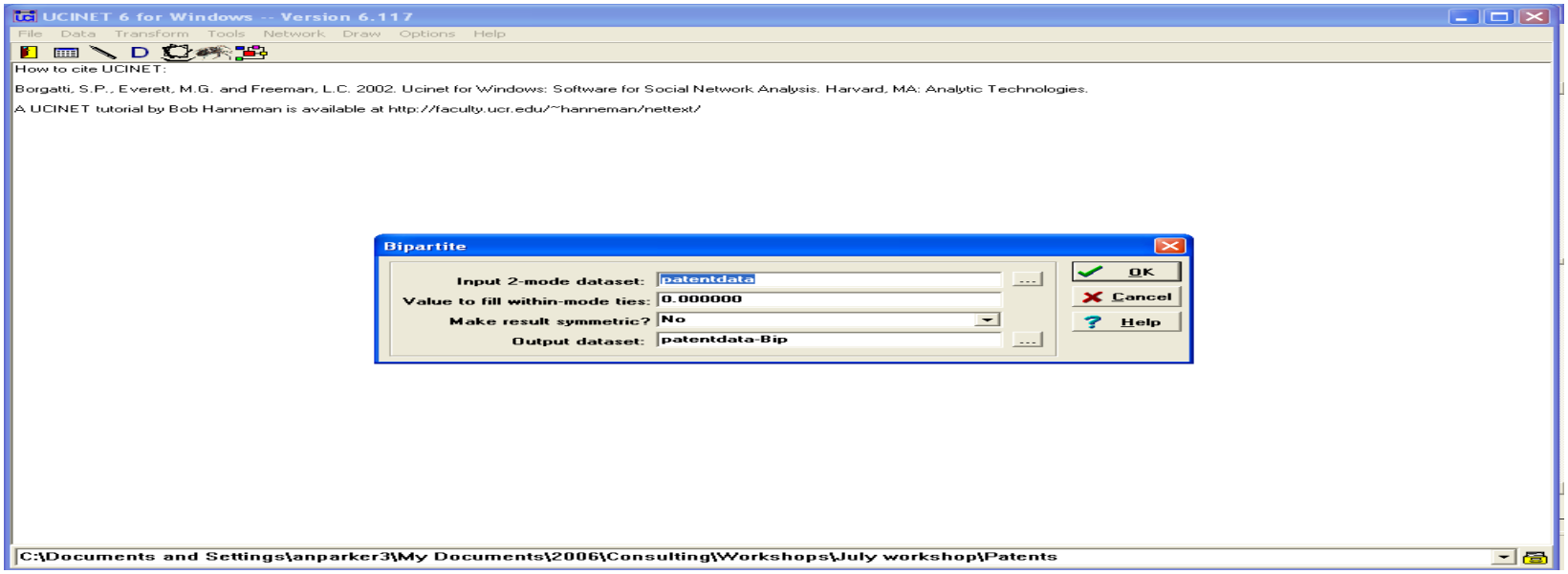
Running the Bipartite Function on 2-Mode Data

- The data that we collected is 2-mode data. We cannot run the various analytical measures in UCINET on the data as it stands because the matrix is not square and the rows and columns are different modes. To do this we need to run the bipartite function. This function makes the matrix square and adds mode 1 rows to mode 2 columns and vice versa.

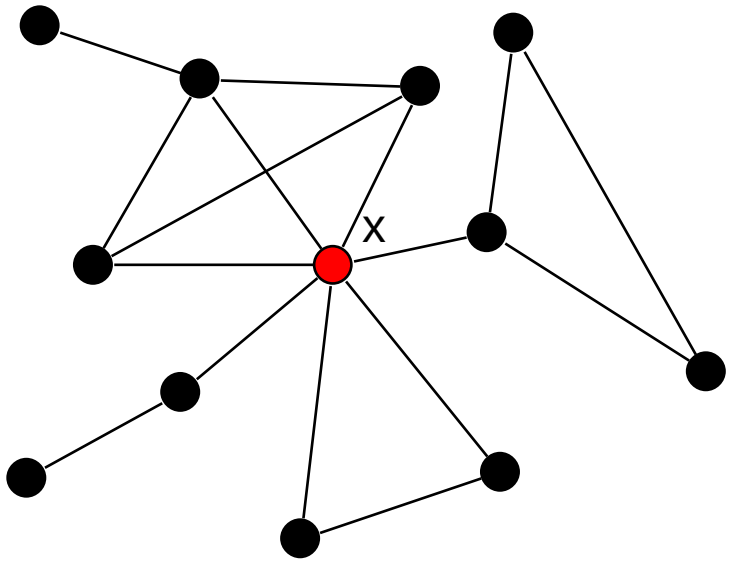


Step 1. Transform > Bipartite

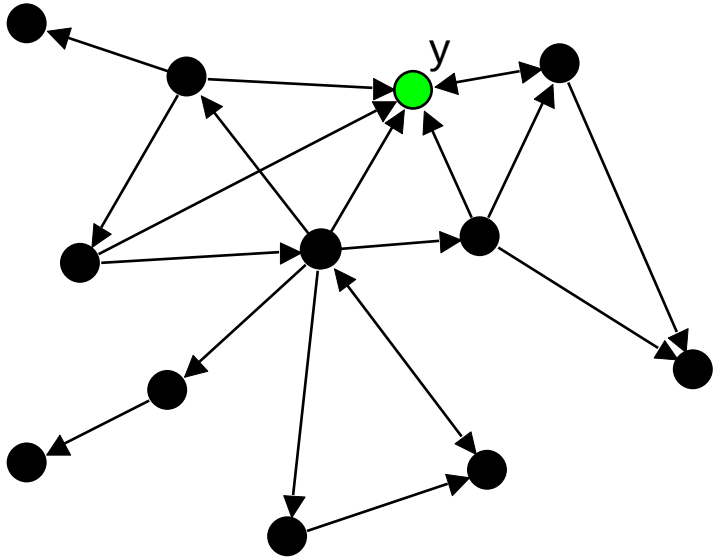
Step 2. Choose input dataset (patentdata.##h)

Step 3. Specify output data set (patentdata-BiP.##h)

Degree Centrality



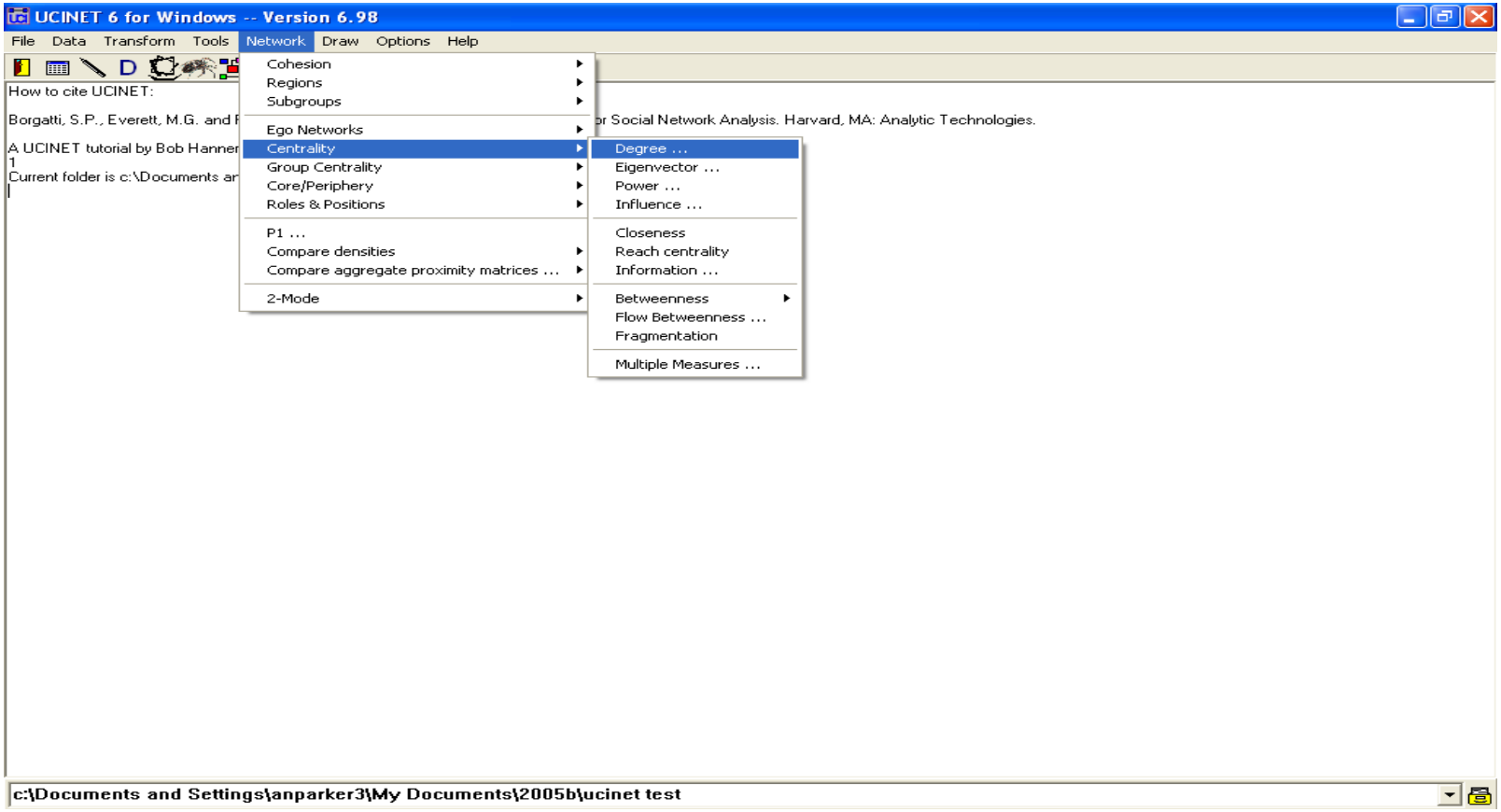
Communication Network
degree of X is 7



Seek Advice Network
in-degree of Y is 5

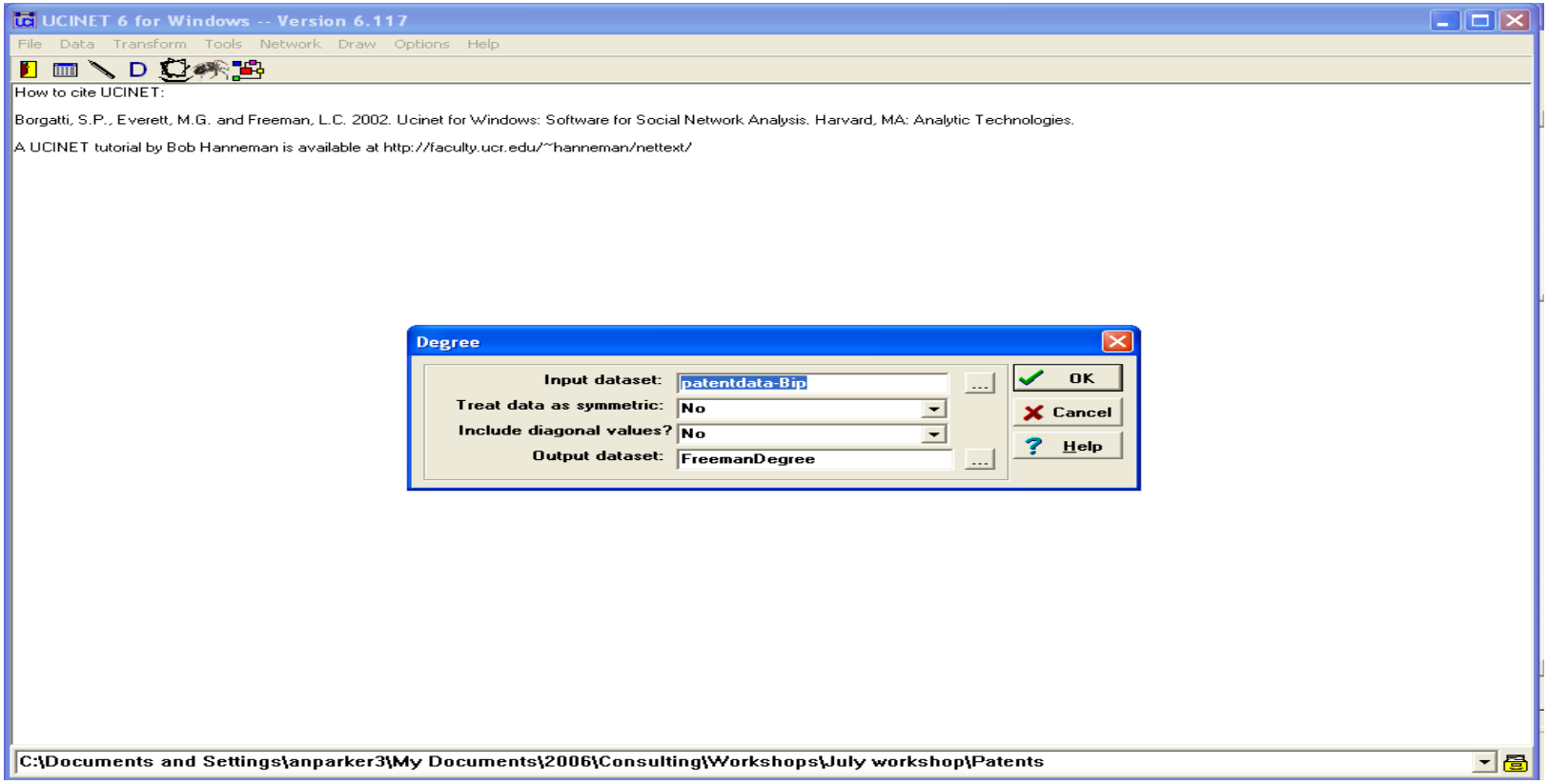
- How well connected each individual is
- Technical definition: Number of ties a person has

