2. Review of Basic Concepts
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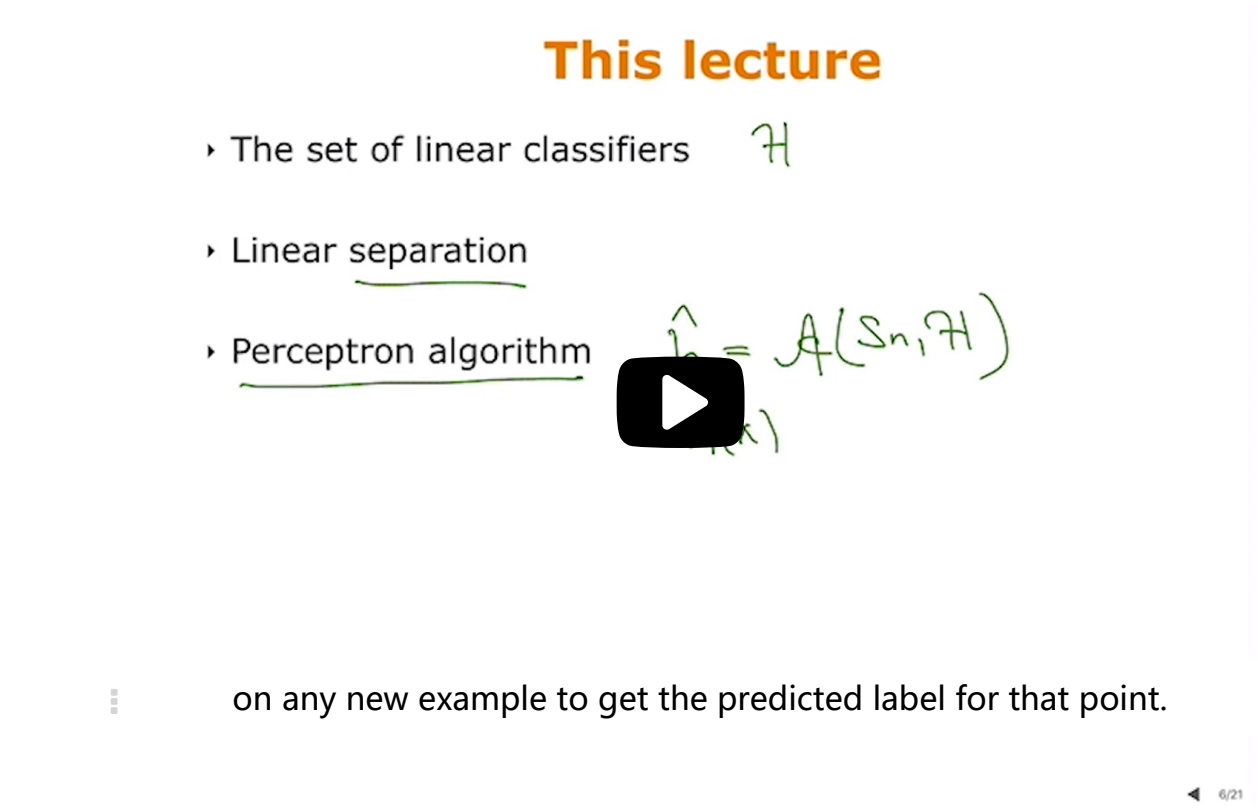

So perceptron algorithm finds a classifier h hat,

where hat denotes an estimate from the data.

It's an algorithm that takes, as an input, the training

set and the set of classifiers and then returns

that estimated classifier, OK?

And then we can apply that estimated classifier

on any new example to get the predicted label for that point.

10:44 / 10:44 1.25x

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$[\![A]\!]$ either takes value 1 or 0 depending on whether A is True or False. For example, $[\![1 = 3]\!] = 0$, $[\![1 = 1]\!] = 1$, and $[\![1 \neq 3]\!] = 1$

Concept Review Problem: car accident prediction 1

1/1 point (graded)
In this problem, we will put ourselves in the shoes of a car insurance company. Our goal is to find out whether customers were involved in an accident on July 4th, 1998.

For 8 customers, we know the following information:

1. number of accidents the customer made in the past.
2. number of miles the customer has driven.
3. the customer's age

Also, for 5 of the customers, we know whether each of them was involved in an accident on July 4th, 1998.

If we want to learn a model in a supervised way, what is n, the number of training examples?

$n =$ 5 ✔ **Answer:** 5

Solution:

We have 5 data points with known labels.

Submit | You have used 2 of 3 attempts

Answers are displayed within the problem

Concept Review Problem: car accident prediction 2

1/1 point (graded)
The insurance company recorded relevant information for all 8 customers, as illustrated in the table below.

	number of past accidents	miles customer drove so far	customer's age
customer 1	0	2710.9	21
customer 2	2	13209.2	40
customer 3	1	89001.4	32
customer 4	3	12381.1	18
customer 5	0	1893.5	24
customer 6	2	32493.5	24
customer 7	1	5443.5	30
customer 8	0	4493.5	28

What is the dimension of each feature vector?

$d =$ 3 ✔ **Answer:** 3

Solution:

Each feature vector has length 3 (columns in the table), and thus its dimension is 3.

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Answers are displayed within the problem

Concept Review Problem: car accident prediction 3

1/1 point (graded)
How many feature vectors are there in the above table?

$\text{Number of Feature vectors}$ 8 ✔ **Answer:** 8

Solution:

There are 8 rows in the table.

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Answers are displayed within the problem

Concept Review Problem: Classifier and Training Error 1

1/1 point (graded)
Assume we have training data and a classifier like the following: (where $h\left(x\right)$ denotes the value outputted by the classifier with the data point as input)

	$h(x)$	y
data 1	1	1
data 2	-1	1
data 3	1	1
data 4	1	-1
data 5	-1	-1

What is the training error?

$\varepsilon_n(h) =$ 0.4 ✔ **Answer:** 0.4

Solution:

We have 5 data points total, two of which $h(x)$ does not match y (data2 and data4). Thus $\varepsilon_n(h) = \frac{1}{5}\sum_{i=1}^{5}\left[\left[h(x_i) \neq y\right]\right] = \frac{2}{5}$

Submit You have used 2 of 3 attempts

Answers are displayed within the problem

Concept Review Problem: Classifier and Training Error 2

1/1 point (graded)
Now let's examine the training error $\varepsilon_n(h)$ in a general sense. $\varepsilon_n(h)$ is a function of: (choose all those apply)

- ☑ n, the number of training data ✔
- ☑ h, the classifier ✔
- ☐ the number of test data

✔

Solution:

By definition, $\varepsilon_n(h) = \frac{1}{n}\sum_{i=1}^{n}\left[\left[h(x^i) \neq y^i\right]\right]$. Because x, y(training set) is given, $\varepsilon_n(h)$ depends on n and h. It does no thave any term related to the test data.

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Answers are displayed within the problem

Discussion

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Topic: Unit 1 Linear Classifiers and Generalizations (2 weeks):Lecture 2. Linear Classifier and Perceptron / 2. Review of Basic Concepts