Machine Learning 1 - Practice Problems 3

Universidad de La Sabana
Santiago Toledo-Cortés
Facultad de Ingeniería 2025-2

1. Two-Class Classification Problem

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:

$$p(x|C_1) = \frac{2 - x}{2}$$
$$p(x|C_2) = \frac{1}{2}.$$

Additionally, the a priori probabilities of the classes are:

$$P(C_1) = \frac{3}{4},$$
$$P(C_2) = \frac{1}{4}.$$

(a) Classification of x

Which values of x should be classified into C_1 and which into C_2?

(b) Cost-Based Classification

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 assign 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?