MACHINE LEARNING

The A Team

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Contents in Brief

Let’s Get Started

Machine Learning — What ?

Field of study that gives computers the ability to learn without being explicitly programmed.

Instead of writing code, you feed data to the generic algorithm and it builds its own logic based on the data.

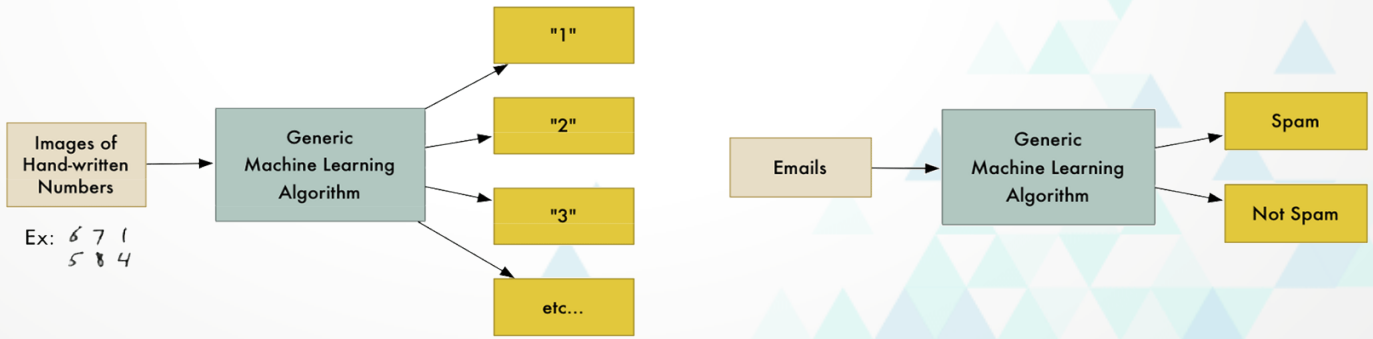


Figure: Classification Algorithms

Case Studies — Supervised Learning

Bedroom	Sq.Ft	Neighbourhood	Price
3	2000	Uptown	$350,000
2	800	Downtown	$200,000
2	850	City Centre	$150,000
1	550	Suburbs	$75,000
4	2000	Suburbs	$200,000

Bedroom	Sq.Ft	Neighbourhood	Price
3	2000	Uptown	???

Supervised learning is the machine learning task of inferring a function from labeled training data.

Case Studies — Supervised Learning

Math's Exam - Answer Keys	
1) 2 4 5 = 3	5) 6 2 2 = 10
2) 5 2 8 = 2	6) 3 1 1 = 2
3) 2 2 1 = 3	7) 5 3 4 = 11
4) 2 2 4 = 6	8) 1 8 1 = 7

- The training data consist of a set of training examples.
- Training Data :
  - Input Object : Set of Features
  - Desired Output : Supervisory Signal
- A supervised learning algorithm produces an inferred function.
- An analogus task in human and animal phsycology : Concept Learning.

