
Machine Learning: Introduction

Micro-teaching session

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Learning objectives

- To recognise a machine learning technique for a particular problem.

What is Learning?

- *“Learning denotes changes in a system that ... enable a system to do the same task ... more efficiently the next time.”* - Herbert Simon
- *“Learning is making useful changes in our minds.”* - Marvin Minsky.
- *Machine learning is programming computers to optimise a performance criterion using example data or past experience.*
 - *programs that can learn from data without explicit programming.*

Daily Examples

- iPhone Siri
- Bank applications on understanding unauthorised usage of cards
- Online shopping suggestion methods
- Mailing office automatic postcode reader
- Fingerprint recognition
- Face recognition

Why Machine Learning?

- There is no need to “learn” to calculate payroll
- Learning is used when:
 - Human expertise does not exist:
 - Nasa ‘Rover’.
 - Humans are unable to explain their expertise
 - speech recognition, check forgery
 - Rapidly changing phenomena
 - credit scoring, financial modeling, fraud detection.
 - Need for customization/personalization
 - personalized news reader, movie/book recommendation

Machine Learning Problems

Supervised Learning

Unsupervised Learning

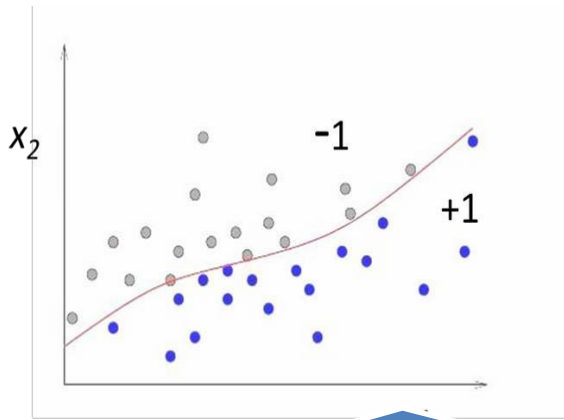
Discrete
Continuous

classification or
categorization

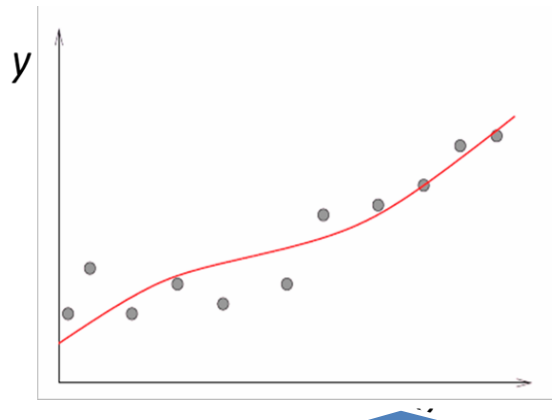
clustering
association rule mining
density estimation

regression

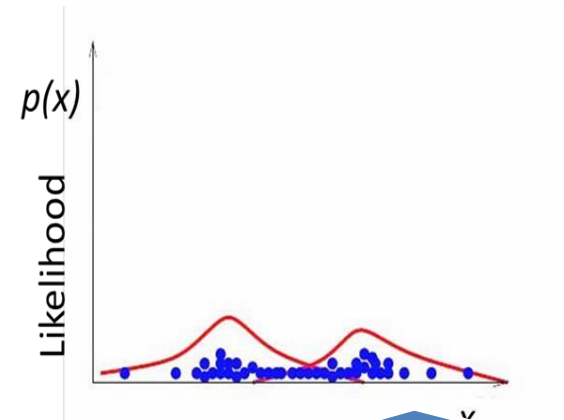
dimensionality
reduction
density estimation



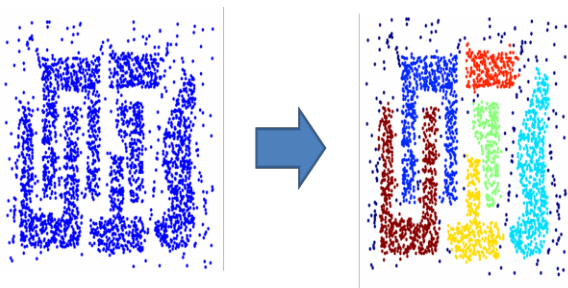
Classification



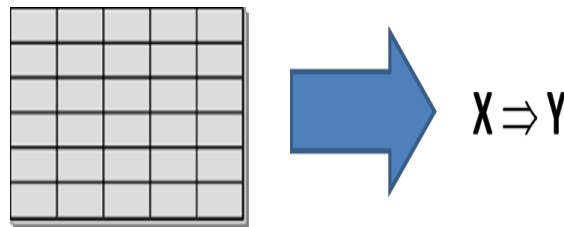
Regression



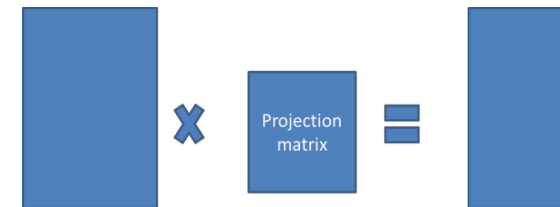
Density estimation



Clustering



Association rule mining



Dimensionality reduction

Identify the Machine Learning Technique

- 1) Find out how many types of plants there are from leaves measurements
- 2) Predict the mark of a student's exam
- 3) Predict the house price of a property
- 4) Predict the outcome of an election
- 5) Understand the body mass index of babies
- 6) Find out if customers who buy a book on statistics will buy a book on data science
- 7) Visualise gene expression data which is high-dimensional
- 8) Predict if a student will pass a test

Take away

- Machine learning is not monolithic.
 - different types of learning (e.g., supervised, unsupervised) and various techniques (e.g., regression, clustering).
- Different problems require different machine learning techniques.

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