Network Analysis exercises

Social and Graph Data Management

November 11th, 2022

1. Read this survey article `http://snap.stanford.edu/class/cs224w-readings/newman06powerlaws.pdf`, and identify:
   a) how to plot data that follows power law distributions
   b) how to estimate the exponent of a power law that fits data
   c) how to prove which moments of a power law exist
   d) some examples of real distributions that do not follow power laws
   e) why power laws are called scale-free

2. We want to compare the (average) local clustering coefficient defined in the lecture, with the global clustering coefficient, defined as

$$\frac{3 * \#\text{triangles}}{\#\text{ connected triples}}$$

   A connected triple is a 2-hop path, also called a wedge.

   Compute both the average local clustering coefficient and the global clustering coefficient for the graph defined as follows, that consists of 2 star patterns: Nodes 1 and 2 have a link to each other and to the remaining N-2 nodes. The N-2 other nodes are independent (their only links are to 1 and 2).

   (Solution chap 2.13 p 57)

3. Answer questions a to e of exercise 3.11.1 in the book (until question about $\langle k^{cr}$ included).

4. Answer exercise 4.10.2 in the book (friendship paradox. Until generating scale-free networks excluded)