

Csci 688 (Kincaid/WF 8:30-9-50 a.m.)

Scale-Free Networks

Homework 8: Due April 9, 2008

As on the last homework you may work in groups.

1. Write a program (language of your choice) to generate a scale-free network via preferential attachment. Please explain any assumptions you make with regard to your implementation. Make sure that the degree of the dynamically added nodes is an input parameter. Steve Park's suite of random number generators (rngs.c, rngs.h, rvgs.c and rvgs.h) are available on the math network in `~rrkinc/homework/`. I have also included C code for generating $G_{n,p}$ graphs that use these random number generators (erdos-GNP.c).
2. Verify that your code is producing a scale-free network by analyzing its degree distribution for $n = 100, 500$ and 1000 nodes. Plot the degree distribution on a log-log scale using any tools you like (e.g. Maple or Splus). Does the degree distribution follow a power law? Why or why not? Explain how you generated your plots.
3. Compute the average shortest path distance for your network when $n = 1000$. How does it compare to $\log n$; $\log \log n$?
4. Find a way to plot your resulting graphs for $n = 100, 500$ and 1000 nodes. Is it easy to see that it is scale-free? Why or why not? Explain how to generate your plots.

Please email me your code. Turn in hardcopies of your log-log degree distribution plots, your graph plots and the answers to the questions in 2, 3 and 4.