

Course > Week 6... > Compr... > Quiz 6

Quiz 6

Problem 1

1/1 point (graded)

You are given a binary 4-dimensional linear decision boundary with coefficient vector ${f w}=[2,1,4,3]$ and b=-12. How would you classify the point (2,1,1,2)?









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Problem 2

1/1 point (graded)

In which of the following situations has our linear classifier correctly labeled a data point? Select all that apply.

$$ule{\mathbf{w}} \cdot \mathbf{x} + b > 0$$
 and $y > 0$

$$\mathbf{y}\left(\mathbf{w}\cdot\mathbf{x}+b\right)>0$$

$$ightharpoonup \mathbf{w} \cdot \mathbf{x} + b < 0$$
 and $y < 0$



Problem 3

1/1 point (graded)

Let's say that we have a linear classifier given by $\mathbf{w} = [1, 1, -3, 0]$ and b = -2. Our loss function measures the amount by which our prediction is incorrect: $loss = -y(\mathbf{w} \cdot \mathbf{x} + b)$. If our prediction is correct, there is no loss.

What is the loss on the data point (\mathbf{x},y) where $\mathbf{x}=(3,1,1,4)$ and y=1?







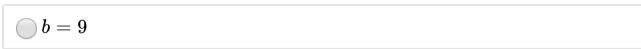
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Problem 4

1/1 point (graded)

If the Perceptron algorithm does 9 updates before converging on a solution, what value of b can you expect to have?



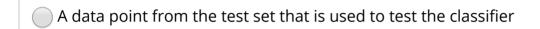
$$\bigcirc b = -9$$

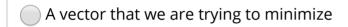
$$b \in [-9,9]$$
 Generating Speech Output

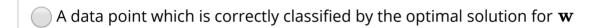
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$\bigcirc b$	\in	[0,	9]
~			

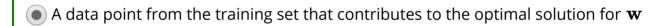
Problem 5

1/1 point (graded)
What is a support vector?









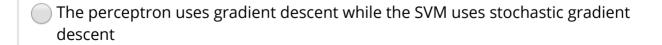


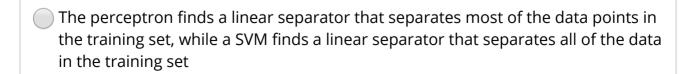
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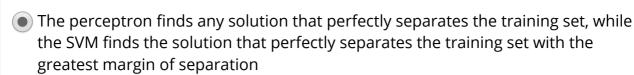
Problem 6

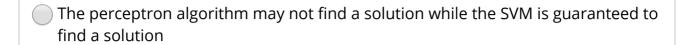
1/1 point (graded)

What is the difference between the perceptron algorithm and the support vector machine?











Problem 7

1/1 point (graded)

The optimal solution for a SVM is given by the coefficient vector \mathbf{w} and the constant b. The width of the margin is given by γ . What is the value of γ ?

$$left \gamma = rac{1}{||\mathbf{w}||}$$

$$\bigcirc \, \gamma = rac{1}{||\mathbf{w}||}$$

$$\bigcirc \gamma = ||\mathbf{w}||$$

$$\bigcirc \gamma = b - rac{1}{||\mathbf{w}||}$$



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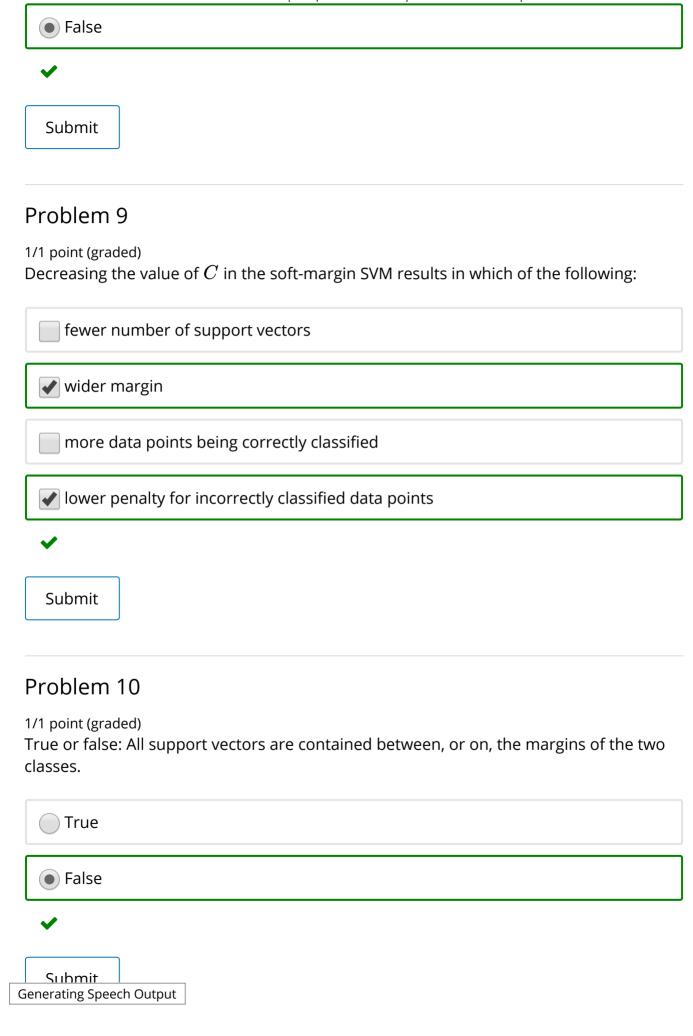
Problem 8

