

Homework 6

Due September 19, at class

Suppose that we have two competing probability models for a scalar observation:

$$H_0 : p_0(x) = \frac{1}{\sqrt{2}} e^{-\sqrt{2}|x|}$$
$$H_1 : p_1(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2}$$

- a. Show that the two models have the same mean and variance, and plot the density functions.
- b. Find the likelihood ratio.
- c. Compute the decision regions for the various values of the threshold in the likelihood ratio test.
- d. Design a Bayes detector with $p_0 = p_1 = 1/2$, $c_{0,0} = c_{1,1} = 0$ and $c_{1,0} = c_{0,1} = 1$ (this gives a threshold $\eta = 1$). Compute the Bayes cost of the resulting decision rule. (You can use the Matlab function `erf` to numerically compute the integrals over the Gaussian density.)