

MACHINE LEARNING



The A Team

Machine Learning

Group 9

Introduction

Regression

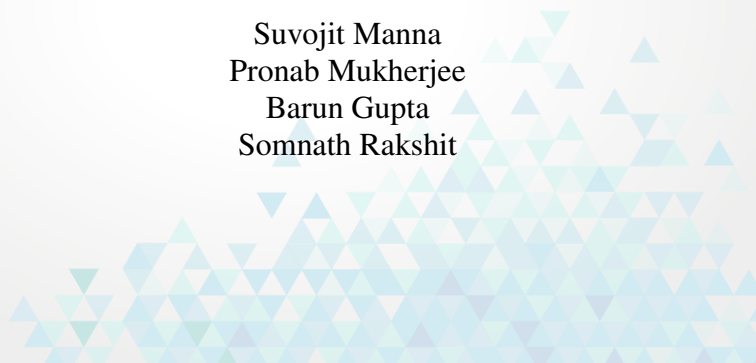
Classifications

Deep Learning

Conclusion

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Contents in Brief

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Conclusion

1 Introduction

2 Regression

3 Classifications

4 Deep Learning

5 Conclusion



Let's Get Started

Machine Learning — What ?

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

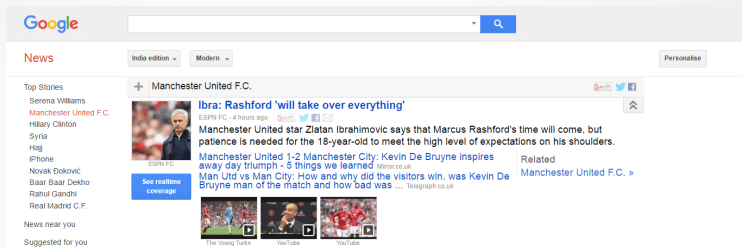


Figure: Google News grouping similar stories together.

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

Cocktail Party Problem — Unsupervised Learning

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

Sound from :

- *Microphone 1*
- *Microphone 2*

Output from Learning Algorithm :

- *Output 1*
- *Output 2*

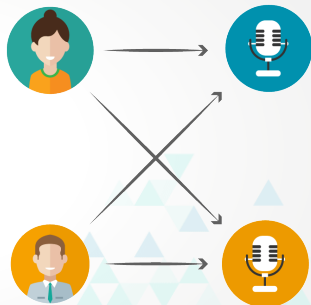


Figure: Overlapped Recordings

Case Studies — Unsupervised Learning

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

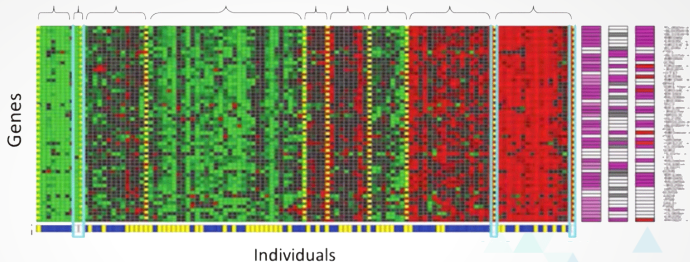


Figure: Gene Clustering

- 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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion



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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

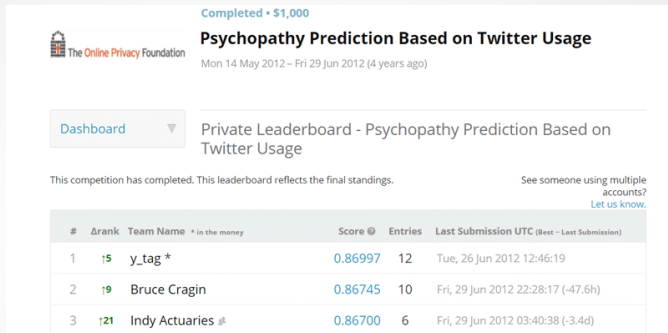


Figure: Kaggle Challenge : Psychopathy Prediction

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

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion



Applications — Machine Learning

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion

- 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

Benefits — Machine Learning

Machine Learning

Group 9

Introduction

Case Studies

Formal Definition

Applications

Benefits

Regression

Classifications

Deep Learning

Conclusion



Introduction — Regression

Machine Learning

Group 9

Introduction

Regression

Usages

Benefits

Example Cases

Classifications

Deep Learning

Conclusion



Usages — Regression

Machine Learning

Group 9

Introduction

Regression

Usages

Benefits

Example Cases

Classifications

Deep Learning

Conclusion



Benefits — Regression

Machine Learning

Group 9

Introduction

Regression

Usages

Benefits

Example Cases

Classifications

Deep Learning

Conclusion



Example Cases — Regression

Machine Learning

Group 9

Introduction

Regression

Usages

Benefits

Example Cases

Classifications

Deep Learning

Conclusion



Introduction — Classifications

Machine Learning

Group 9

Introduction

Regression

Classifications

Usages

Example Cases

Deep Learning

Conclusion



Usages — Classifications

Machine Learning

Group 9

Introduction

Regression

Classifications

Usages

Example Cases

Deep Learning

Conclusion



Example Cases — Classifications

Machine Learning

Group 9

Introduction

Regression

Classifications

Usages

Example Cases

Deep Learning

Conclusion



Introduction — Deep Learning

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Neural Networks

Meaning

Usages

Advantages

Conclusion



Neural Networks — Deep Learning

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Neural Networks

Meaning

Usages

Advantages

Conclusion



Meaning — Deep Learning

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Neural Networks

Meaning

Usages

Advantages

Conclusion



Usages — Deep Learning

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Neural Networks

Meaning

Usages

Advantages

Conclusion



Advantages — Deep Learning

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Neural Networks

Meaning

Usages

Advantages

Conclusion



The pain is almost over

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Conclusion



Bibliography

Machine Learning

Group 9

Introduction

Regression

Classifications

Deep Learning

Conclusion

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Now that was very interesting!

The End