

Machine Learning Fundamentals

Week 7 Video 1

FOUNDATIONS OF ML

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TODAY'S TOPIC

WHEN DOES A MACHINE LEARNING
MODEL GENERALIZE OR
WORK WELL IN THE FUTURE?

CLASSIFICATION

EMAILS: SPAM OR NOT SPAM

TRAINING SET

EMAIL-1 , SPAM
EMAIL-2 , NOT SPAM
EMAIL-3 , SPAM
⋮
⋮
⋮

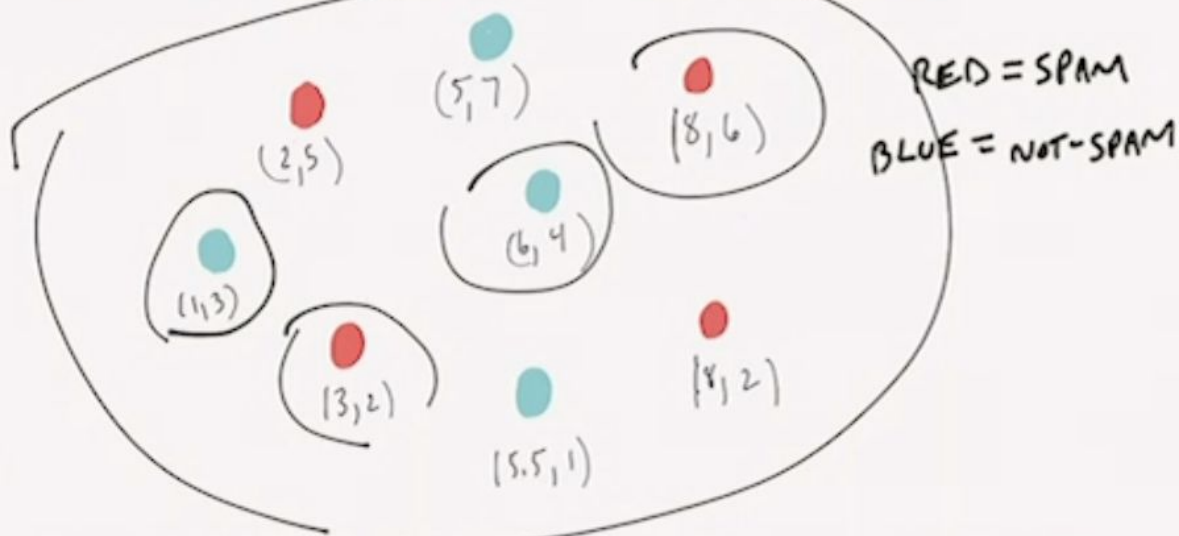
CLASSIFIER
MODEL
HYPOTHESIS

PROGRAM
FUNCTION

FUNCTION
 f

$\leadsto m$ $f(m)$ output SPAM
NOT-SPAM

EMBEDDINGS



GOAL: FIND MODEL PREDICTS WELL IN FUTURE.

PROXY: FIND MODEL DOES WELL ON TRAINING SET.

KEY CONCEPT

"GENERALIZATION GAP"
FOR A CLASSIFIER h

$err(h) =$
fraction of all
emails h gets
wrong.

$$|\hat{err}(h) - err(h)|$$

$\hat{err}(h)$ ← EMPIRICAL
LOSS
fraction of all
emails in YOUR
TRAINING SET h

OVERFITTING

$\hat{err}(h)$ IS SMALL
BUT $err(h)$ IS LARGE