SNA Basics #2
Two-Mode Social Network Data

This exercise explores some of the properties of two-mode (i.e., affiliation) networks. Two-mode networks differ from one-mode networks in that rather than consisting of a single set of actors, they either consist of two sets of actors, or one set of actors and one set of events. They are sometimes referred to as *affiliation networks*, but they are also known as *membership networks* and *dual networks*. The data that we will use is what is known as Davis's Southern Club Women. Davis and her colleagues recorded the observed attendance of 18 Southern women at 14 different social events. The result is a person-by-event matrix such that a given cell x_{ij} equals "1" if person i attended social event j, and "0" otherwise. The data are included in the file, `SNA Basics #2 (Data).zip`.

Part I – Two-Mode Networks in UCINET & NetDraw

Data>Display

1. After opening UCINET, choose the *Data>Display* command (you can also click on the "D" button just below the menu bar) and then select the "davis.##h" file. This should pull up a matrix that looks like Figure 1. Note that the women are listed in the rows, and the events are listed in the columns.

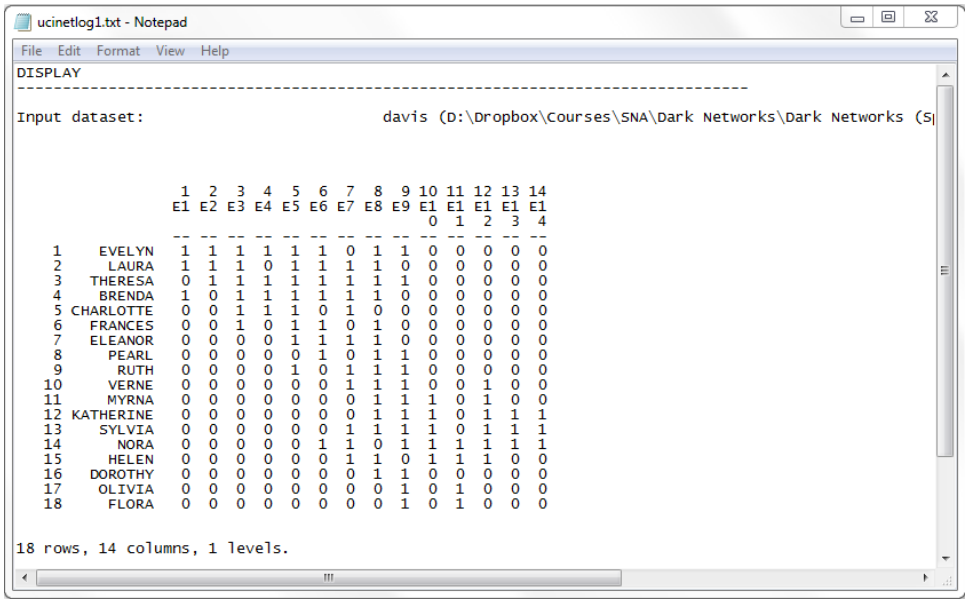

Figure 1: Davis's Southern Women Matrix

[NetDraw] File>Open >Ucinet dataset >2-Mode network

Layout >Non-metric MDS of geo distances

2. Now visualize the two-mode network in NetDraw. *Opening a two-mode network in NetDraw is somewhat different than opening a one-mode network.* You need to choose the 2-Mode network option, which is found under the *File>Open>Ucinet dataset* submenu. Visualize the network using non-metric multidimensional scaling (MDS) or one of the other layout algorithms. Assuming for the purposes of this exercise that the boundaries of this social network are well specified, do any events appear more or less popular? What about the women?

Analysis >Centrality measures

Properties>Nodes>Symbols >Size>Attribute-based

3. One way to measure the popularity of events and actors is to calculate degree centrality on the two-mode network. To do this in NetDraw, select the *Analysis> Centrality measures* command. This brings up a dialog box that allows you to select which centrality measures you wish to estimate. Accept NetDraw's defaults and click OK. Now, adjust the size of each node by its degree centrality using the *Properties>Nodes>Symbols>Size>Attribute-based* command. This will bring up a dialog box that looks similar to Figure 2. Under the "Select attribute" drop-down menu, choose Degree and click "Apply." The size of the nodes in your network map should now vary in size in terms of how "popular" a particular event (as determined by the number of women attending) or woman (as determined by the number of events each woman attended).

