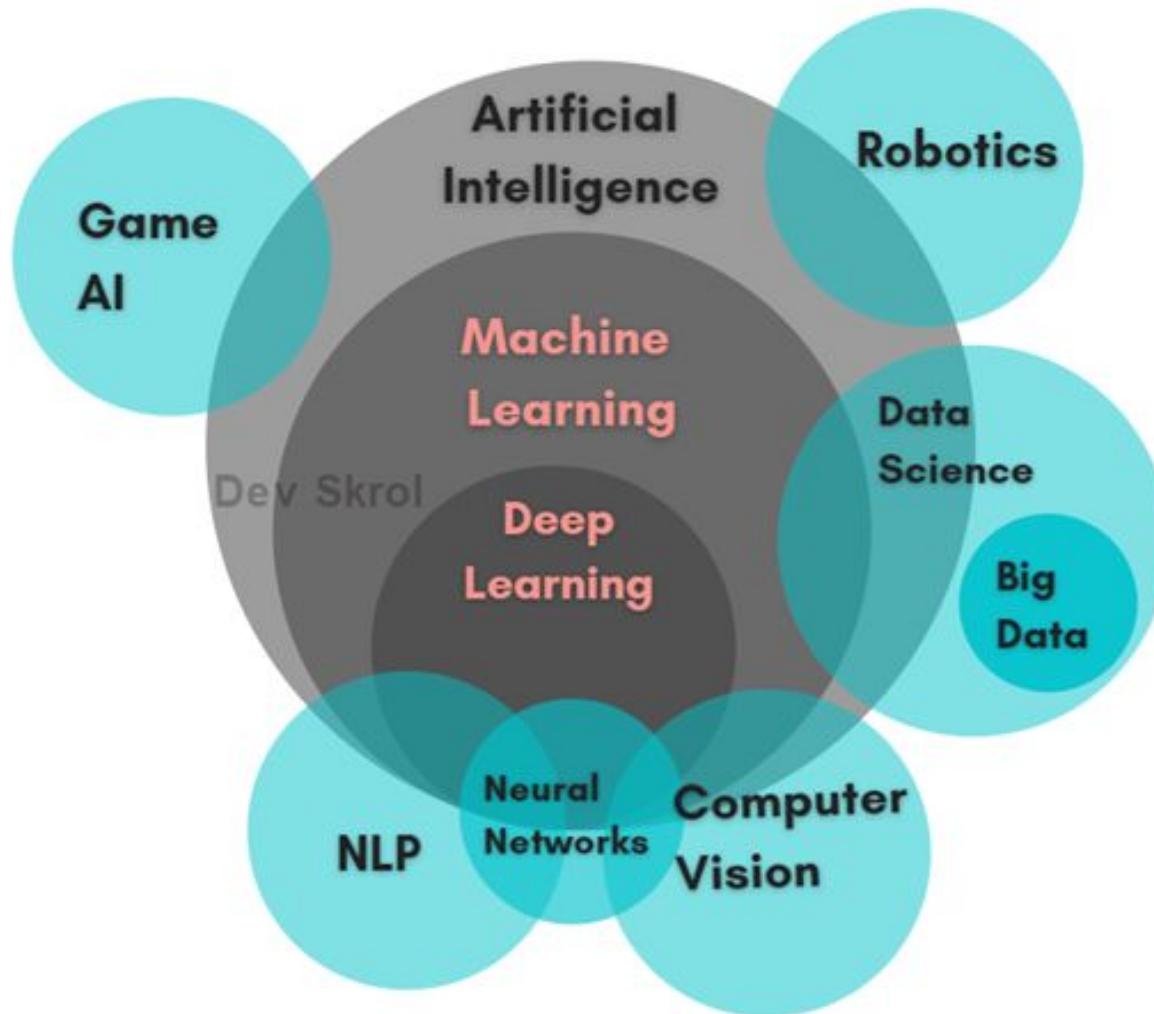


# Machine Learning Course



Field	Data Type	Simple Description
Machine Learning	Numeric, categorical, textual, images	General algorithms that learn patterns from data and make predictions or group similar data points.
Deep Learning	Complex data (images, text, audio, video)	Advanced techniques using neural networks (like human brain structure) to deeply understand complex patterns in large datasets.
NLP	Textual or speech data	Techniques specialized in understanding, interpreting, and generating human languages.
Computer Vision	Images and videos	Techniques that enable computers to see, recognize, and interpret visual data from the world around us.

