

## Models and Simulations: Problem Set 5

### Network Models

This week, your goal is to finish the models called “Network\_Formation1” and “Network\_Formation2” on the website. To finish each model, you will implement the two programs described in pseudo-code below. For “Network\_Formation1”, you should implement the function called “grow\_network” below, and for “Network\_Formation2”, you should implement the program called “rewire.” When you are finished, you will have implemented two rather well-known network formation algorithms; I won’t tell you which because that would ruin the fun. When you submit your programs, please also write one or two sentences briefly comparing and contrasting the degree distributions produced by the two algorithms. The degree distribution is plotted in the interface for your convenience.

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**Algorithm 1**

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**procedure** GROW NETWORK

**while** Number agents in Network < Number of user determined agents **do**

        Create a new agent  $g$

**for all** Agents  $h$  other than  $g$  **do**

            Let  $p$  be the proportion of edges that are incident to  $h$

        ▷ That is,  $p$  is the number of  $h$ 's neighbors divided by the number of edges

            With probability  $p$ , form a link between  $g$  and  $h$

**end for**

**end while**

**end procedure**

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**Algorithm 2**

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**procedure** TO REWIRE

**for all** agents  $g$  **do**

**for all** neighbors  $h$  of  $g$  **do**

      With probability  $p_{rewire}$

        ▷ The probability is fixed by the user in the interface

      Destroy link between  $g$  and  $h$

      Select an agent  $k$  at random and form a link between  $k$  and  $g$

**end for**

**end for**

**end procedure**

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