Quantitative Analysis: Degree Centrality



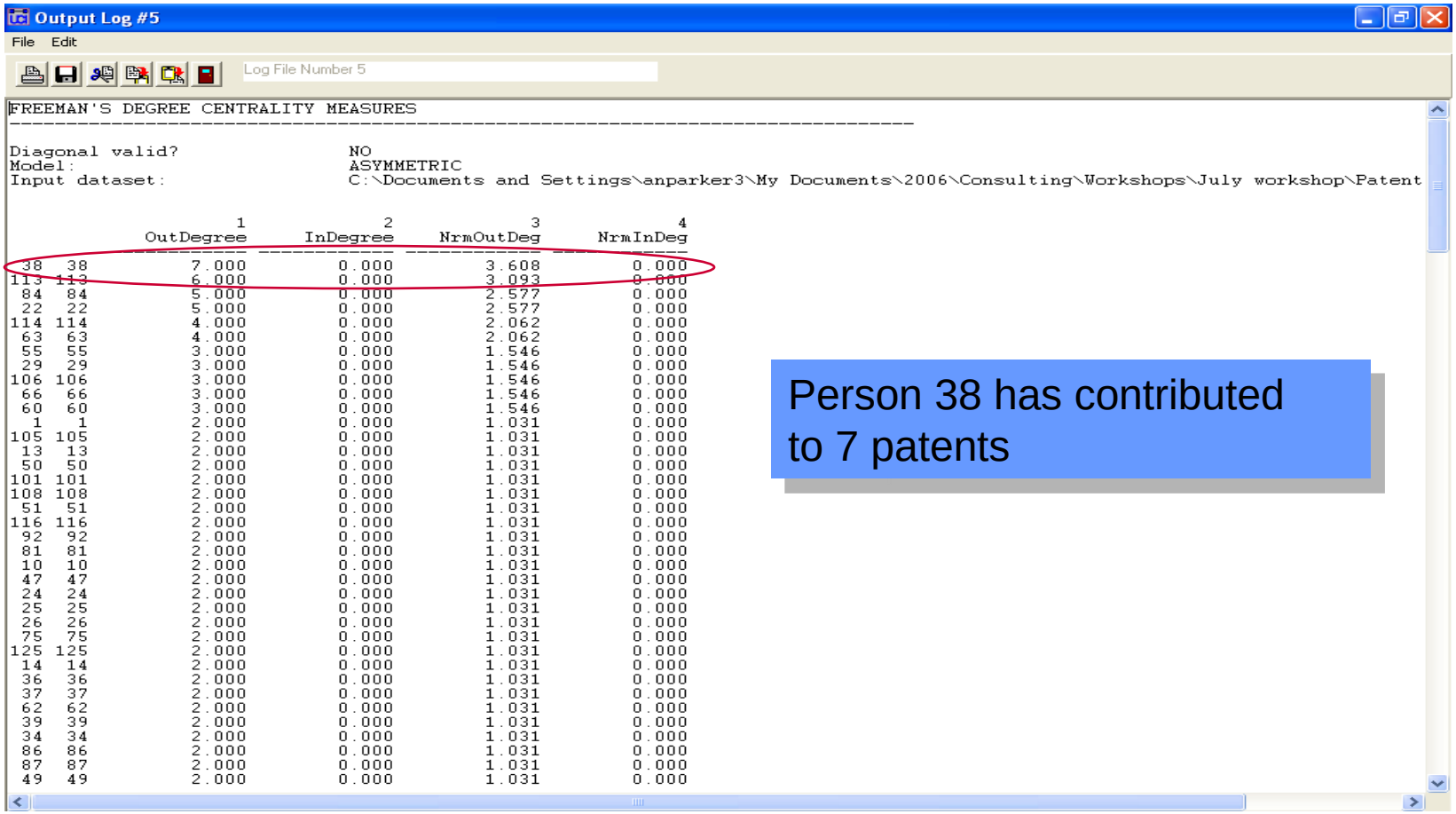
Step 1. Network > Centrality > Degree

Quantitative Analysis: Degree Centrality



Step 2. Input dataset “patentdata-BiP.##h”
Step 3. Choose whether to treat data as symmetric. Choose “no.”

Quantitative Analysis: Degree Centrality


Output Log #5

File Edit

Log File Number 5

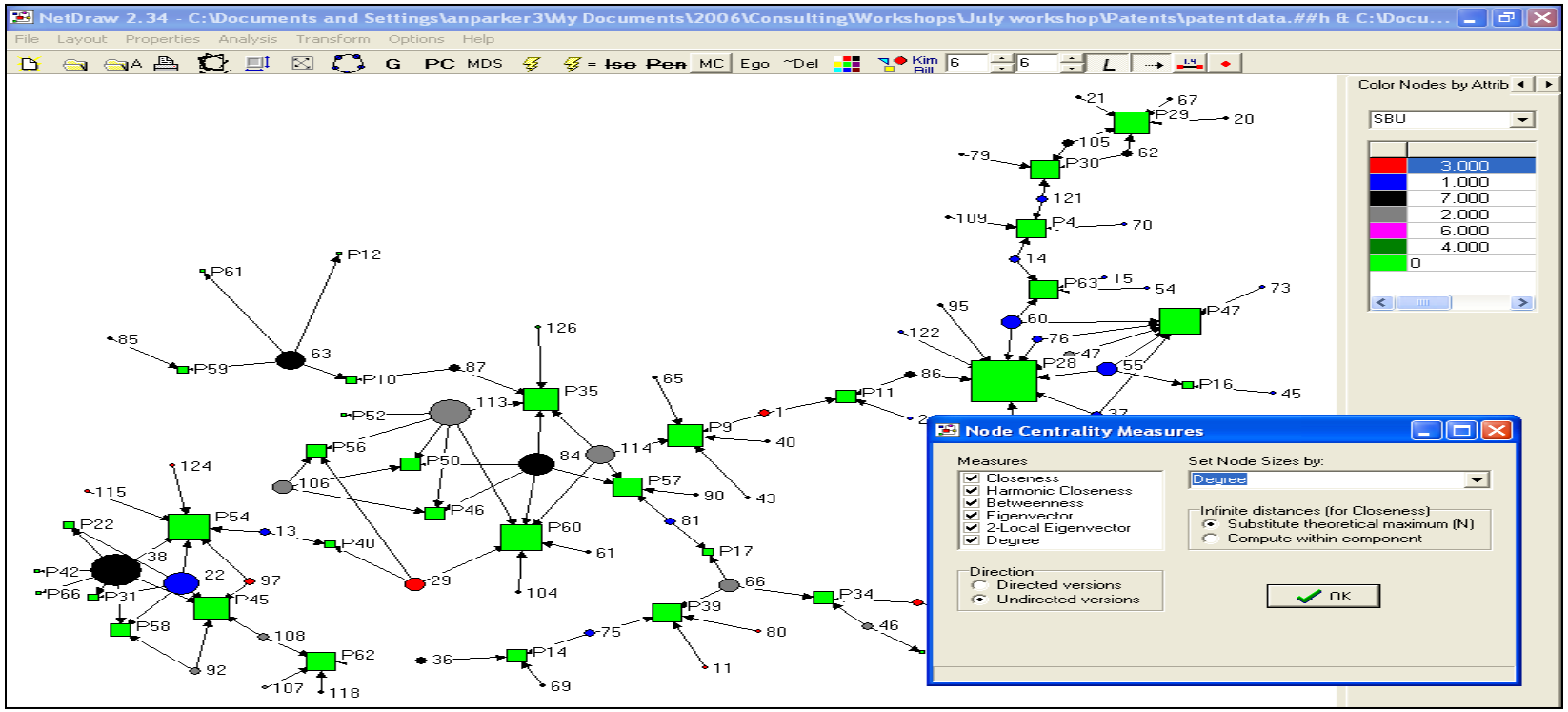
FREEMAN'S DEGREE CENTRALITY MEASURES

Diagonal valid? NO
Model: ASYMMETRIC
Input dataset: C:\Documents and Settings\anparker3\My Documents\2006\Consulting\Workshops\July workshop\Patent

		1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
38	38	7.000	0.000	3.608	0.000
113	113	6.000	0.000	3.093	0.000
84	84	5.000	0.000	2.577	0.000
22	22	5.000	0.000	2.577	0.000
114	114	4.000	0.000	2.062	0.000
63	63	4.000	0.000	2.062	0.000
55	55	3.000	0.000	1.546	0.000
29	29	3.000	0.000	1.546	0.000
106	106	3.000	0.000	1.546	0.000
66	66	3.000	0.000	1.546	0.000
60	60	3.000	0.000	1.546	0.000
1	1	2.000	0.000	1.031	0.000
105	105	2.000	0.000	1.031	0.000
13	13	2.000	0.000	1.031	0.000
50	50	2.000	0.000	1.031	0.000
101	101	2.000	0.000	1.031	0.000
108	108	2.000	0.000	1.031	0.000
51	51	2.000	0.000	1.031	0.000
116	116	2.000	0.000	1.031	0.000
92	92	2.000	0.000	1.031	0.000
81	81	2.000	0.000	1.031	0.000
10	10	2.000	0.000	1.031	0.000
47	47	2.000	0.000	1.031	0.000
24	24	2.000	0.000	1.031	0.000
25	25	2.000	0.000	1.031	0.000
26	26	2.000	0.000	1.031	0.000
75	75	2.000	0.000	1.031	0.000
125	125	2.000	0.000	1.031	0.000
14	14	2.000	0.000	1.031	0.000
36	36	2.000	0.000	1.031	0.000
37	37	2.000	0.000	1.031	0.000
62	62	2.000	0.000	1.031	0.000
39	39	2.000	0.000	1.031	0.000
34	34	2.000	0.000	1.031	0.000
86	86	2.000	0.000	1.031	0.000
87	87	2.000	0.000	1.031	0.000
49	49	2.000	0.000	1.031	0.000

Person 38 has contributed to 7 patents

Visualizing Degree Centrality in Netdraw

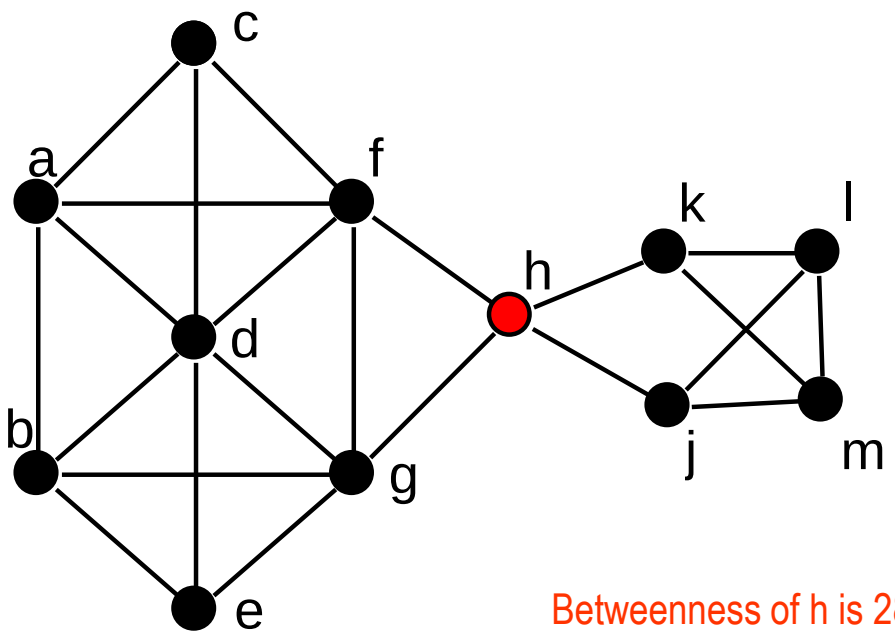


Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Degree

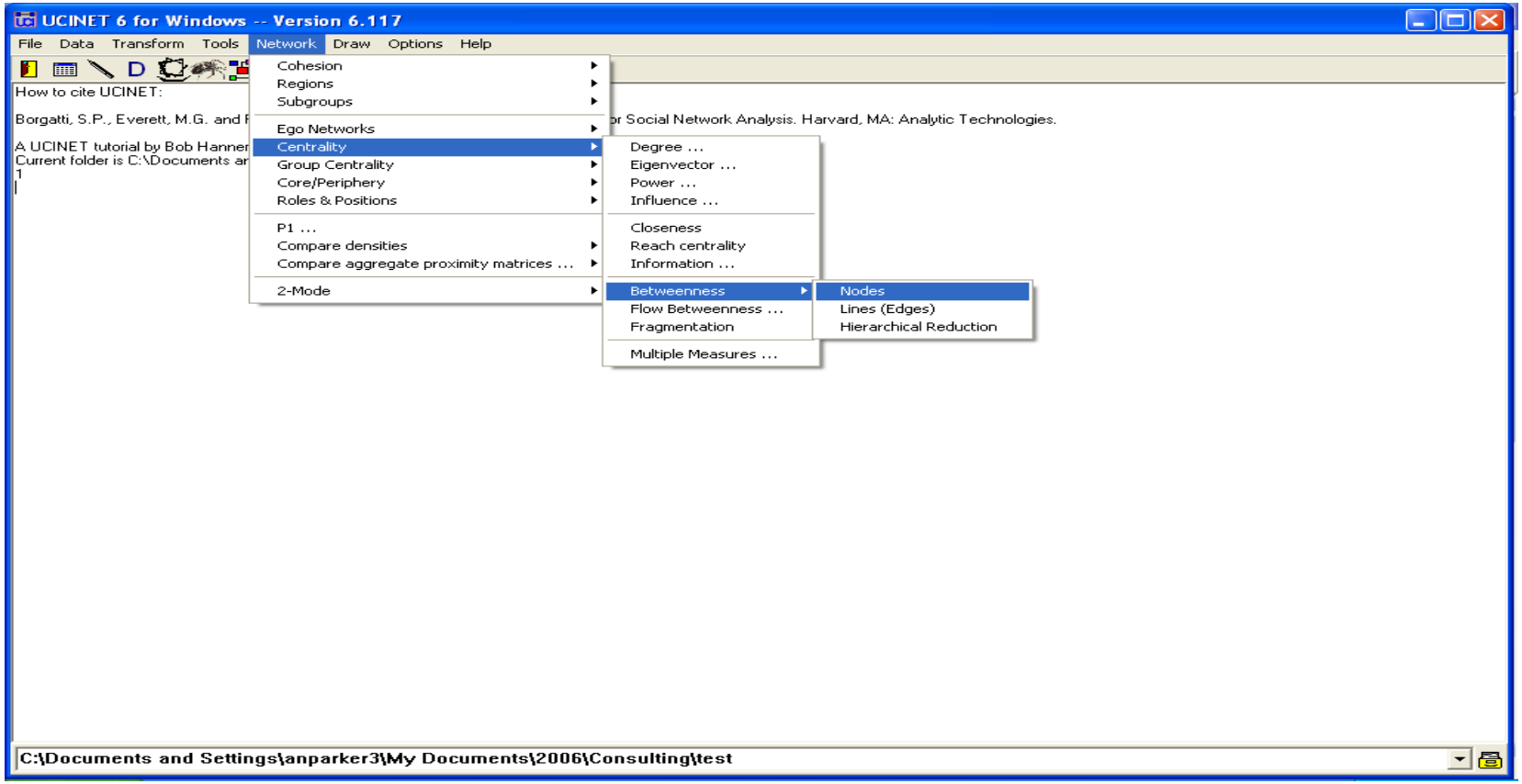
NOTE: The nodes that have the best degree centrality scores are the largest

