CS166 9.1 MKW

Question 1

What about the scale-free networks that make the disease persist at higher recovery rates?

Scale free networks have higher average neighbor degree which makes the infection easier when we update asynchronously and select a random neighbor to check if they're infected or not (and that chosen neighbor is usually the one who has more connections and thus more chance of getting infected). This means that overall there is higher chance of getting infected compared to a completely random networks like Watts-Strogatz. Therefore, the tipping point for recovery rate increases for scale free networks for a disease to die out.

Question 2

Can an infectious disease eventually die out on scale-free networks if MFA says that for any non-zero infection chance, the disease will persist forever?

Yes, it can. MFA applies only to very large (infinite) size networks where there will always be some infected nodes left (e.g., let's say 0.001% of nodes). In case where our network size is finite (e.g., 100 nodes), that 0.001% number equates to zero, so when we reach that zero, we can never get the disease back again since the probability of someone randomly getting it without having infected neighbors is zero. Therefore, we could see in class that at Barabasi-Albert network size 1000, the recovery rate needs to be higher to defeat the disease, and the disease can still be defeated even though the degree distribution follows the power law.

Reflection poll

Referencing what you learned today about how epidemics spread in scale-free networks, comment on how flu shots (short-term inoculations that reduce an individual's chance of getting flu) should be marketed. Imagine you work in public health. Which types or groups of people would you target in order to reduce the overall spread of flu in a population?

As we could see from the simulation, in non-randomized (scale-free) networks, the infection stays over time at higher recovery rates because the central (largely connected) nodes are still infected and can infect a large amount of adjacent nodes. When those nodes by chance get recovered, we can see that the infection dies out on a finite size (also not too big of a network). This suggests that we should give flu shots to those central nodes who interact with many people every day like teachers, salesmen.