1/1 point (graded)

True or false: A soft-margin SVM has fewer support vectors than a hard-margin SVM.



) True



Problem 11

1/1 point (graded)

What does the slack variable represent?

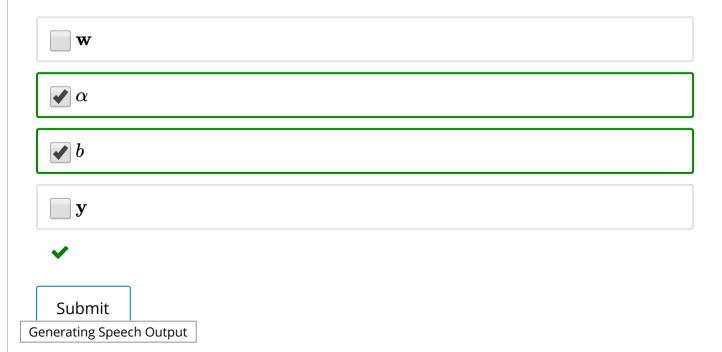
$lacktriangle$ It is a vector containing the amount of error each point $(x^{(i)},y^{(i)})$ contributes to the optimization problem
It is a coefficient that we must determine to optimize the problem
$igcup$ It is a vector containing the number of times each w_i is updated
it is a value that determines how much error the optimization problem is allowed to have
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Problem 12

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1/1 point (graded)

Using the dual form of the perceptron algorithm, which of the following values are updated during each pass over the training set?



Problem 13

1/1 point (graded)

When optimizing the dual form of the hard-margin SVM, when are the values $lpha_i$ non-zero?

- When the data point $(x^{(i)},y^{(i)})$ is on the linear separator between the two classes
- lacksquare When the data point $(x^{(i)},y^{(i)})$ is right on the margin for its class
- igcup When the data point $(x^{(i)},y^{(i)})$ is in the interior of the region for its class
- igcup When the data point $(x^{(i)},y^{(i)})$ is on the wrong side of the linear separator



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Problem 14

1/1 point (graded)

When using multiclass logistic regression on data with labels, $Y=\{1,2,\ldots,k\}$, and a linear classifier specified by $\mathbf{w}_1,\mathbf{w}_2,\ldots,\mathbf{w}_k\in\mathbb{R}^d$ and $b_1,b_2,\ldots,b_k\in\mathbb{R}$, and given a point (\mathbf{x},y) , what is the probability that y=j, where $0< j\leq k$?

$$\bigcirc Pr\left(y=j|\mathbf{x}
ight)=e^{\mathbf{w}_{j}\cdot\mathbf{x}+b_{j}}$$

$$igcup_{pr} \left(y = j | \mathbf{x}
ight) = rac{e^{\mathbf{w}_{j} \cdot \mathbf{x} + b_{j}}}{e^{\mathbf{w}_{k} \cdot \mathbf{x} + b_{k}}}$$

$$lackbox{lachbox{lackbox{$$

$$igcup_{ij} Pr(y=j|\mathbf{x}) = rac{e^{\mathbf{w}_j \cdot \mathbf{x} + b_j}}{1 + e^{\mathbf{w}_j \cdot \mathbf{x} + b_j}}$$

Problem 15

1/1 point (graded)

What does ξ_i represent in the soft-margin SVM?

igcup It is the number of times the i'th point was updated

lacksquare It is the amount of slack the i'th point has

 \bigcirc It represents the i'th support vector

lt represents the width of the margin



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