4. Linear Separation

Bookmark this page

Exercises due Sep 23, 2020 05:29 IST *Completed*

Linear Separation

Start of transcript. Skip to the end.

Let's understand through examples

how constrained a set of linear classifiers really is.

So if we take a set of examples, the training

set, and ask whether it's separable,

whether there exists a linear classifier that correctly

classifies all the training examples.

Video
Download video file

Transcripts
Download SubRip (.srt) file
Download Text (.txt) file

Given θ and θ_0, a **linear classifier** $h : X \to \{-1, 0, +1\}$ is a function that outputs $+1$ if $\theta \cdot x + \theta_0$ is positive, 0 if it is zero, and -1 if it is negative. In other words, $h(x) = \text{sign}(\theta \cdot x + \theta_0)$.

Basics 1

1/1 point (graded)

As described in the lecture above, h is a linear classifier which is defined by the boundary $\theta \cdot x = 0$ (where theta is a vector perpendicular to the plane.) The ith training data is $(x^{(i)}, y^{(i)})$, where $x^{(i)}$ is a vector and $y^{(i)}$ is a scalar quantity. If θ is a vector of the same dimension as $x^{(i)}$, what are $y^{(i)}$ and sign($\theta \cdot x^{(i)}$) respectively?

- ◯ output of the classifier h, label
- ◯ label, dimension of the feature vector
- ◯ label, distance of the point from the linear classifier
- ◉ label, output of the classifier h

✔

Submit You have used 1 of 2 attempts

Basics 2

1/1 point (graded)

For the ith training data (x^i, y^i), what values can $y^{(i)}$ take, **conventionally** (in the context of linear classifiers)?

Choose all those apply.

- [x] -1
- [x] $+1$
- [ ] 0
- [ ] $+10$

✔

Submit You have used 1 of 3 attempts

Basics 3

1/1 point (graded)

For the ith training data (x^i, y^i), what values can $sign\left(\theta \cdot x^{(i)}\right)$ take? Choose all those apply.

- [x] -1
- [x] $+1$
- [x] 0
- [ ] $+10$

✔

Submit You have used 1 of 3 attempts

When the Product is Positive

1/1 point (graded)

When does $y^{(i)}\left(\theta \cdot x^{(i)}\right) > 0$ happen? Choose all those apply.

- [x] $y^{(i)} > 0$ and $\theta \cdot x^{(i)} > 0$
- [ ] $y^{(i)} < 0$ and $\theta \cdot x^{(i)} > 0$
- [ ] $y^{(i)} > 0$ and $\theta \cdot x^{(i)} < 0$
- [x] $y^{(i)} < 0$ and $\theta \cdot x^{(i)} < 0$

✔

Submit You have used 1 of 3 attempts

Intuitive Meanings of Positive Product

1/1 point (graded)

1/1 point (graded)

What is the intuitive meaning of $y^{(i)}\left(\theta \cdot x^{(i)}\right) > 0$?

- (●) x^i label and classified result match
- ( ) x^i label and classified result do not match
- ( ) x^i is on the boundary of the classifier
- ( ) training error is positive

✔

Submit You have used 1 of 2 attempts

Intuitive Meanings of Negative Product

0/1 point (graded)

What is the intuitive meaning of $y^{(i)}\left(\theta \cdot x^{(i)}\right) < 0$?

- (●) x^i label and classified result match
- ( ) x^i label and classified result do not match
- ( ) x^i is on the boundary of the classifier
- ( ) training error is negative

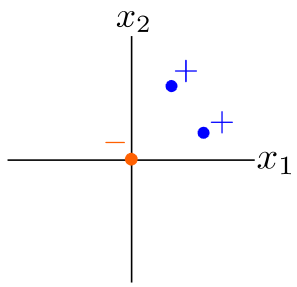
✖

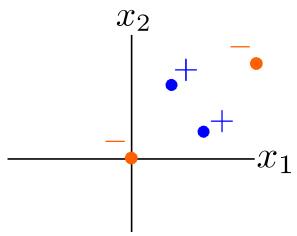
Submit You have used 1 of 1 attempt

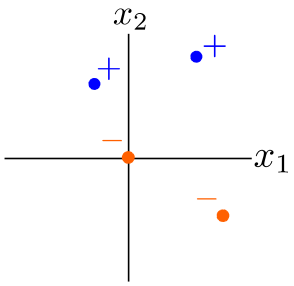
Linear Separation 1

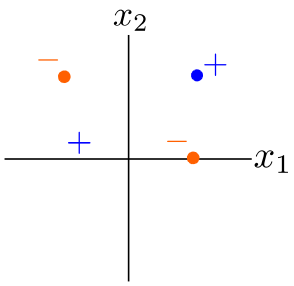
1/1 point (graded)

Of the following, which is linearly separable? Choose all those apply.

- [x] 

- [ ] 





Submit You have used 2 of 2 attempts

Linear Separation 2

1/1 point (graded)

A set of Training examples is illustrated in the table below, with the classified result by some linear classifier h and the label y^i. Is it linearly separable?

	$h(x^i)$	y^i
example 1	-1	-1
example 2	1	1
example 3	1	1
example 4	-1	-1
example 5	-1	-1

- (•) yes
- ( ) no

Submit You have used 1 of 1 attempt