Betweenness Centrality



- Extent to which individuals lie along short paths
- Index of potential to play brokerage, liaison or gatekeeping
- Technical definition: number of times that a person lies along the shortest path between two others, adjusted for number of alternative shortest paths

Quantitative Analysis: Betweenness Centrality



Step 1. Transform > Symmetrize > choose input dataset “patentdata-BiP”

Step 2. Network > Centrality > Betweenness > Nodes

Quantitative Analysis: Betweenness Centrality

Output Log #14

File Edit

Log File Number 14

FREEMAN BETWEENNESS CENTRALITY

Input dataset: C:\Documents and Settings\anparker3\My Documents\2006\Consulting\Workshops\July workshop\Patent

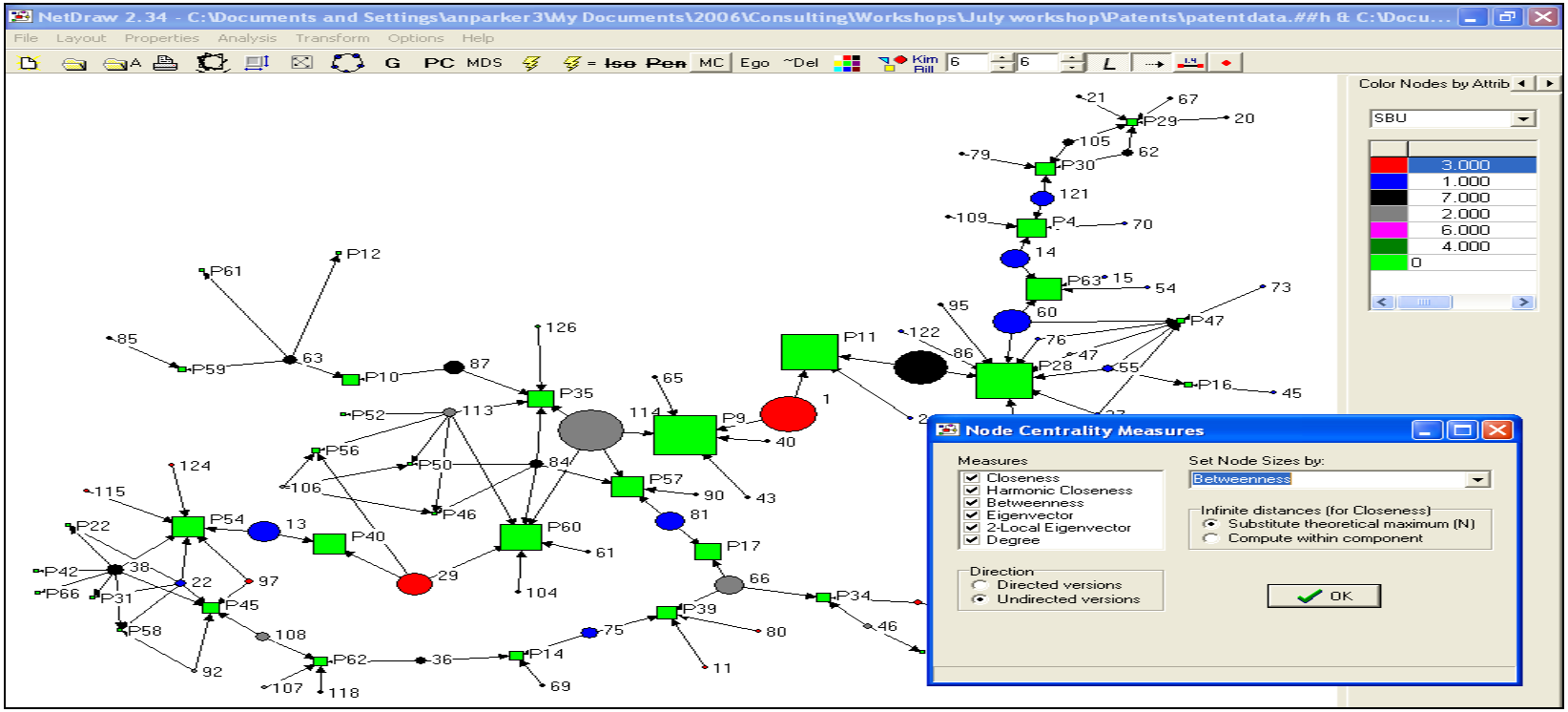
Important note: this routine binarizes but does NOT symmetrize.

Un-normalized centralization: 410765.077

	1 Betweenness	2 nBetweenness
114 114	2291.385	12.240
136 P9	2154.000	11.506
155 P28	1955.000	10.443
1 1	1952.000	10.427
138 P11	1952.000	10.427
86 86	1856.000	9.914
187 P60	1343.385	7.176
60 60	1259.600	6.728
190 P63	1197.000	6.394
29 29	1155.652	6.173
167 P40	1084.611	5.794
184 P57	1071.024	5.721
181 P54	1046.611	5.591
13 13	1036.011	5.534
14 14	972.000	5.192
66 66	924.389	4.938
131 P4	921.000	4.920
81 81	906.831	4.844
144 P17	853.827	4.561
162 P35	810.099	4.327
121 121	680.000	3.632
157 P30	608.500	3.250
166 P39	595.989	3.184
87 87	522.000	2.788
172 P45	473.005	2.527
38 38	449.114	2.399
137 P10	440.000	2.350
75 75	406.389	2.171
189 P62	381.543	2.038
141 P14	377.650	2.017
84 84	377.418	2.016
108 108	368.689	1.969
63 63	361.000	1.928

Person 114 has the highest Betweenness Centrality

Visualizing Betweenness Centrality in Netdraw



Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Betweenness

Conducting an Organizational Network Analysis

Types of 2-mode networks

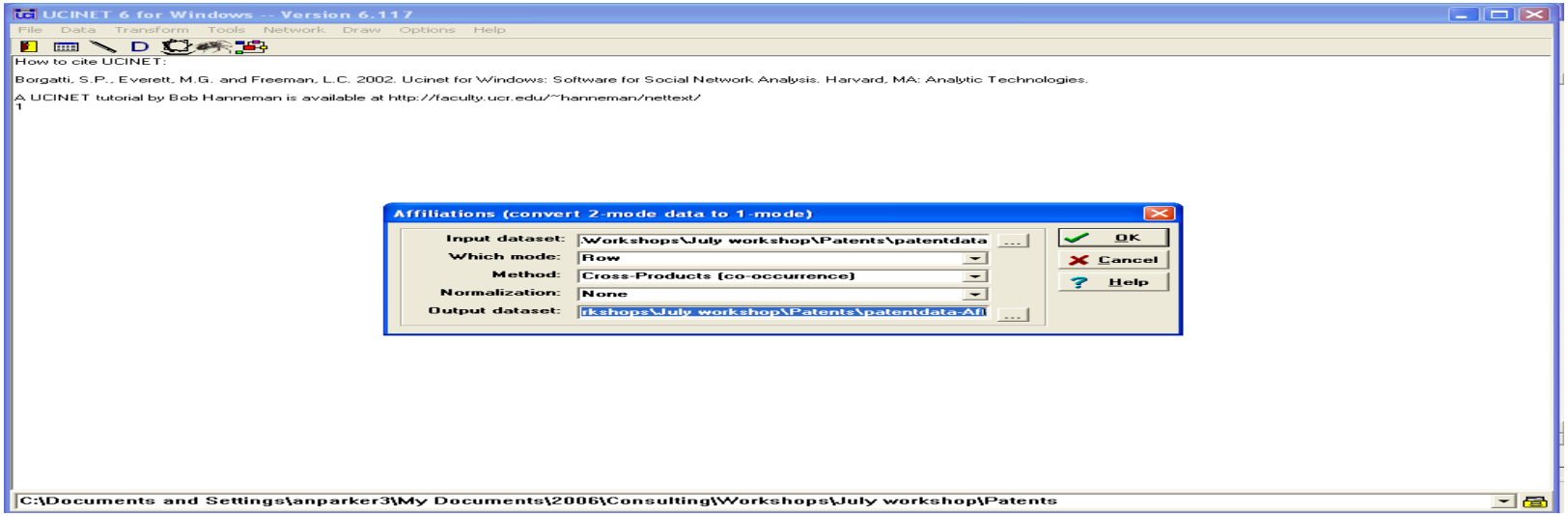
Visual analysis of 2-mode networks

Quantitative analysis of 2-mode networks

Transforming 2-mode networks to 1-mode

Transforming 2-Mode Networks to 1-Mode: Affiliations Routine

- The data that we collected is 2-mode data. Sometimes we want to change this to 1-mode. To do this we need to run the affiliations function. This function makes the matrix square and assumes that there is a tie between two people if they are affiliated to the same association/organization/patent etc.



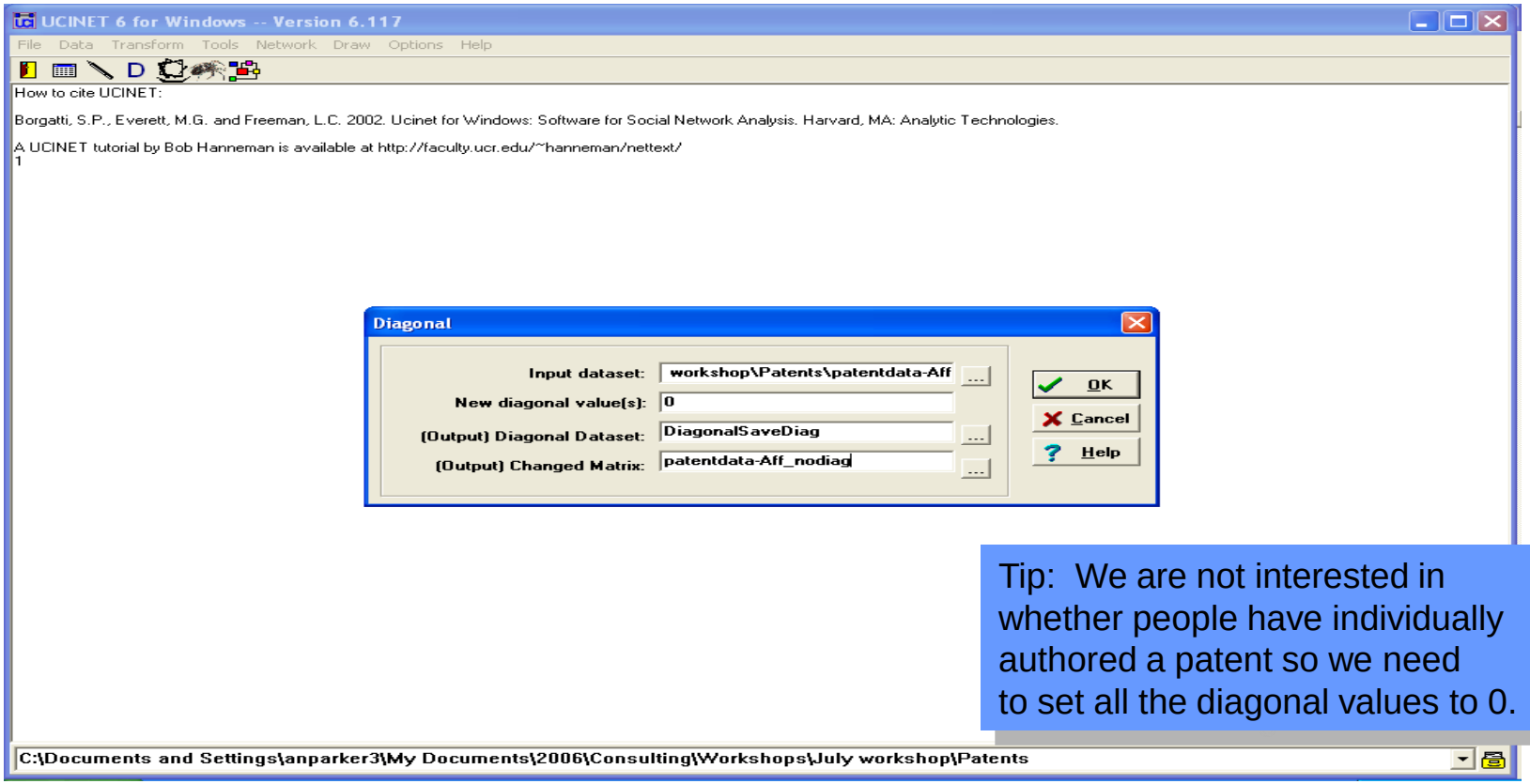
Step 1. Data > Affiliations

Step 2. Choose input dataset (patentdata.##h)

Step 3. Choose which mode. In this case choose row for people or column for patents

Step 4. Specify output data set (patentdata-Aff.##h)

Deleting the Diagonal

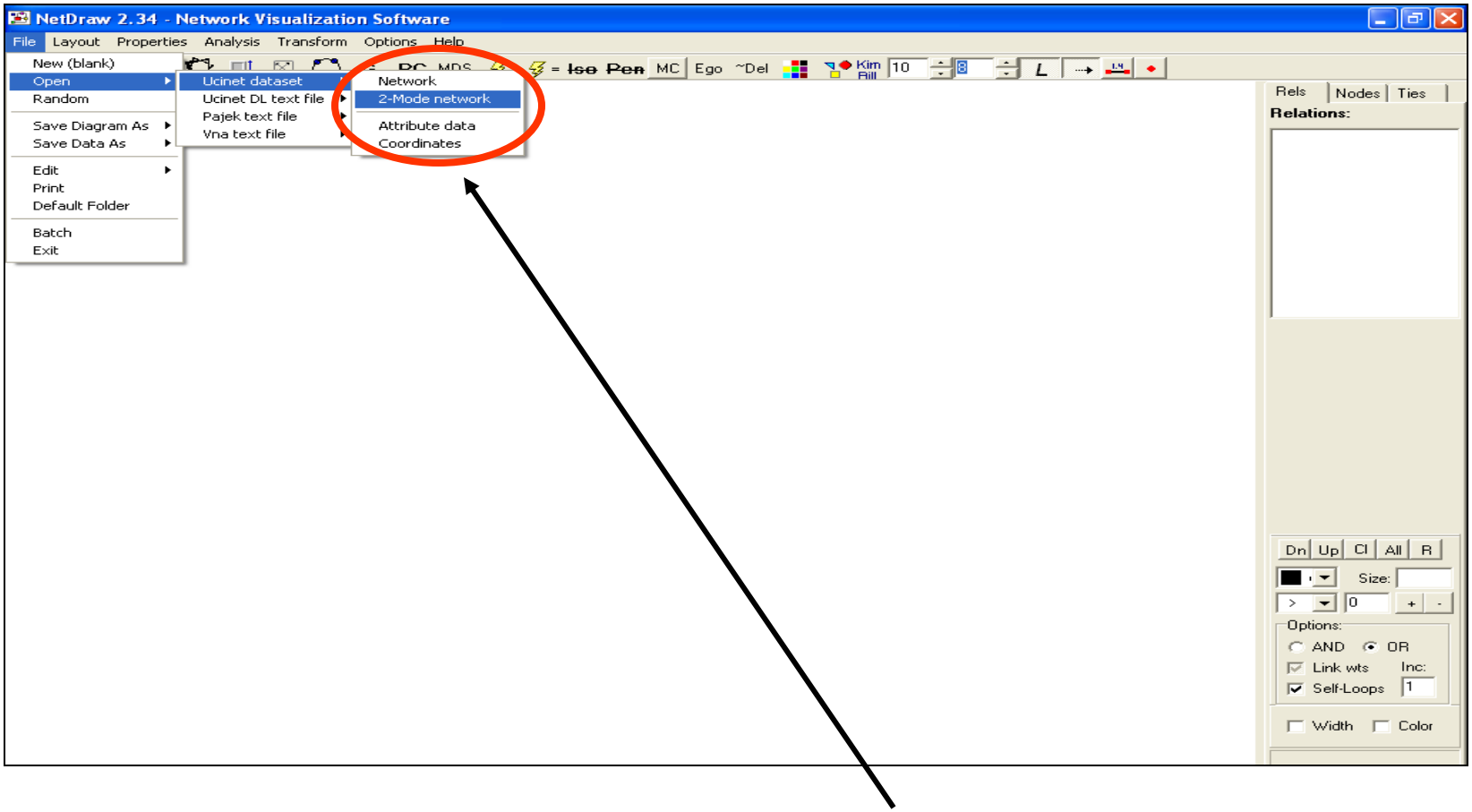


Tip: We are not interested in whether people have individually authored a patent so we need to set all the diagonal values to 0.

