Types of Machine Learning

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Machine Learning Redux

machines observe a pattern and attempt to imitate it in some
way that can be either direct or indirect.

Machine
learning   ~=   Monkey see,
                  monkey do

Supervised Versus Unsupervised

- Using the **pixels** of an image to detect the <u>presence or absence</u> of a cat

- Using the **movies you've liked** to predict more <u>movies </u>you may like

- Using someone's **words** to predict whether they're <u>happy or sad</u>

- Using weather sensor **data** to predict the <u>probability of rain</u>

- Using car engine **sensors** to predict the optimal tuning <u>settings</u>

- Using news **data** to predict <u>tomorrow's stock price</u>

- Using an input **number** to predict a <u>number </u>double its size

- Using a raw **audio file** to predict a <u>transcript </u>of the audio

Supervised Learning

Supervised Machine Learning

Supervised learning is a method for transforming one dataset into another. For example, if you had a dataset called Monday Stock Prices that recorded the price of every stock on every Monday for the past 10 years, and a second dataset called Tuesday Stock Prices recorded over the same time period, a supervised learning algorithm might try to use one to predict the other.

Monday
stock prices → Supervised
learning → Tuesday
stock prices

Supervised Learning

What you know $\rightarrow$ Supervised learning $\rightarrow$ What you want to know
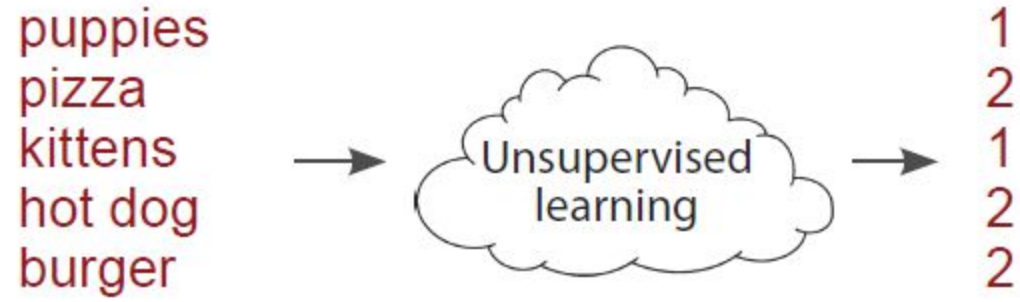
Unsupervised Learning

Unsupervised Learning

Unsupervised learning shares a property in common with supervised learning: it transforms one dataset into another. But the dataset that it transforms into is not previously known or understood.

