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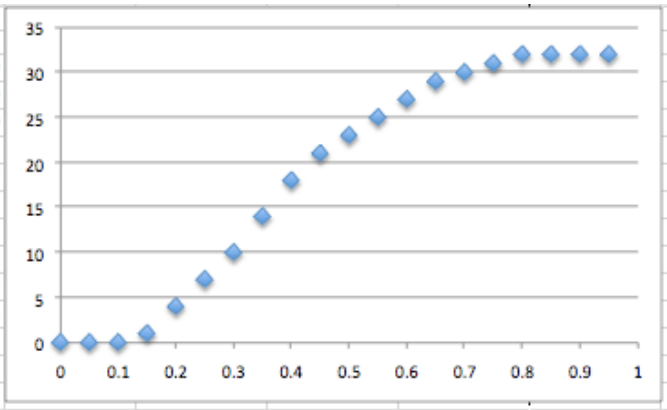
**Science of the Web**
**Homework 3**

Hypothesis

The more people that the starter node knows, the greater success the product is going to have. In terms of probability, if you only know one friend and there's a 95% chance that they'll get it- there's still a whopping 5% chance that NO ONE will know about this product. However, playing the odds with more people would probably lead to more success than fewer people with greater probability.

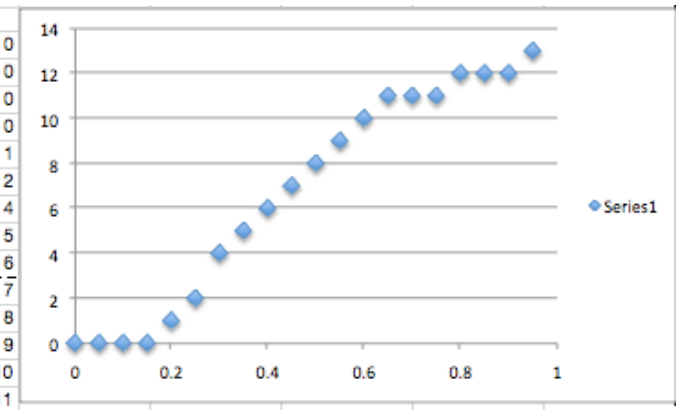
| probability | avg adoption | % adoption |
|---|---|---|
| 0 | 0 | 0 |
| 0.05 | 0 | 0 |
| 0.1 | 0 | 0 |
| 0.15 | 1 | 3.03030303 |
| 0.2 | 4 | 12.12121212 |
| 0.25 | 7 | 21.21212121 |
| 0.3 | 10 | 30.3030303 |
| 0.35 | 14 | 42.42424242 |
| 0.4 | 18 | 54.54545455 |
| 0.45 | 21 | 63.63636364 |
| 0.5 | 23 | 69.6969697 |
| 0.55 | 25 | 75.75757576 |
| 0.6 | 27 | 81.81818182 |
| 0.65 | 29 | 87.87878788 |
| 0.7 | 30 | 90.90909091 |
| 0.75 | 31 | 93.93939394 |
| 0.8 | 32 | 96.96969697 |
| 0.85 | 32 | 96.96969697 |
| 0.9 | 32 | 96.96969697 |
| 0.95 | 32 | 96.96969697 |




In comparing the data from each node, it seems to hold that more friends does in fact yield more adopters. However, the gap is much more narrow than I had expected. I am very surprised to see things like Node 16, with 2 friends, achieving an 18 user adoption at 50% probability. While this is about 9 users less than someone like Node 32 (with 27 adoptions), you must keep in mind that node 32 had 10 more friends to talk to directly!

