Network Science

PY 895, Fall 2016

Dr. Jianxi Gao, Prof. H. E. Stanley

Homework 3, due by October 14th (before the class)

Write your name at the top of your HW before handing it in. Staple all pages together. Hand-in a **pdf** *(no other format is accepted), containing the visualization, analysis. Name the file as yourLastName_HW3.pdf (in my case it would be Gao_HW3.pdf) and send it via email.*

1. **Network Visualization**

   Generate one undirected Erdős-Rényi network with $N = 500$ nodes and average degree $\langle k \rangle = 4$ and 8.

   a) Visualize the networks (for example with Cytoscape) in different ways: using different node colors and different node sizes for different topological properties (at least two different visualizations);

   b) Analyze the networks. For example, study number of components, average degree and some others you know.

2. **Network representation**

   Consider the network in Fig. 1. Construct:

   a) its adjacency matrix;

   b) its edge list;

   c) its compressed row storage.

   d) Considering each link as undirected and unweighted (symmetrize the matrix), what is the clustering coefficient of each node and the clustering coefficient of the network?

   e) If you switch the labels of node 5 and node 6, how would the adjacency matrix change? And the edge list? What kind of information can you not infer from the edge list representation of the network that you can infer from the adjacency matrix?
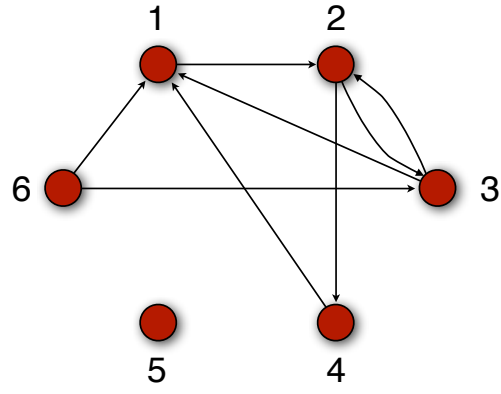
FIG. 1. A small Network.