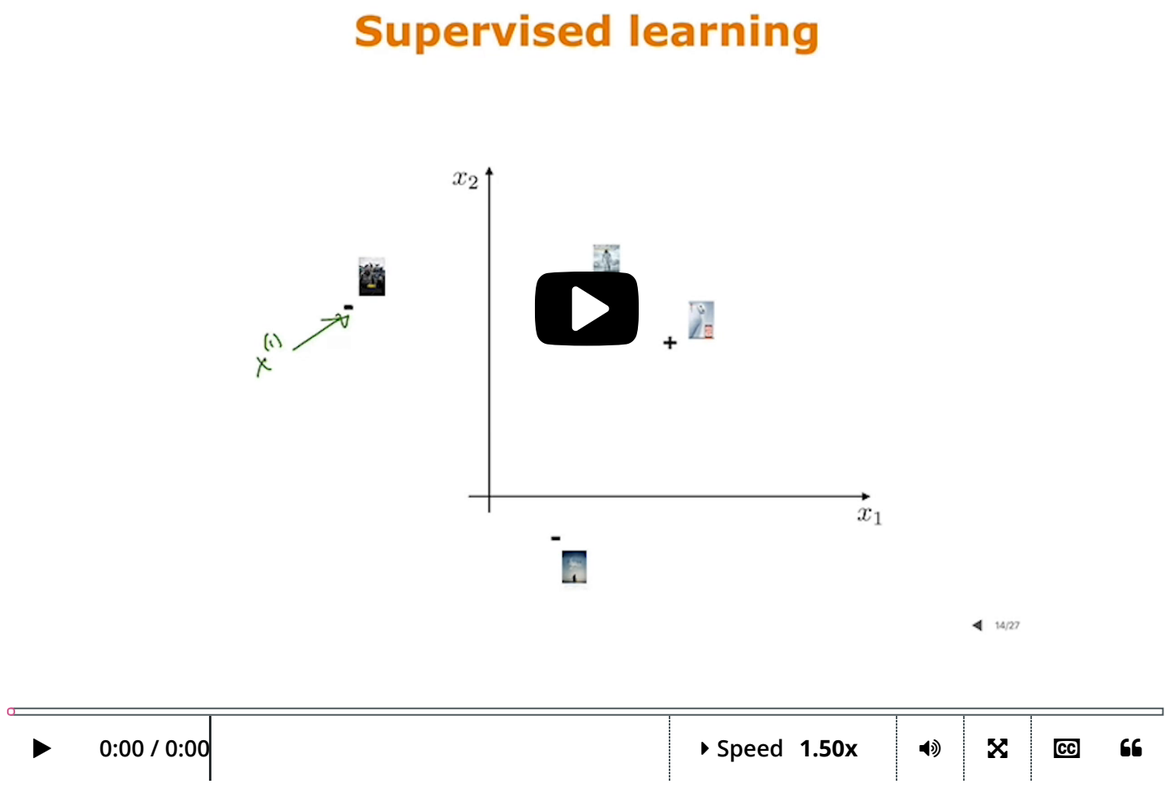
6. Introduction to Classifiers: Let's bring in some geometry!
Introduction to Linear Classifiers



Start of transcript. Skip to the end.

Now let's look at this a little bit more geometrically.

Those examples.

x here.

I have x1 represented as a point in space.

It's vector has a representation as a point in space

and I can now place all the four training examples

as points in this space.

Just to facilitate the illustration here,

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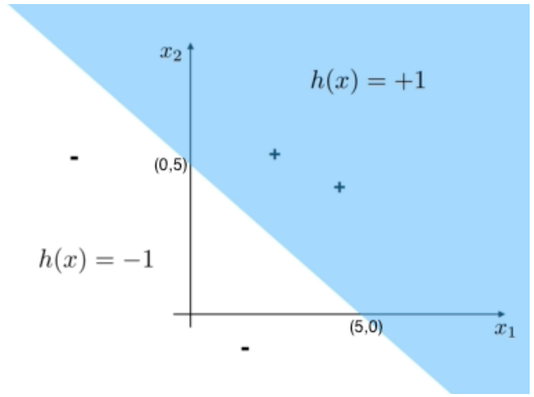
Training data can be graphically depicted on a (hyper)plane. **Classifiers** are **mappings** that take **feature vectors as input** and produce **labels as output**. A common kind of classifier is the **linear classifier**, which linearly divides space(the (hyper)plane where training data lies) into two. Given a point x in the space, the classifier h outputs $h(x) = 1$ or $h(x) = -1$, depending on where the point x exists in among the two linearly divided spaces.

