

ECE 532 Homework 4

Due Thursday February 10 at the beginning of class

Consider a classification problem involving a single (scalar) feature x with class-conditional densities:

$$\begin{aligned} p(x|Y = 0) &= \frac{1}{\sqrt{2}} e^{-\sqrt{2}|x|} \\ p(x|Y = 1) &= \frac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}x^2} \end{aligned}$$

- a. Show that the two densities have the same mean and variance, and plot the density functions.
- b. Find the likelihood ratio.
- c. Design a Bayes-optimal classifier 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 compute the integrals over the Gaussian density.)