Homework 9

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Part II: Programming and Questions

11. (a)

Answer:

$$w_0 = 0.46118099$$
$$w = \begin{bmatrix} 1.42189318 \\ -1.58830104 \end{bmatrix}$$

11. (b)

Answer:

points which are closest to the decision boundary: $[2.11457352, 1.5537852]$, $[2.51879639, 1.91565724]$, $[1.71138733, 2.45204836]$.

11. (c)

Answer:

the decision function is:

$$f_{primal}(x) = w * x - w_0$$

Which w and w_0 has been mentioned in 11. (a)

11. (d)

Answer:

predict result of $(3.0, 1.5)^T$: 1.0
predict result of $(1.2, 3.0)^T$: -1.0

11. (e)

Answer:

support vectors: $[2.11457352, 1.5537852]$, $[2.51879639, 1.91565724]$, $[1.71138733, 2.45204836]$.
corresponding α: $[1.02105592, 1.2511842, 2.2722402]$

11. (f)

Answer:

$$f_{\texttt{dual}}(\mathbf{x}) = \left(\sum_{i \in I} \alpha^{(i)} y^{(i)} K(\mathbf{x}^{(i)}, \mathbf{x}) \right) + w_0, \ \textit{where } I = \{i \mid \alpha^{(i)} \neq 0\}$$

which $w_0 = 0.46118098$

11. (g)

Answer:

predict result of $(3.0, 1.5)^T$: 1.0

predict result of $(1.2, 3.0)^T$: -1.0