

# Perspectives 2 - HW1

**Aabir Abubaker Kar**

**aabir@uchicago.edu**

## **Social policies to reduce deviant aggressive behavior**

Consider four well-known and widely believed theories of socially deviant aggressive behavior (e.g. criminal behavior, revolutionary behavior, rude behavior, etc.):

- Theory I: Deviant aggressive behavior is learned from experience. Individuals in a society learn to do those things for which they receive rewards and to avoid those things for which they receive punishment.
- Theory II: Deviant aggressive behavior is a symbolic expression of hostility toward personal authority figures. When an individual is frustrated in his personal life, he becomes angry toward parents, bosses, or public officials. He will express this anger by deviant aggressive behavior.
- Theory III: Deviant aggressive behavior is the rational action of oppressed individuals. Social rules systematically discriminate among people. People who are most hurt by the rules are least likely to profit from conforming to them and thus do conform less.
- Theory IV: Deviant aggressive behavior is a social role. Individuals are socialized into the role through contact with a deviant subculture.

What social policy might be appropriate to reduce deviant aggressive behavior if Theory I were correct? Theory II? Theory III? Theory IV? (500-800 words)

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Social policy is a complicated topic as it seeks identify and tweak factors that will influence society in a specific way. Identifying these factors and adjusting them is a challenging problem, given that society is a complex amalgamation of people's behaviors that are diverse, differently motivated, and non-trivial to explain or understand. With this caveat, I would suggest the following approaches to social policy intending to reduce deviant aggressive behavior (henceforth referred to as DAB).

In the case that Theory 1 is correct, DAB is learned behavior that individuals have most likely at some point been rewarded for rather than punished. This dissolves into the two notions of ill-begotten benefit, and that of actions without consequences, either or both of which could teach DAB. For instance, a criminal who steals would have likely started by stealing small items, benefiting from being able to use and own them, but also escaping detection and punishment. Under this theory, this person should ideally have been identified as a thief, had the stolen articles confiscated, and faced punishment for stealing - as soon as possible after their transgression. Social policy that seeks to address this should then ensure that the rewards from DAB are made less accessible (such as by not glorifying DAB, detecting and preventing DAB, and empowering the victims of the aggressors) and that DAB is actively punished (such as by socially sanctioning bullies and criminals, and dealing retributive justice to those who are guilty of it). This theory being true would imply that a system of heavy policing of DAB would be sufficient to eliminate it.

Theory 2 expresses the idea that individuals take motifs of their personal lives as a guide for how to behave in general. DAB is now a result of an individual taking out their frustration with personal authority figures on society at large. Within this paradigm, healthy interpersonal relationships would eliminate this frustration and thus the motivation for DAB. Social policy to address this would ideally facilitate a resolution of this personal conflict, especially within interpersonal relationships with authority figures. Improved access to personal and inter-personal counselling, mental health care, infusing authority with empathy and cultivating a culture of healthy coexistence. This would have to deal heavily with reforming the institutions of the family, employment, markets, and states. It would also have to cultivate healthier personal behavior, mindfulness and interpersonal communication.

Theory 3 introduces the bold idea that DAB is both, rational, and exhibited by oppressed individuals. It takes a systemic view of oppression, positing that those least favored by social rules and norms benefit by breaking them. Social policy designed to address this would have to aim for a more equitable society. Taken to its logical extreme, this theory states that in an equilibrium where all people are equally benefited by social rules and norms, there will be no crime as there will be no incentive to deviate. This implicitly requires a shifting of the rules and norms themselves. Theory 3 would therefore imply that a radical restructuring of society is required to reduce crime.

Theory 4 states that DAB is exhibited by certain subcultures that are in some sense sustaining their numbers by recruiting new individuals. It is thus a social role taken on by certain people. A policy to address this would require inhibition and perhaps elimination of these subcultures. This would require the identification of these subcultures (say, terrorist organizations), programs to rehabilitate their members, social sanctions on the groups, and even policing and retribution to mitigate their recruitment. This theory also has a policing-heavy policy implication. The idea that these groups are somehow resistant to rehabilitation (perhaps because of their indoctrination into radicalism) may lead this type of policy to explore the violent annihilation of these sub-cultures. Drone strikes on 'terrorists' in the Middle East are an example of this.

