Practice Problems 3

Machine Learning

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1. Consider the following two-class classification problem, C_1 and C_2. The probability that an observation $x \in [0, 2]$ is generated by each of the classes is given by the following probability density functions:$p(x|C_1) = \frac{2-x}{2}$ and $p(x|C_2) = \frac{1}{2}$. In addition, the a priori probabilities of the classes are: $P(C_1) = \frac{3}{4}$ and $P(C_2) = \frac{1}{4}$.

   (a) Which values of x should be classified in C_1 and which values in C_2?

   (b) Suppose now that there is a cost λ_{ij} associated with classifying an example x from class C_j into class C_i. Suppose further that $\lambda_{11} = \lambda_{22} = 0$. What values would you give to λ_{12} and λ_{21} such that the classification intervals of x for C_1 and C_2 were $[0, 1]$ and $[1, 2]$ respectively?