I believe that has happened largely because of nodes like 33, 32, and 16. So long as these nodes were able to hear about the product, then everyone they knew had a chance to learn about the product. I hold that it is very important to spread word to these key nodes, even if they are not the *initial* adopters.

| Average adoption | avg depth |
|---|---|
| 0 | 0 |
| 0.05 | 0 |
| 0.1 | 0 |
| 0.15 | 0 |
| 0.2 | 1 |
| 0.25 | 2 |
| 0.3 | 4 |
| 0.35 | 5 |
| 0.4 | 6 |
| 0.45 | 7 |
| 0.5 | 8 |
| 0.55 | 9 |
| 0.6 | 10 |
| 0.65 | 11 |
| 0.7 | 11 |
| 0.75 | 11 |
| 0.8 | 12 |
| 0.85 | 12 |
| 0.9 | 12 |
| 0.95 | 13 |




This data showed that the depth grew linearly as the value of p increased, until it began to plateau near the peak.

Bonus Opportunities (10 points each)
1) Come up with your own measure of information flow.

Any concept I can come up with still relies, essentially, on the threshold principle in the Deterministic model. I believe that there should be a more precise way to distinguish factors, such as the popularity/eligibility of the product. Not in terms of your friends opinions, but the prestige or status associated with the device. People don't buy $100,000 Porsche's because all of their friends have one, but rather that its position as a status symbol (or they are bent on having a very high quality car regardless of the price). Furthermore, some upper class won't touch "generic" products while the lower class can't afford to touch anything but- regardless of their desire for it.

2) See whether there are interesting transitions that occur when the value of p changes. For example, for a given node in the network is there some small transition range [low, high] such that if p < low it is unlikely that a majority of users will adopt the product, but if p > high it is likely that a majority of people will adopt the product? From a slightly different perspective, look at the probability distribution Pr[ Majority of network uses product I p, initial user N]

Please see InterestingMoments.pdf

A Model of Peer-Pressure (40)
1) What is the optimal initial user in the network? What is the optimal set of two initial users? Who are the optimal three initial users? In each case the answer might not be unique, but any answer which is optimal will be considered correct.

KarateLinearNetwork.txt

33 had the most with 10
33 & 0 had the most with 20
33 & 2 & 0 had the most with 23

if you eliminate #33 as an option, then the simulator chooses 32 & 2 & 0
if you eliminated #33 and #0, then the simulator chooses 32 2 and 1.
It's interesting to note that 2 out of 3 of these guys had the highest degrees in the network.

Degrees:
[0] degree: 32
[1] degree: 18
[2] degree: 20
[3] degree: 12

[4] degree: 6
[5] degree: 8
[6] degree: 8
[7] degree: 8
[8] degree: 10
[9] degree: 4
[10] degree: 6
[11] degree: 2
[12] degree: 4
[13] degree: 10
[14] degree: 4
[15] degree: 4
[16] degree: 4
[17] degree: 4
[18] degree: 4
[19] degree: 6
[20] degree: 4
[21] degree: 4
[22] degree: 4
[23] degree: 10
[24] degree: 6
[25] degree: 6
[26] degree: 4
[27] degree: 8
[28] degree: 6
[29] degree: 8
[30] degree: 8
[31] degree: 12
[32] degree: 24
[33] degree: 34

Given this data, I would have suspected that 33, 32, and 0 would have yielded the optimal result. It turns out that they do! But its the exact same total as 33 2 and 0. This can be explained by the fact that thresholds play a part.

2) Suppose you were given a network without the influence weights Bij given to you. Come up with a method of generating values of Bij and explain the intuition behind your definition.

I would consider groups of friends such that you had the highest respect for people that you were directly connected to with an edge. A friend-of-a-friend would have some weight, but it would be less than that of a direct friend (and greater than a stranger). Put more succinctly, the bias is determined by the depth between two nodes. This would further extend to how many of your friends are also friends with a given node. The more connections you possess to someone, the more likely you are to agree with their opinions and be exposed to their product usage. If there is anyone you dislike (negative biases?) you might want to actually subtract form the value
being assessed for a node.

My intuition is that of real world experience. When a group of my friends are using something, not only am I likely to check it out because I respect their opinion and think it must be good- but it becomes the trendy thing to do and you want to be a part of it. This is likely how something such as Facebook spreads so quickly. Not only is it (some what) useful, but you are missing out on an entire subset of culture without it that your friends are a part of.