## The Theory of Procrastination

People often do things at the last minute (students turning in papers, professors grading exams, and so on).

- a. Ask yourself why the observation might be true and write down your explanations.
- b. Generalize the explanatory model – that is, induce the most general, abstract model you can produce that still has the original observation as a consequence.
- c. Induce an alternative model that also has the original observation as a consequence.
- d. For each of the two general models produced in (b) and (c), derive two interesting predictions (four predictions in total). Be sure the logical connection between your model and your predictions is explicitly stated and that any assumed facts concerning the world are made explicit.

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Successful procrastination involves the actual completion of the task in question, even if it is at slightly lower quality due to the distribution of time and effort spent on it being pushed up against the due date. I assume that non-completion of the task does not count as procrastination. I also assume no complications wherein deadlines can be renegotiated - as even renegotiated deadlines have to be met.

In simple terms, one would assume that procrastinators put things off simply because they can. They can afford to, either because the consequences are bearable, or because there will not be significant consequences. The idea of consequences being positive or negative implies that this can be modelled with some kind of payoff function.

In a reductionist sense, one can think of procrastination in terms of a task that has some **payoff**  $P$ , requires an investment of **hours**  $\hat{h}$  and **effort**  $\hat{e}$  to complete, and that has a **due date**  $t_d$  by which it must be completed. The carets imply that  $\hat{h}$  and  $\hat{e}$  are arrays of different values of hours and effort invested over the time leading up to  $t_d$ . I distinguish between hours (quantitative) and effort (qualitative) to account for the fact that the same amount of time spent doing something can have very different outcomes depending on some notion of effort actually invested during that time (ceteris paribus).

The task can also be done to a variable degree of **quality**  $q(\hat{t}, \hat{e}, \dots)$ , which (ceteris paribus) will likely be a function of distribution of the hours and effort invested in completing it. This could be a simple function of the sum total of hours and effort, or more complicated functions on the allocation of these resources over time.

The phenomenon can then be condensed to just 5 variables (two of which are distributed over a time axis). In particular, procrastination is the concentration of the largest values of  $\hat{h}$  and  $\hat{e}$  towards the end, close to  $t_d$ . Note that the payoff is expected to be a function of all positive or negative outcomes of the task, including mental stress, satisfaction, and economic, social, or any other benefit or cost.

Assuming that the task's payoff is dependent on the quality with which it is completed (with some positive correlation wherein lower quality implies a lower payoff), procrastination is likely the result of the equation of any marginal decrease in payoff with some incremental payoff from the leisure of not having to invest more sustained time and effort in the task.

Using this model, I will predict two specific cases of procrastinators that are commonly observed. The first is the 'effective procrastinator', who faces very little noticeable decrease in the quality of their work from procrastination. Often, this type procrastinates 'effectively' so habitually that they meet all or most deadlines, and still produce 'good enough' output (as usually judged by others, rather than oneself). In this situation, the payoff on the task is largely attached to the external validation of it, rather than the person's own investment in it. This is commonly observed in people who don't enjoy their jobs, while keeping them.

Another case is that of people who are motivated by stress, or even who do their best work under stress. In this situation, the payoff is likely inflated as the deadline approaches, and the incentive to invest time and effort in the task is low when there is plenty of time left, peaking rapidly as the deadline approaches. This situation is also likely in view of the considerable demands on the time and effort of certain groups, such as graduate students. There are simply limited resources to invest in a task, and it receives priority as its payoff swells close to a due date.

An alternate model that could explain procrastination is one of optimization. Making the bold assumption that a person's idealized state is one of work rather than leisure, a person would want to minimize the hours and effort that they spend working on any task they have taken on. Here we eliminate the need to think about the payoff of the task. The person simply needs to complete this task before a deadline. Consider  $\hat{h}$  and  $\hat{e}$ , arrays of the number of hours and amount of effort invested in the task successfully completed by the deadline.