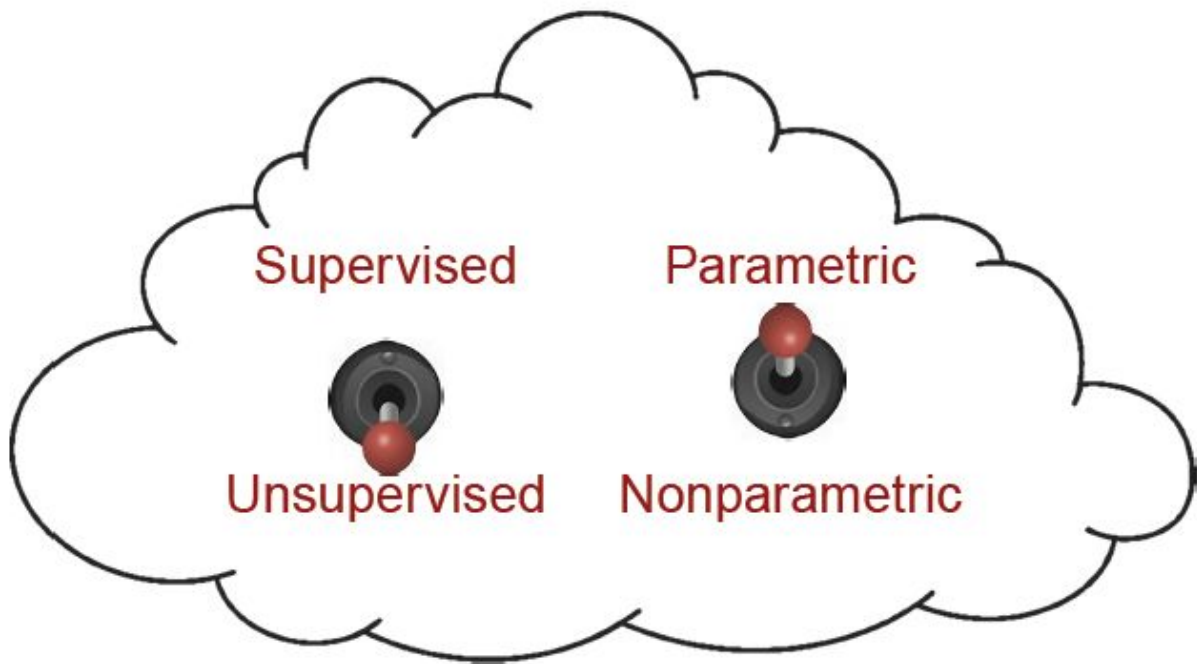List of datapoints → Unsupervised learning → List of cluster labels
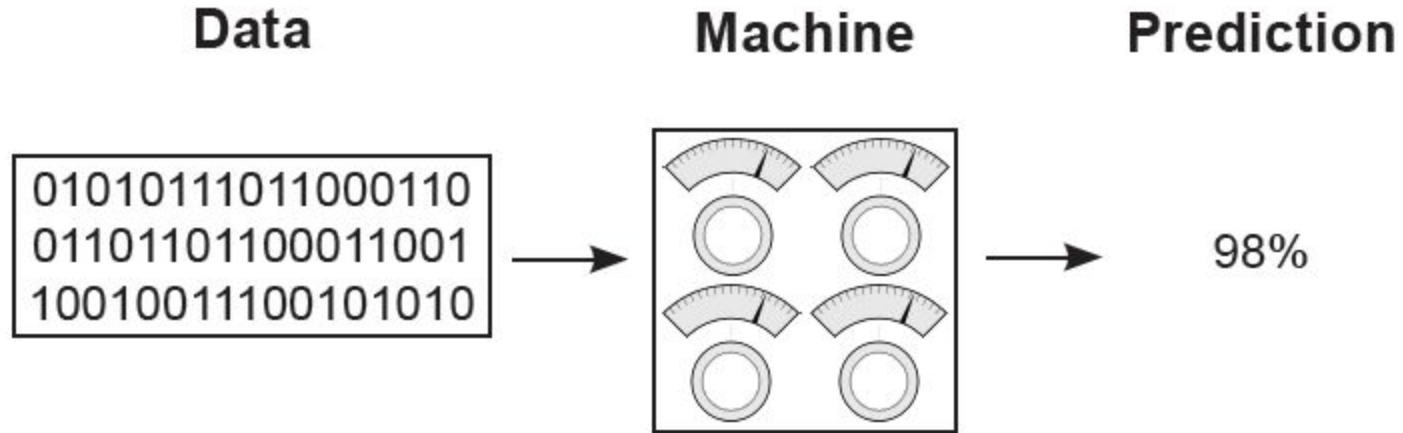
Unsupervised Learning

