Behaviour Dynamics in Social Networks - Assignment 4

Maria Hotoiu, Federico Tavella

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Abstract

Learn to use parameter tuning tools to find the best values for a set of missing parameter values in a model.

1 Part 1

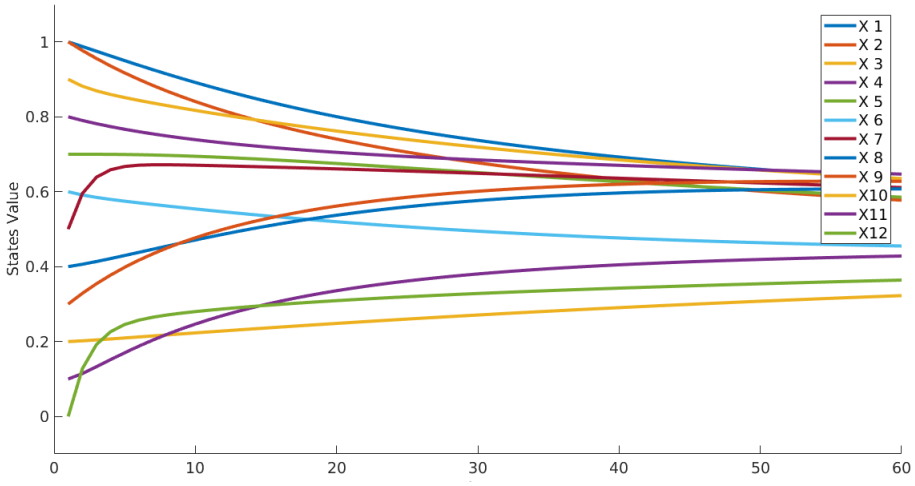

Figure 1: Results from the simulation

2 Part 2

η_L	K(t = 2)	L(t = 2)	|K-L(t = 2)|	K(t = 13)	L(t = 13)	|K-L(t = 13)|	Sum of differences
0	0.1146	0	0.1146	0.2221	0	0.2221	0.3367
0.05	0.1146	0.0127	0.1019	0.2395	0.1232	0.1162	0.2181
0.10	0.1146	0.0255	0.0892	0.2517	0.1949	0.0568	0.1460
0.15	0.1146	0.0382	0.0765	0.2603	0.2359	0.0243	0.1008
0.20	0.1146	0.0509	0.0637	0.2664	0.2592	0.0072	0.0709
0.25	0.1146	0.0636	0.0510	0.2708	0.2724	0.0016	0.0526
0.30	0.1146	0.0764	0.0383	0.2739	0.2799	0.0060	0.0443
0.35	0.1146	0.0891	0.0256	0.2763	0.2844	0.0081	0.0337
0.40	0.1146	0.1018	0.0128	0.2781	0.2873	0.0092	0.0220
0.45	0.1146	0.1145	0.0001	0.2795	0.2892	0.0097	0.0098
0.50	0.1146	0.1273	0.0126	0.2806	0.2906	0.0100	0.0226

Table 1: Exhaustive search for different values of η_L

The best value for η_L (i.e. the one with the minimum sum of differences at $t = 2$ and $t = 13$) is $\eta_L = 0.45$.

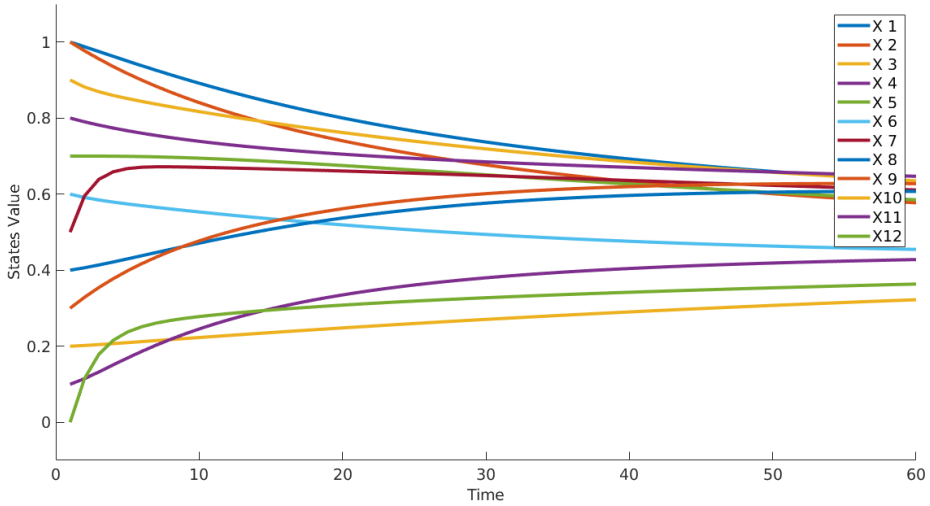

Figure 2: Results from the simulation for $\eta_L = 0.45$

3 Part 3

η_L	SSR	Error
0	0.9593	0.2827
0.05	0.0222	0.0430
0.10	0.0463	0.0621
0.15	0.1618	0.1161
0.20	0.2621	0.1478
0.25	0.3402	0.1684
0.30	0.4010	0.1828
0.35	0.4491	0.1935
0.40	0.4881	0.2017
0.45	0.5202	0.2082
0.50	0.5472	0.2135

Table 2: Exhaustive search for different values of η_L

The best value for η_L is $\eta_L = 0.05$. In Figure 3, we can see how the error derived from the simulation is of the same magnitude of the one represented in the graph.