Step 1. Transform > Diagonal
Step 2. Input dataset “Patentdata-Aff.##h”

Step 3. New diagonal values “0”
Step 4. Output dataset “Patentdata-Aff_Nodiag.##h”

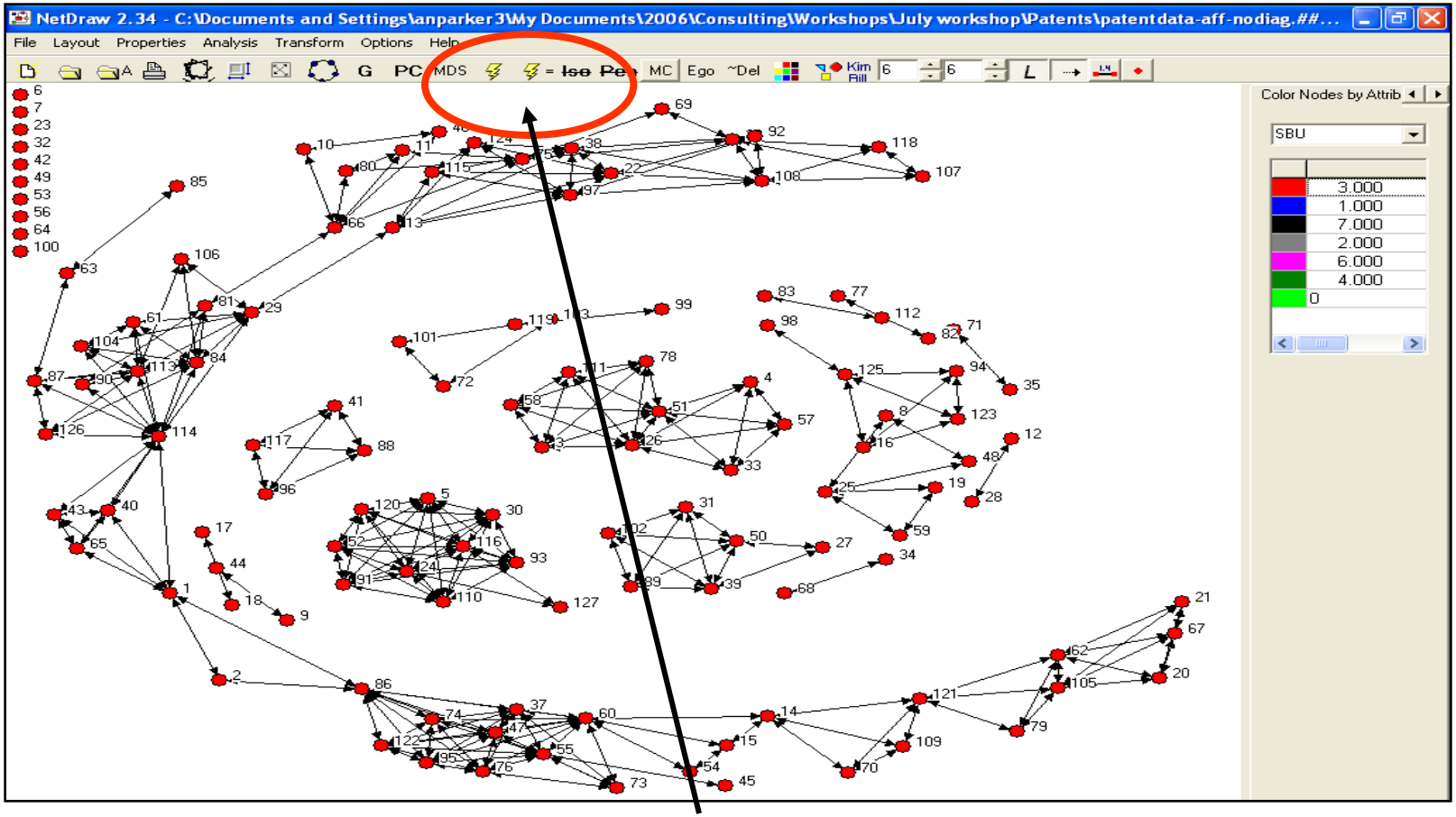
Opening Data in NetDraw



Step 1. File > Open > Ucinet dataset > Network

Step 2. Choose network dataset (patentdata-Aff_nodiag.##h)

