Homework 1: Model Building and Model Selection / Fitting

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1 DEVIANT AGGRESSIVE BEHAVIOR

In order to formulate social policy on any given theory, it's necessary to identify the relevant mechanisms operating within that theory, and then determine how social and political action can affect the mechanism within their respective constraints. Accordingly, I devote the first half of my response for each theory to identifying the mechanisms, and the second half to prescribing policy.

According to Theory I, deviant aggressive behavior is learned from experience. The mechanism proposed in the prompt is via reward pathways: learning to do those things for which they receive rewards and avoiding those for which they do not. This theory finds kinship with Classical (or Pavlovian) conditioning, where an affected stimulus is paired with a neutral stimulus, in order to elicit a response to the neutral behavior. The way in which this case differs is in characterizing deviant aggressive behavior as 'neutral', however, this doesn't functionally change the response.

Drawing from the psychology literature, one of the best proven ways to reverse the effects of Classical conditioning is via systematic desensitization. By producing an incompatible response to the conditioned stimulus, the reward pathways, and subsequent conditioning, are reversed. On a micro-scale, this takes the form of reducing the net reward incurred by performing the deviant behavior. Taking net reward to be the difference between reward and punishment, this can be operationalized on a large scale via two primary channels. Policymakers may either impose larger penalties for the behavior, such as larger criminal penalties, or reduce the perceived benefit accrued from the activity (for example, in the case of gang violence, making structural

interventions within gangs themselves by taking out key members, such that the organization is less lucrative to join).

According to Theory II, deviant behavior is a symbolic expression of hostility toward personal authority figures. In this case, the individual projects aggressive tendencies toward figures like parents or supervisors in the form of deviant aggressive behavior. The psychological anthropology literature suggests religious rite and ritual as a culturally-mediated mechanism to absorb symbolic expressions of hostility (Whiting, 1980).

In order to operationalize this in the form of social policy, it's necessary to look for politically expedient analogues to ritual acts of violence. For example, one of the modern Western examples of personally-meaningful ritual is routine physical exercise, specifically gym-going. Gym-going carries strong positive value to those who practice it (self-improvement) that is exogenous to the outcome of interest (reducing deviant behavior as a form of symbolic hostility). This makes messaging around gym-going easy to motivate. Therefore, a policy action could involve an advertising campaign for exercise, or providing a financial incentive for gym memberships.

According to Theory III, deviant behavior is the rational action of oppressed individuals. The mechanism here relies on existing laws that differentially discriminate between different groups of individuals in systematic ways. The have-nots within this framework are most likely to engage in deviant behavior. Notably, this theory doesn't imply an amplification of deviant behavior via collective action across these marginalized groups. Therefore, any policy will only treat the atomistic action of the individuals.

One real-world turn of events is striking to me here, and I would like to focus on it because of how timely it is and as a potent, though unconventional example of future policy direction. Feminist philosopher Miranda Fricker (2007) discusses the concept of epistemic injustice as unfairness related to knowledge. Many people unfairly characterize feminism as a "man-hating" movement, some characterizing it as deviant and aggressive. Conservative policymakers with this frame of mind would want to target policy to this end (although this would be a politically fraught decision).

However, metoo testimonials have blown open this paradigm and relegated those accusing feminists of "man-hating" to the margins of online discourse. By reclaiming the epistemes around sexual violence, women have been able to totally change the dialogue and policy around sexual violence and assault. Although the "deviant behavior" of feminists is a matter of perception, the policy implications are very real. Policymakers could provide a platform for the oppressed to express their truths, giving them the ability to be involved with public policy that can change the rules in place, in such a way that they too can be incentivized to conform to them.

Theory IV posits that deviant aggressive behavior is a social role, and individuals are socialized into it through contact with a deviant subculture. Subcultural theory in fact emerges from the Chicago School of Sociology, where Sutherland and Cressey (1934) argue that rationalizations for deviance are learned from friends and family in their differential association theory. This dovetails well with Theory I's classical conditioning story, since reward mechanisms are often

socially mediated as well.

However, since I already discussed structural edits to gangs in my policy response to Theory I, I'll focus on the family component of the mechanism in this policy response. Policymakers could address this by focusing on families as a unit of social influence. This may include targeting messaging around better parenting practices, or providing financial incentives for parents to remain involved in positive ways with their children (e.g., financial incentives to keep families together and avoid single-parent households).

