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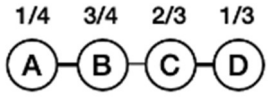
Online Social Networks
4 May 2022
I pledge my honor that I have abided by the Stevens Honor System. – Nidhi Parekh

Assignment 8: Power, Behavior, Dynamics

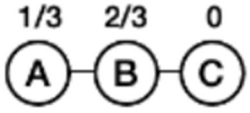
1. Suppose a network exchange theory experiment is run on the graph to the right using the one-exchange rule.
    a. **Which node or nodes you would expect to make the most money? (i.e. receive the most favorable exchanges)**
        i. Nodes E,F, and G
    b. **Explain your answer**
        i. Even though node A seems to have the most power in the graph, A is connected to nodes E, F, G and they each have an attractive alternative which makes them more powerful than A. The alternatives (Nodes B, C, D) will not want to be excluded and so they will be able to make better negotiations with E,F,G than A could.

2. Suppose a network exchange theory experiment is run on the graph to the right (i.e. a graph that is a 3-node path), using the one-exchange rule. Now you, playing the role of a fourth node X, are told to attach by a single edge to one of the nodes in the network.
    a. **How should you attach to the network to put yourself in as powerful a position as possible, where power will be determined by the result of a network exchange theory experiment run on the resulting 4-node network?**
        i. I would attach node X to the node E or to Node F.
    b. **Explain your answer**
        i. If node X is attached to either node E or F, then node X will have more power over either node because for example, if A excludes E, E will have no choice but to negotiate with X, in order to not be fully left out. The chance that E or F (whichever has node X attached) will negotiate with X will increase. With X attached to either E or F, A would be in danger of exclusion from one of the nodes.

3. **The graphs below represent the outcomes of a network exchange theory experiment. For each, determine whether the outcome is stable or unstable, and explain your answer.**
    a. 

        i. Stable
    b. **Explain your answer – not just numerically (< 1, etc), but also explain what that actually means regarding bargaining position**
        i. This is stable because A+B =1, B + C > 1, C+D =1. Between B and C, there is no better offer to this than both nodes already have. A-B negotiation works well for B and C-D negotiations works well for C. If B

and C end up making a deal with each other, it might lower the outcomes for both B and C to a point where B + C =1

c. 

i. Unstable

d. **Explain your answer – not just numerically (< 1, etc), but also explain what that actually means regarding bargaining position**

i. A +B = 1 but the problem is that B+C < 1. From this graph, node A proposes a 1/3-2/3 split between A and B and even though it sums up to 1, it excludes C from this negotiation.

4. **The stem graph below represents the outcome of a network exchange theory experiment in which the participants have outside options. In this experiment, A bargained with B and C bargained with D. Use the Nash Bargaining Solution equations to show that this is a balanced outcome. Show your work.**

Equations:

- s=1-(x+y)
- x+1/2*s
- y+1/2*s

$$x + \frac{1}{2}s = \frac{x+1-y}{2} \; to \; A$$
$$y + \frac{1}{2}s = \frac{y+1-x}{2} \; to \; B$$

For Nodes A,B:

X=0,y=1/2, s = 1-(0+1/2) -> s=1/2

(0+1-1/2)/2 = (1/2)/2 = ¼ to A

(1/2 + 1-0) / 2 = (3/2)/2 = ¾ to B

For Nodes C,D:

X= ¼ , y = ¼, s = 1- (1/4+1/4) -> s=1/2

(1/4 + 1 – ¼)/2 = (1)/2 = ½ to C

(1/4 + 1- ¼)/2 = (1)/2 = ½ to D

Using the Nash Bargaining Solution equations, this proves that this is a balanced outcome as shown in the stem graph.

5. **Social media influencers are powerful members of social networks, many attracting millions of followers. In your own words, write a brief essay (200 words) about an influencer or two that you follow, and why you follow them. If you don't follow any influencers, then research an influencer or two and discuss their position and influence on social media.**

   While they do not exactly have a ton of followers like normal influencers have, I would say my sister is a 'micro' influencer which counts. My sister has approximately 8K followers on Instagram and her page is filled with artworks done by her. The name of her Instagram page is called 'agopisketches', which is dedicated to sketches and paintings with Hinduism as the main theme. A lot of her drawings tell a story about different Hindu Gods and Goddesses, as well as devotees. Besides the fact that she is my sibling, I learn a lot from her artwork and as a follower, I can see the emotions and feelings being put into them which makes one more attracted to this page. She also engages with her audience through direct messages or through Instagram stories. Another Instagram user with a similar page is Abhishek Singh. His Instagram page is 'abhiart'. He dedicates his page to his artwork, which mostly revolves around the theme of Hinduism as well. Not only is his artwork about Hindu Gods and Goddesses, but he also touches upon nature and Earth. Oftentimes, he writes stories surrounding his themes. As an Instagram user, I rarely see influencers who talk about Hinduism or even apply their culture into art or music. To see influencers like these show up on my feed is something I would hope to see more often.