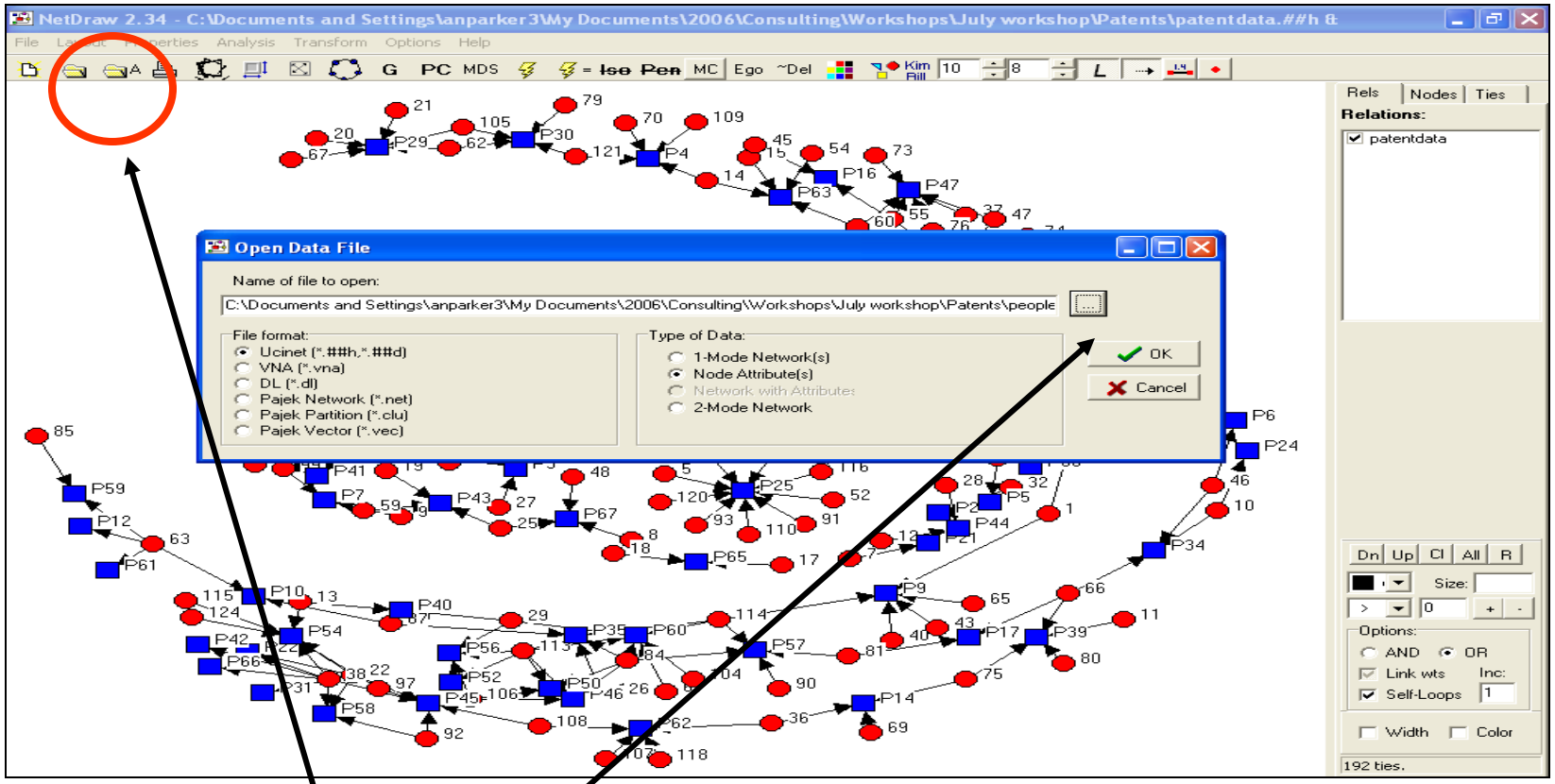
Using Drawing Algorithm in NetDraw



Step 1. Choose ⚡ option on tool bar

Step 2. Choose ⚡ = option on tool bar

Using Attribute Data in NetDraw

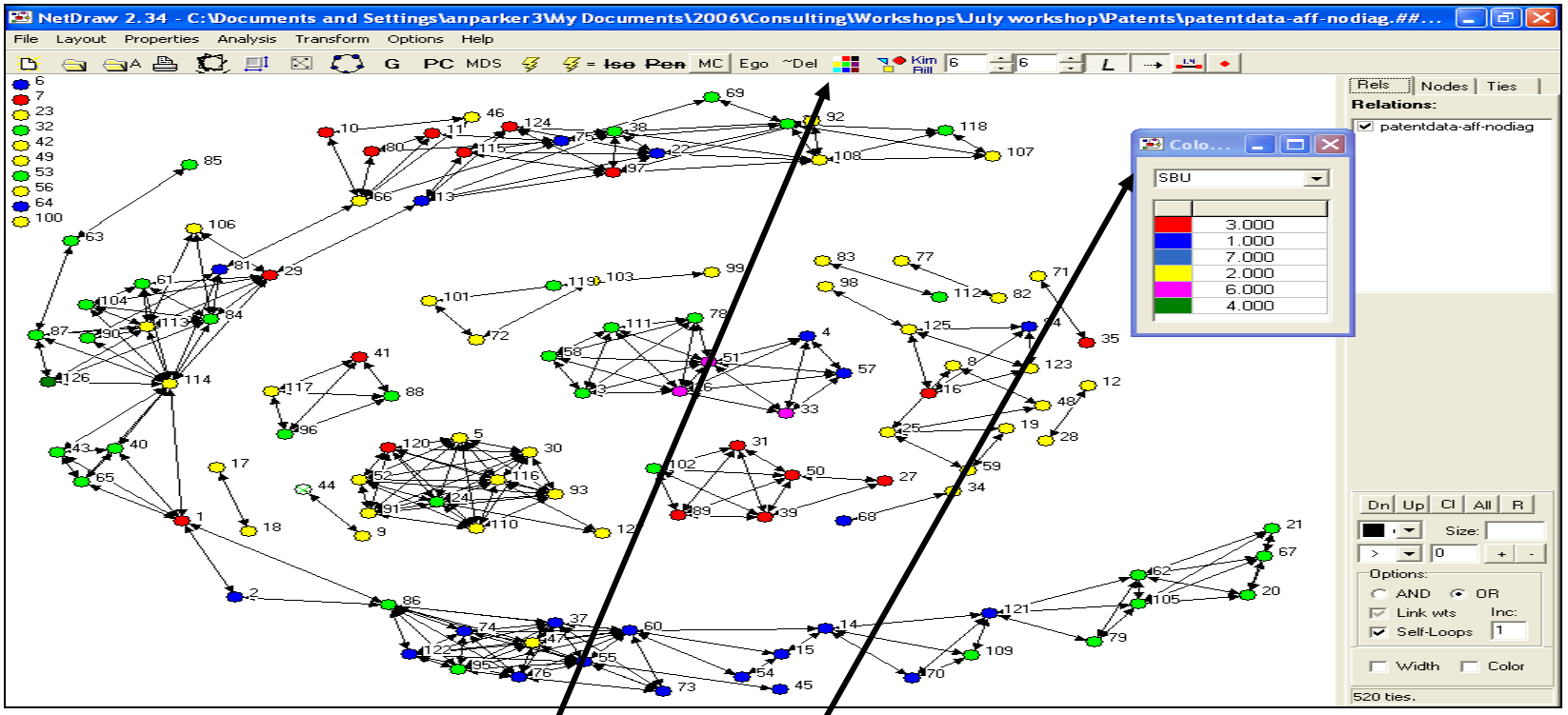


Step 1. Click - open folder icon A

Step 2. Click - box

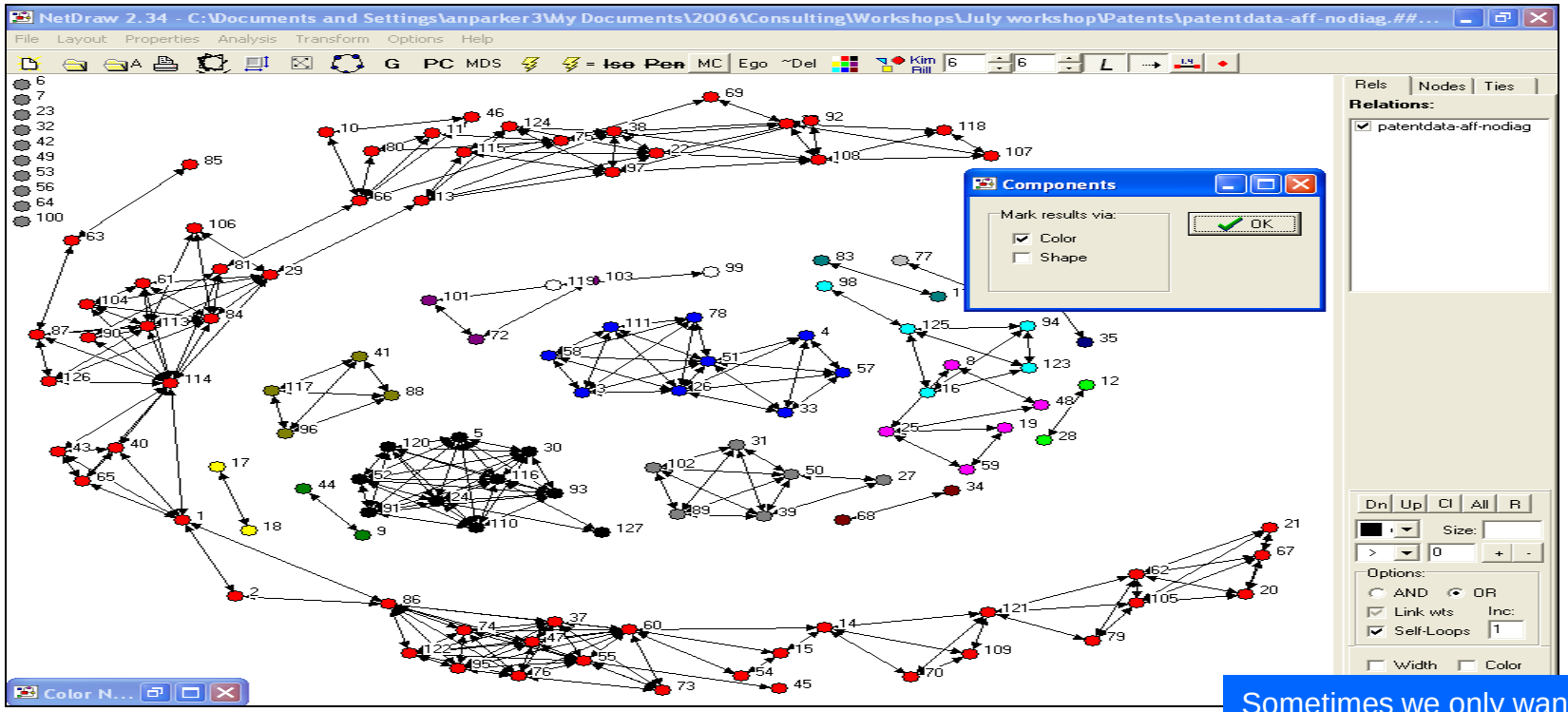
Step 3. Choose attribute dataset (peopleattrib.##h), then click OK.

Choosing Color Attribute in NetDraw



Step 1. Select “paint pallet” icon
Step 2. Select attribute, e.g. “SBU”

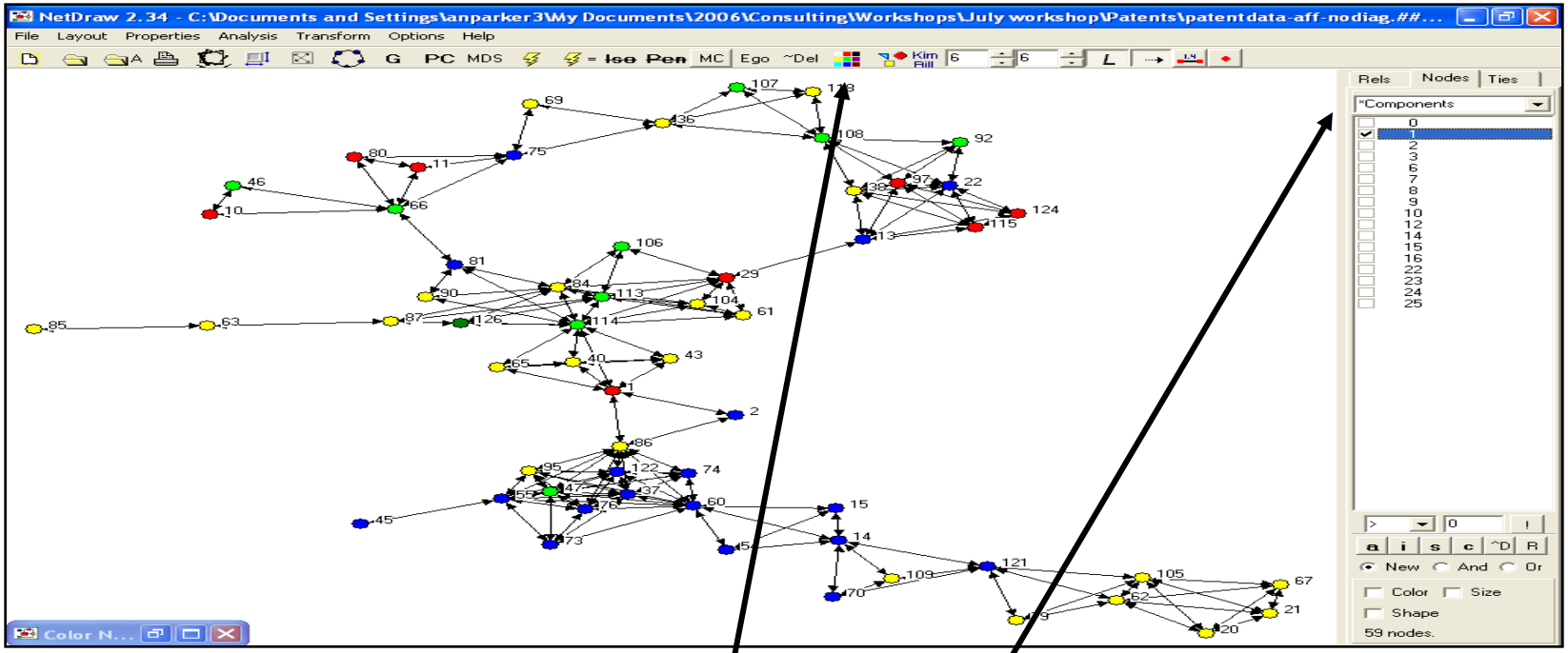
Selecting the Main Component



Step 1. Analysis > Components
Step 2. Select “color”

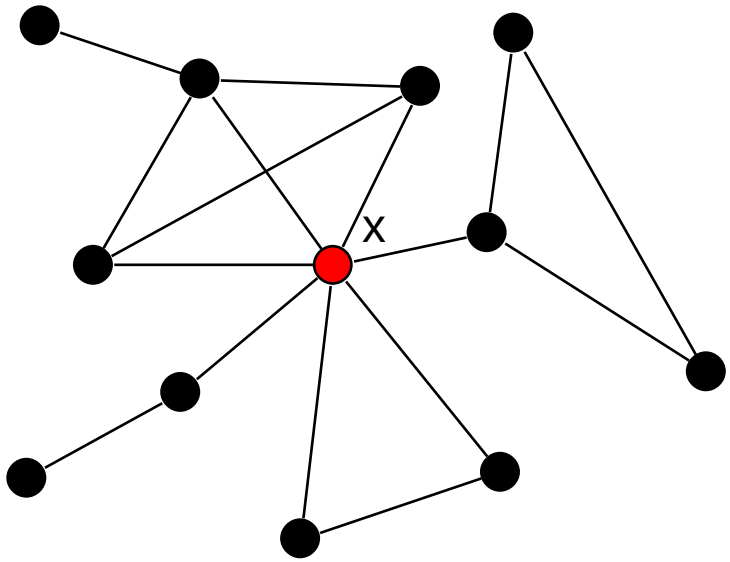
Sometimes we only want to see the largest connected part of a network. We can do this by looking at components.

Viewing the Main Component

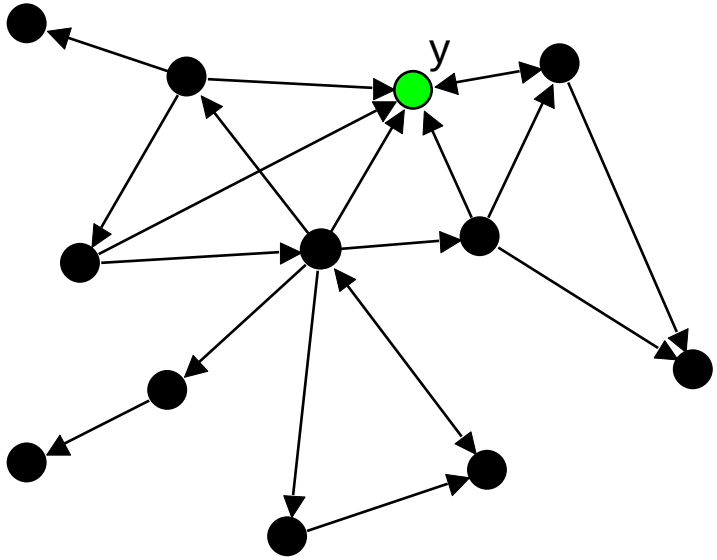


Step 1. Nodes > select attributes “component”
Step 2. Analysis > Deselect all boxes except #1
Step 3. Redraw using drawing algorithm. Choose option on tool bar
Step 4. Select “paint pallet” icon
Step 5. Select attribute, e.g. “SBU”

