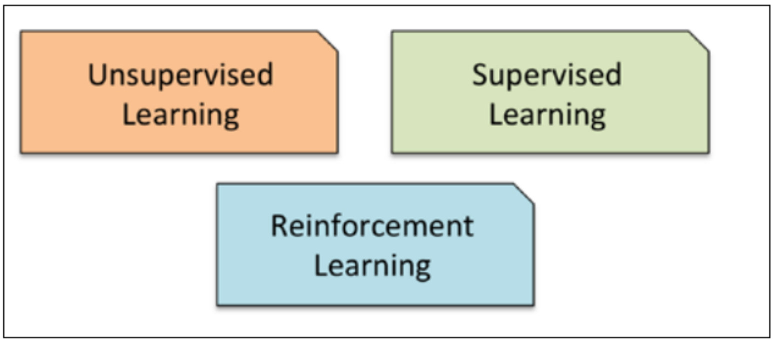
Introduction to Machine Learning

Types of ML

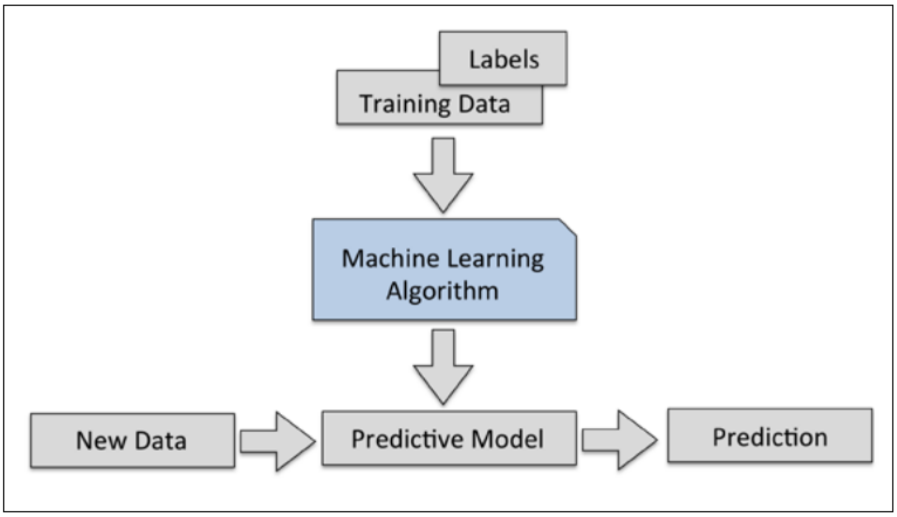


Making predictions with Supervised Learning

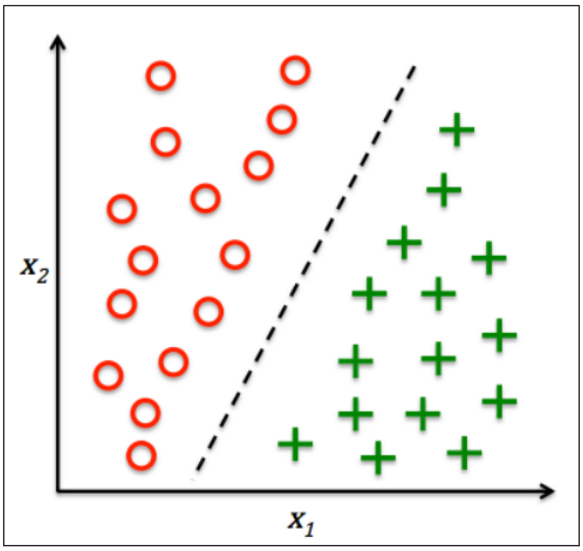
Here, the term supervised refers to a set of samples where the desired output signals (labels) are already known.

