

ECE531 Homework Assignment Number 2

Due by 8:50pm on Thursday 05-Feb-2009

Make sure your reasoning and work are clear to receive full credit for each problem.

1. 3 points. A city has two taxi companies distinguished by the color of their taxis: 85% of the taxis are Yellow and the rest are Blue. A taxi was involved in a hit and run accident and was witnessed by Mr. Green. Unfortunately, Mr. Green is mildly color blind and can only correctly identify the color 80% of the time. In the trial, Mr. Green testified that the color of the taxi was blue. Should you trust him?
2. 8 points total. Consider the coin flipping problem where you have an unknown coin, either fair (HT) or double headed (HH), and you observe the outcome of n flips of this coin. Assume a uniform cost assignment. For notational consistency, let the state and hypothesis x_0 and \mathcal{H}_0 be the case when the coin is HT and x_1 and \mathcal{H}_1 be the case when the coin is HH.
 - (a) 3 points. Plot the conditional risk vectors (CRVs) of the deterministic decision rules for the cases of $n = 1, 2, 3, 4, \dots$ coin flips. You might want to write a Matlab script to do this for $n > 2$.
 - (b) 2 points. What can you say about the convex hull of the deterministic CRVs as n increases?
 - (c) 3 points. When $n = 2$, find the deterministic decision rule(s) that minimize the Bayes risk for the prior $\pi_0 = 0.6$ and $\pi_1 = 0.4$. Repeat this for the case when $n = 3$. Does the additional observation reduce the Bayes risk for this prior?
3. 3 points. Poor textbook Chapter II, Problem 2 (a).
4. 3 points. Poor textbook Chapter II, Problem 4 (a).
5. 3 points. Poor textbook Chapter II, Problem 6 (a).