Degree Centrality



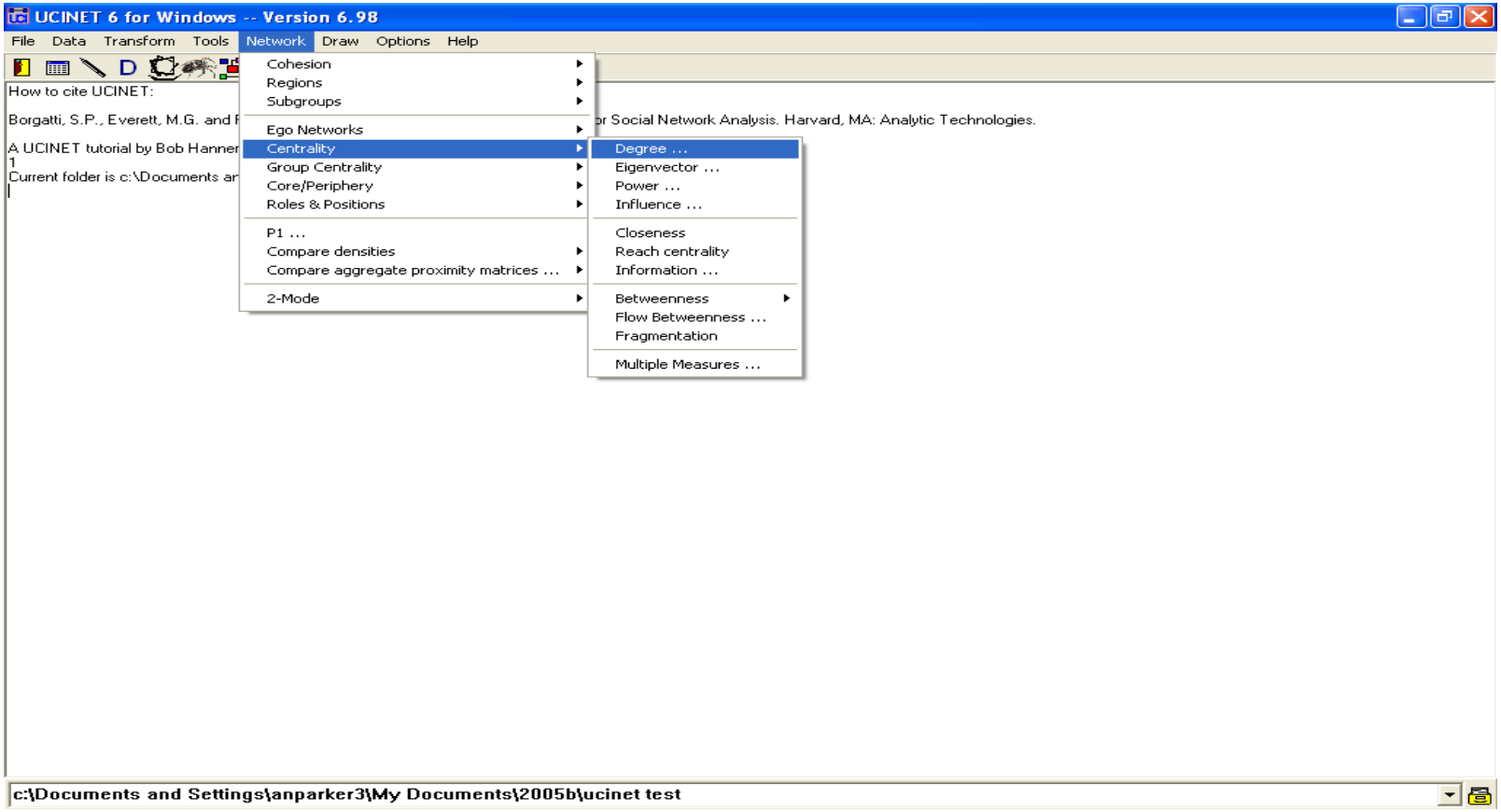
Communication Network
degree of X is 7



Seek Advice Network
in-degree of Y is 5

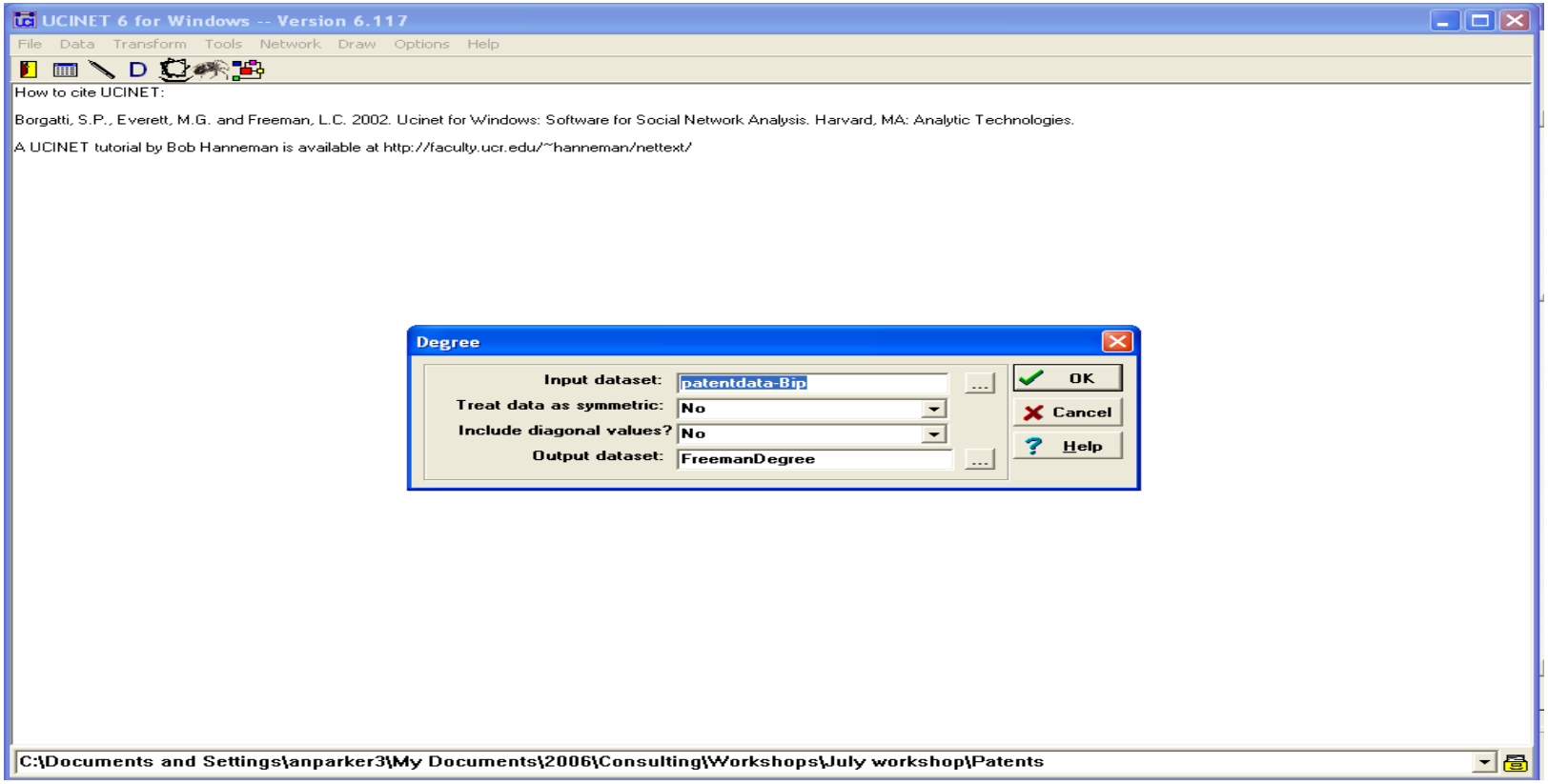
- How well connected each individual is
- Technical definition: Number of ties a person has

Quantitative Analysis: Degree Centrality



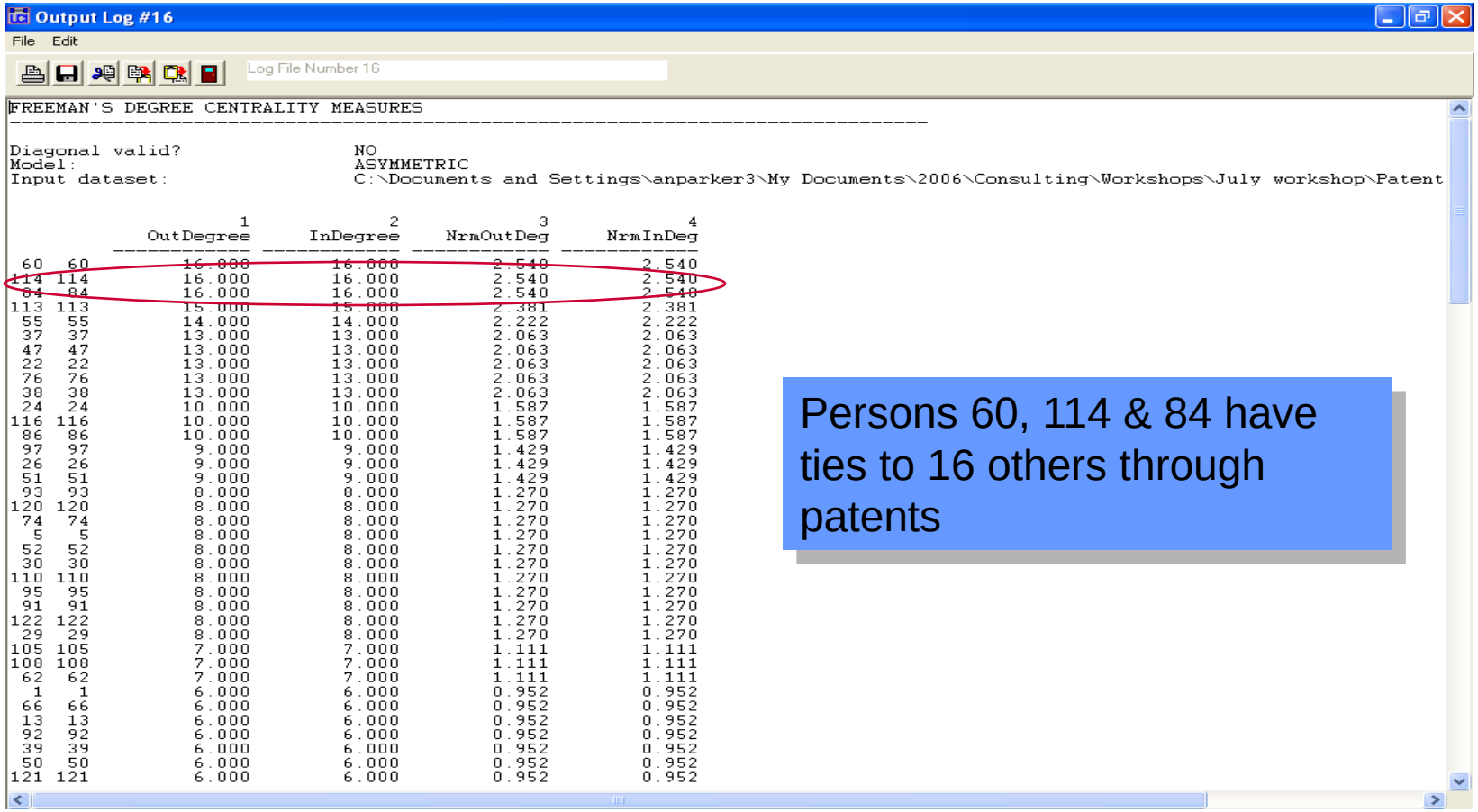
Step 1. Network > Centrality > Degree

Quantitative Analysis: Degree Centrality



Step 2. Input dataset “patentdata-Aff_nodiag.##h”
Step 3. Choose whether to treat data as symmetric. Choose “no.”

Quantitative Analysis: Degree Centrality


Output Log #16

File Edit

Log File Number 16

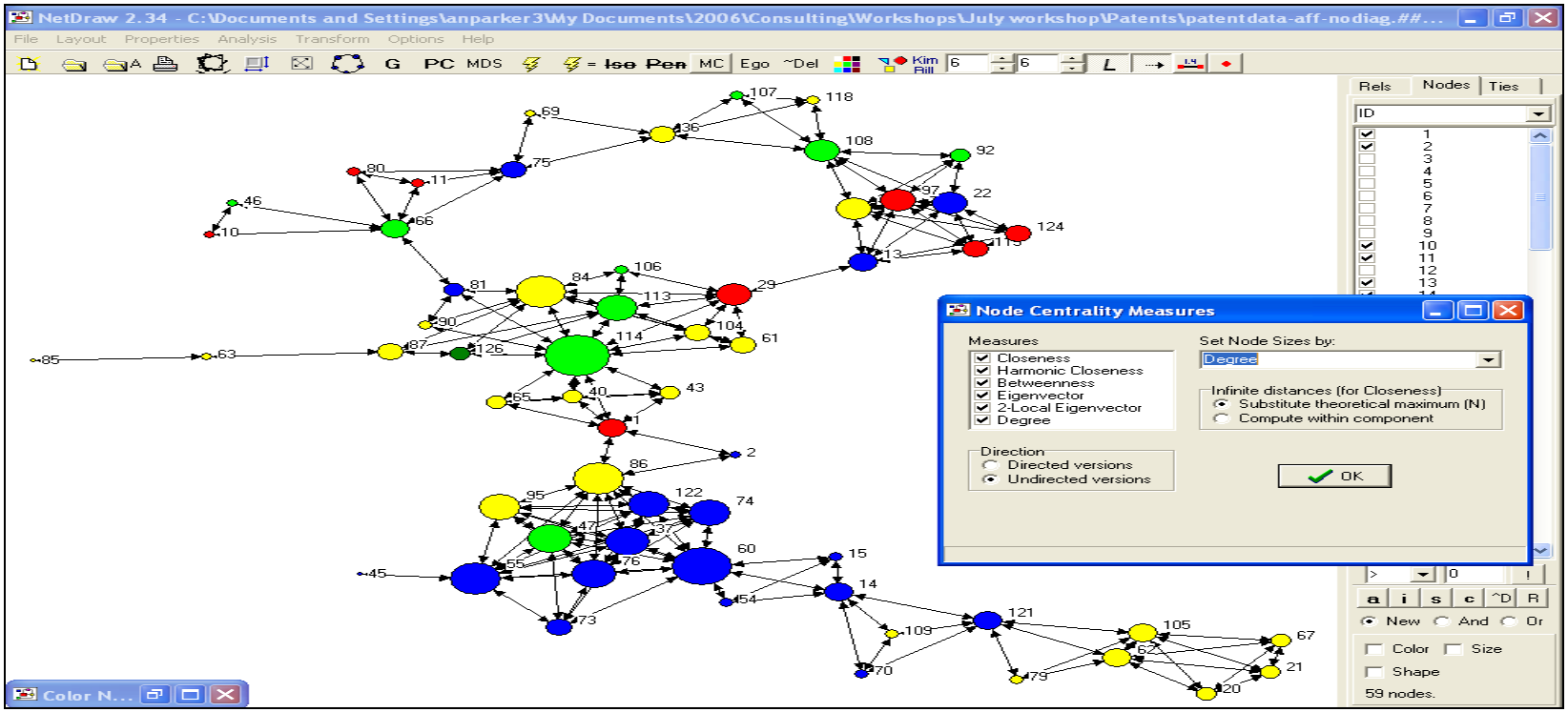
FREEMAN'S DEGREE CENTRALITY MEASURES

Diagonal valid? NO
Model: ASYMMETRIC
Input dataset: C:\Documents and Settings\anparker3\My Documents\2006\Consulting\Workshops\July workshop\Patent

		1 OutDegree	2 InDegree	3 NrmOutDeg	4 NrmInDeg
60	60	16.000	16.000	2.540	2.540
114	114	16.000	16.000	2.540	2.540
84	84	16.000	16.000	2.540	2.540
113	113	15.000	15.000	2.381	2.381
55	55	14.000	14.000	2.222	2.222
37	37	13.000	13.000	2.063	2.063
47	47	13.000	13.000	2.063	2.063
22	22	13.000	13.000	2.063	2.063
76	76	13.000	13.000	2.063	2.063
38	38	13.000	13.000	2.063	2.063
24	24	10.000	10.000	1.587	1.587
116	116	10.000	10.000	1.587	1.587
86	86	10.000	10.000	1.587	1.587
97	97	9.000	9.000	1.429	1.429
26	26	9.000	9.000	1.429	1.429
51	51	9.000	9.000	1.429	1.429
93	93	8.000	8.000	1.270	1.270
120	120	8.000	8.000	1.270	1.270
74	74	8.000	8.000	1.270	1.270
5	5	8.000	8.000	1.270	1.270
52	52	8.000	8.000	1.270	1.270
30	30	8.000	8.000	1.270	1.270
110	110	8.000	8.000	1.270	1.270
95	95	8.000	8.000	1.270	1.270
91	91	8.000	8.000	1.270	1.270
122	122	8.000	8.000	1.270	1.270
29	29	8.000	8.000	1.270	1.270
105	105	7.000	7.000	1.111	1.111
108	108	7.000	7.000	1.111	1.111
62	62	7.000	7.000	1.111	1.111
1	1	6.000	6.000	0.952	0.952
66	66	6.000	6.000	0.952	0.952
13	13	6.000	6.000	0.952	0.952
92	92	6.000	6.000	0.952	0.952
39	39	6.000	6.000	0.952	0.952
50	50	6.000	6.000	0.952	0.952
121	121	6.000	6.000	0.952	0.952

