Problem Set 1

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Building models

Problem 1-Deviant aggressive behavior

If Theory I were correct, in order to reduce deviant aggressive behavior, it is important for a society to punish deviant aggressive behavior, as individuals will then avoid such behavior and hence punishment. On the other hand, this society will need to also provide rewards for non-deviant aggressive behavior, as individuals will learn to adopt these acts because they bring forth positive consequences. Following the positive reinforcement of desired, non-deviant behavior and the negative punishment of undesired, deviant behavior, our assumption in this theory that individuals learn deviant aggressive behavior from experience would hold while such behavior will be reduced appropriately.

If Theory II were correct, in order to reduce deviant aggressive behavior in the society, it will be important to implement appropriate interventions in this expression of hostility. To avoid the vicious cycle of 1) an individual having personal frustrations display hostility toward authority figures, and 2) the problem does not get solved and individual returns to showing aggression due to frustration, these authority figures should intervene and provide such individual with help to reduce their frustrations. Since in this scenario it is assumed that this individual expresses his anger through deviant behavior, it would not be effective to implement a social policy that helps divert one's expression of anger through other forms or means.

If Theory III were correct, in order to reduce deviant aggressive behavior, it would be appropriate to first reduce systematic discrimination in the social rules. As a result, individuals could benefit more from conforming to these rules and perhaps display less deviant behavior. The fundamental rationale for these oppressed individuals to engage in deviant behavior is that they are not receiving what they would like to from certain social rules. A rational action, by definition, is the optimal choice for one in a given situation, after considering other possibilities that would leave them worse off. Thus, the basic solution to this problem would stem from preventing individuals from having to resort to deviant behavior. To that end, conformity should be made the rational choice of individuals through alleviated harm in doing so.

If Theory IV were correct, the society will need a social policy that effectively reduces individuals' exposure to deviant subcultures and thus their conformity to deviant norms. In this case, deviant behavior is seen as a social role that comes with corresponding social expectations and norms. A deviant subculture would by definition have values and behavior that substantially differ from the vast majority of the society. Here, we assume that individuals are socialized into the social role and then given the expectations of deviant behavior. One key feature of a deviant subculture is that it usually breaks off from society and its members conforming to the values and norms of this subculture that are largely different from those of the mainstream. If an individual's chances of being in contact of a deviant subculture could be largely minimized, then it would be less likely from them to adopt deviant aggressive behavior in this case.

Problem 2-Waiting until the last minute

A. One reason for individuals to do things at the last minute could be that the task is difficult and they are not ready for it and thus dread to face it due to fear of failure. Another possibility is the opposite: they believe that the task is easy enough for them to complete with a trivial amount of time. One other explanation is the lack of motivation for one to complete this task, as we are constantly distracted by many other things. Last but not least, people might procrastinate because they do not see immediate gratification,

or positive feedback from performing the task early on. Sometimes the task is too far into the future for one to act sooner in the process.

B. An individual would evaluate their preparedness for a task through two measures: the difficulty of the task and their relevant knowledge in order to complete the task.

C. An individual would assess the difference in their utility of starting early on the task by judging how much reward there is and their utility of the time they lose that could be used for something else.

D. Based on the first model, if one judges a task to be easy enough and that they are fairly equipped with relevant knowledge, they will act sooner than later to perform the task. If one has enough relevant knowledge but thinks the task is difficult, they would dread to perform it. This is to assume that the evaluation of the task is independent of the assessment of a person's own ability. Based on the second model, if one does not get a positive utility in the reward of starting early minus the cost of the time spent, they will not start early on this task. If one's evaluation of their gained reward and lost time cost is zero or near zero, they are indifferent about whether to start early or not. This is assuming that we are calculating the expected cost and utility here, since the actual figures cannot be directly assessed.

Selecting and fitting a model

Problem 3

A. A flexible method would be better when the sample size is large and the number of predictors is small. Because we have a large number of observations, we don't need to be very concerned about overfitting, as would not be as likely. A flexible method would learn the pattern better in this case.

B. An inflexible method would be better when the number of predictors is large and the number of observations is small. A flexible method might result in overfitting, increasing the variance.

C. A flexible method would be better when the relationship between the predictors and response is highly non-linear. An inflexible method would not be ideal for grasping the pattern of non-linear relationships. D. An inflexible method would be better when the variance of the error terms is very high. When the variance is high, a flexible method tends to also capture such noise, which is undesirable when fitting other data.

Problem 4-Bias-variance

As moving from less to more flexibility in our method, bias is lowering because our model is getting more complex and high bias would come from oversimplifying assumptions. Variance is increasing because we are approaching overfitting of the training data, capturing noise in the dataset that lowers generalizability. Training error decreases because the more flexible the method, the better it fits the training set, resulting in lower training error. Test error decreases first and then increases because it would go from underfitting to overfitting, making the model more difficult to generalize as it gets extremely flexible. Irreducible error is constant throughout the graph because irreducible error stems from the inherent noise of X not completely determining Y, which is a fact that we are not changing by only increasing the flexibility of our model.