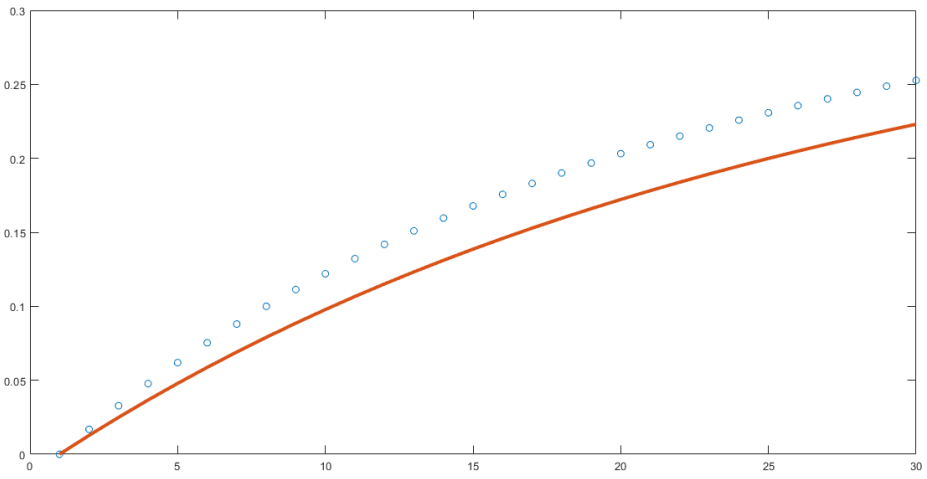

Figure 3: Simulated values for $\eta_L = 0.05$ (line) vs empirical values (dots)

4 Part 4

If we want to use exhaustive search over 12 states in the range $[0, 0.5]$ with grain size of 0.01, we should check $(\frac{0.5-0}{0.01}+1)^{12} = 51^{12}$ sets of values.

η_i	Value
η_1	0.257
η_2	0.105
η_3	0.062
η_4	0.078
η_5	0.323
η_6	0.089
η_7	0.370
η_8	0.229
η_9	0.113
η_{10}	0.032
η_{11}	0.139
η_{12}	0.312

Table 3: Best set of values for η

The error corresponding to these speed factors is 0.1046. It is worth to mention that, due to randomicity in the Simulated Annealing algorithm, two different run of the optimization tool will rarely lead to the same values - thus, to the same corresponding error. Even in this case, the error resulting from the simulation and the one in Figure 4 are of the same magnitude.

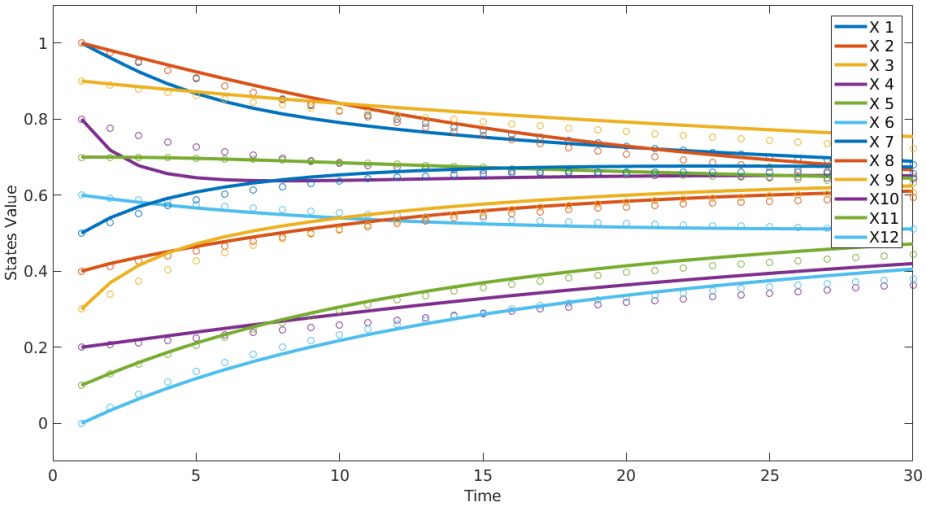

Figure 4: Simulated values (lines) vs empirical values (dots)

Finally, we can see in Figure 5 the changes in the state values of each node.

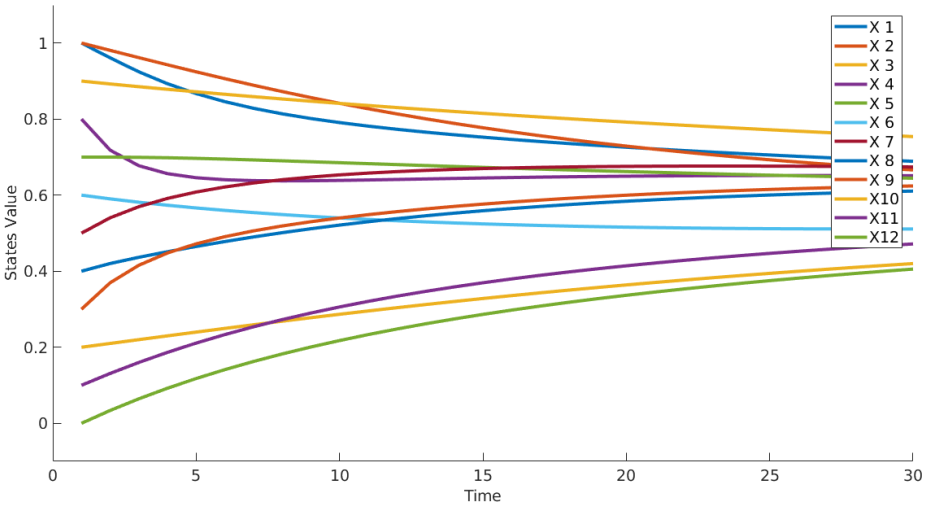

Figure 5: Changes in the state values of each node