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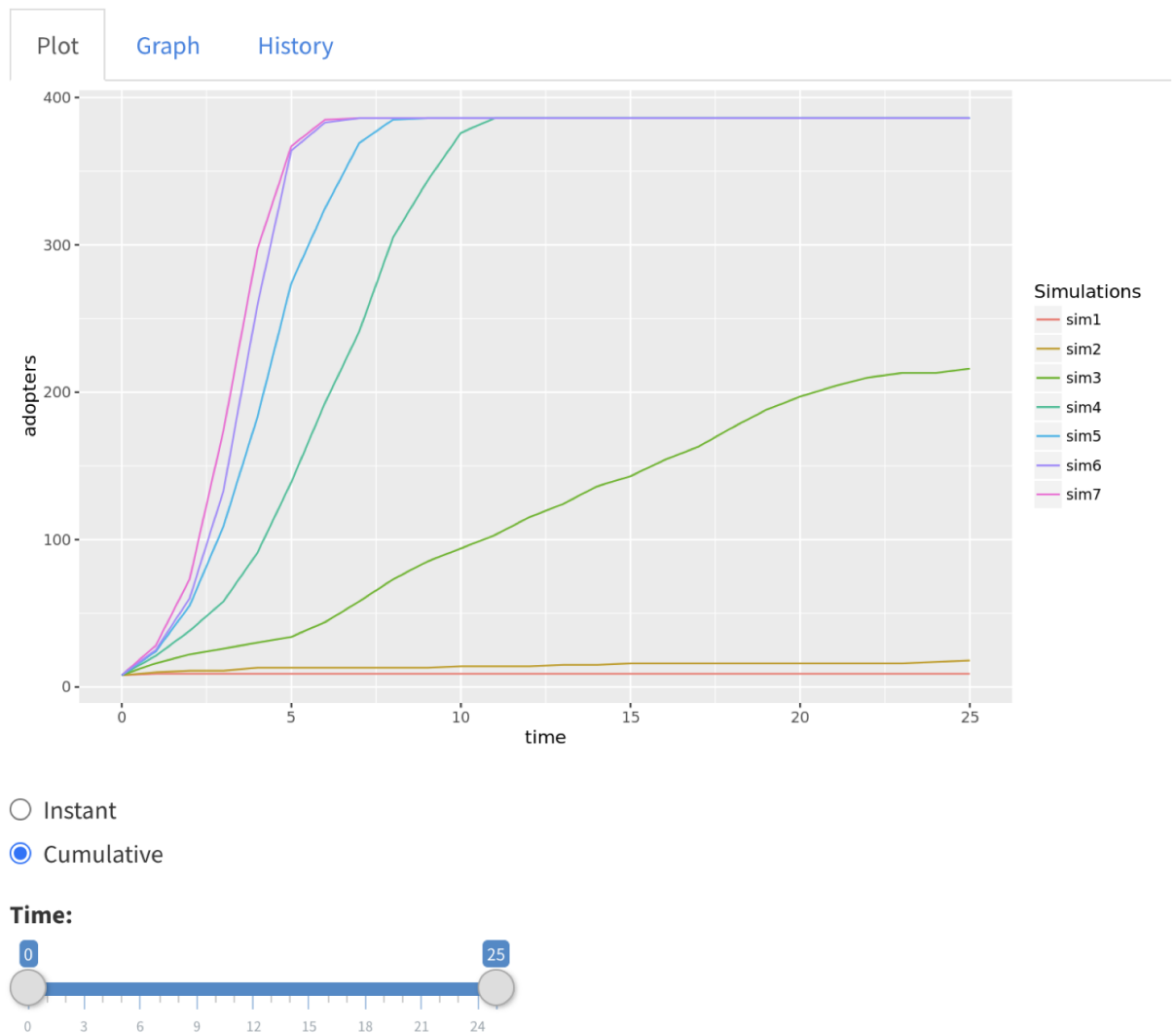
Homework 3
Managing Disruptive Technologies
Fall 2021

a. Number of Edges : 811
   Number of Nodes : 400

   Density = 2|E|/N(N-1) = 0.0101

   Average Degree = Sum(Degrees)/Number of Nodes = 4.055

b.