Persons 60, 114 & 84 have ties to 16 others through patents

Visualizing Degree Centrality in Netdraw

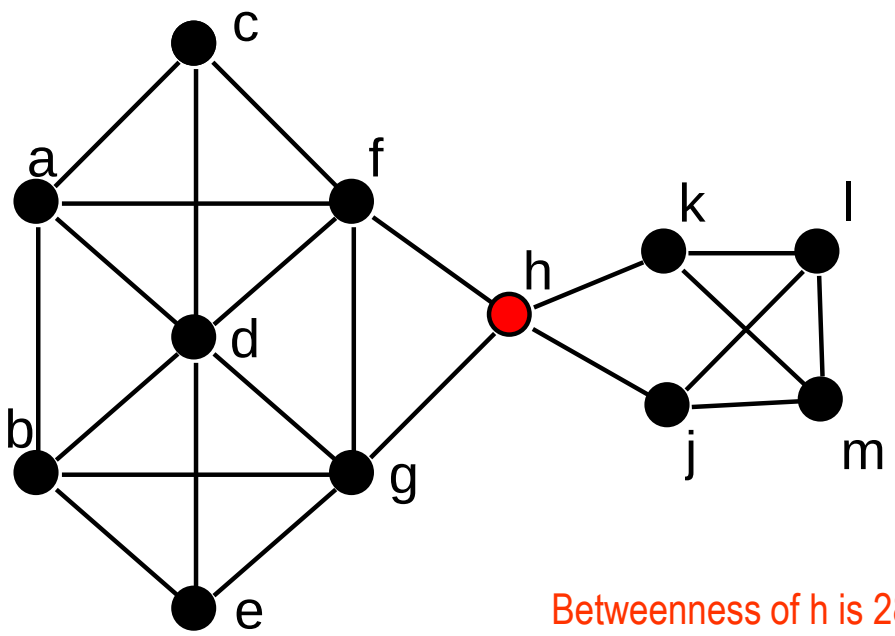


Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Degree

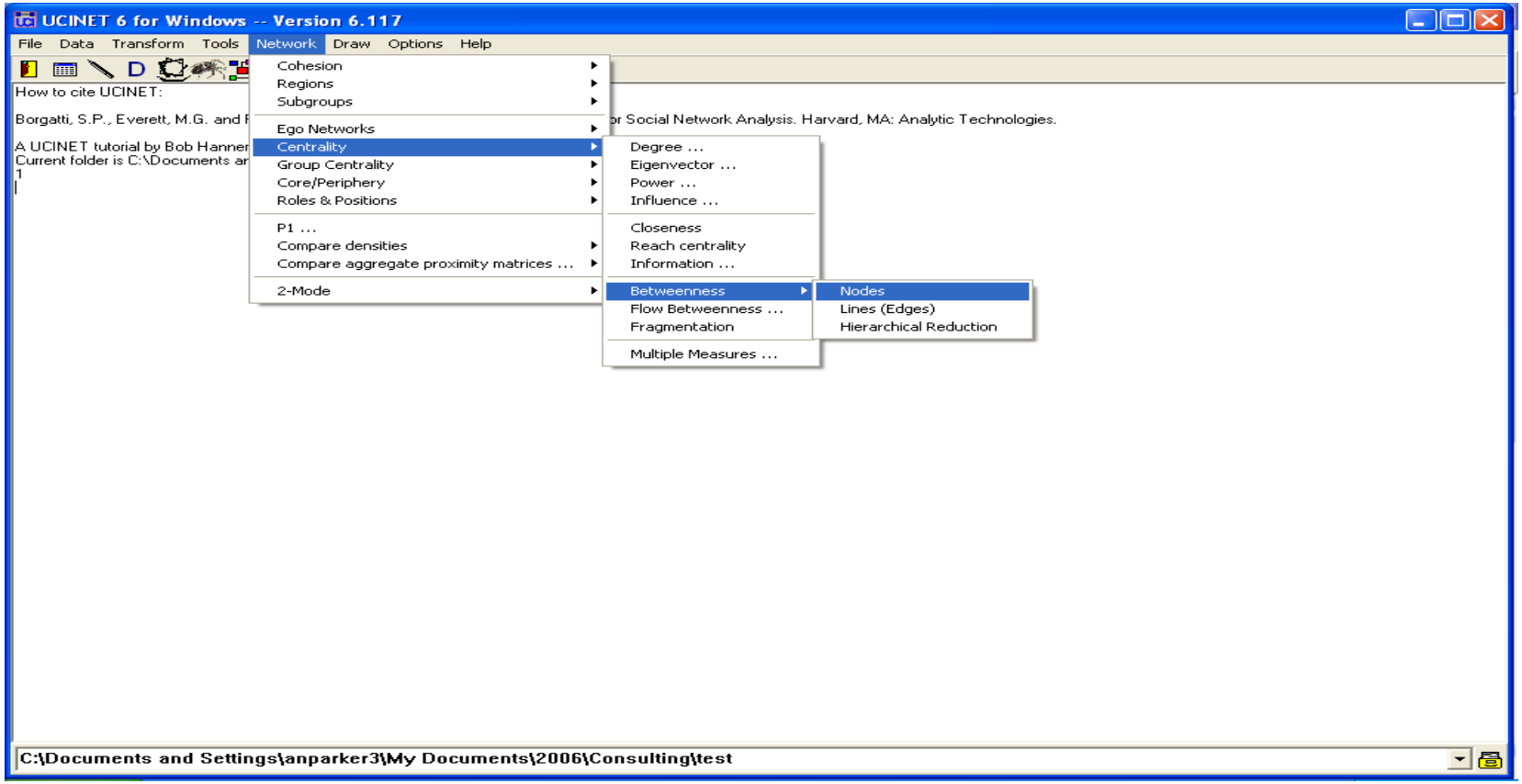
NOTE: The nodes that have the best degree centrality scores are the largest

Betweenness Centrality



- Extent to which individuals lie along short paths
- Index of potential to play brokerage, liaison or gatekeeping
- Technical definition: number of times that a person lies along the shortest path between two others, adjusted for number of alternative shortest paths

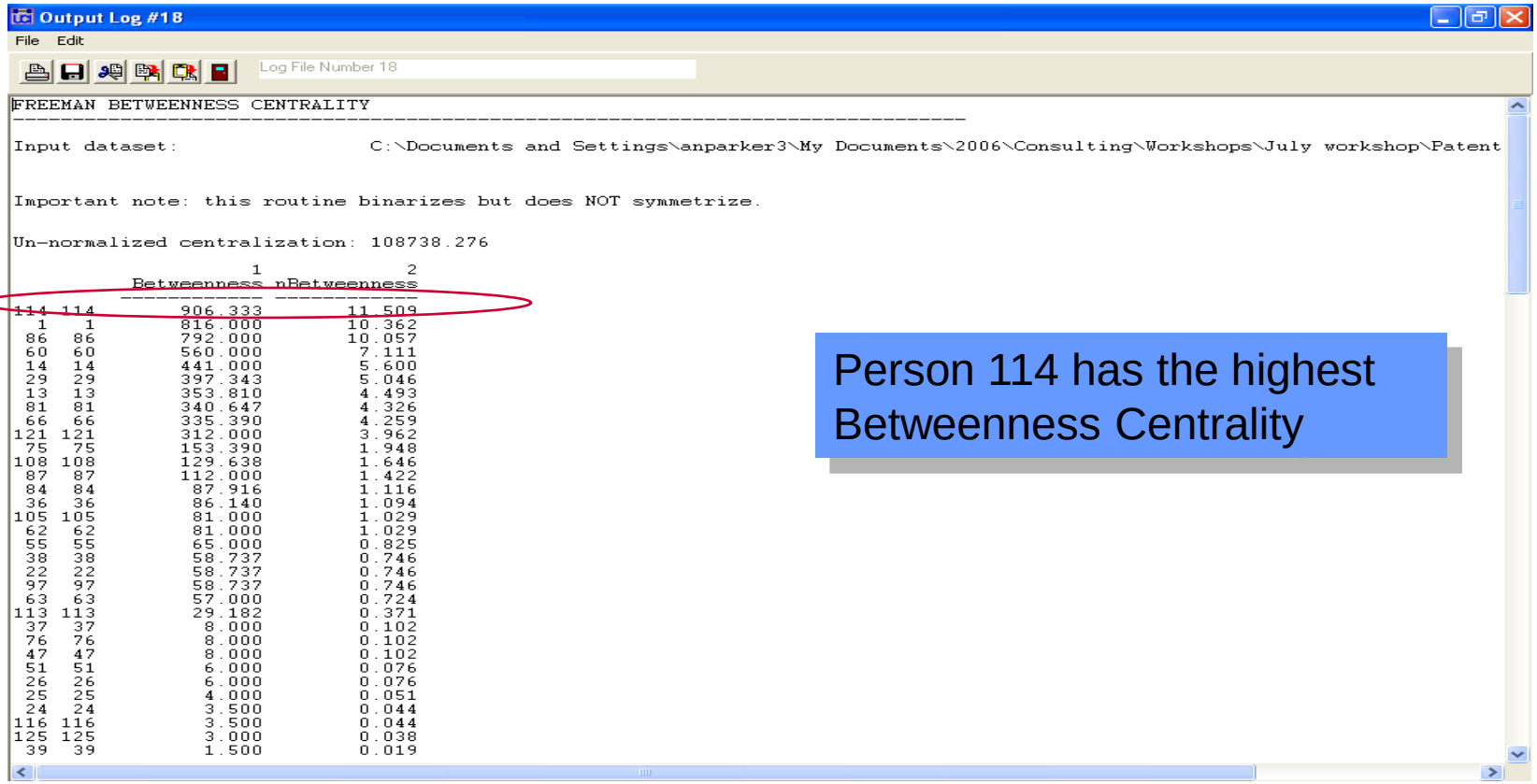
Quantitative Analysis: Betweenness Centrality



Step 1. Transform > Symmetrize > choose input dataset “patentdata-Aff_nodiag”

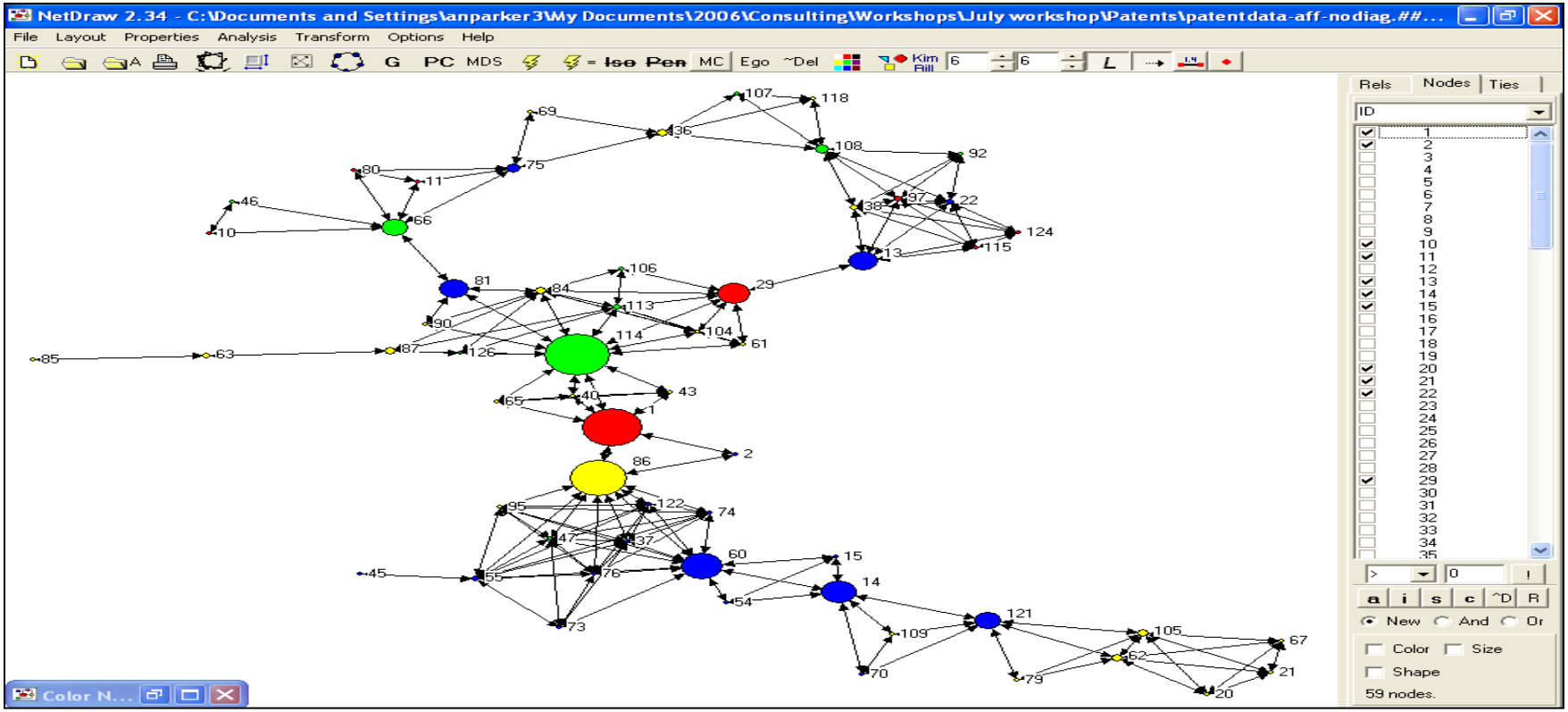
Step 2. Network > Centrality > Betweenness > Nodes

Quantitative Analysis: Betweenness Centrality



Person 114 has the highest Betweenness Centrality

Visualizing Betweenness Centrality in Netdraw

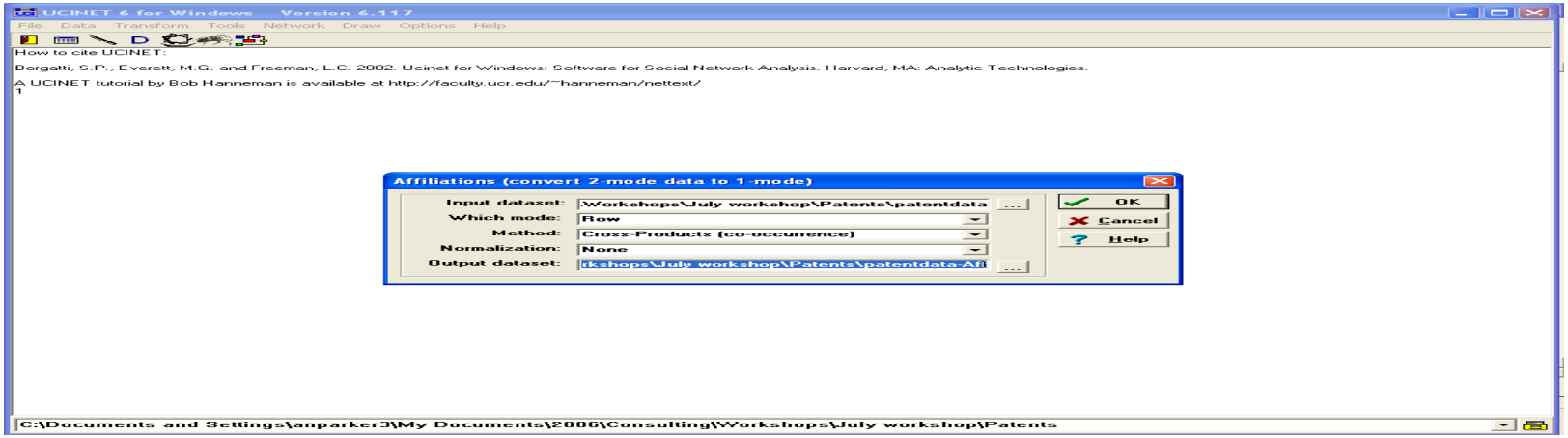


Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Betweenness

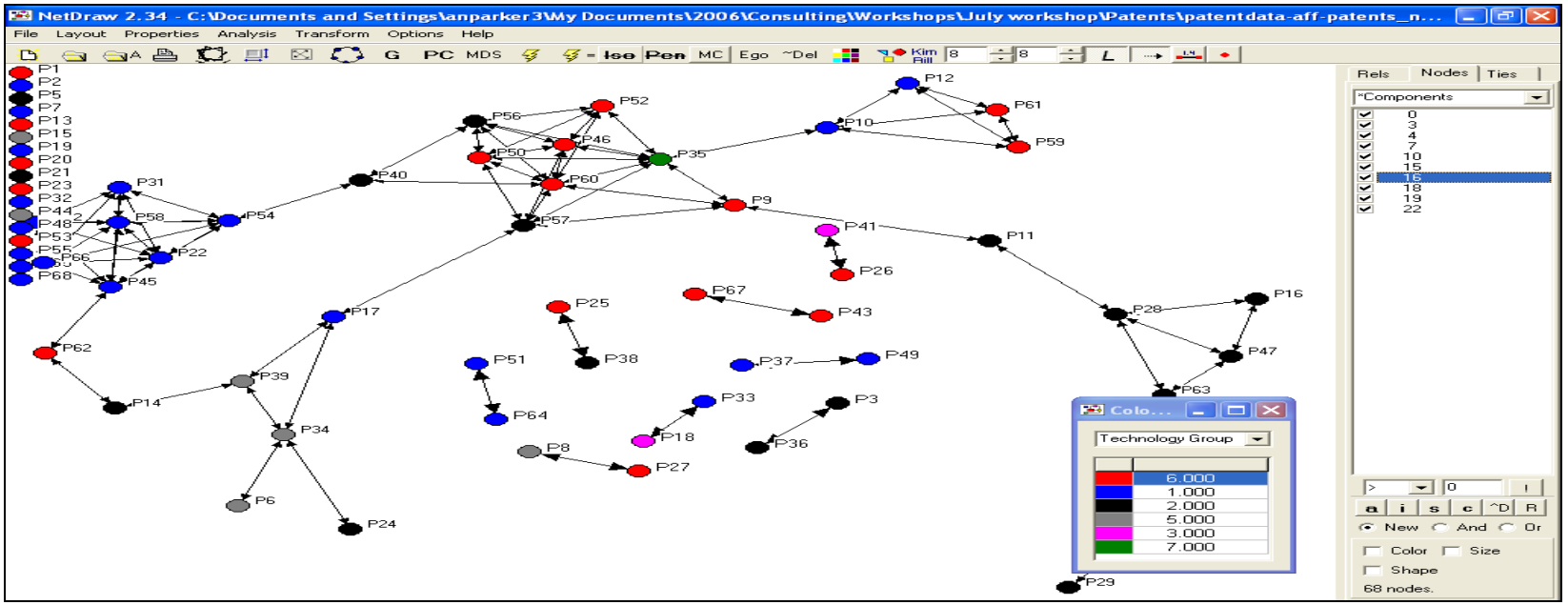
Transforming 2-Mode Networks to 1-Mode: Affiliations Routine

