

PHYS 597A, CMPSC 497E: Graphs and networks in systems biology

Homework assignment 7, due Tuesday Oct. 27

1. Based on what we have learned in class so far, answer the following questions in your own words. You can support your answer with formulas but formulas alone will not count as an answer.

(a) Why doesn't the average clustering coefficient of a regular lattice depend on the size of the lattice?

(b) Why doesn't the average clustering coefficient of a small world network (generated with the Watts-Strogatz model) depend on the size of the network?

(c) Comparing two large networks of equal number of nodes and edges, one generated by the Watts-Strogatz model and one generated by the Barabási-Albert model, which one has a larger average distance?

(d) Comparing two large networks of equal number of nodes and edges, one generated by the Watts-Strogatz model and one generated by the Barabási-Albert model, which one has a larger degree range?

2. Construct a graph with eight nodes and twelve edges (you can do it randomly or select an example that seems interesting).

(a) Propose a node measure (or combination of measures) that can serve as a proxy for the severity of the effect of the nodes's removal on the connectivity of the network. Order the nodes by this measure from highest expected effect to lowest. (Hypothetical example: the lower the clustering coefficient of the node, the higher the effect of its removal.)

(b) For each node, determine what is the effect of its removal on the size of the remaining largest connected component, the diameter of the largest connected component, and a third measure of your choosing. Order the nodes based on these three measures from highest effect to lowest. Do the results match your expectations from part (a)?