Case Studies — Unsupervised Learning

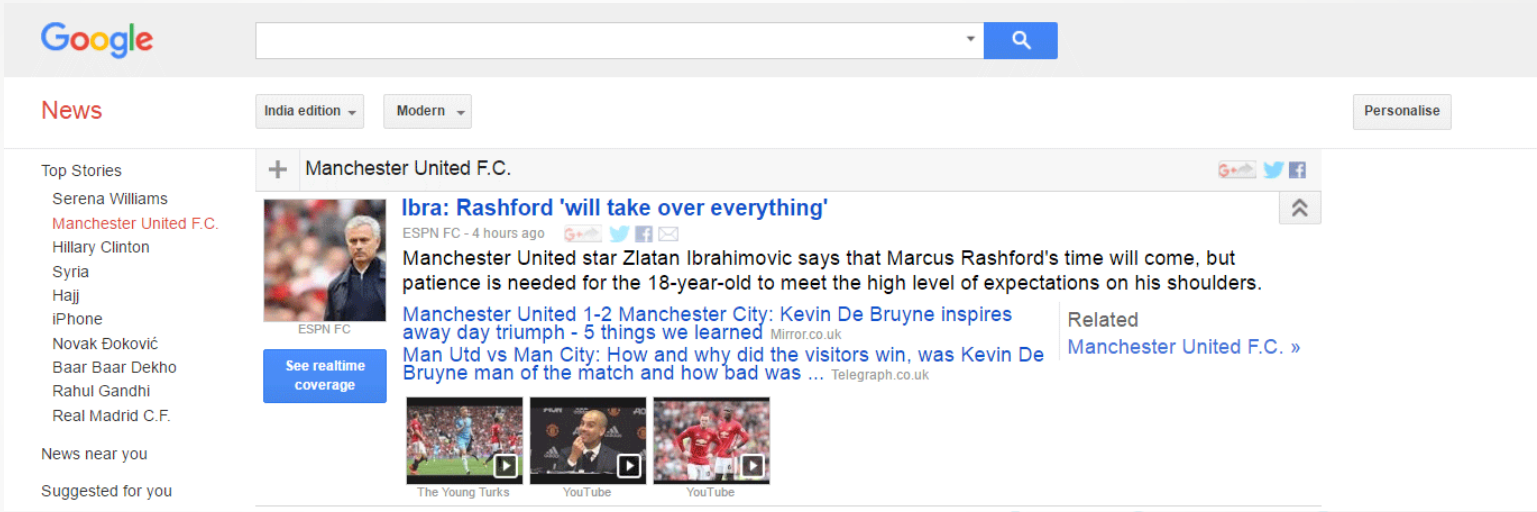


Figure: Google News grouping similar stories together.

Unsupervised learning is the machine learning task of inferring a function to describe hidden structure from unlabeled data.

Cocktail Party Problem — Unsupervised Learning

Sound from :

- *Microphone 1*
- *Microphone 2*

Output from Learning Algorithm :

