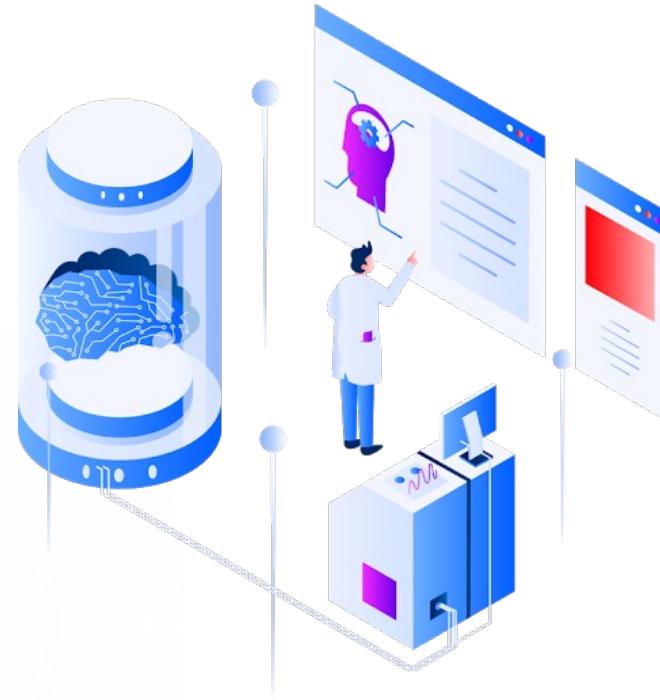




Introduction to Machine Learning

Ketan Kotecha, PhD(IIT Bombay)
<https://www.linkedin.com/in/ketankotecha/>



What is Artificial intelligence?

AI



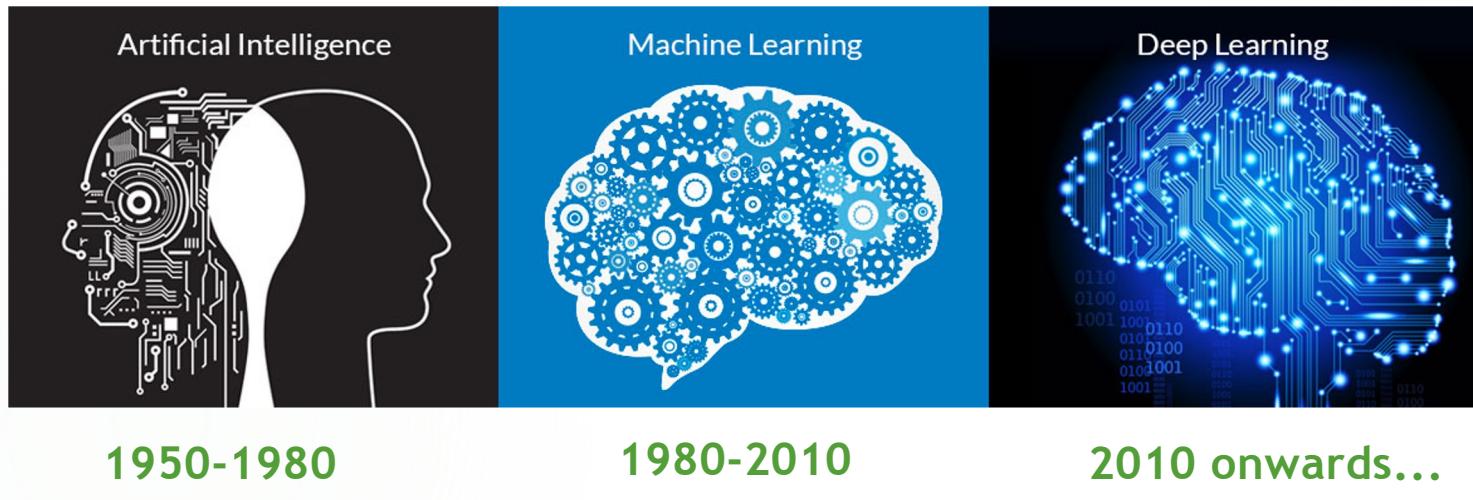
Ability to learn, understand and think" -Oxford Dictionary