- You can also look at 1-mode patent data. In this case there is a tie between two patents of one person co-authored both of them.



Step 1. Data > Affiliations
Step 2. Choose input dataset (patentdata.##h)
Step 3. Choose which mode. In this case choose column for patents
Step 4. Specify output data set (patentdata-Aff_patents.##h)
Step 5. Transform > Diagonal
Step 6. Input dataset “Patentdata-Aff_patents.##h”
Step 7. New diagonal values “0”
Step 8. Output dataset “Patentdata-Aff_patents_Nodiag.##h”

Viewing the 1-Mode Patent Data in NetDraw



Step 1. File > Open > Ucinet dataset > Network

Step 2. Choose network dataset (patentdata-Aff_patents_nodiag.##h)

Step 3. Click - open folder icon A

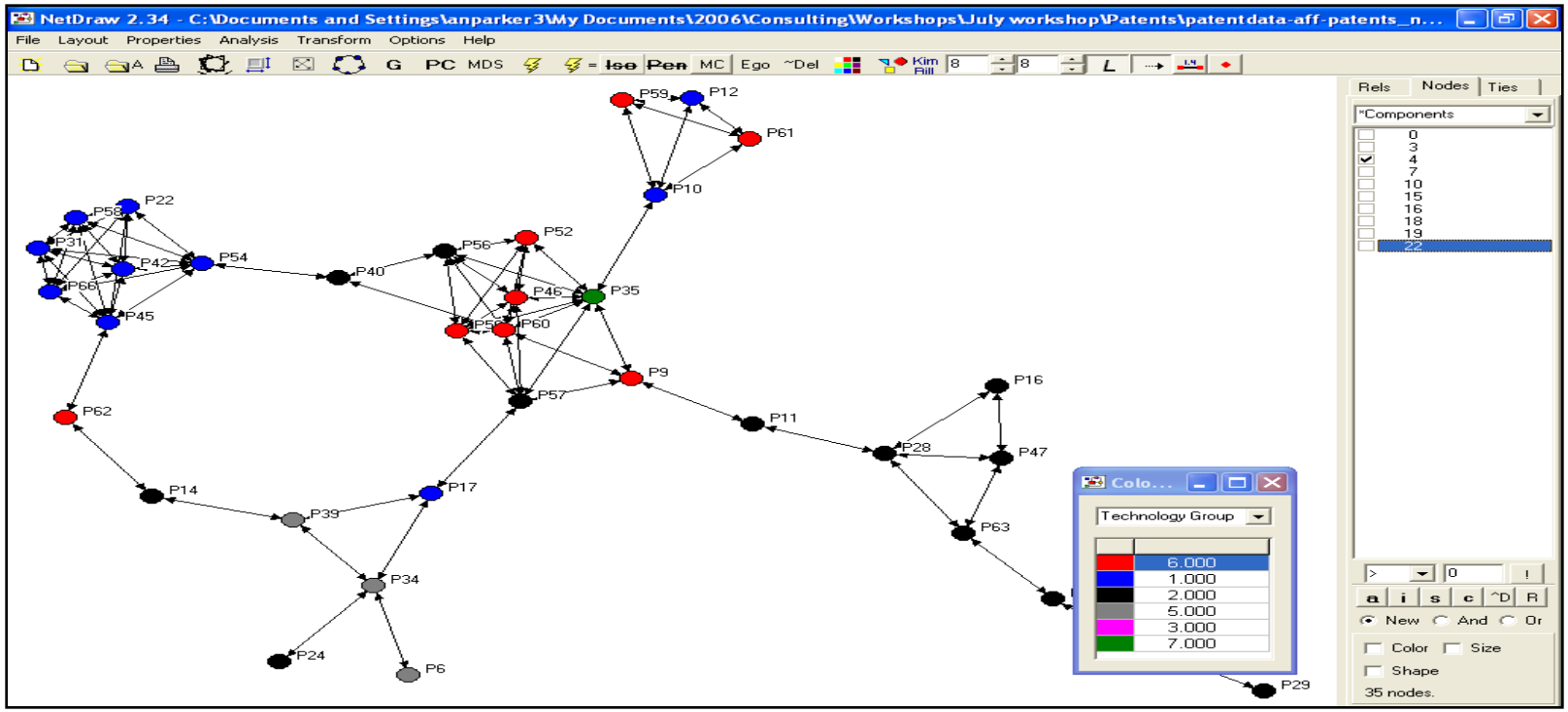
Step 4. Click - box

Step 5. Choose attribute dataset (patentattrib.##h), then click OK.

Step 6. Select “paint pallet” icon

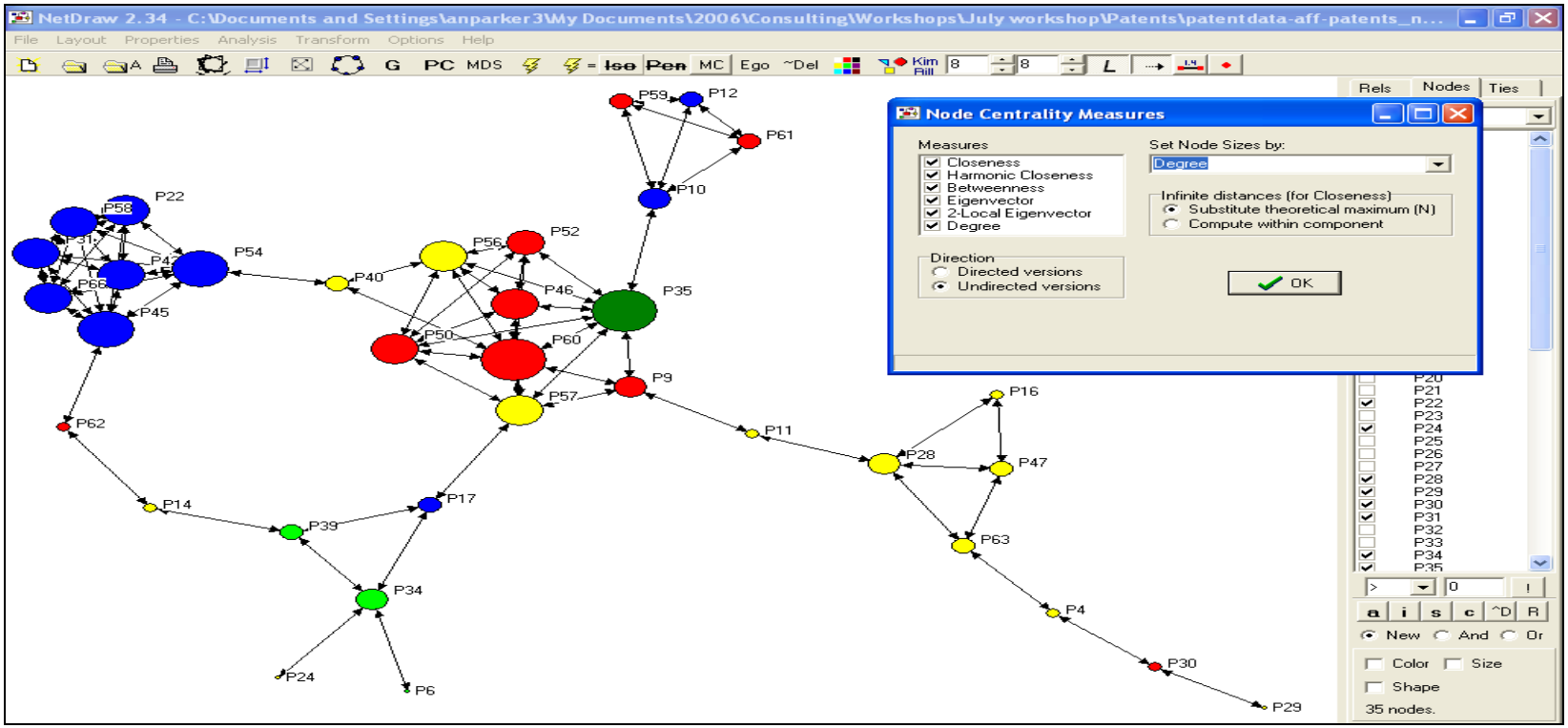
Step 7. Select attribute, e.g. “technology group”

Viewing the Main Component



Step 1. Nodes > select attributes “component”
Step 2. Analysis > Deselect all boxes except #4
Step 3. Redraw using drawing algorithm. Choose ⚡ option on tool bar
Step 4. Select “paint pallet” icon
Step 5. Select attribute, e.g. “technology group”

Visualizing Degree Centrality in Netdraw

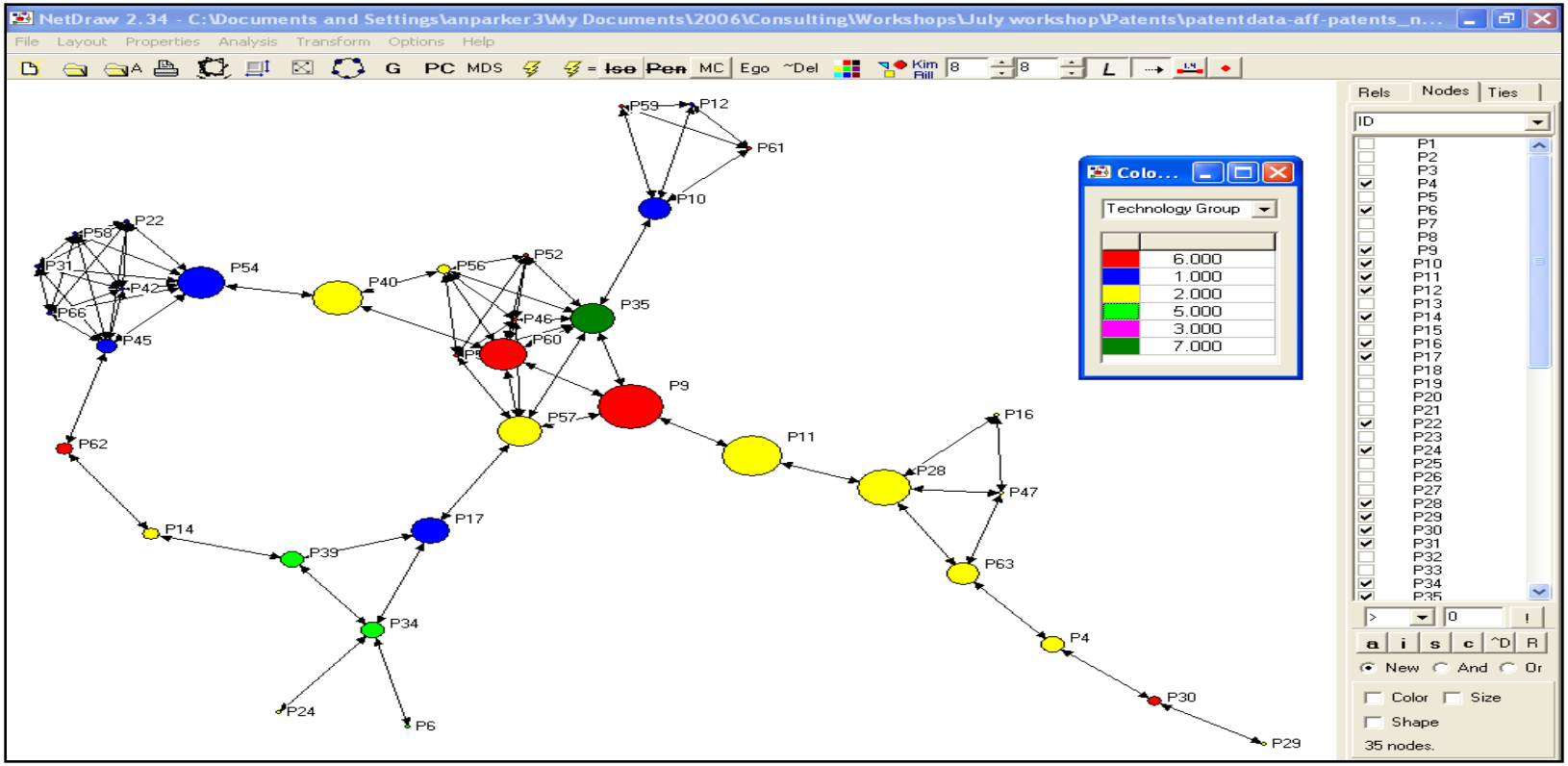


Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Degree

NOTE: The nodes that have the best degree centrality scores are the largest

Visualizing Betweenness Centrality in Netdraw



Step 1. Analysis > Centrality measures

Step 2. Choose which measure to set node sizes by, e.g. Betweenness