Problem Set 4 – Model Explanations

Econ 4310

Due: 11:59pm, 10/29/2025

Please turn in a single copy of the problem set on Canvas. Each of you must independently write your own solutions to the homework. You should feel free to discuss the questions with each other, with me, or with our graduate AIs. However, the work you produce must, in the end, represent your own thoughts and understanding of the problems. In particular, it would not be appropriate to study someone else's answer to a problem and reproduce it as your own.

1. **Heuristics.** Tom works at a mid-size company in the Bay Area. He's highly educated, with a background in engineering. Tom follows LinkedIn news closely, enjoys flexible work hours, coffee shops, and free snacks. Based on this, you might assume that Tom is a software engineer.

   (a) Why might the availability hueristic lead you to this conclusion?

   (b) Why might the representativeness heuristic lead you to this conclusion?

2. **Bayes Rule.** Suppose on a given Monday night one out of every 1000 drivers on I64 is legally drunk. The police have a field sobriety test which never fails to detect a truly drunk driver, but also falsely indicates drunkenness 5% of the time for sober drivers. Suppose a (uniformly) randomly chosen driver is stopped, the test is administered, and indicates drunkenness.

   (a) With what probability is the driver drunk? Show the calculation.

   (b) Compare your answer above with your conjecture about the typical response you may receive if you polled 100 random people with this question at your favorite coffee shop or library one day. Briefly explain any predicted discrepancy.

3. **Search and Satisficing.**
   Suppose a decision maker operates according to the model of search and satisficing we discussed in class. Let us assume that they view the distribution of alternatives' values as independent uniform draws on the interval $[0, 100]$. Suppose they have done some search already and the current best alternative is valued at $b = \$50$.

   (a) Calculate the expected marginal benefit of searching one more item.

   (b) If the search cost is $k = 20$, what is the optimal plan of action?

   (c) If the search cost is $k = 10$, what is the optimal plan of action?

4. **Rational Inattention.**

Suppose you have to decide whether to buy a car or not, so that your possible actions are buy or not buy, represented as:

$$A = \{B, N\}.$$

The car can be in either good or poor condition, so that the states of the world are

$$S = \{G, P\}.$$

Your utilities are given by:

$$U(B, G) = 10, \quad U(B, P) = 0, \quad U(N, G) = 6, \quad U(N, P) = 6.$$

Thus, if you don't buy, you receive a certain utility of 6, whereas if you buy, you are better off in the Good state than the Poor state.

(a) If your prior belief is that $\Pr(G) = \Pr(P) = 0.5$, what is your optimal action based on this belief? Why?

Now suppose you can view the outcome of a signal that is imperfectly informative about the true state, with potential outcomes g and p, and a conditional distribution given by $\Pr(g|G) = \Pr(p|P) = 0.8$.

(b) What is your optimal action if you see signal p? Why?

(c) What is your optimal action if you see signal g? Why?

(d) What is your ex ante expected utility if you know you have access to the signal?

(e) If you can choose between (i) having no information beyond your prior, and (ii) having the signal above, what is the most you should be willing to pay for the signal?

5. **Rational Inattention II.**

Suppose I surprise you with a final exam that contains two True/False questions. I inform you, truthfully, that there is a 90% chance that the correct answers to the two questions are the same (either both True or both False), and a 10% chance that they are different. The first question is relatively easy, while the second question is quite difficult. Both questions count equally towards your grade. Imagine that as you work on a question, you spend time, and your probability of answering it correctly increases. The relatively easier question has the property that if you spend equal amounts of time on the two questions, your probability of answering the first question correctly would be higher.

(a) Is the marginal benefit of answering the first question correctly greater than, less than, or equal to the marginal benefit of answering the second question correctly? Why?

(b) Is the marginal cost of answering the first question correctly greater than, less than, or equal to the marginal benefit of answering the second question correctly? Why?

(c) If you are time-constrained (i.e., with insufficient time to confidently answer either question correctly), to which question should you devote more time? Why? Base your answer on your conclusions from parts (a) and (b).

(d) Suppose that you wind up devoting all of your time during the exam to working on the first question (even if that was not optimal), and are 80% sure that the correct answer is False. After answering the first question, you have only enough time to guess an answer to the second question. What answer should you provide (this is obvious) and how confident are you that your answer to the second question is correct (this requires a calculation)?

6. **Rational Inattention - Class Data.**

(a) As discussed in class, the treatment in which states are correlated, and no feedback is given between periods (NC; labeled as Treatment 4 in the data), has the prediction from the Rational Inattention model that accuracy should be higher in the first period (t=1) compared to the first period from the other treatments. If time spent is a good proxy for how much information is gathered, it should also be that the time spent in the first period of Treatment "No Feedback, Correlated" is longer than the time spent in the first period of the other three treatments. Is this true in the data?

(b) Separate the data (from both periods in all four treatments) into correct responses (where the chosen color matches the true state) and incorrect responses. Calculate the average time spent in the two cases. What are they? Is it true that correct responses took longer on average than incorrect ones?