Linear Classifier

1/1 point (graded)

We have a linear classifier h that takes in any point on a two-dimensional space. The linear classifier h divides the two-dimensional space into two, such that on one side $h(x) = +1$ and on the other side $h(x) = -1$, as depicted below.



For $x = (10, 10)$, would $h(x)$ be -1 or $+1$?

- $+1$ ✔
- -1

As an aside, classifiers need not be linear. They can be of any shape!

Solution:

$(10, 10)$ belongs to the region where $h(x) = +1$.

Submit You have used 1 of 2 attempts

Answers are displayed within the problem

Training Error

1/1 point (graded)

Suppose a classifier correctly classifies 5 points in the training set and 1 points in the test set. Suppose it incorrectly classifies 5 points in the training set and 2 points in the test set. What is the training error? Is it better than chance?

- [x] 0.5, equal to chance ✔
- [ ] 0.46, worse than chance
- [ ] 0.55, better than chance
- [ ] 0.33, worse than chance

✔

Solution:

We only focus on the training points since the question is asking for training error. We correctly classify 50 percent of points, making this classifier equal to chance.

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

Hypothesis Space

1/1 point (graded)

What is the meaning of the "hypothesis space"?

- [ ] the set of test points

- (•) the set of possible classifiers ✔
- ( ) the set of training points
- ( ) the positive test examples

Solution:

Each classifier represents a possible “hypothesis" about the data; thus, the set of possible classifiers can be seen as the space of possible hypothesis

Submit You have used 1 of 3 attempts

Answers are displayed within the problem

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Topic: Unit 1 Linear Classifiers and Generalizations (2 weeks):Lecture 1. Introduction to Machine Learning / 6. Introduction to Classifiers: Let's bring in some geometry!

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The framing of the language is so confusing . correctly classified : 5 in training , 1 in test incorrectly classified : 5 in training , 2 in test error according to the lecture : E(h) = 1/n (Sum(1 if correct, 0 if incorrect) = 6/13 = 0....	3
3：06 Maybe (x(i), y(i)) for professor wrote (x(i), y(1))	3
[Staff] Candidate Classifiers & Generalization. Two related questions: 1) A lack of classifier "generalization" seems a lot like "overfitting." Are they the same? 2) The notion that if I consider fewer potential classifiers fro...	5
great stuff Feels so good to finally see machine learning developed with mathematical rigor as opposed to the hand wavy overly wordy books written for general public.	12
[staff] For the future: would be good to use the words "hypothesis space". Note that "hypothesis space" was not used in the video -- I just checked the transcript in case I missed it. There is the similar expression "hypothesis class". "And the probl... Community TA	9

Question about the linearity of the classifier		3
staff- training error question	I had selected the right choice in my first attempt itself but was marked as wrong by the grader. Kindly check at your end and do the needful.	3
11:48 “this classifier would have a test error about half” ????	Meaning that the test error here is 0.5 ???	5
"The more complex set of classifiers we consider, the less well we are likely to generalize." How can one proves that?	Hi, Quoting the Professor - "The more complex set of classifiers we consider, the less well we are likely to generalize." How can one go about proving this? I would think thi...	2
6.1 round bracket on graph axes means negative?	Is it -5 on x1 and -0.5 on x2 or just a misuse of brackets? Ta	2
[INAUDIBLE] at 6:14	The professor says movie, since it's related to movie recommendation.	2
Chance	What is chance ???	8
[Typo?]		2

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