Depending on a person's style of working, there are limited sets  $\hat{H}$  and  $\hat{E}$  of values of  $\hat{h}$  and  $\hat{e}$  for which they can complete the task.

For any task, individual, and set of circumstances, we construct a leisure function  $\mathcal{L}_T(\hat{h}, \hat{e})$ . This will likely be negatively correlated with hours and effort invested, and in the simplest form, could be a regression on  $\sum_{i=1}^n \hat{h}_i$  and  $\sum_{i=1}^n \hat{e}_i$ . The maxima of this function would have some solutions of  $\hat{h}, \hat{e}$ . Due to the negative correlation, the global maximum would be the trivial case of no effort and no time ever invested. However, we consider the maxima within the regions of  $\hat{H}$  and  $\hat{E}$ . Thus, procrastinators are those people who can complete tasks even by working at the last minute.

The possible natures of the leisure function  $\mathcal{L}_T$  have interesting consequences. Different people may value different distributions of leisure, explaining that some folks might not want to procrastinate at all. For instance, a person who thrives in a disciplined routine may prefer daily doses of leisure rather than valuing

the sum total. A procrastinator's  $\mathcal{L}$ , however, would more likely have aggregate measures on  $\hat{h}, \hat{e}$ .

The sets  $\hat{H}$  and  $\hat{E}$  also reflect different types of people. A regular worker may not be able to complete a task working at the last minute, and may have to exclude those distributions from the set over which to optimize  $\mathcal{L}_T$ . A procrastinator, on the other hand, would have access to 'procrastinate-able' solutions for maximum leisure while still completing the task.

## Model meta-hyperparameters

1. For each part, indicate whether we would generally expect the performance of a flexible statistical learning method to be better or worse than an inflexible method. Justify your answer.

Taking the examples of deep neural networks as a 'flexible' method and regressions as an 'inflexible' method, one would expect more complex problems (more outliers, more variance, more predictors, more uncertainty) to be better solved by deep learning, and more straightforward ones to be better solved by regression.

**a) The sample size  $n$  is extremely large, and the number of predictors  $p$  is small.**

⇒ **flexible > inflexible**, as there may be many complex patterns to account for from the small number of predictors. For example, in computer vision, image classification has finite numbers of predictors (the pixels in an image) but both a large sample size, and a large number of possible outputs.

**b) The number of predictors  $p$  is extremely large, and the number of observations  $n$  is small.**

⇒ **inflexible > flexible**, as with a large number of predictors, assuming a highly complex solution with a flexible model would likely lead to overfitting and non-generalizability. This is especially true if the number of observations is small. An example of this is an economic survey trying to predict household income from other demographic parameters.

**c) The relationship between the predictors and response is highly non-linear.**

⇒ **flexible > inflexible**, as inflexible methods often rely on assumptions of linearity. Flexible methods are able to account for the relation between  $\Delta x$  and  $\Delta y$  being highly non-linear in some cases.

**d) The variance of the error terms  $\sigma^2 = \text{Var}(\epsilon)$  is extremely high.**

⇒ **inflexible > flexible**, as a high variance implies a higher chance of over-fitting.

1. Bias-variance: Think about the graph including bias, variance, training error, test error, and irreducible error curves, moving from less flexible statistical learning methods towards more flexible approaches.
  - a) Explain why each of the five curves has the shape it has.

**bias** - bias is a measure of the accuracy of the model's assumptions. As an increasingly flexible model overfits, it gets more and more accurate, almost becoming tautological (the data teaches the model and the model represents the data) until saturation at minimum bias

**variance** - a simplistic model cannot account for much difference and will exhibit low variance. As it gets increasingly flexible, a model will overfit more and more, leading to highly specific predictions and a lack of generalizability. Minor fluctuations in training data now get amplified more than necessarily, gradually increase the variance of the predictions, even though the bias on the whole is low.

**training error** - the training error reduces rapidly as more complicated models fit the training data better and better, becoming flat and relatively constant the model cannot overfit any more

**test error** - the test error is usually positively correlated with the bias

**irreducible error** - the irreducible error comes from factors beyond the capacity of any model, and is therefore constant even as more flexible models are adopted