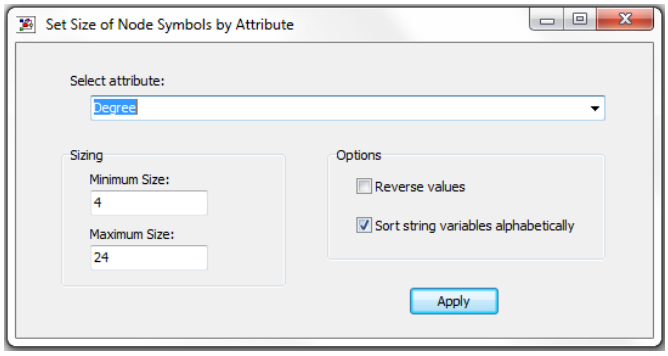

Figure 2: NetDraw Node Size Dialog Box

[UCINET] Data>Affiliations (2-mode to 1-mode)

4. Return to UCINET and derive both an actor-by-actor matrix and an event-by-event matrix from the original actor-event matrix using the *Data>Affiliations (2-mode to 1-mode)* command. This will bring up a dialogue box that looks similar to Figure 3 (next page). For the actor-by actor matrix, choose "Row" for "Mode" since the women are listed by rows; for the event-by-event matrix, choose "Column" for "Mode" since the events are listed by columns. Accept the rest of UCINET's defaults. Be sure to save the files ("Output dataset") under different file names. Older versions of UCINET would use the same default name and automatically overwrite previously created files (without a warning!). Now, the default names for one-mode networks derived from two-mode networks that are based on rows differ from those based on columns. Notice in Figure 3 that the default name is the original file's name plus "-Rows," which indicates that the resulting network is an affiliation network based on the rows of the "davis" dataset.

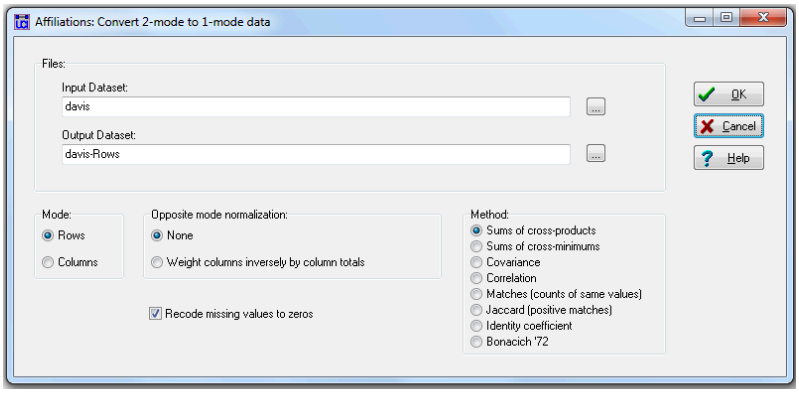

Figure 3: UCINET Affiliations dialogue box

Data>Display

5. Display the two matrices (not the graphs) by either choosing the *Display* option found under the *Data* menu or by clicking on "D" icon located just below UCINET's menu bar. We can tell a lot about the actors and events simply by looking at the cell values of these matrices. The cell values in the actor-by-actor matrix indicate the number of events to which those two people attended, while in the event-by-event matrix, the cell values indicate the number of people those two groups share. Moreover, the diagonal in the actor-by-actor matrix indicates the number of events to which that person attended, while in the event-by-event matrix it indicates how many actors attended that event. Looking at the two matrices, answer the following two questions: What actor attended the most events? What event attracted the most actors? How do these "findings" match up with the picture you drew using Net Draw?

[NetDraw] File>Open >Ucinet dataset>Network

6. Now visualize the two new matrices in NetDraw using multidimensional scaling (MDS) or one of the other layout algorithms. Remember when you are opening the files that these are one-mode matrices. Which women appear to be socially close to one another? Are some women more central? Which women appear to be socially distant from the others? What events appear socially close? Are any events more central? Do any events appear to be less popular?