6. Your company has decided to interview two candidates A and B for a single job. A hiring committee was formed to decide which of the two candidates to hire. Everyone on the committee was interested in making the best possible hire, but after the interviews it was clear that members of the committee had different ideas about which of the two candidates was the best choice. When the committee met to make the final decision, they decided to go around the room and ask each person on the committee to announce which of the two candidates they believed to be the best choice for the company. In fact, everyone on the committee said that candidate A seemed to be the best choice, so the offer was made immediately to candidate A without additional discussion. Now that candidate A has worked for the firm for a while, it is clear that candidate B would have been a better choice.
   a. **Your boss has asked you to explain how the committee members could have unanimously supported candidate A when she was reasonably certain that before the committee meeting at least some of the members of the committee thought that B was probably the best choice. Based on the teachings of chapter 16, what can you tell her?**
      i. Based on the teachings from chapter 16, I would say the decision to hire candidate A was due to information cascading or herding. After hearing the reason from a few people on the interview committee explain why candidate A is better might have influenced the rest of the committee's

decision and hence, candidate A was chosen. Usually, as the opinions of others are heard, it affects their opinion or even hides their true feelings just to agree with the crowd. Since a few people felt candidate A was the top choice, there's a good chance that the rest of the committee might have inferred to go for the same candidate as well. Social pressure also plays a role in this situation for conformity.

b. **Based on the teachings of chapter 16, can you suggest another procedure that the committee could have used that would have revealed the initially differing opinions about the candidates and which might have avoided the unanimous choice of candidate A and resulted in the actually better choice of candidate B?**

   Another procedure that the committee could have used that would avoid information cascading would be talking about the qualities of both candidates without having to decide which is better. The focus on the candidates and their strengths and weaknesses helps everyone form a better decision. Then, instead of having everyone say their decision out loud, they could do a poll or write in a small piece of paper their answer anonymously.

7. You have developed a new product which performs the same service as an established product, but your product is much better than the established product. If the number of users of the two products were the same, then each potential purchaser's reservation price for your product would be twice their reservation price for the existing product. The difficulty that you face is that no one wants to use more than one of the two products. Currently, every potential purchaser is using the established product. Your cost of production and your competitor's costs of production are exactly the same and they are equal to the price at which your competitor's product is sold. If all of the potential purchasers switched to your product, the maximum price that you could charge (and still have all of them buy your product) would be twice the current price. So clearly you could make a nice profit if you could attract these potential purchasers. **Based on the teachings of Chapter 17, what strategies would you use to try to convince users to switch to your product?**

a. I think the biggest strategy to convince users to switch to my product would be to lower the price initially to the point where I would incur a loss instead of a profit in order to gain customers. Then after a while, when the number of users is the same or higher than the competitor's product, I would gradually increase the price so that I wouldn't gain or lose money. Then after a while again, the price of the product will increase, and I would start earning a profit.
   Another strategy would be to involve 'fashion leaders' because usually advertisement from the fashion industry attracts more people and they are more likely to buy the product. (Got this from slide 10 of BehaviorofSN)

8. Consider an on-line news site, such as cnn.com, which consists of a front page with links to many different articles. The operators of these sites generally track the popularity of the various articles that get posted. Suppose that the operators of the site are considering changing the front page, so that next to each link is a counter showing how many people have clicked on the link. (e.g., next to each link it might say: "30,480 people have viewed this story," with the number getting updated over time.)
    a. **What effect do you think this change will have on the behavior of people using the site? Explain your answer.**
        i. If people find out how many have viewed the site or an article, it influences a person's decision and makes a person view it more. The higher the view count or the number of users (popular), the more likely a person would be willing to read an article or view the site. This is part of the rich-get-richer phenomena.
    b. **Do you expect that adding this feature will cause the popularity distribution of the articles to follow a power-law distribution more closely or less closely, compared to the version of the site before these counters were added? Explain why or why not.**
        i. This feature will likely cause the popularity distribution of the articles to follow a power-law distribution more closely. Using the graph in slide 12 of BehaviorOfSn powerpoint, the more popular articles/sites (smaller number in rank – x-value) will have a greater number of views (y-value in graph) and the less popular ones (larger number in rank – x-value is larger) will have a smaller number of views (y-value).

9. Consider the network to the right. Suppose that each node starts with the behavior B, and each node has a threshold of q = 1/2 for switching to behavior A.
    a. **Let g and h form a two-node set S of initial adopters of behavior A. If other nodes follow the threshold rule for choosing behaviors, which nodes will eventually switch to A? Explain your answer.**
        i. For Node D: p = fraction of neighbors choosing A = 2/2 > Q=1/2
            Node D switches to A
        For Node J: p = fraction of neighbors choosing A = 2/3
            Node J switches to A
        For Node K: p = fraction of neighbors choosing A = ½
            Node K switches to A
        For Node I: p = fraction of neighbors choosing A = 1/3
            Node I does not switch to A
        For Node F: p = fraction of neighbors choosing A = 1/3
            Node F does not switch to A
        For Node C and E --- because I and F don't switch, they do not switch to A and they stay in behavior B
        Overall, Nodes d,J,k switch to behavior A

b. **Find a pair of nodes in the part of the graph outside S that blocks behavior A from spreading to all nodes, starting from S, at threshold q. Explain your answer.**

In this case, it looks like nodes F and I would be the nodes that block A from spreading to all of the nodes. When we get to node k, it is able to spread because of 1 of 2 its neighbors (node J) is switched to A. When we get to node I, none of its neighbors besides k has switched to A, and it's less than the threshold so it can't switch. The same applies for node F. G is the only neighbor node that is part of behavior A, but the rest of the neighbors are still in behavior B. Hence, those two nodes remain in behavior B. Because those two node stay in B, nodes C and E are unable to switch. C's neighbors are nodes E and F and E's neighbors are nodes C and I. F and I have not switched to behavior A so the four nodes on the left side stay in behavior B.

10. **Using several sentences, in general terms, in your own words, explain the effect that a tightly-knit community can have on a cascade.**

This is a little similar to the previous question. Cascading can spread a behavior throughout a graph. Essentially, a tightly knit community have a big impact on cascades, since they can block the spread of an information cascade. If a community has dense internal connections and comes across an information cascade, the community has the ability to either spread and be part of the cascade or resist. Once the community resists, the information cascade won't be able to fully spread to the rest of the nodes within the community.