3. Linear Classifiers Mathematically Revisited
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Inner product and Orthogonal vectors

1/1 point (graded)
What is the inner product of $\left[0,1,1\right]$ and $\left[1,1,1\right]$?

2 ✔ **Answer:** 2

Solution:

$0 \cdot 1 + 1 \cdot 1 + 1 \cdot 1 = 2$

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Linear Classifier Practice

1/1 point (graded)
We saw in the lecture above that for a linear classifier h, $h\left(x;\theta\right) = sign\left(\theta \cdot x\right)$, i.e. the sign of the dot product of θ and x. Now consider θ which is given by

$$\theta = (1, -1) \tag{3.1}$$

Which of the following points would be classified as positive by θ? Please choose all correct answers.

- [x] $(1, -1)$
- [x] $(1, 0)$
- [ ] $(0, 1)$
- [ ] $(0, 0)$

✔

Solution:

X is positively classified by the classifier if and only if $x \cdot \theta > 0$. The dot product of $(1, -1)$ with θ is positive. Also, $(1, 0) \cdot \theta$ is positive. On the other hand, $(0, 1) \cdot \theta$ and $(0, 0) \cdot \theta$ are nonpositive. Thus the first and second points are positively classified by θ.

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Offset Added

1/1 point (graded)

Again, we have a linear classifier with θ given by

$$\theta = (1, -1) \tag{3.2}$$

and the offset, θ_0 given by $\theta_0 = -1$ Now which of the following points would be classified as positive by θ? Please choose all correct answers.

- [x] $(1, -1)$
- [ ] $(1, 0)$
- [ ] $(0, 1)$
- [ ] $(0, 0)$

✔

Solution:

X is positively classified by the classifier if and only if $x \cdot \theta + \theta_0 > 0$. The dot product of $(1, -1)$ with θ is 2, and adding -1 makes it still positive. However, $x \cdot \theta + \theta_0 \leq 0$ for other data points.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

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? why theta is orthogonal to the decision boundary? 4

Sorry if you are dissapointed, but I do not understand why theta is orthogonal to the decision...

Suggestion 3

It would be more didactic if drawings of both cenarios (Linear Classifier Practice and Offset A...

☑	Linear classifier X is positively classified, if x.theta > 0 and negatively classified, if x.theta < 0. What about, if x.t...	5
?	Degree of freedom What does the author mean by degree of freedom here?	2
💬	Confusion at 12.40 regarding θ_0	2
💬	Can Anyone explains this with a numerical example? > There are multiple parameter vectors theta that defined exactly the same classifier. Each lin...	4
☑	Exchange label values In the lecture, we assume that all points that (after the seperation) above the line have a labe...	3
?	about the norm of the theta vector	2

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