

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

Homework assignment 6, due Tuesday Oct 13

Read chapter VII, Scale-free Networks, sections A-D.3 (pages 71-75) and chapter VIII, The Theory of Evolving Networks, sections A-F (pages 76-83) of "Statistical mechanics of complex networks". Note that you don't have to read VII.D.4 (Spectral properties) and VIII.G. (Connection to other problems in statistical mechanics).

1. Write down three questions or ideas that you had while reading the text. Follow up on your questions/ideas (a good starting point is http://en.wikipedia.org/wiki/Scale-free_networks) and summarize what you found.

2. What is your favorite evolving network model? Why?

3. Describe properties relevant to some real networks that were not incorporated in the evolving network models reviewed. Propose a model that would take into account these properties.

Describe qualitatively the network resulting from your model. How does the number of nodes and edges change in time? What functional form do you expect for the degree distribution? How will the average (or maximum) distance between nodes depend on the number of nodes in the system? Do you expect that the clustering coefficient will decrease as the network grows?

Note: support your answers. Don't just give a list of desired properties, try to determine the properties of your model.

Extra credit: Simulate or derive analytically your model network's properties. For the latter use approximations as necessary.