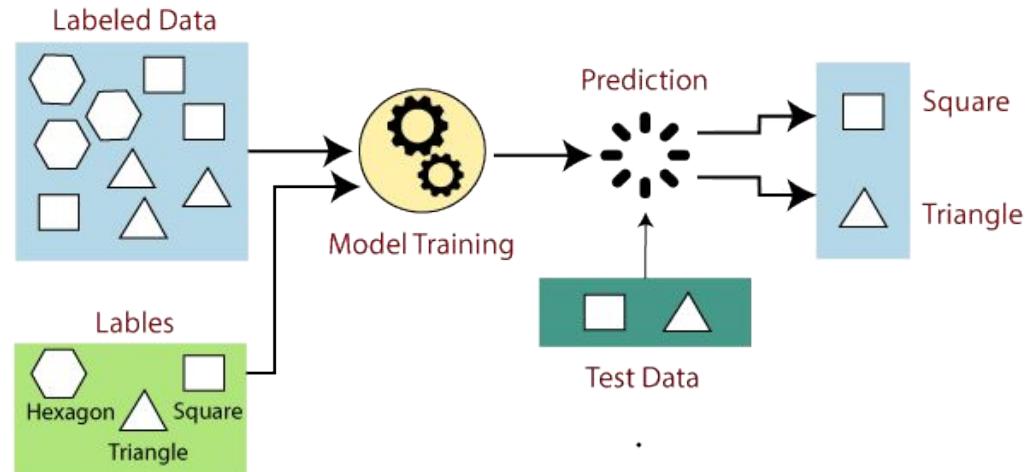
بالتالي، معظم تطبيقات NLP و Computer Vision الحديثة تستخدم Deep Learning، وهي وبالتالي جزء من منظومة أكبر هي Machine Learning.

# **Types of Learning**

- **Supervised (inductive) learning**
  - Given: training data + desired outputs (labels)
- **Unsupervised learning**
  - Given: training data (without desired outputs)
- **Semi-supervised learning**
  - Given: training data + a few desired outputs
- **Reinforcement learning**
  - Rewards from sequence of actions

# Supervised learning:

- Has the presence of a supervisor as a teacher.
- when we train the machine using **data that is labeled**.
- Machine is provided with a new set of examples(data) to see how well the algorithm is doing.



Name	Age	Experience	Martial_Status	Salary
John	25	4	YES	1000 USD
Nathan	26	5	NO	1200 USD
Garima	27	6	YES	1500 USD
Alice	26	5	NO	1200 USD
Mark	32	10	YES	2000 USD
Saurabh	35	13	NO	3000 USD

**Labelled data**

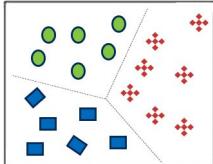
Hence, we learned from past historical available data ( prior knowledge ) for all the employees and predict it for any unseen or future data ( Eric in our case ).

Name	Age	Experience	Martial_Status	Salary
Eric	27	2	NO	??

**Unseen data**

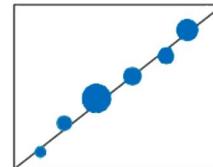
# SUPERVISED LEARNING

## EXAMPLES



### Classification

Is this data input  
red, blue or green?



