Assignment 7

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1. In general herd behavior occurs when there is an explicit network of individuals and only public information is available. A herd behavior experiment requires 4 main constraints. 1. There needs to be a decision that the individuals make, 2. Decisions need to be made in sequential order, 3. The decision is not mindless and on some basis, individuals have some private information that helps them decide, 4. No private information (personal thoughts) are shared between individuals but individuals can infer or see some public information observed from others behavior.

Golf Tee Shot Herd Behavior Experiment

I'll assume some prior knowledge of the sport of golf for my herd behavior experiment; I think it's a good example though. Oftentimes the tee shot (first swing) on a particular hole can be blind (to a position out of view) or over a hazard that has the potential to incur a penalty shot if it is entered. However, there can be a reward for hitting a longer shot to a blind position or over a hazard. There is a decision that is to be made whether to "go for it" or play it safe.

Players hit their shots in sequential order. It is also part of the rules and etiquette to not give advice to other players. So the first individual may choose to lay up and play it safe. The next player can then make their decision. Often, especially if one of the players has played the course before, they have some private information that led to their decision. The next player infers whether it is a good idea to go for it or not.

I have been around a lot of situations like these and the majority of the time all of the players in the group will sequentially make the same decision even if it is a poor choice and they all have some prior private knowledge. The public knowledge in this case is what shot the other individual hit and potentially the outcome of their shot. It's quite funny to watch an individual question themselves and switch which club and shot they were going to use after observing another individual. This experiment can easily be run empirically by counting whether individuals go for it or not in the groups.

5.

i)

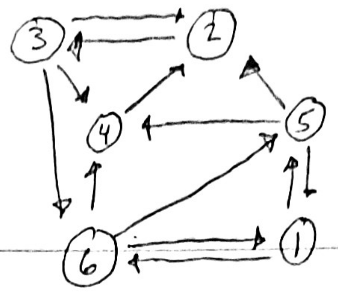
Social media networks provide a platform for information diffusion and content among the public. Analyzing how this process occurs across a network can provide valuable insight into how these networks operate. Additionally these insights can provide methodology for influencing trends and making information diffusion more efficient. The goal of this research was to enhance the literature and attempt some empirical analysis of the dynamics of social media networks.

ii)

The methodology employed by research involves collecting data from the social media platforms Digg and Twitter. The two sites have some similarities for comparison. Each site has posts by users that can then be shared by other users. The researchers chose to study shares and fan votes over time. They constructed networks for analysis by having the nodes be the posts and the shares by users to be the edges.

iii)

Researchers observed that information cascades occurred differently on the two social media networks. This was primarily because of the design of the promotion and sharing process of the networks. Digg had a denser social network but posts tended to not spread as far. Twitter was less dense but posts would eventually reach further. The analysis of post dynamics showed that Digg seemed to operate with two separate mechanisms. At first the social network (connections between users) drove the sharing and fan votes on a post. Once the post becomes popular enough it gets featured on some front pages on the Digg platform. Once this occurred more unconnected users vote on the post but overall engagement slowed down significantly. For Twitter, there appeared to only be one mechanism that influenced the popularity of posts. The social network itself and the links between users seemed to be the driving factor for sharing and fan votes. Posts tended to arise more linearly and increase in the chance to be shared over time. For both sites the popularity of posts followed a power law distribution. This means that a few posts will receive the majority of the likes and shares.



Problem 2

ICM

$t = 0$ Activated: V_5

$t = 1$ $5-1 = 4/3 = 1$ $5-2 = 3/3 = 1$ $5-4 = 1/3 = 0$ activated: V_5, V_1, V_2

V_1 ✓ V_2 ✓ V_4 ✗

$t = 2$ $2-3 = -1/3 = 0$ $1-6 = -5/3 = 1$ activated: V_5, V_1, V_2, V_6

V_3 ✗ V_6 ✓

$t = 3$ $6-4 = 2/3 = 0$ activated: V_5, V_1, V_2, V_6

V_4 ✗

After convergence nodes activated: V_5, V_1, V_2, V_6

Problem 4

SIRS $\quad S \xrightarrow{\beta} I \xrightarrow{\gamma} R \xrightarrow{\xi} S$

$S(t) + I(t) + R(t) = N$

β - infection rate $\quad \gamma$ - recovery rate $\quad \xi$ - becoming susceptible rate

eqn's: $\frac{dS}{dt} = -\frac{\beta S I}{N} + \xi R$

$\frac{dI}{dt} = \frac{\beta S I}{N} - \gamma I$

$\frac{dR}{dt} = \gamma I - \xi R$

SEIRS $\quad S \xrightarrow{\beta} E \xrightarrow{\sigma} I \xrightarrow{\gamma} R \xrightarrow{\xi} S$

$S(t) + E(t) + I(t) + R(t) = N$

σ - exposed to infected rate

eqn's: $\frac{dS}{dt} = \frac{-\beta S I}{N} + \xi R$

$\frac{dE}{dt} = \frac{\beta S I}{N} - \sigma E$

$\frac{dI}{dt} = \sigma E - \gamma I$

$\frac{dR}{dt} = \gamma I - \xi R$