For example email with `spam` or `non-spam` labels and predicting the class of new email is a sample of **classification**

Another subcategory of supervised learning is **regression**, where the outcome signal is a continuous value

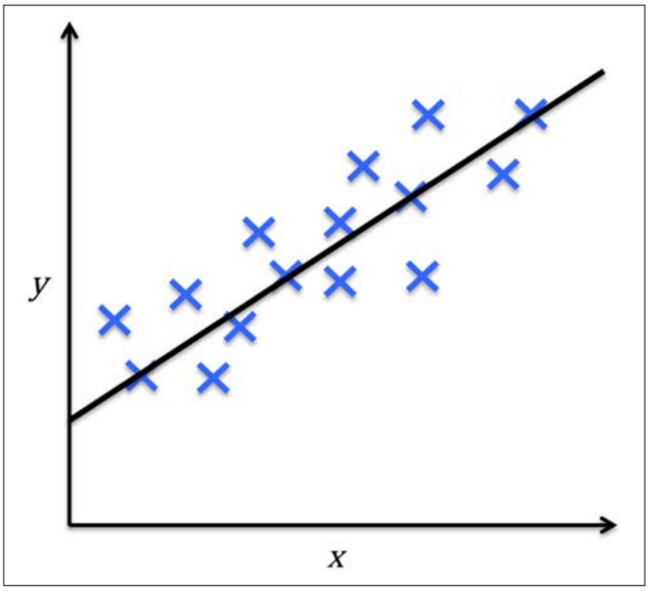


A sample two-dimensional data binary classification



Regression for predicting continuous outcomes

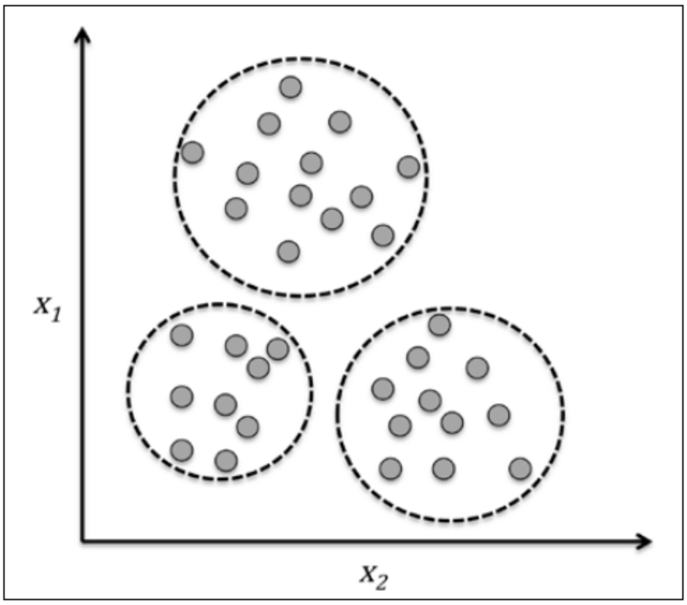
In regression analysis, we are given a number of **predictor (explanatory)** variables and a continuous **response variable (outcome)**, and we try to find a relationship between those variables that allows us to predict an outcome.



Reinforcement learning

Unsupervised learning

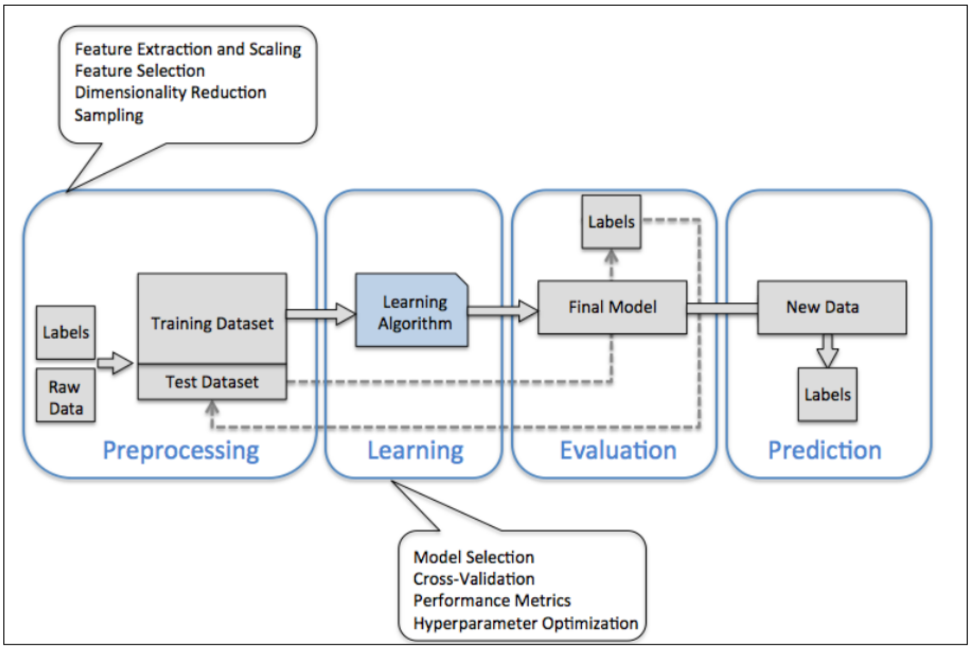
Simple 2D clustering example based on the similarity of their features x1 and x2