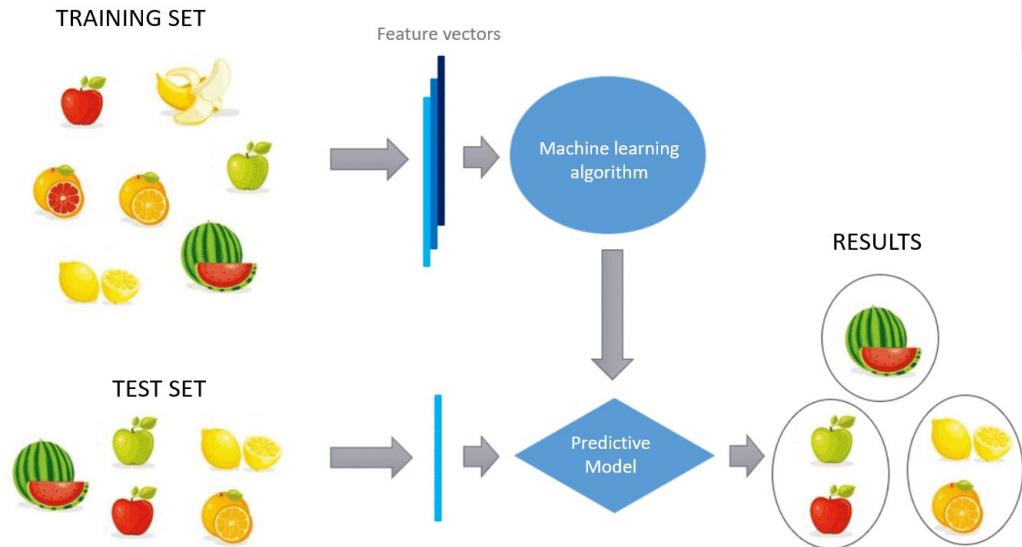
### Regression

What is the impact of  
product price on number of  
sales?  
What is the impact of years  
of experience on salary?

# Unsupervised learning

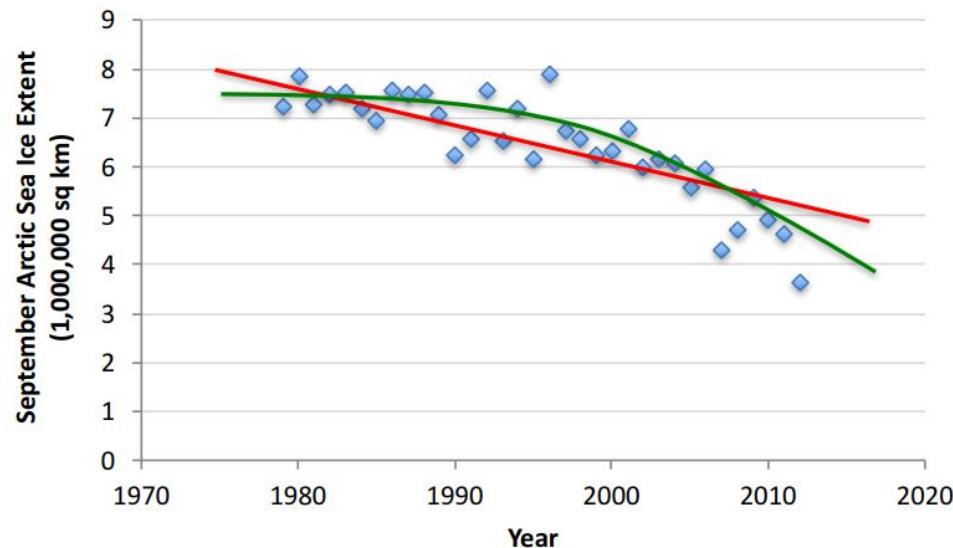
:

- Training of a model using information that is not labeled.
- Allowing the algorithm to act on that information without guidance.
- Model is restricted to find the hidden structure in **unlabeled** data by itself.



# Supervised Learning: Regression

- Given  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$
- Learn a function  $f(x)$  to predict  $y$  given  $x$ 
  - $y$  is real-valued == regression



# Supervised Learning



## Regression



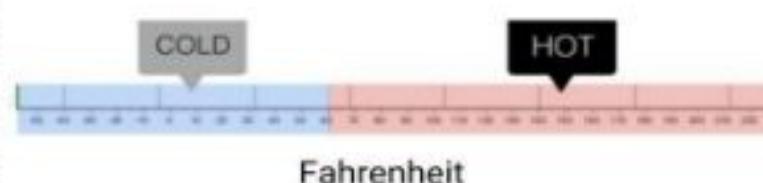
What will be the temperature tomorrow?



