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In Class Problem 11

IE 7374: Machine Learning

Prove that we can calculate $b^* = \frac{1}{2}[min_{1:y_i=1} w^{*T} x_i - max_{1:y_i=-1} w^{*T} x_i]$

Answer to Question

The decision boundary for SVM is,

$$y_i(w^{*T} x_i + b) = \pm 1$$

To solving those parameters, w^*, b on decision boundary, it can be regarded as those problems below

$$min_{1:y_i=1}(w^{*T x_i} + b) = 1 \tag{1}$$

$$max_{1:y_i=-1}(w^{*T x_i} + b) = -1 \tag{2}$$

Add (1) and (2), solve b, we can get b^*

$$b^* = -\frac{min_{1:y_i=1}(w^{*T x_i} + b) + max_{1:y_i=-1}(w^{*T x_i} + b)}{2}$$