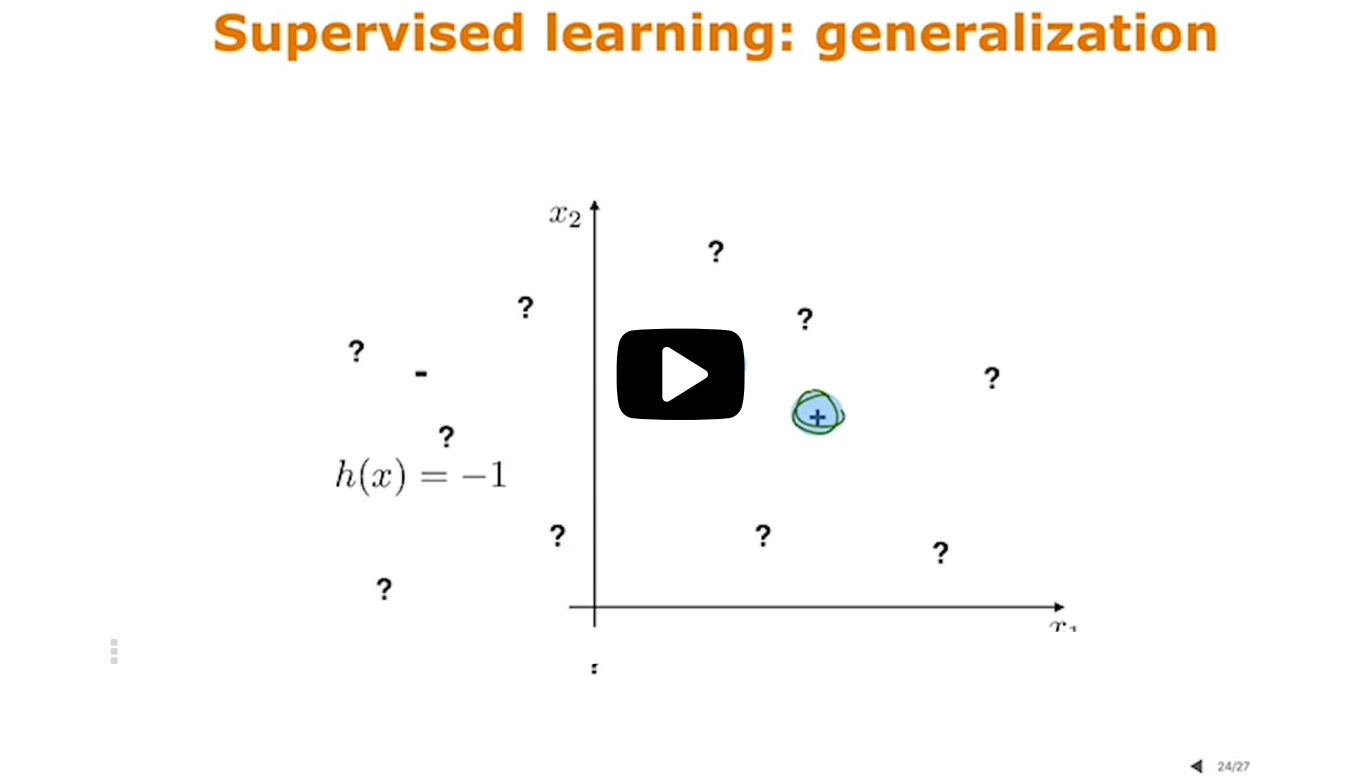
6. Introduction to Classifiers: Let's bring in some geometry!
Introduction to Linear Classifiers



13:44 / 13:44 1.25x

OK?

So we would wish to, in general, solve these problems

by finding a small set of possibilities that work well

on the training set, so as to generalize well

on the test set.

We will talk much more about this problem of generalization

later.

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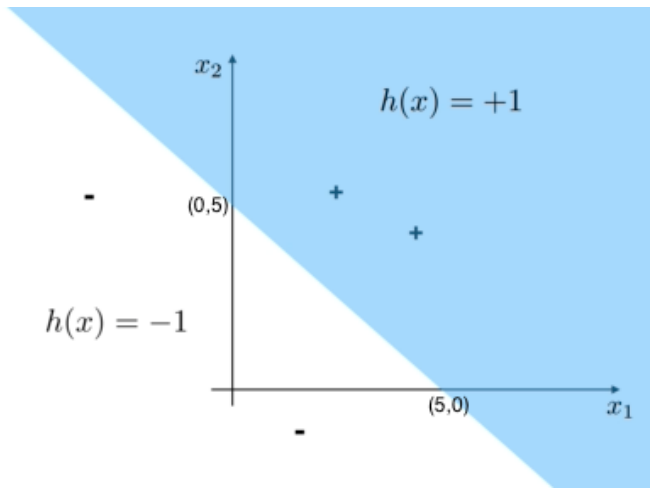
Training data can be graphically depicted on a (hyper)plane. **Classifiers** are **mappings** that take **feature vectors as input** and produce **labels as output**. A common kind of classifier is the **linear classifier**, which linearly divides space(the (hyper)plane where training data lies) into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



For $x = (10, 10)$, would $h\left(x\right)$ 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

ℹ 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?

- ☑ 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.

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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

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Discussion

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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!