## Classification

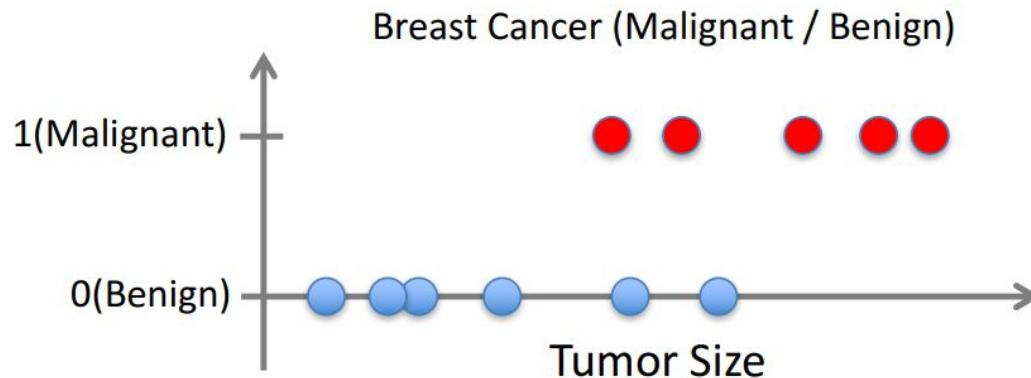


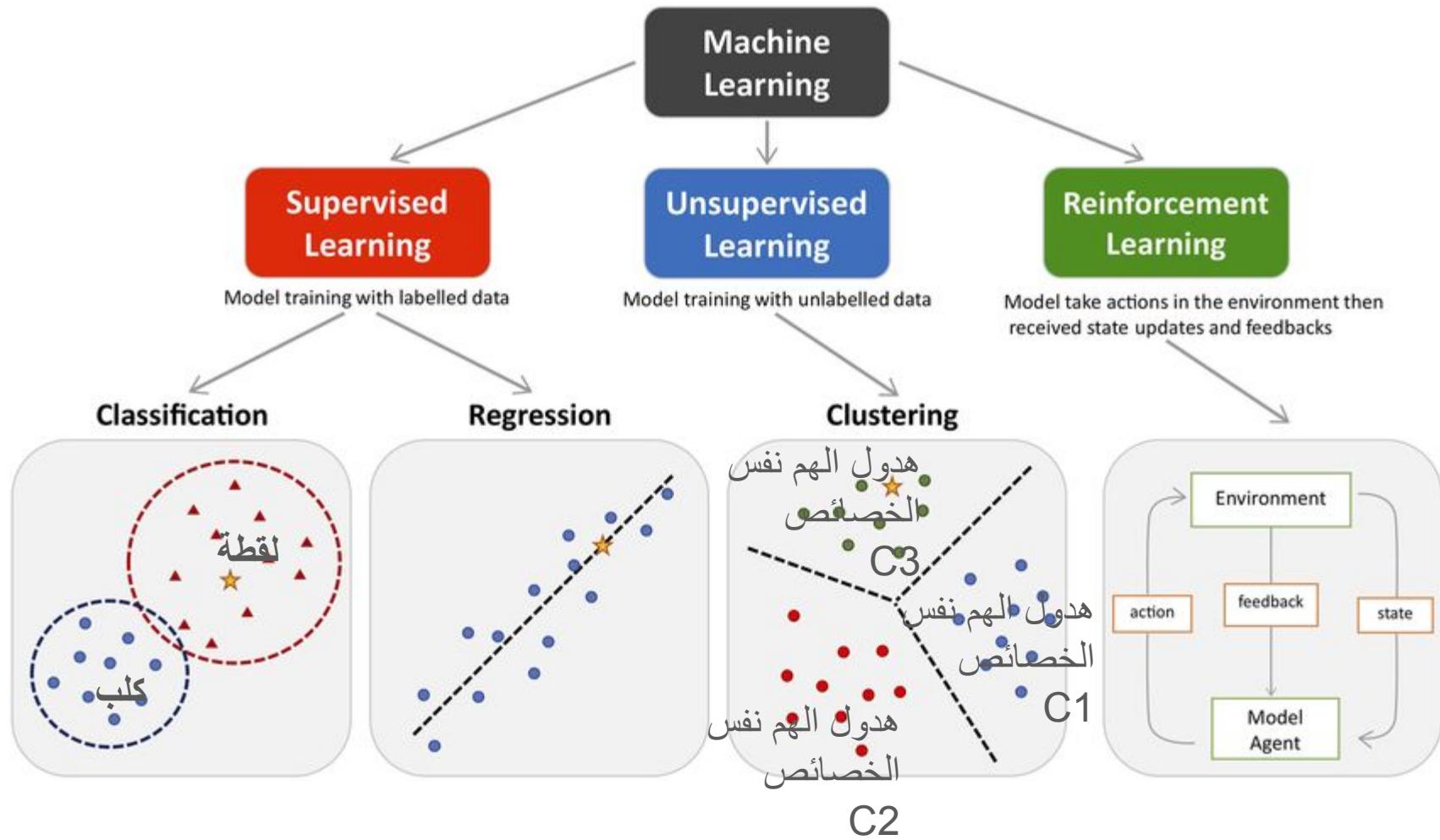
Will it be hot or cold tomorrow?