Part II – Two-Mode Networks in Pajek

[Pajek] File>Network>Read

1. Open Pajek and then read Davis's Southern Club Women Network data using the *File>Network>Read* command. Be sure when opening the file, you look for a file with a .dat extension (Figure 4). Pajek will detect that the network is two-mode and indicate as much in the Network drop list.

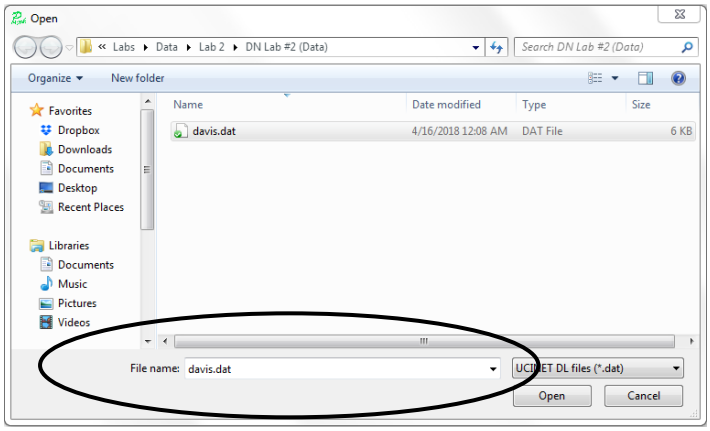

Figure 4: Pajek Open File dialogue box (looking for .dat files)

2. Earlier versions of Pajek actually added an affiliation partition in the partition drop list. Now, it requires users to create the affiliation partition themselves using the *Network>2-Mode Network>Partition into 2 Modes* command (I have no idea why). As we saw previously, Pajek partitions assign nodes to different classes (categories). In this case, the two classes are individuals and events. Partitions can indicate just about any type of class or category (e.g., position held, geographical location, gender, etc.).

Network>2-Mode Network> Partition into 2 Modes

Draw>Network + First Partition

Options>Value of lines >Similarities

Layout>Energy

3. Next, draw the network using the partition. Choose the *Draw>Network + First Partition* option from the main menu, and then energize it using both *Kamada-Kawai* and *Fruchterman Reingold* found under the *Layout>Energy* menu (be sure that the factor in Fruchterman Reingold is set to 1 and that you have selected the *Similarities* option under the *Options>Value of lines* submenu). How do these drawings compare to your drawing done in NetDraw above?

Options>Colors >Partition Colors >For Vertices

4. Notice that Pajek assigns different colors to the event and actor nodes. Pajek allows you to change which colors are assigned to different partitions by choosing the *Partition Colors>For Vertices* option under the *Options>Colors* submenu of the Draw screen. When you do this, it brings up a dialog box. To assign the color red to class one, click on the red box, which will bring up another dialog box asking which cluster (i.e., partition class) you want to assign that color. Type the number "1". Now, choose a second color and assign it to cluster "2". Close the dialog box. The drawing should now reflect the new colors. If it does not, redraw it with an energy command. At the bottom of the options dialog box, you will note that there are three default options (one color, two grayscale). The grayscale options are useful when printing in black and white and/or the differences between the partitions represent some sort of ranking (e.g., the darker the node, the higher the degree centrality). The color options are useful when the differences in the nodes are nominal (e.g., male vs. female, event vs. actor).

5. Return to the Main screen by closing the Draw screen. Deriving one-mode networks from two-mode networks in Pajek is simple but (like in UCINET) you need to know which actors/events are assigned to the rows and columns. In this case, the women are assigned to the rows and the events to the columns (at least they should be – but it does not really matter). To create an actor-by-actor (co-membership) matrix choose the *Rows* option under the *Network>2-Mode Network>2-Mode to 1-Mode* submenu. The Report window will appear. Close this and you will see that a new network appears in the Network drop list. Repeat the procedure, except this time choose the *Columns* option. After you have created these two new one-mode networks, draw them using the *Kamada-Kawai* energy command. When drawing the new networks, choose the *Draw>Network* command, not the *Draw>Network + First Partition* command – remember, the network you intend to draw must be showing at the top of the Network drop list. How do these compare to the drawings in Part I, #6 above?

Network>2-Mode Network>
>2-Mode to 1-Mode
>Rows, Columns

Layout>Energy
>Kamada-Kawai

Draw>Network