Homework 1

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Building Models

Deviant Aggressive Behavior

If **Theory I** were correct, it means that if a person is rewarded for a certain kind of behavior, he/she will conduct this behavior again in the future. On the other hand, if a person is punished by conducting a deviant behavior, he/she will avoid this kind of behavior. Hence, we should adopt a social policy that build a reward/punishment system in a society.

For example, we can punish deviant aggressive behaviors through laws (fines, or jail if the behavior is serious). We can encourage people to behave in a way opposite to the deviant aggressive behavior through rewards such as money or acknowledgement. We can also give rewards for those who stop others from behaving aggressively.

If **Theory II** were correct, it means that a person will commit deviant aggressive behavior towards personal authority figures such as parents, bosses, or public officials if he/she is frustrated towards his/her personal life. It is not possible to completely eliminate the personal authority figures in life especially in the case of parents. Also, we cannot eliminate the hierarchical system in society. For example, there is no boss or managers in a company. The society cannot function well.

Some approaches such as encouraging conversations between a person and personal authority figures can be used to alleviate the tension and hence reduce the deviant aggressive behavior. Another way of thinking is that we try to reduce the frustration in a person's life. For example, government can build more free consulting places for stressful people or come up with policies that can achieve higher level of the equality in a society, improve the welfare system, alleviate the stress on students or workers and so on.

If **Theory III** were correct, it means that social rules hurt people disproportionately. The group of people hurt by the rules more does not receive as many profits as others, so they have less incentive to conform the rules. Some example social policies can be the ones that can reduce the social inequality and discriminations from the rules.

For example, better tax policies can alleviate the burden for people with low income. Welfare policies may help with specific group of people such as disabled, single mothers, household with a lot of children, the old with no guardians. Other policies like free education for all people and encouraging them to go to schools can also reduce the deviant aggressive behaviors.

If **Theory IV** were correct, it means that people conduct deviant aggressive social behaviors because they have contact with the deviant subculture.

If this is true, we can either stop the contact between deviant subgroups and the public and educate the subgroups and prevent them from forming a larger group and influence others. When identified certain groups with deviant aggressive social behaviors, we should cut the ways of promoting the

groups and exposing them to the general public, using laws for some groups such as terrorist if necessary. Certain degree of education may teach people how to behave better and contribute to the society in a positive way.

Waiting until the last minute

a. People do things at the last minute (aka procrastinate) due to the following reasons:
   - In most of the cases, people rely on self-control to get things done. When we get positive motivations such as bonus or rewards, we will do the things faster. Instead, when we experience some negative factors such as constant failure, we tend to refuse to do things right away. Things that will bring anxiety will have negative factors for people and hence induce the procrastination. For example, papers, homework and exams are very frustrating and many people who do not like those things will do these at the last minute. Other things that a person may have passion about, such as video games, shopping, can be done in a short period of time.
   - People do things at the last minute because they underestimate the things they have to do in the future. People often view their future self as being disconnected from their present self. It can cause them to think that they don't have to worry about the future, since their future self will be the one who has to handle any tasks. Hence people tend to do things that they face at present, while procrastinate when the deadline is not coming.

b. the Discounted Utility Model: Individuals discount the future utility. In economics, people often use this model to explain the discounted utility in the future. Discounted utility is the utility of future events, as perceived at the present time as opposed to at the time of its occurrence. It is calculated as the present discounted value of future utility, and for people with time preference for sooner rather than later gratification, it is less than the future utility.

c. An alternative model: people tend to avoid challenging things until they have to do this. As I mentioned earlier, there may be some negative factors that discourage them from completing things immediately. The exogenous factor is the difficulty of the task and the previous experience with the task (eg. failures.)

d. Prediction for the discounted utility model:

   1) People often discount the future utility. For students, it's easier to discount the value of attaining a good grade on an exam while that exam is still weeks away compared to when it's only days away, which is one of the reasons why people wait until right before the deadline to complete necessary tasks.

   2) Another prediction is that young people might not keep doing exercise to stay healthy when instead they can use this time for other things they like. The utility of being healthy in the future is largely discounted by people and perceived less important compared to other things. However, when they are getting older, they may realize the importance of keep doing exercise.

Prediction for the alternative model:

1) People tend to avoid doing difficult task until the last minute. When facing a multi-task situation, people will do the easier jobs (as they perceived) first and then the difficult ones. For example, students prefer to play first and finish their assignment on weekends.
2) People who have previous failure on certain things tend to have less incentive to finish them at first. They are afraid of failing again. For example, a person who have failed at the driving time may feel discouraged, begin to question and do not have incentive to do the test again.

Selecting and Fitting a Model

1.

a. When the sample size n is extremely large, and the number of predictors p is small, the flexible statistical learning method is better than an inflexible approach. A flexible method will fit the data closer and with the large sample size.

b. When the number of predictors p is extremely large, and the number of observations n is small, the flexible statistical learning method is worse than the inflexible approach. A flexible method would overfit the small number of observations.

c. When the relationship between the predictors and response is highly non-linear, the flexible statistical learning method is better than an inflexible approach. With more degrees of freedom, a flexible method would fit better than an inflexible one.

d. When the variance of the error terms $\sigma^2 = \text{Var}(\boldsymbol{\epsilon})$ is extremely high, the flexible statistical learning method is worse than the inflexible approach. A flexible method would fit to the noise in the error terms and increase variance.

2.

Bias: The bias decreases. As a general rule, as we use more flexible methods, the variance will increase, and the bias will decrease. The bias will decrease because with more model flexibility, it is easier to fit the model

Variance: The variance increases. Variance refers to the amount by which $\hat{f}$ would change if we estimated it using a different training data set, so if the curve fits the observations very closely, changing any point may cause $\hat{f}$ to change considerably, and so will result in some variance.

Training error: The training error declines monotonically as flexibility increases. Because as flexibility increases the f curve fits the observed data more closely.

Testing error: The test error has a U-shape. It initially declines as flexibility increases but at some point, it starts to increase again. This is because when a f curve yields a small training error but a large test error, we are actually overfitting the data.

Irreducible error: The irreducible error is a constant so it is a parallel line, this curve lies below the test error curve because the expected test error will always be greater the Var(ε)