Simulation 1: Influence parameter : 5
Simulation 2: Influence parameter : 10
Simulation 3: Influence parameter : 15
Simulation 4: Influence parameter : 20
Simulation 5: Influence parameter : 25
Simulation 6: Influence parameter : 30
Simulation 7: Influence parameter : 35

The simulations show that the greater the influence parameter, the faster the market reaches its maximum adopters. This is because more people will help in sharing information about the product faster. For influence parameter 5,10 and 15 the adopters did not reach 400 (maximum) within 25 timeframes. For influence parameter 35, the number of adopters reached 400 in the shortest time among all the 7 simulations. Thus we can conclude that a higher influence parameter will achieve higher adoption in short time period

c. Choosing 8 different targets from 400 people :
$^{400}C_8$ = **15,148,408,086,508,950**

d. Chosen 8 Targets that maximize the revenue are -
Ids : 6, 59, 166, 109, 266, 224, 306, 359
Strategies used to arrive at final set of targets : Simulations done based on targets chosen with best centrality measures. In the first strategy, top 8 targets in terms of degree measure were chosen and results were drawn for influence parameter 10 and 20. In the second, top 8 targets based on closeness measure were chosen and similarly used betweenness for the third strategy and eigen vectors for the fourth strategy. It was observed that the strategy based on degree generated the highest revenue and the one based on betweenness generated a revenue very close to that of degree measure. It was noticed that these targets were not well spread out among all the four clusters and hence there was a chance to better improve the strategy. Further I chose 2 top targets from each cluster with higher degree and the results drawn were better than the previous strategies. I carried out the same strategy for betweenness measure and observed that the revenues generated by the strategy using top 2 targets from every cluster for higher degree were maximum.
The centrality measure for any adopter in a network is a measure of how fast is its ability to diffuse the information about a product. And considering there were 4 different clusters in this particular dataset, it was important to choose targets that would enhance diffusion of information in their own clusters.
Hence, target Ids as follows - 6 and 59 from cluster 1, 166 and 109 from cluster 2, 266 and 224 from cluster 3 and 306 and 359 from cluster 4.
Revenue formula for the given graph : sum of 25 timeframes(10*number of adopters at timeframe t) - seeds*10

