

# Machine learning

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- ✓ **Machine Learning** is a class of algorithms which is data-driven, i.e. unlike "normal" algorithms it is the data that "tells" what the "good answer" is.

- ✓ **Example:**

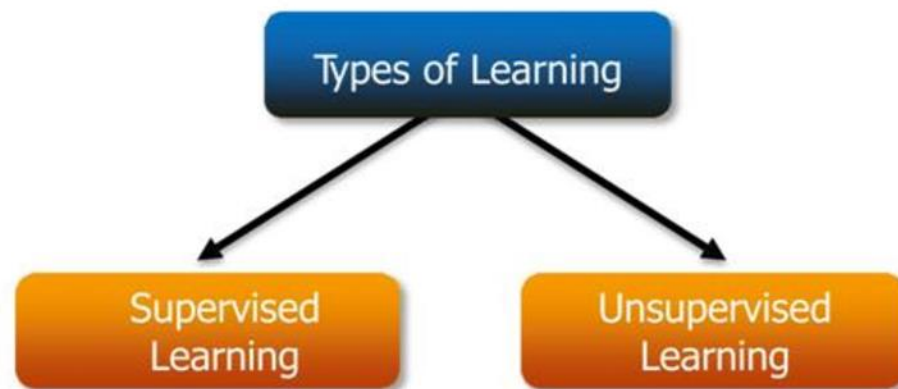
An hypothetical non-machine learning algorithm for face recognition in images would try to define what a face is (round skin-like-colored disk, with dark area where you expect the eyes etc).

A machine learning algorithm would not have such coded definition, but will "**learn-by-examples**": you'll show several images of faces and not-faces and a good algorithm will eventually learn and be able to predict whether or not an unseen image is a face.

## Learning Techniques

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**Attain knowledge by study, experience, or by being taught.**



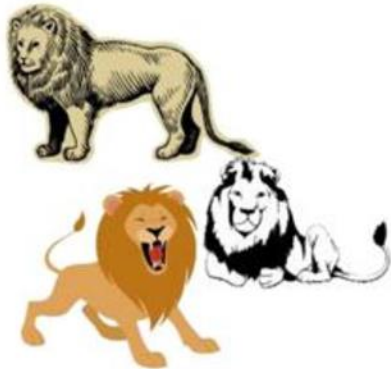
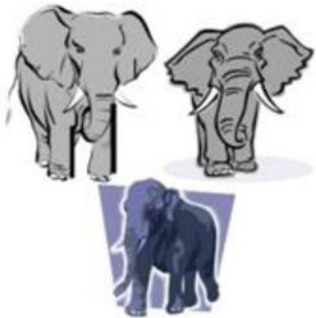
# Supervised Learning

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## **Supervised learning : Training data includes both the input and the desired results.**

- ✓ For some examples, the **correct results (targets)** are known and are given in input to the model during the learning process.
- ✓ The construction of a **proper training, validation and test set (Bok)** is crucial.
- ✓ These methods are usually **fast** and **accurate**.
- ✓ **Have to be able to generalize:** give the correct results when new data are given in input without knowing a priori the target.