Parametric versus Non-Parametric Learning

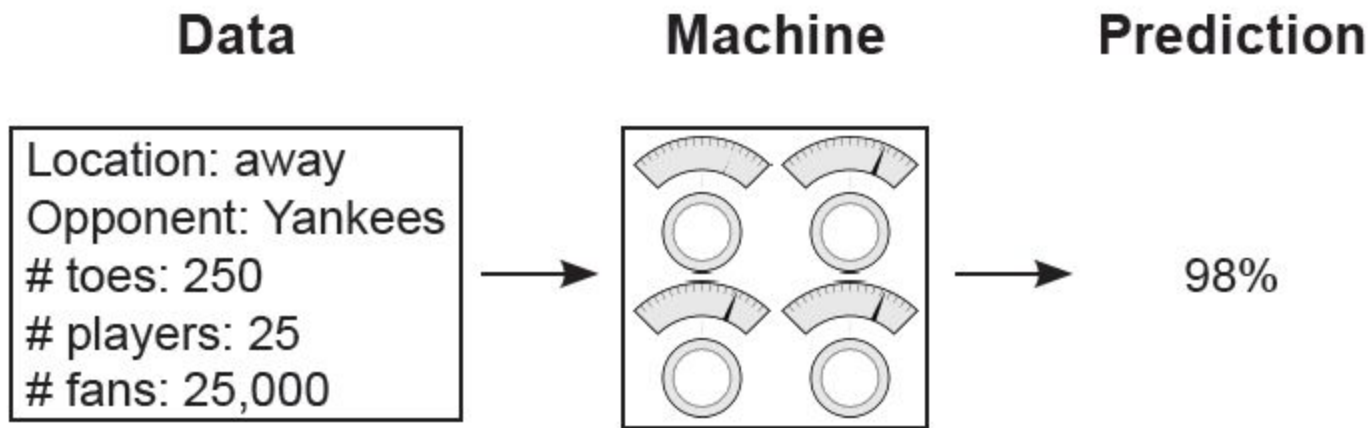# Parametric versus Non-Paremetric

A parametric model is characterized by having a fixed number of parameters, whereas a nonparametric model's number of parameters is infinite (determined by data).

Supervised

Parametric

Unsupervised

Nonparametric

Supervised Parametric Learning

Data

```
01010111011000110
01101101100011001
10010011100101010
```

Machine

Prediction

98%

Step 1: Predict

Data

Location: away
Opponent: Yankees
toes: 250
players: 25
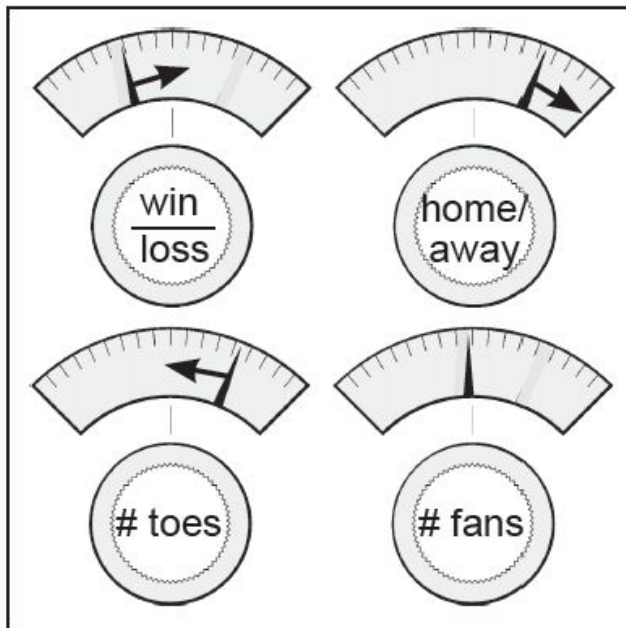# fans: 25,000