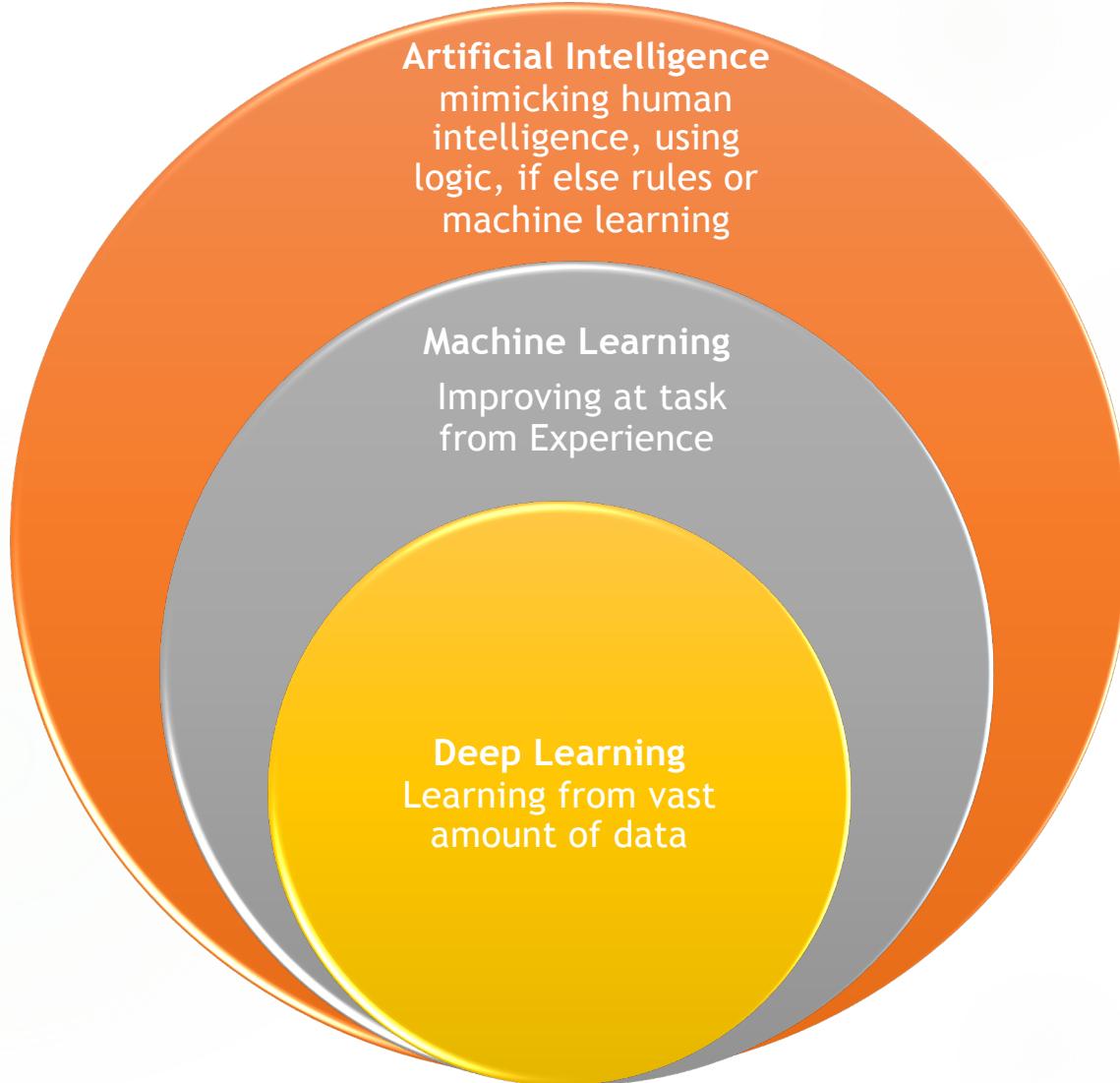


Intelligence is also the ability to learn from the environment and change our behavior based on inputs we get. The study of how to make computers perform functions which at present humans are good at.