# Supervised Learning: Classification

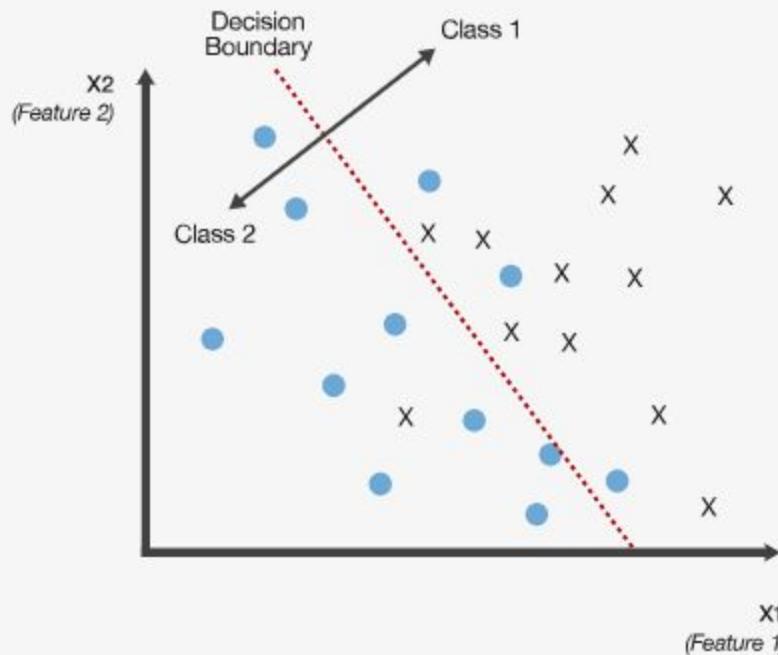
- Given  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$
- Learn a function  $f(x)$  to predict  $y$  given  $x$ 
  - $y$  is categorical == classification