Machine

Prediction

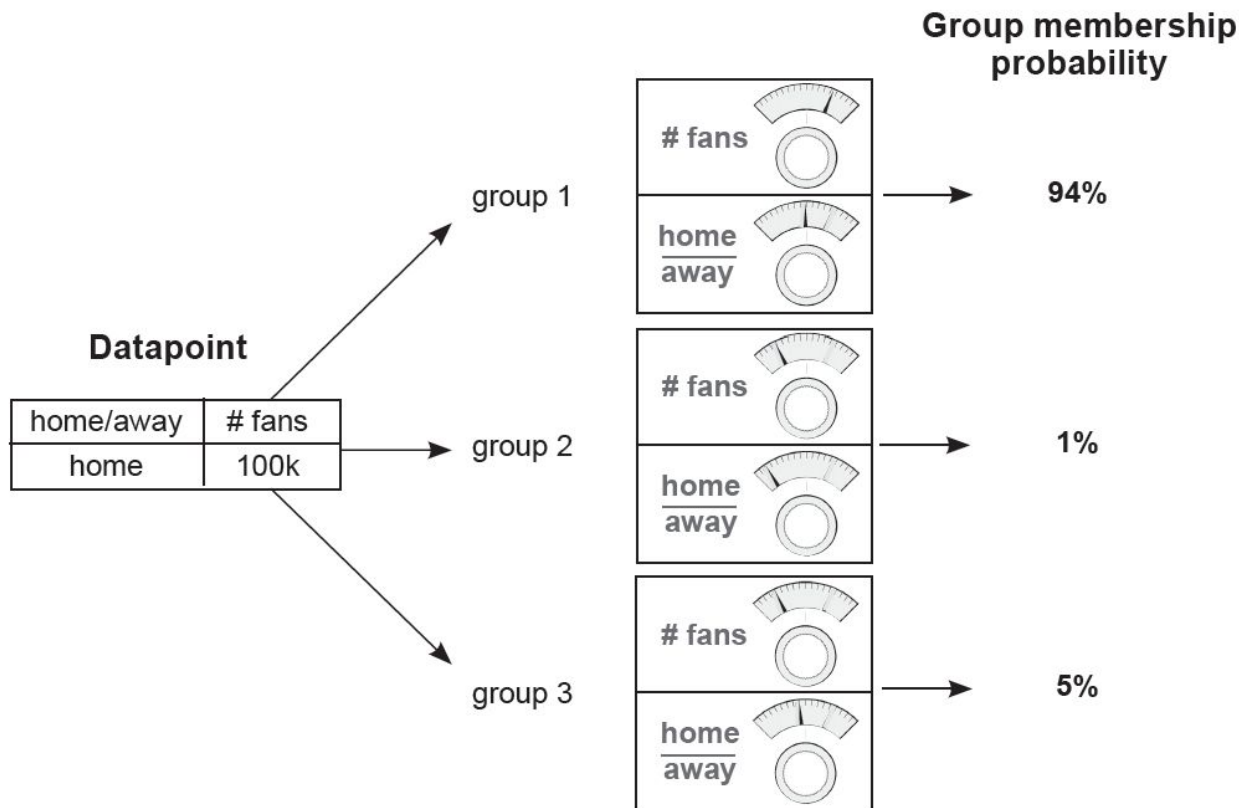98%

Step 2: Compare the Truth Pattern

Pred: 98% > **Truth**: 0%

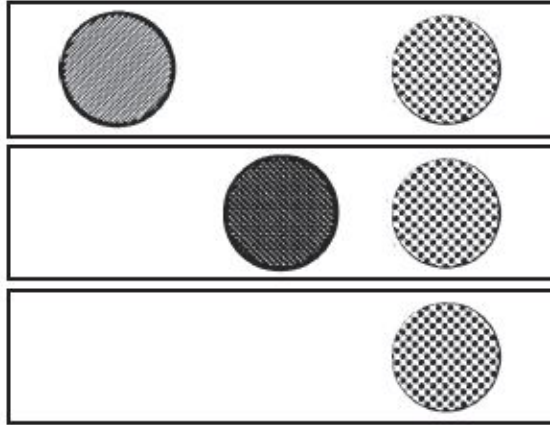# Step 3: Learn the Pattern

Adjusting sensitivity by turning knobs

Unsupervised Parametric Learning

Home or away	# fans
home	**100k**
away	50k
home	**100k**
home	**99k**
away	50k
away	*10k*
away	*11k*

Group membership probability

Datapoint

home/away	# fans
home	100k

group 1 → # fans / home away → **94%**

group 2 → # fans / home away → **1%**
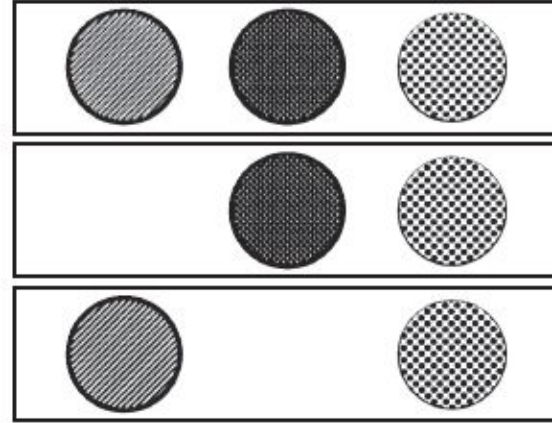
group 3 → # fans / home away → **5%**

Nonparametric Learning

Stop

Go

Stop

Go

Go

Stop

Summary