- *Output 1*
- *Output 2*

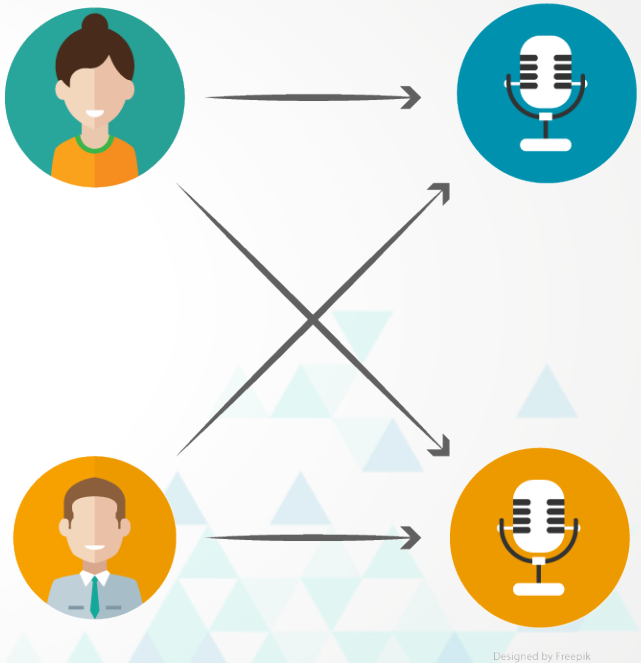


Figure: Overlapped Recordings

Case Studies — Unsupervised Learning

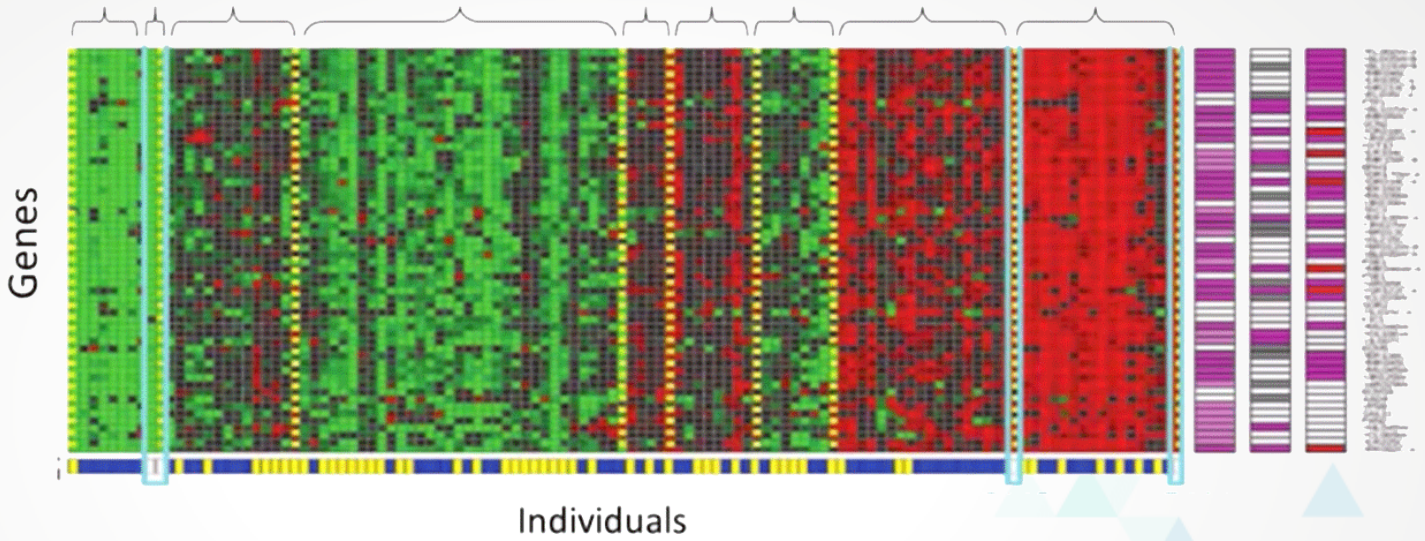


Figure: Gene Clustering

- Training Data given to the learner is unlabeled.
- No error or reward signal to evaluate a potential solution.
- Closely related to density estimation in statistics.

Machine Learning — Formal Definiton

The field of machine learning is concerned with the question of how to construct computer programs that automatically improve with experience.

A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E.

Evolved from :

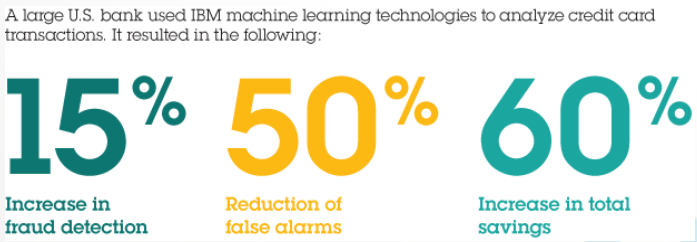
- Pattern Recognition
- Computational Learning Theory
- Artificial Intelligence

Applications — Machine Learning

- Adaptive websites
- Classifying DNA sequences
- Computer vision
- Internet fraud detection
- Natural language processing
- Online advertising
- Recommender systems
- Search engines
- Sentiment analysis
- Speech and handwriting recognition

Industry Trends

Google Chauffer : Self Driving Car by Google



IBM Research : Credit Card Fraud Detection

Industry Trends

Completed • $1,000

The Online Privacy Foundation

Psychopathy Prediction Based on Twitter Usage

Mon 14 May 2012 – Fri 29 Jun 2012 (4 years ago)

Dashboard

Private Leaderboard - Psychopathy Prediction Based on Twitter Usage

This competition has completed. This leaderboard reflects the final standings.

See someone using multiple accounts? Let us know.

#	Δrank	Team Name * in the money	Score	Entries	Last Submission UTC (Best – Last Submission)
1	↑5	y_tag *	0.86997	12	Tue, 26 Jun 2012 12:46:19
2	↑9	Bruce Cragin	0.86745	10	Fri, 29 Jun 2012 22:28:17 (-47.6h)
3	↑21	Indy Actuaries	0.86700	6	Fri, 29 Jun 2012 03:40:38 (-3.4d)

Figure: Kaggle Challenge : Psychopathy Prediction

The aim of the competition is to determine to what degree it's possible to predict people with a sufficiently high degree of Psychopathy based on Twitter usage and Linguistic Inquiry.

Benefits — Machine Learning

Introduction — Regression

Usages — Regression

Benefits — Regression

Example Cases — Regression

Introduction — Classifications

Usages — Classifications

Example Cases — Classifications

Introduction — Deep Learning

Neural Networks — Deep Learning

Meaning — Deep Learning

Usages — Deep Learning

Advantages — Deep Learning

The pain is almost over

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- https: //www.kaggle.com/c/twitter-psychopathy-prediction
- Mastering the game of Go with deep neural networks and tree search (2016), D. Silver et al.

Now that was very interesting!

The End