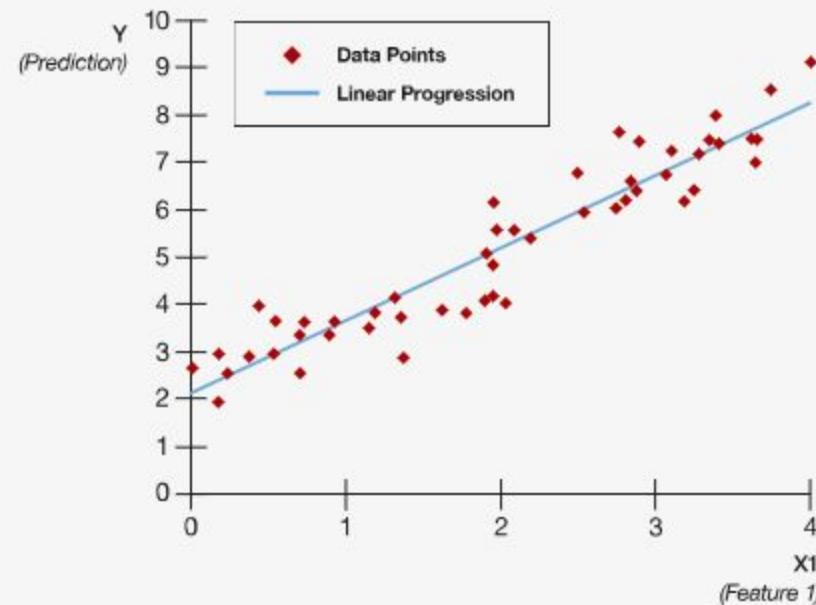
# Classification

## Predicting a Class Label



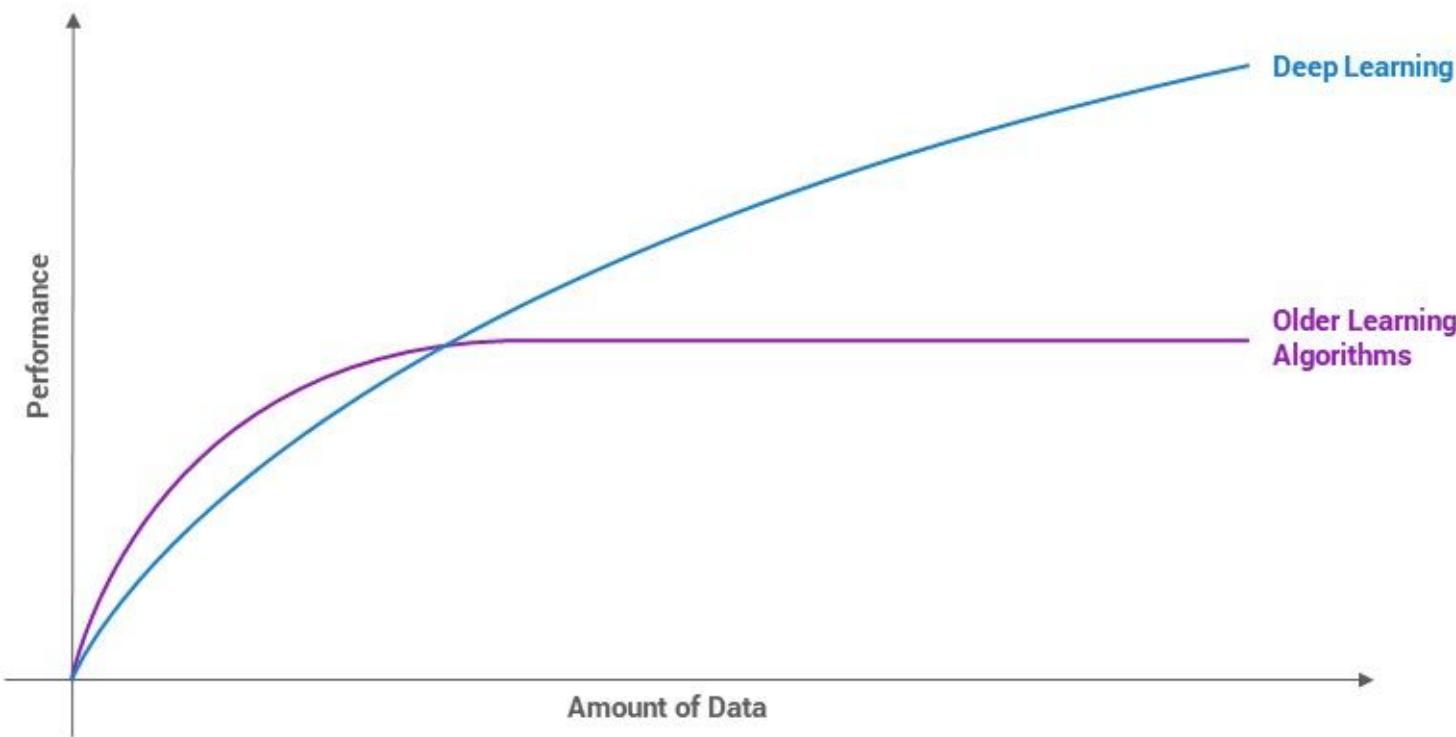