Dimensionality reduction for data compression

$x_j^{(i)}$ we will use the superscript **(i)** to refer to the ith training sample, and the subscript **j** to refer to the jth dimension of the training dataset.

A roadmap for building machine learning systems



Preprocessing – getting data into shape

preprocessing ; transforming the features in the range [0,1] or normal distribution

for coorelated and redundant data –> dimensionality reduction techniques

Training and selecting a predictive model

One legitimate question to ask is: how do we know which model performs well on the final test data-set and real-world data if we don't use this test set for the model selection but keep it for the final model evaluation?

inally, we also cannot expect that the default parameters of the different learning algorithms provided by software libraries are optimal for our specific problem task. hyperparameter optimization techniques

Evaluating models and predicting unseen data instances

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Chapter 2: Classification

The Perceptron algorithm learns the weights for the input signals in order to draw a linear decision boundary.

Basic concepts

- activation function
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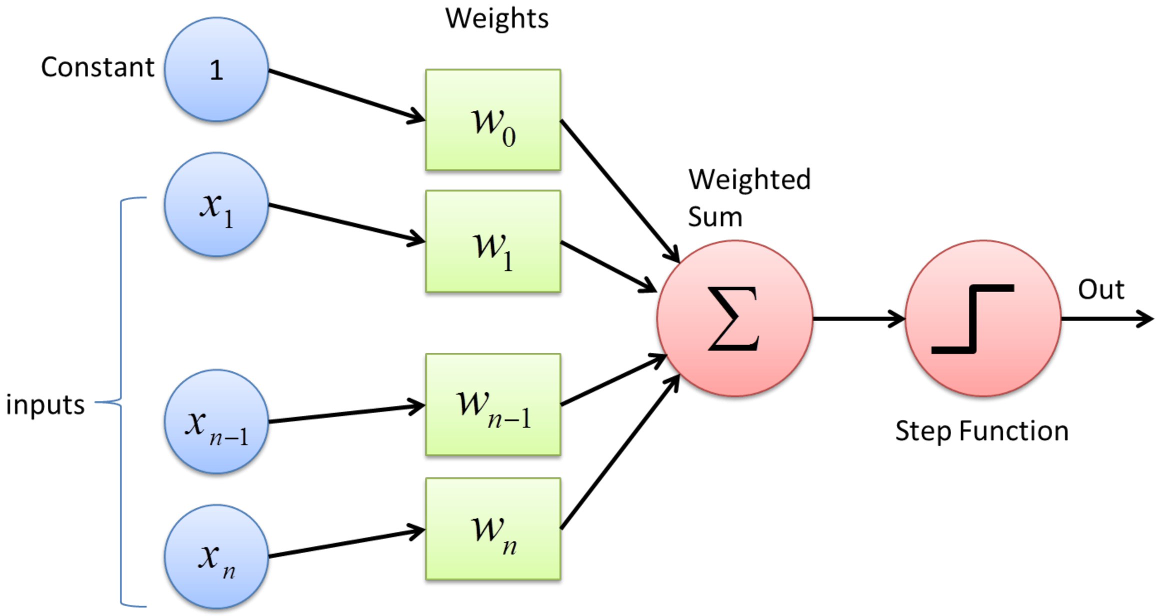
Weights
Constant
1
w_0
x_1
w_1
Weighted Sum
Σ
Out
inputs
x_{n-1}
w_{n-1}
Step Function
x_n
w_n