

MACHINE LEARNING



The A Team

Machine Learning

Group 9

Introduction

Regression

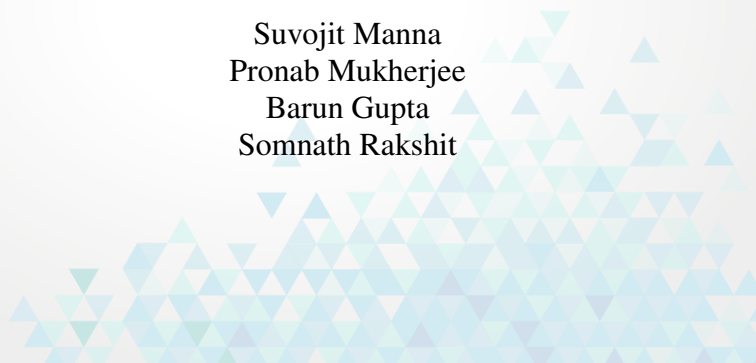
Classifications

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Let's Get Started

Machine Learning — What ?

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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

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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	City Centre	???

Definiton

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

Case Studies — Supervised Learning

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Math's Exam - Answer Keys

$$1) 2\ 4\ 5 = 3 \quad 5) 6\ 2\ 2 = 10$$

$$2) 5\ 2\ 8 = 2 \quad 6) 3\ 1\ 1 = 2$$

$$3) 2\ 2\ 1 = 3 \quad 7) 5\ 3\ 4 = 11$$

$$4) 2\ 2\ 4 = 6 \quad 8) 1\ 8\ 1 = 7$$

- 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 analogous task in human and animal psychology : Concept Learning.

Case Studies — Unsupervised Learning

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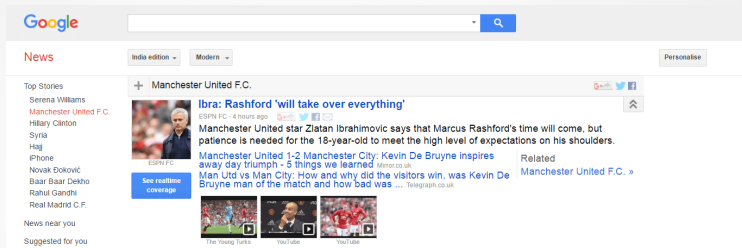


Figure: Google News grouping similar stories together.

Definiton

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

Cocktail Party Problem — Unsupervised Learning

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Sound from :

- *Microphone 1*
- *Microphone 2*

Output from Learning Algorithm :

- *Output 1*
- *Output 2*

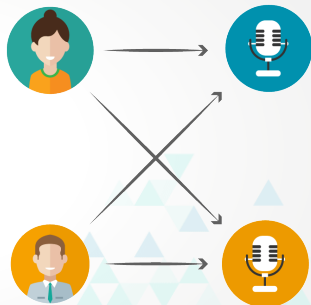


Figure: Overlapped Recordings

Case Studies — Unsupervised Learning

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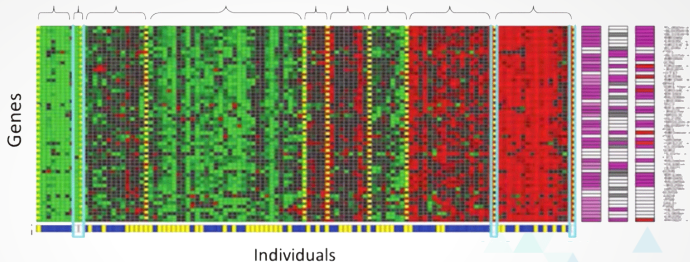


Figure: Gene Clustering

- 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 Definition

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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

Industry Trends

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Google Chauffeur : Self Driving Car by Google

A large U.S. bank used IBM machine learning technologies to analyze credit card transactions. It resulted in the following:



IBM Research : Credit Card Fraud Detection



Mail Services : Spam Filtering

Industry Trends

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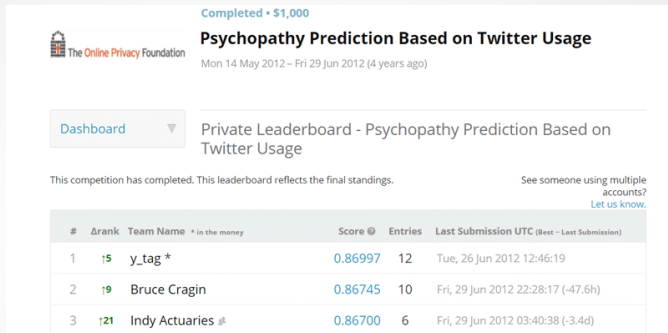


Figure: Kaggle Challenge : Psychopathy Prediction

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.

Entertainment — Machine Learning

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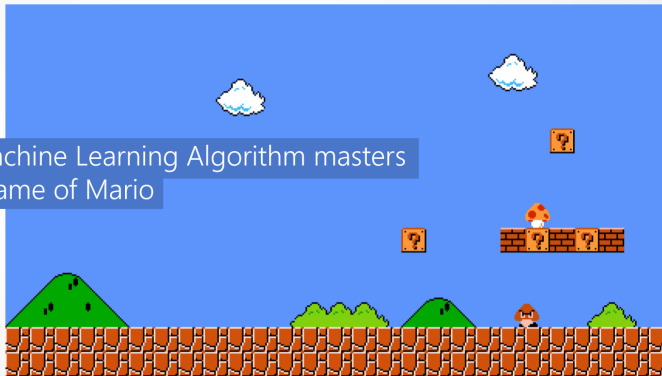
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▶ Machine Learning Algorithm masters the game of Mario



Applications — Machine Learning

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- 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

Machine Learning — Why ?

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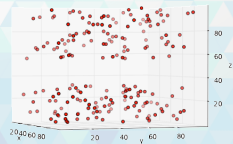
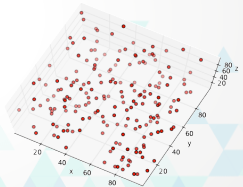
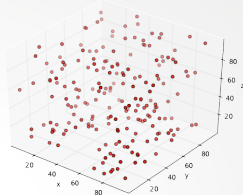
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- Can work with huge amount of data.
- Can make intelligent decisions by taking into account multiple features.
- Can find patterns in large amount of data which is almost impossible for human beings.
- These algorithms are self-modifying in nature, they get better over time as the usage increases.



Introduction — Regression

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Usages — Regression

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Benefits — Regression

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The pain is almost over

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Now that was very interesting!

The End