# Regression

## Predicting a Quantity



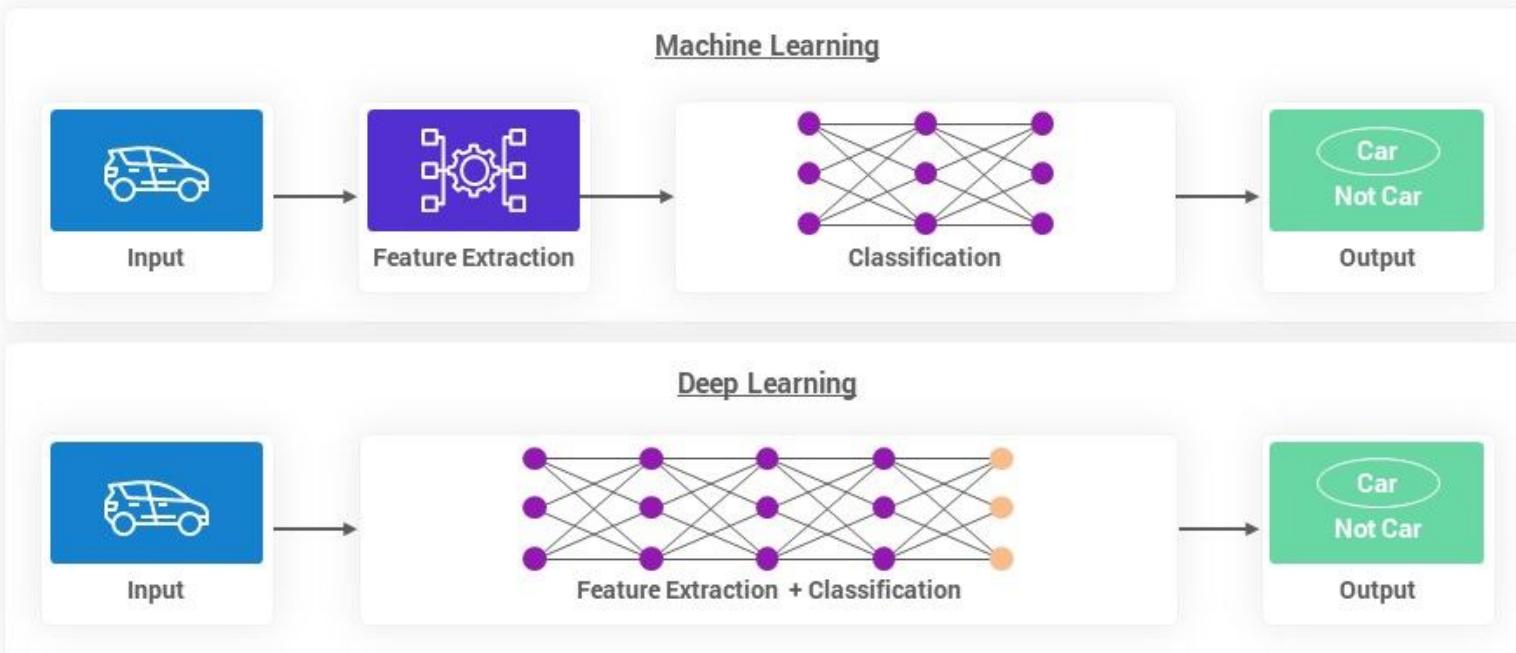
# Why is Deep Learning Important?

Why is Deep Learning Important?



