MO412 – Network Science University of Campinas

Homework 01

Assigned on 2020-09-26 **Due on 2020-10-02**

1. Using any programming language, construct an undirected network with $N = 10000$ nodes, numbered from 1 to N, and average degree close to $\langle k \rangle = 4.0$. To achieve this, add each link (i, j) for $i < j$ to the network with probability p, choosing p so that the average degree is as close as possible to 4.0.

   (a) Which value did you use for p?

   (b) Draw the degree distribution of your network with any plotting software, both in normal scale and in log-log scale.

   (c) Hand-in your code, value of p, and drawings from the previous item.

2. Perform a similar experiment as in the previous problem, but with the following difference: for every $j > 1$, add a link (i, j) for node $i < j$ with probability

$$\frac{k_{i,j} + \epsilon}{\sum_{m=1}^{j-1}(k_{m,j} + \epsilon)} \times q,$$

   where $k_{i,j}$ is the degree of i at the beginning of iteration j, $\epsilon = 0.00001$, and $q = 4/3$.

   Draw the degree distribution of your network with any plotting software, both in normal scale and in log-log scale.

   Hand-in your code and the degree distribution drawings.