## Supervised Learning



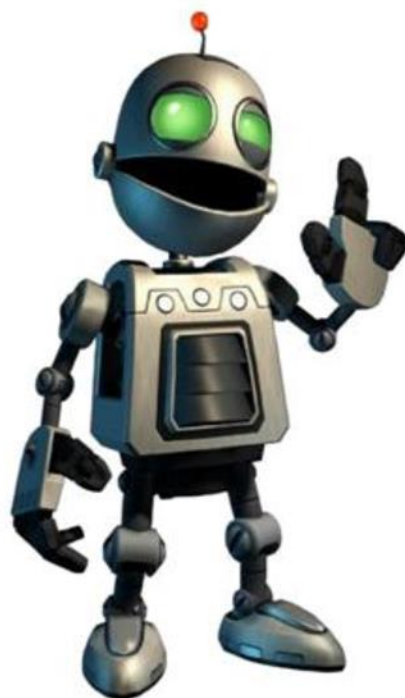
# Unsupervised learning

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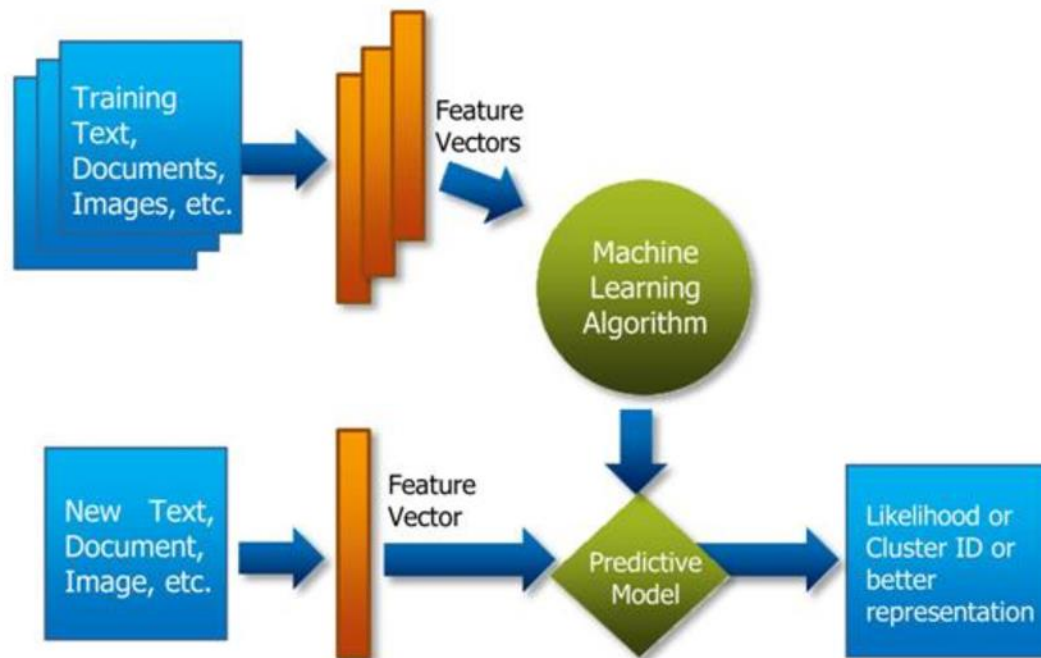
## Unsupervised Learning:

- ✓ The **model** is not provided with the correct results during the training.
- ✓ Can be used to **cluster the input data in classes** on the basis of their statistical properties only  
Cluster significance and labeling.
- ✓ The **labeling** can be carried out even if the labels are only available for a small number of objects representative of the desired classes.

## Examples



## Example – Unsupervised Learning Model





# Machine Learning Use Cases – YouTube

**YouTube** utilizes recommendation systems to bring videos to a user that it believes the user will be interested in.

They are designed to:

- ✓ Increase the numbers of videos the user will watch
- ✓ Increase the length of time he spends on the site, and
- ✓ Maximize the enjoyment of his YouTube experience.

Filters ▾ About 215 results

Job Tracker Control



3:34:46

Big Data and Hadoop 1 | Hadoop Tutorial 1 | Big Data Tutorial 1 | Hadoop Tutorial for Beginners -1

Hadoop 2.0



3:12:19

Demystifying Hadoop 2.0 - Part 1 | Hadoop Administration Tutorial | Hadoop Admin Tutorial Beginners



16:45

Hadoop Tutorial | Hadoop Tutorial for Beginners | Big Data Tutorial | Hadoop Training | Big Data Training



## Use Case – You Tube (Contd.)

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### User Activity:

In order to obtain personalized recommendations, YouTube's recommendation system combines the related videos association rules with the user's personal activity on the site.

### This includes several factors:

- ✓ There are the videos that were watched - along with a certain threshold, say by a certain date. After all, you don't want to count videos watched from 2 years ago if the user has watched enough videos, most likely.
- ✓ Also, YouTube factors in with emphasis any videos that were explicitly "liked", added to favourites, given a rating, added to a playlist. The union of these videos is known as the seed set.
- ✓ Then, to compute the candidate recommendations for a seed set, YouTube expands it along the related videos.

