

Dr. Ali Tafti

IDS 564: Social Media and Network Analysis, Spring 2016

Lab 2: Network Measures

The goal of this lab is to gain familiarity and some practice in analyzing and measuring social network attributes with R.

Preparation

If you have not used R before, let me recommend a couple of gentle tutorials on these web sites:

- a) <http://www.ats.ucla.edu/stat/r/>
- b) <http://www.r-tutor.com/r-introduction>

Another important resource is this book listed on the syllabus, which is available in print or electronic format online

Kolaczyk, Eric D., and Gábor Csárdi. *Statistical analysis of network data with R*. Vol. 65. Springer, 2014. (KC)

For brevity, I'll be referring to this book at KC for the initial of the authors' last names.

In R, you'll need to download the igraph library and its dependencies. Some of the examples in KC may also call for additional libraries; their data is also included in their *sand* library, and they provide instructions in chapter 1 for obtaining it. Whether or not you obtain the KC book, you can access the R code used in each chapter of the book: <http://github.com/kolaczyk/sand>. You can run individual chunks of code, in the order they are numbered in the source files. Basically, the book gives you commentary on each of the chunks of code, and tells you where you can find out more about the underlying concepts. This lab will draw from some of the technical materials from chapters 2 through 4 of that book.

Load and analyze the Acquisition Network

Please download and save the provided CSV file, "MergerNet_Jan21_2016_forR.csv" which is posted on the Blackboard homework area. (A variant of this data set was used in Advanced Lab 1.). I have also provided an R source file, which you can extend to answer the quiz 2 questions. For your own learning, you may also want to take the chunks of code provided by KC, and apply them to this dataset.

You will notice that the provided R script lets you determine whether the given network is a multigraph (it is not.) It transforms the network to a simple graph with the *simplify()* function, which combines the edge weights into a sum of existing

weights between each pair of nodes. Then, it constructs an alternative weighting scheme, by taking the inverse of the logarithm of the default weight.

Induced-subgraph: Sub-Network graph

Please generate an induced subgraph of the network that includes only the 3-digit industry nodes listed in Fig. 5 of the working paper by Tafti, Rahmati and Westland (2015) referenced below. The code to create the induced subgraph is provided in the script file:

```
sub_net<-induced.subgraph(g_acq_simpl, v=c('511', '541',  
'518', '519', '517', '325', '423', '446', '512', '523',  
'561', '621', '115', '482', '485', '487', '491', '492',  
'521', '712' ))
```

Make a distinct color or shape for the nodes '511', '541', '518', and '519'. Make the width of the edges proportional to the (logarithm of) edge weights, and make the size of the nodes proportional to any measure of node centrality of your choosing. Use the Fruchterman Reingold layout, or any other layout of your choosing. Chapter 3 of the KC book provides a salient coding example when it renders the Karate network.

Please include your diagram in a Word or PDF file, and submit it on this assignment page; in addition to submitting the quiz for this lab. Also submit your full R script, which generates all of the requested measures as well as your graph.

Quiz 2

After exploring the network properties of this data, please navigate to quiz 2 (which is associated with this lab) and answer the specific questions about this network. Specifically in that quiz, you will be asked to specify shortest path length between specific sets of nodes, to specify various centrality measures for specific nodes, specify the clustering coefficient (transitivity) and diameter of the entire network, and do other analysis tasks.

Optional reference

For your optional reference, this working paper is available in the , in the Blackboard Resources folder: *“Proximity to software and labor inequality: Examining the industry-level network of corporate acquisitions,”* by Ali Tafti, Pouya Rahmati, and J. Christopher Westland (2015), is available in the Resources area of Blackboard. Comments are welcome.