

CS166 7.1 MKW

Question 1

Compare and contrast Barabasi-Albert (BA) network and Watts-Strogatz (WS). What is one similarity in generating these graphs and one difference? Why?

One similarity is that both algorithms are randomized, so in reality, when we look at degree distributions, we will likely get some noise from the theoretical estimate. As scale the network size for BA and runtime for WS, we should get smaller noise and closer to theoretical estimate. A difference is that BA's degree distribution follows a power law because a new node has preferential edge assignment to nodes with higher degrees, proportionally. An analogy for this is "the rich get richer, the poor get rich much slower."

Question 2

Can Barabasi-Albert (BA) model generate a network that has degree distribution of Watts-Strogatz network? When will the BA model always meet this condition?

Yes, it can but it is unlikely because we need to counter preferential edge assignment where there is low chance of **not** assigning to well-connected nodes and high chance of **not** assigning to poorly-connected nodes. The chance is very small for larger networks. We can, however, always make BA equate to WS by having n nodes and $n(n-1)/2$ edges (fully connected graphs), in which case there is no other way to route edges.