

Consider problem of classification into three classes and a 2D space of signs $\mathbf{x} = [x_1, x_2]^\top$. For each class we have following data (transposition will be left out for simplified notation, but all vectors are implicitly in columns).

A: $\mathcal{T} = \begin{bmatrix} -1 & 3.5 \\ 0 & 2.0 \end{bmatrix}$

B: $\mathcal{T} = \begin{bmatrix} 4 & 0.5 \\ 5 & -1.0 \end{bmatrix}$

C: $\mathcal{T} = \begin{bmatrix} 6 & -0.5 \\ 7 & -1.0 \end{bmatrix}$

Find parameters of discrimination function so that

$$s^* = \arg \max_{s \in S} f_s(\mathbf{x}) \quad (1)$$

will classify these data without mistakes. Discrimination function is linear (affine), in form of

$$f_s(\mathbf{x}) = \mathbf{w}_s^\top \mathbf{x} + w_{s0} \quad (2)$$

For every class, we are trying to find three numbers. For completeness we point out, that valid result is not a drawing lines into graph, but finding three numbers for each of these classes.