Graph for the chosen strategy at influence parameter 20 -
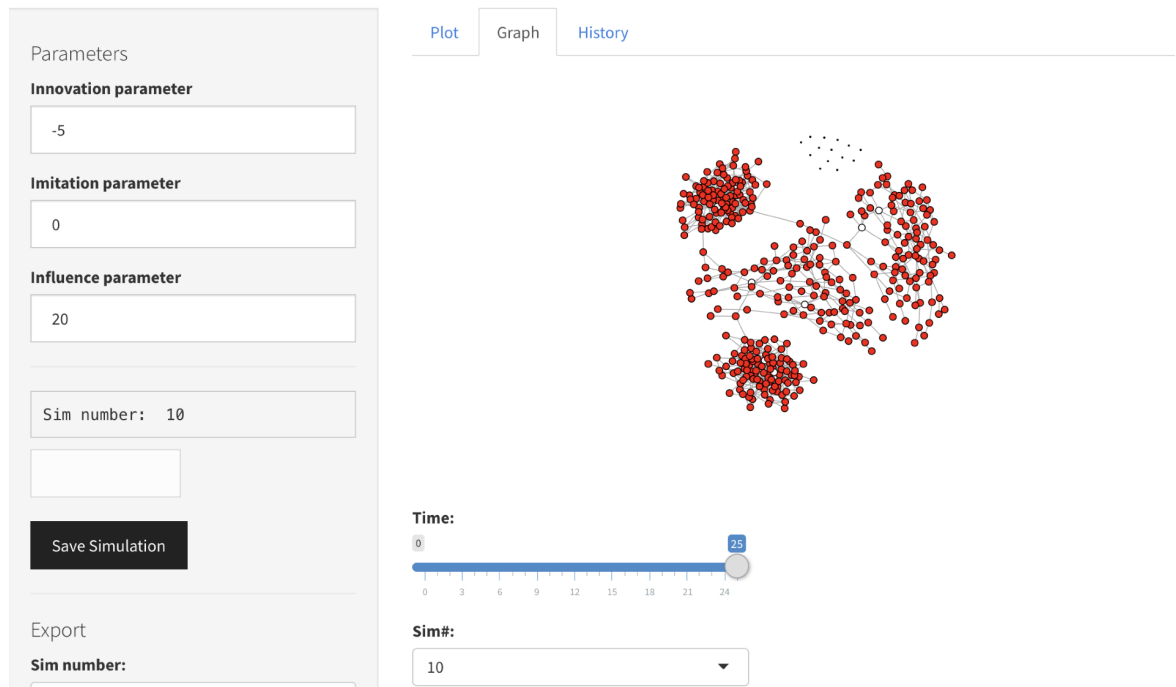
Following are the simulation results for the chosen strategy with influence parameter 10 :
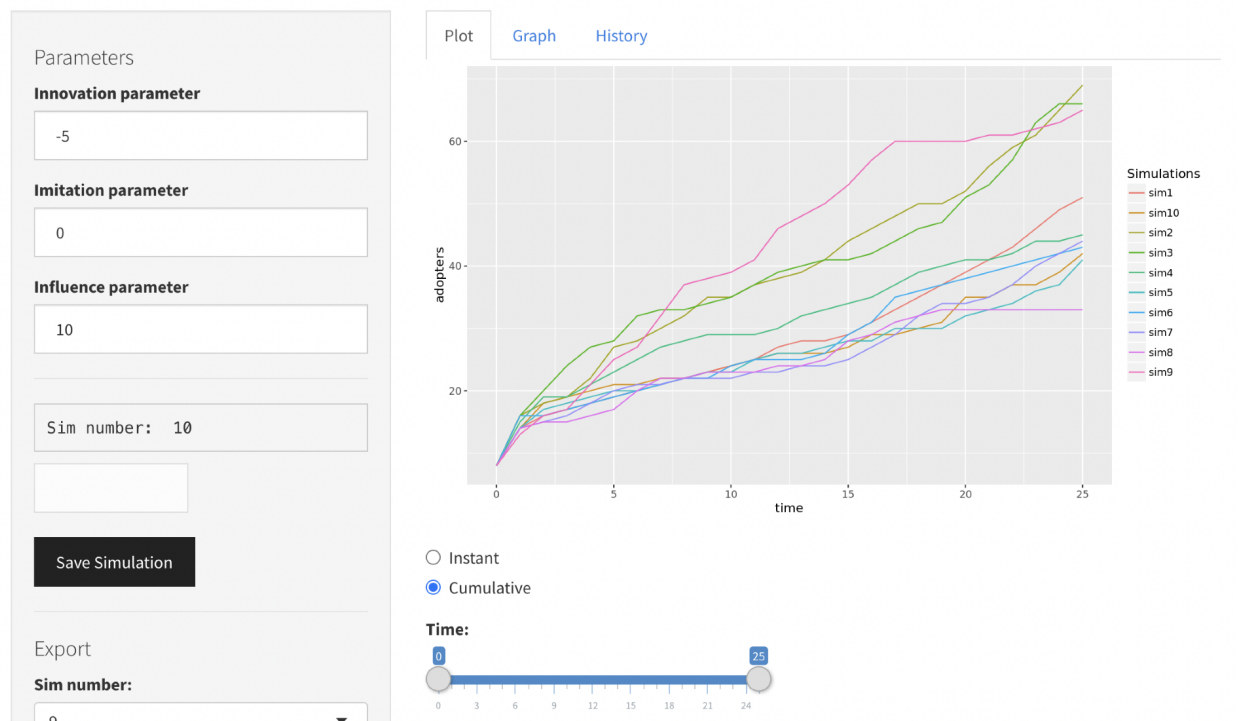
Revenues for 10 simulations : 7120, 3110, 6330, 4910, 4770, 6340, 8120, 6020, 7340, 4020.
Average Revenue : $5808, Total adopters at t=25 : 50

