Online Simulation Technical Appendix for "From Acquaintances to Friends: Homophily and Learning in Networks"

We perform Monte Carlo simulations of the network learning and formation process to derive properties of the resulting networks. Fixing the set of I agents and the normal prior distributions $N(\mu_i^0, \sigma_i^2)$, for each run of the simulation we take a draw of true agent types from the prior distribution. We then form the initial network G^0 based on the tolerances δ_i and these true types. Using this network G^0, we simulate the signals that each agent sends in each period of the experimentation phase. All the simulations in the paper use one period for the experimentation phase, and thus one signal is sent per agent during experimentation. Greater numbers of periods will tend to increase the differences with the complete information network. From the agent signals, we can compute the learned information network G^L that forms using the agent linking rules.

For each G^L we then apply the capacity constraints using the stable network procedure described in the paper to get the final network G^*. Thus in each run of the simulation we can arrive at a final network G^*.

Using the same types that were drawn initially, we can also derive the resulting complete information network G^C by computing which agents wish to link with each other given the social tolerance preferences. We then apply the capacity constraints onto the network to get the final complete information network G_C^*. From all the runs of the distribution, we can then get estimates of the probability that each final incomplete information network G^* and complete information network G_C^* will form.

From the distributions of G^* and G_C^* obtained through the runs of the simulation, we can analyze different parameters of interest, which are defined below.

Definitions:

Average number of links of each agent

From the numerical analysis, we get the probability of the network evolving into each possible final network. Then we take the number of links each agent has in each final network, and we weight it by the probability that final network occurs, to get the average number of links each agent has.

Jaccard Distance

For a fixed final complete information and final incomplete information graph, we count the number of differences in the adjacency matrices of the two graphs and sum them up. We take the average of this sum over all runs of the Monte Carlo simulations.

Average Total distance of links of each agent

The sum of the distance of all the links each agent has in each final network. We take the average over the agents.

Local Clustering Coefficient

The average of the local clustering coefficient of all the nodes of the network. The local clustering coefficient of a node is equal to the proportion of links that exist among the subgraph of that node and its direct neighbors divided by the total number of links that are possible within this subgraph.