2 WAITING UNTIL THE LAST MINUTE

People may wait until the last minute due to several reasons. Some people delay work due to anxiety, while others have turned it into an effective strategy, using the stress of the impending deadline as a slingshot to gather speed before submitting. In both cases, the operating mechanism is stress of varying magnitude, and the individualized response to that stress.

2.1 FAILURE OF SELF-REGULATION

In the most general terms, procrastination can be defined as a gap between what one intends to do and what one actually ends up doing. The underlying mechanism at play here is self-regulation, specifically emotional regulation. These emotions might be either endogenous or exogenous to the act of procrastination itself.

In the case that they are endogenous, the emotions have to do with the learned response to the stress of the task itself, or stressors that have become conditioned along with the task. In the case that they are exogenous, the emotions have to do with emotions that are not intertwined with the task (for example, grieving).

In both cases, they trigger or amplify the stress response by creating the foregoing gap.

2.2 PROCRASTINATING FOR EFFECTIVENESS

My alternative model regards effective procrastinators. I define effectiveness as the ratio of quality of work and time to completion. Under the effective procrastinator model, the procrastinators are operating within the same domain as those who are not able to properly self-regulate, in that they both use stress as the primary operating mechanism. However, effective procrastinators are able to mobilize that stress to minimize the amount of time spent working (the denominator in their effectiveness function).

2.3 Model Predictions

2.3.1 Model 1

Where self-regulation is the primary issue, I predict that we would observe differential procrastination behavior across different groups depending on their relationship with the task of emotional regulation. For example, those suffering from PTSD would be much more likely to procrastinate than those who do not, as they struggle greatly with emotional regulation.

I also predict that providing individualized accommodations would help reduce procrastination when the sources of anxiety are not endogenous to the task itself. For example, some procrastinators may suffer from homelessness or food insecurity, and accommodations providing help in these cases would lessen the emotional burden significantly for those individuals.

2.3.2 Model 2

Where efficacy is the primary issue, I predict that people would procrastinate more on easy tasks. If efficacy is defined as the ratio of quality and time to completion, then if completion time can be brought down without sacrificing quality, the task will be a more attractive for effective procrastination.

I also predict that interventions focused on future utility would be very effective under this model at reducing procrastination. For example, if people are assigned tasks that have no strict deadline, but instead a continuously and monotonically declining payoff function (for example, the total credit that can be achieved on an assignment is reduced by one point for every hour that passes after it is posted), they would benefit much less from procrastination.

3 Selecting and Fitting a Model

Flexible models are those which impose weaker assumptions about the world in which they take place. For example, neural nets would represent a flexible model, while OLS would be an inflexible model.

3.1 Large n, small p

In this case, flexible models are more effective, because they have access to large amounts of training data. Although the number of predictors is low, there may be several interaction terms that cannot be captured with the simplifying assumptions of an inflexible model.

3.2 Small n, large p

In this case, inflexible models are more effective, since flexible models would hone in on idiosyncrasies of the data and overfit. Inflexible models would be far more generalizable to different datasets.

3.3 Nonlinear relationship between predictors and response

Many inflexible models have strong linearity assumptions built-in, rendering them ineffective for this case. Therefore, a flexible model would perform better.

3.4 Variance of the error terms is very high

Where the error variance is high, flexible models will tend to treat noise as signal and fit to the data inaccurately. Therefore, inflexible models would generally do better (as long as variance in the errors is constant, since the problem of heteroskedasticity poses its own issues).

4 Bias-variance

4.1 Shape of Bias

As complexity increases, bias monotonically decreases. A complex model with many parameters will fit the data extremely well, and thereby reduce bias.

4.2 Shape of Variance

As complexity increases, variance monotonically increases. The idea here is that there is a higher potential for overfitting. A complex model captures some idiosyncrasies of the data, and variance increases as a result.

4.3 Shape of Training Error

As complexity increases, training error monotonically decreases. The idea here is that the model will have low error with regard to the data the model is trained on, and this will especially be so as the complexity increases and we again enter overfitting territory.

4.4 Shape of Test Error

As complexity increases, the test error has a u-shape: first falling, and then rising. The lowest point reflects the sweet spot of neither overfit nor underfit. The test error is affected by bias, variance, and the irreducible error. When complexity is high, the model is overfit and the test error is also high. when complexity is low, bias is low, and the model is a low accuracy predictor of the outcome of interest, and the test error is also high.

4.5 Shape of Irreducible Error

Irreducible error is constant with respect to model complexity. It's agnostic of any model we choose, since it represents the noise associated with the data itself.