Following are the simulation results for the chosen strategy with influence parameter 20 :
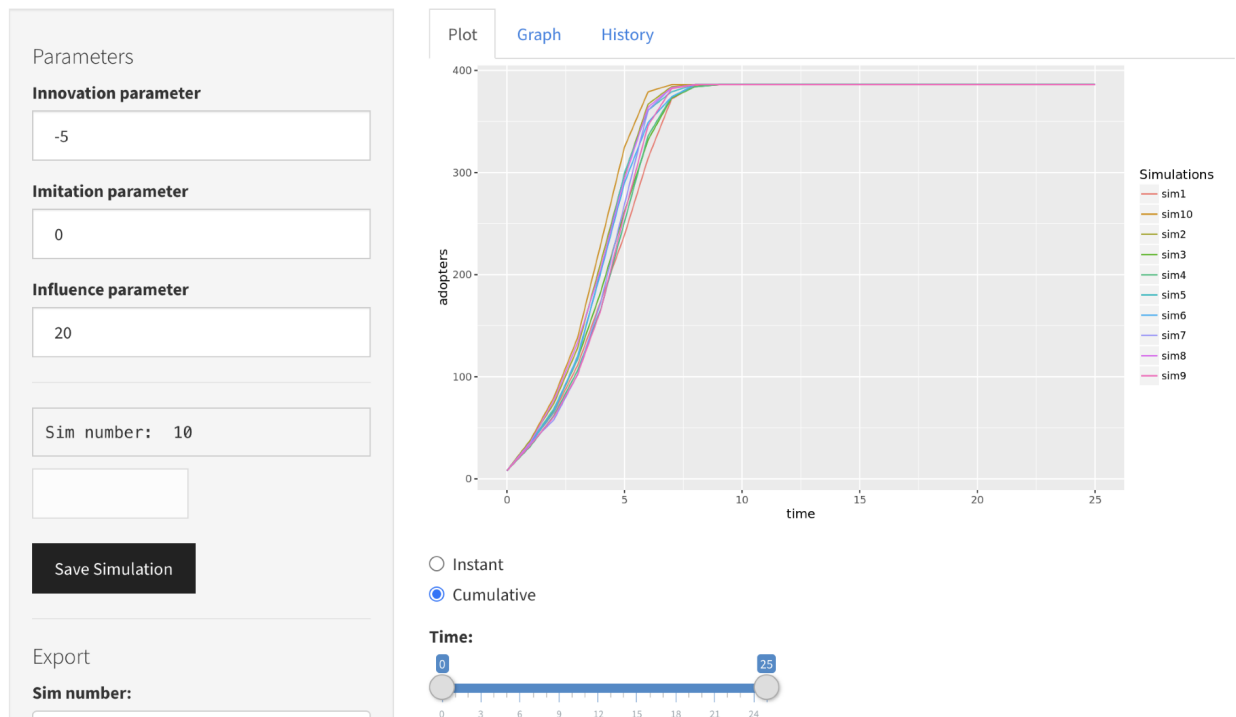
Revenues for 10 simulations : 80580,82500,81160,80750,82150,81850,81300,82420, 8980,83250
Average Revenue : $81694
Total adopters at t=25 : 386

Thus, for a higher influence parameter i.e 20, the revenue generated was much higher than for influence parameter 10. The number of adopters reached close to its maximum at timeframe 7 approximately. Thus, a higher influence parameter diffuses the information faster. Spreading out the targets among all the clusters helped gain more adopters in a short period of time.