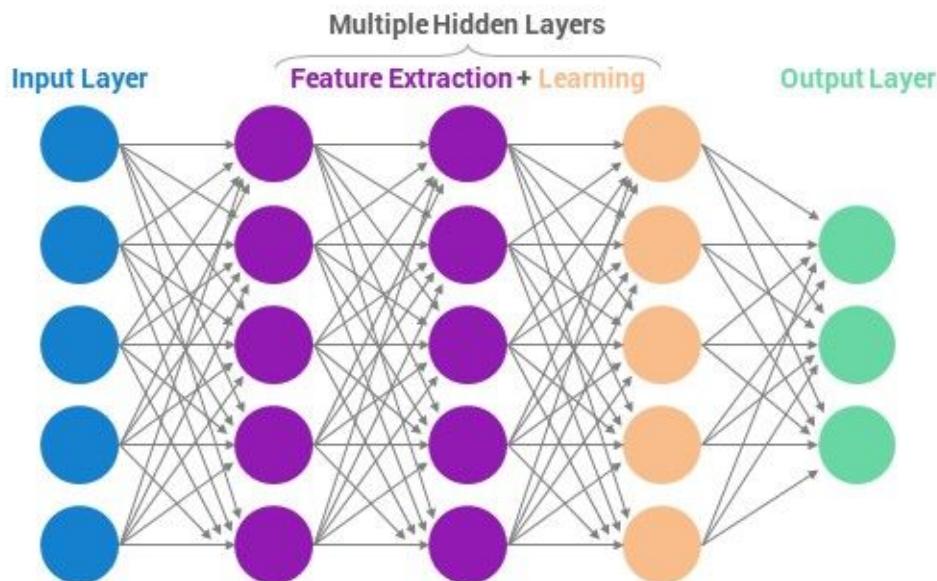
# Machine Learning vs. Deep Learning

Machine Learning vs. Deep Learning



# Deep Neural Network

Deep Neural Network



## Input Layer

It contains those units (Artificial Neurons) which receive input from the outside world on which the network will learn, recognize about, or otherwise process.

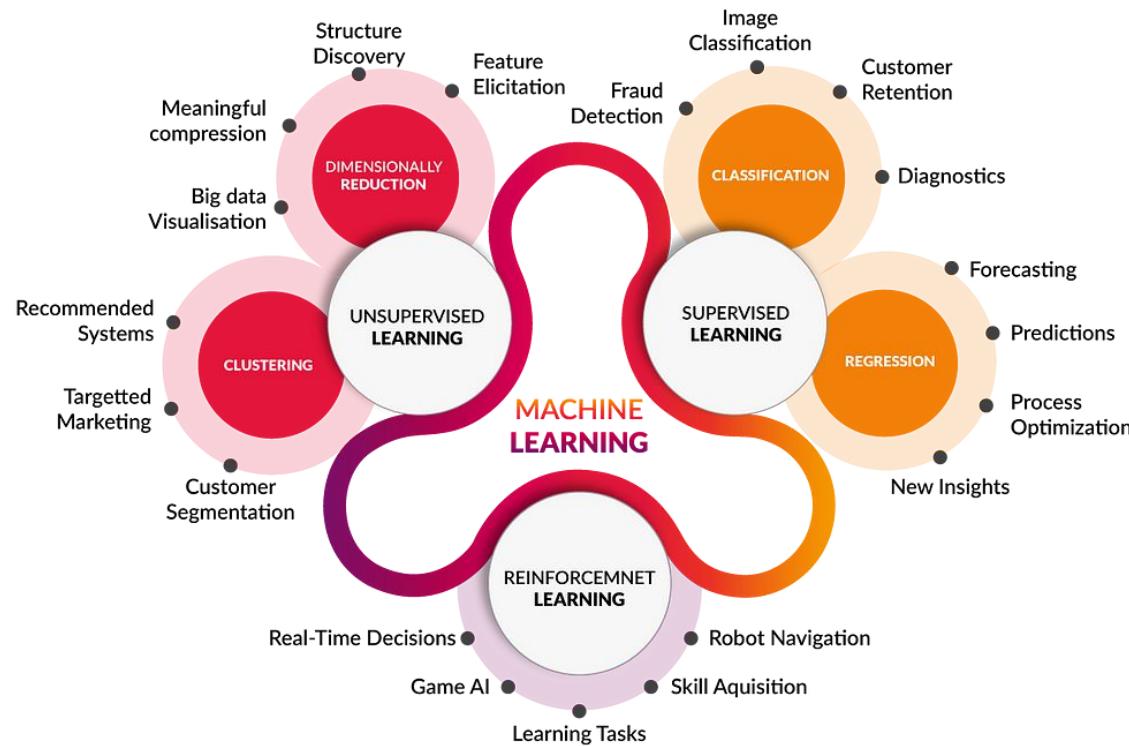
## Output Layer

It contains units that respond to the information about how it learns any task.

## Hidden Layer

These units are in between input and output layers. The hidden layer's job is to transform the input into something that the output unit can use somehow.

# Types of Machine Learning





# Machine Learning Algorithm Cheat Sheet

This cheat sheet helps you choose the best machine learning algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the goal you want to achieve with your data.



Microsoft Azure

