

Homework 1

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Building models

Deviant aggressive behavior

If Theory I were correct,

it means that if a person is punished (and not rewarded) for his/her deviant aggressive behavior, the person will less likely to commit the deviant aggressive behavior again. In addition, if a person is rewarded for conducting desired behavior as an alternative to deviant aggressive behavior, the person will more likely to conduct that desired behavior in place of deviant aggressive behavior again in the future. Hence, we should adopt these social policies:

- punishing deviant aggressive behavior through laws, social norms, etc.
- encouraging alternative behavior to deviant aggressive behavior through rewards, acknowledgements, social norms, etc.

If Theory II were correct,

it means that a person would commit the deviant aggressive behavior if he/she is frustrated in his/her personal life and there exist personal authority figures for he/she to direct the deviant aggressive behavior to. It is harder (or unrealistic in the case of parents) to completely eliminate personal authority figures in the society, so it is more realistic to try to reduce frustration in personal life or provide some alternative the express the frustration. Some possible social policies are:

- establishing institutions that help and support individuals through frustrating periods in their personal lives such as counseling center, etc.
- frustration in personal life may result from socioeconomic-related problem. Hence, policy that improve overall well-being and equality would help.

If Theory III were correct,

it means that when social rules are discriminating—that is the rules benefit and cost different people differently—people oppressed by the rules will commit deviant aggressive behaviors. Then, some possible social policies are:

- reducing social and economic gaps/inequalities through auxiliary policies such as accessible education policy, tax policy, etc. so that there are less oppressed individuals from the rules' discriminations.
- allowing oppressed individuals to voice their opinions about the rules and suggests how to improve the rules so that the rules are less discriminating against these oppressed individual.

If Theory IV were correct,

this means that individuals who seek social roles and end up choosing deviant subcultures will commit deviant aggressive behaviors. Then the possible social policies are:

- encouraging and supporting creative subculture (such as sport, art, etc.) such that people have better alternatives for their social roles than the deviant subcultures.
- discourage deviant subcultures that use deviant aggressive behaviors through laws, rules, social norms, etc.

Waiting until the last minute

a)

This depends on how we want to answer this question. If we want to answer using induction paradigm, we might say this observation might be true if we can gather enough incidents regarding this behavior. If we want to answer using deduction paradigm, we might say this observation might be true if we believe there exist some reasons behind this behavior shared by people and can be generalized.

In my theory (using deduction paradigm), this observation might be true because people generally have more than one things to do in their life and they might rank the priority to finish each thing by each thing's deadline. More importantly, people might rank things without deadline as having higher priority.

b)

Theory I: People have many things to finish and they rank each task's priority by the task's deadline with tasks without deadlines having the highest priority.

c)

Theory II: People like to get excited by doing things last minute.

d)

Theory I

- Assumptions: People have more than one tasks to complete at a given moment. People choose which task to do first base on assign priority. People assign priority to tasks with deadlines by the deadlines. Tasks without deadline are randomly assigned priority but they are always ranked higher than tasks with deadlines. People finish one task and move on to the other task in the priority queue right away.
- Prediction I: If people have only one task to do, they will start the task right away when the task is assigned. This is because there is only one task in the priority queue and people complete the task by the priority queue.
- Prediction II: If there are many no-deadline tasks, people may not be able to finish the have-deadline tasks by the deadlines. This is because the priority queue is crowded by the no-deadline tasks, which have higher priority than the have-deadline tasks.

Theory II

- Assumption: Doing things last minutes create excitement. People like excitements.
- Prediction I: If the task has no deadline, people will finish the task right away because the excitement cannot be the factor anymore.
- Prediction II: If the deadline can be extended without additional cost, people will choose to extend the deadline and still work very close to the extended deadline to get the excitement.

Selecting and fitting a model

1)

a)

The inflexible method would be better as there is only small number of predictors. Flexible method would likely try to capture *all* the variations in such a big sample with a handful of predictors. This may lead to bias assignment of weight on each predictors (ex. we may overestimate the predicting power of each predictor in flexible model). Inflexible method will be less likely to capture *all* the variance, hence may introduce less bias when number of predictors is low.

b)

Flexible method will be better. Inflexible model with large number of predictors and small sample may lead to underestimating predicting power of each predictor. Flexible method on the other hand don't have as strict priori assumptions as the inflexible one, so it is more likely to find the *best* predicting weights because there are more possible sets of weights.

Nevertheless, I think this is a bad scenario for both method. Having so little samples and so many predictors will make it really hard for any learning model to find the optimal weights.

c)

Flexible method will be better because we do not assume restrictions as much as in inflexible method. This loose restriction allows the flexible method to have a bigger set of possible weights. On the other hand, inflexible method restricts the possible weight sets and it is likely that when the pattern is highly non-linear, the optimal weight set will be outside of the restriction.

d)

This is similar to c). If you use inflexible model to capture some data and the result error variance is high, your model's restriction is likely wrong and thus it do not allow the *true* optimal weight set. Hence, moving toward more flexible model will loosen the restriction and allow higher possibility to find the optimal weight set.

2)

a)

- Green model (OLS) - This model obviously does not fit the data well. The data is curvilinear but the model assume linear relationship. This leads high bias as well as high variance. The training error would be high because the linear assumption is not appropriate. If the testing data still have the curvilinear relationship (which should be if the test and train sets are splitted randomly), the training error would be high too. The irreducible error is a constant regardless of model.
- Black model - This model is like a sine curve. It fits the data better than the OLS. The model capture the curvilinear relationship in the data. The pattern it captures is a general trend, so it is not overfitted. Hence, the bias is lower than the OLS as well as the variance. The training and testing error should be appropriately low and should be similar since it does capture the general trend. Again, irreducible error is a constant regardless of model.
- Orange model - This model is very much similar to the black one except that this model fit a bit better to the data. That is, this model is more flexible than the sine curve. The bias is lower than the black one but the variance is higher because it sacrifice some variance reduction for lower bias. Training and

testing error should be slightly lower than the black model since this model is more accurate. Irreducible error is a constant.

- Purple model - This model is obviously overfitted. The bias for the training is really low because the model try to capture almost every data point. The variance is higher to reduce the bias. The training error will be really low because the model is almost perfectly fitted to the data. However, the testing error will likely be really high because the trend it captures is not the general trend but the specific trend to this particular training data. Irreducible error is a constant.