

ECE 561: Detection and Estimation Theory
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- 1)
Consider the 5-ary hypothesis testing problem in which the hypotheses are given by $H_j : Y = (j - 2) + X$, $j = 0, \dots, 5$, where X is a standard Gaussian random variable. Assume that all hypotheses are equally likely.
 - a) Find the decision rule with minimum probability of error (Bayes decision rule with uniform priors).
 - b) Find the corresponding minimum Bayes risk.
- 2)
Consider the Bayesian hypothesis testing problem where the prior probability π_0 has not yet been estimated correctly, and has some randomness left in it. Furthermore, assume that the estimation procedure for π_0 was such that it resulted in a random variable that is independent on the random observation Y and the hypothesis. Suppose that the mean of π_0 lies in the interval $(0, 1)$. Consider the problem of minimizing the average risk

$$E_{\pi_0} [\pi_0 \mathcal{R}_0(\delta) + (1 - \pi_0) \mathcal{R}_1(\delta)].$$

Find a decision rule that minimizes the risk above.

- 3)

Textbook, problem 3.12
- 4)

Textbook, problem 3.13
- 5)

Textbook, problem 3.14