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Course > Unit 1 Linear Classifiers and Generalizations (2 weeks) > Lecture 2. Linear Classifier and Perceptron > 3. Linear Classifiers Mathematically Revisited
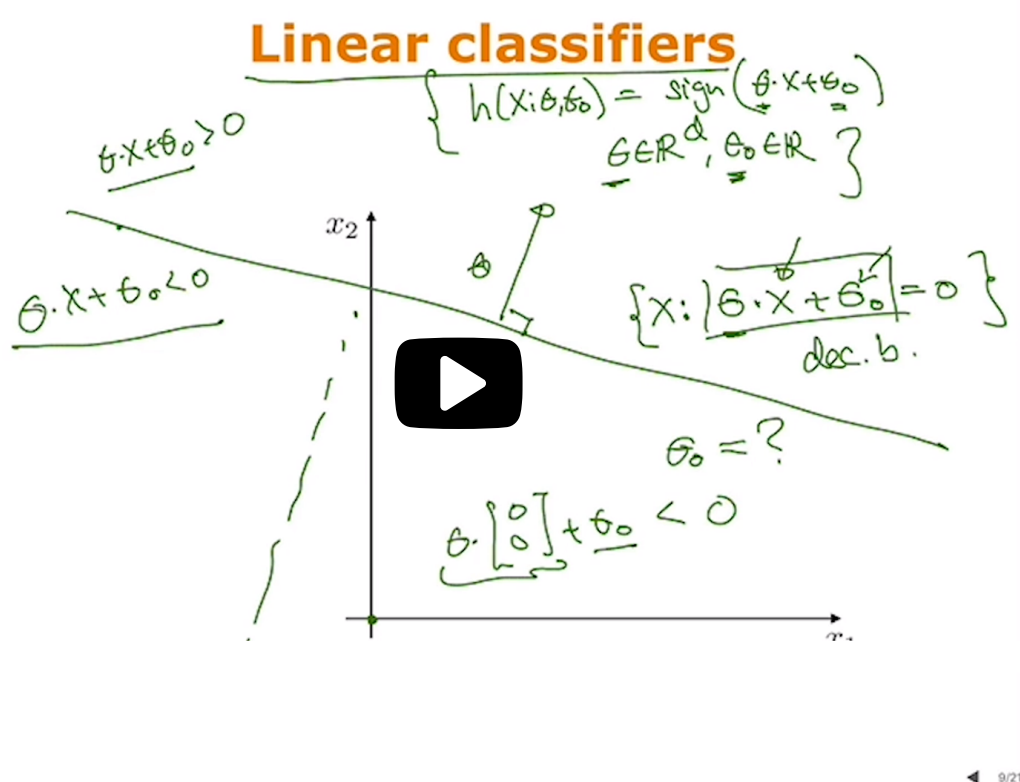
3. Linear Classifiers Mathematically Revisited
Linear Classifiers Mathematically Revisited

lies on the negative side.

So this has to be negative, which implies,

since this is now 0, that theta 0 itself is negative.

If we move this boundary in this direction past the origin,

theta 0 would become positive.

That is the set of linear classifiers through origin

earlier and now the full set of linear classifiers.

13:38 / 13:38   ▶ 1.25x   🔊   ✕   CC   ❝   End of transcript. Skip to the start.

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Inner product and Orthogonal vectors

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

| 2 | ✔ **Answer:** 2

Solution:

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

Submit   You have used 1 of 3 attempts

ℹ   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, $h(x; \theta) = sign(\theta \cdot x)$, 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.

- ☑ $(1, -1)$ ✔
- ☑ $(1, 0)$ ✔
- ☐ $(0, 1)$
- ☐ $(0, 0)$

✔

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.

- ☑ $(1, -1)$ ✔
- ☐ $(1, 0)$
- ☐ $(0, 1)$
- ☐ $(0, 0)$

✔

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.

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ℹ Answers are displayed within the problem

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/ 3. Linear Classifiers Mathematically Revisited