## Use Case – Wine Recommendation

The image is a screenshot of the Next Glass website banner. It features a navigation bar at the top with links: THE SOLUTION, HOW IT WORKS, WHO WE ARE, CAREERS, and NEWS. The main visual is a man in a straw hat drinking from a wine glass against a sunset background. The headline reads 'THE RIGHT WINE EVERY TIME'. Below it, a paragraph describes the service: 'Next Glass™ is revolutionizing wine by removing the adjectives and making it easy to find the perfect glass. Sit back. Relax. Your next glass will be here soon.' A 'Learn More' button is positioned below the text. The bottom of the banner is a teal bar containing two award logos on the left and right, and the text 'COMING 2014' in the center.

THE SOLUTION   HOW IT WORKS   WHO WE ARE   CAREERS   NEWS

# THE RIGHT WINE EVERY TIME

Next Glass™ is revolutionizing wine by removing the adjectives and making it easy to find the perfect glass. Sit back. Relax. Your next glass will be here soon.

[Learn More](#)

**WINNER**  
Elance Bold Ideas Startup Competition 2013

**COMING 2014**

**WINNER**  
Emerging Company of the Year  
NCTA 21 Awards

## Use Case – Wine Recommendation (Contd)



What wine will I enjoy? More than 2 million consumers turn to the Internet for the answer to this question every day



### Problem

- Mysterious ratings and adjective-based reviews do little to help consumers decide which wine to buy
- They can't even agree amongst themselves

### Solution

- Next Glass solves this problem by removing subjectivity and applying science to deliver recommendations based on your previous ratings

## Use Case - Biometrics

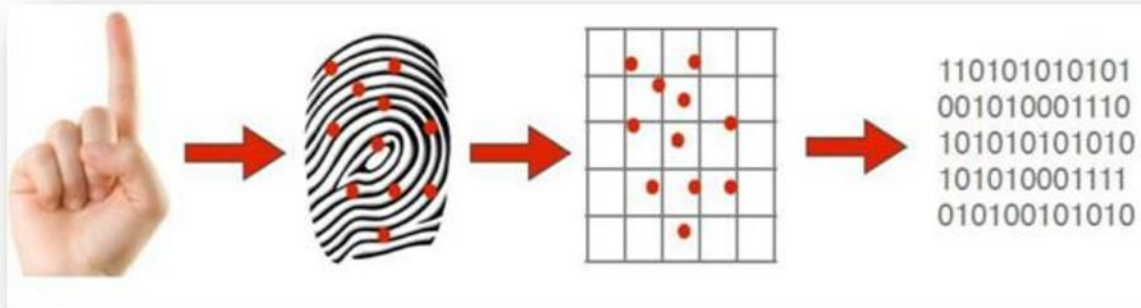


**Biometrics** : The Science of establishing the identity of an individual based on the physical, chemical or behavioral attributes of the person.

### Why is it Important?

- ✓ Identify Individual credentials
- ✓ Identify and prevent banking fraud
- ✓ Enforcement of law and security

## How Does a Fingerprint Optical Scanner Work?



A **fingerprint scanner system** has two basic jobs

- ✓ Get an image of your finger
- ✓ Determine whether the pattern of ridges and valleys in this image matches the pattern of ridges and valleys in pre-scanned images

### Process:

- ✓ Only specific characteristics, which are **unique to every fingerprint**, are filtered and saved as an encrypted **biometric key or mathematical representation**.
- ✓ No image of a fingerprint is ever saved, only a series of numbers (a binary code), which is used for verification. The algorithm cannot be reconverted to an image, so no one can duplicate your fingerprints



## Use Case – Aadhaar

India is reportedly creating a biometric database to hold the fingerprints and face images for each of 1.2 Billion citizens as part of its Unique Identification Project.



## Use Case – Paycheck Secure System

All Trust Network Paycheck Secure System has enrolled over 6 Million users and over 70 Million Transactions.

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