CSCI4190 assignment 2

ziqiao.meng

Due Date: March 30

1 Question 1 (Simple General Cascading) 10%

Please interpret a new example (not covered in the lecture slides and course notes) using simple general cascading model. Explain how your example matches with general cascading model.

2 Question 2 (Simple General Cascading) 20%

Could an information cascade occur if each individual sees only the action of his immediate neighbor instead of seeing all the previous choices? Let's keep the same problem setup of the simple general cascade model except that when individual i chooses he observes only his own signal and the action of individual $i-1$.

- (a) Briefly explain why the decision problems faced by individuals 1 and 2 are unchanged by this modification to the information network.
- (b) Individual 3 observes the action of individual 2, but not the action of individual 1. What can 3 infer about 2's signal from 2's action?
- (c) Can 3 infer anything about 1's signal from 2's action? Explain.
- (d) What should 3 do if he observes a high signal and he knows that 2 Accepted? What if 3's signal was low and 2 Accepted?
- (e) Do you think that a cascade can form in this world? Explain why or why not. A formal proof is not necessary, a brief argument is sufficient.

3 Question 3 (Simple General Cascading) 20%

Still adopt simple general cascade model with specific values for the probabilities. Let's suppose that the probability that Accept is a good idea is $p = 1/2$; and the probability of a High signal if Good is true (as well as the probability of a Low signal if Bad is true) is $q = 3/4$. Finally, let's assume that Good is actually true.

- (a) What is the probability that the first person to decide will choose Accept; what's the probability that this person will choose Reject?
- (b) What is the probability of observing each of the four possible pairs of choices by the first two people: (A,A), (A,R), (R,A), and (R,R)? [A pair of choices such as (A,R) means that the first person chose Accept and second person chose Reject.]
- (c) What is the probability of an Accept or a Reject cascade emerging with the decision by the third person to choose? Explain why a cascade emerges with this probability.

4 Question 4 (Network Effects) 20%

Consider a product that has network effects in the sense of our model from Chapter 17. Consumers are named using real numbers between 0 and 1; the reservation price for consumer x when a z fraction of the population uses the product is given by the formula r(x)f(z), where r(x) = 1 - x and f(z) = z.

- (a) Let's suppose that this good is sold at cost 1/4 to any consumer who wants to buy a unit. What are the possible equilibrium number of purchasers of the good?
- (b) Suppose that the cost falls to 2/9 and that the good is sold at this cost to any consumer who wants to buy a unit. What are the possible equilibrium number of purchasers of the good?

- (c) Briefly explain why the answers to parts (a) and (b) are qualitatively different.
- (d) Which of the equilibria you found in parts (a) and (b) are stable? Explain your answer.

5 Question 5 (Network Effects) 30%

Still adopt the same setting of the previous questions, except that $p^* = 0.97$, $f(z) = 1 + 5x^2$:

- (a) Is condition sufficient enough for applying the equation 17.2 shown in textbook page 519? Justify your thoughts.
- (b) If conditions are sufficient, please draw the curve describing behaviors with respect to expectations and outcomes;
- (c) Analyze the stability and instability of critical points based on the plot in (b);
- (c) How could we make population reach to the highest critical point (e.g. largest population) if starting from 0?. Please explain your methods through calculation and illustrate it in details;