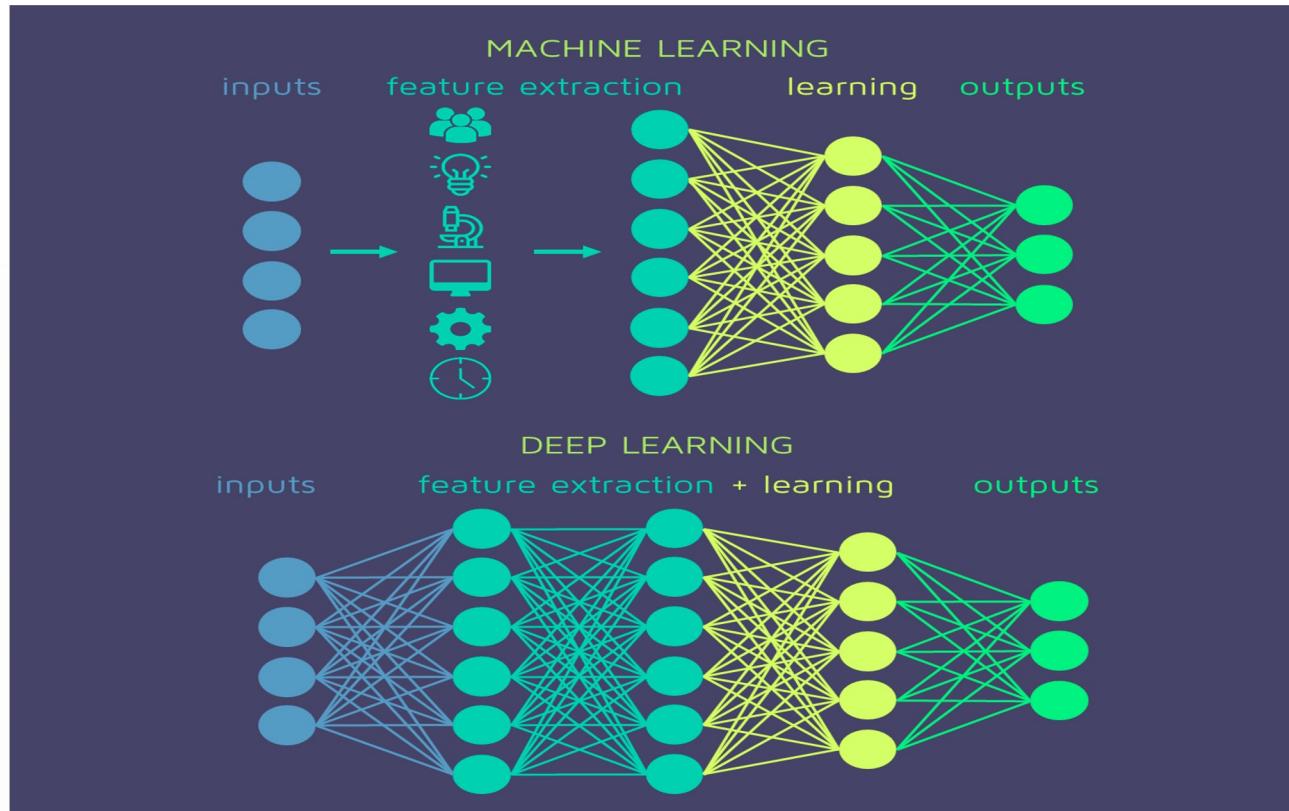


Examples: Voice and Speech Recognition, Face recognition and face identification, Object detection, Intuition, Inferencing, Learning new skills, Decision making,





ML Vs DL



Types of Machine Learning

1

SUPERVISED

Task Driven

Predicts Next Value

(Outcome is Labelled)



Eg: **Regression, Classification**

2

UNSUPERVISED

Data Driven

Finds Clusters

(Outcome is Labelled)



Eg: **Association, Clustering**

3

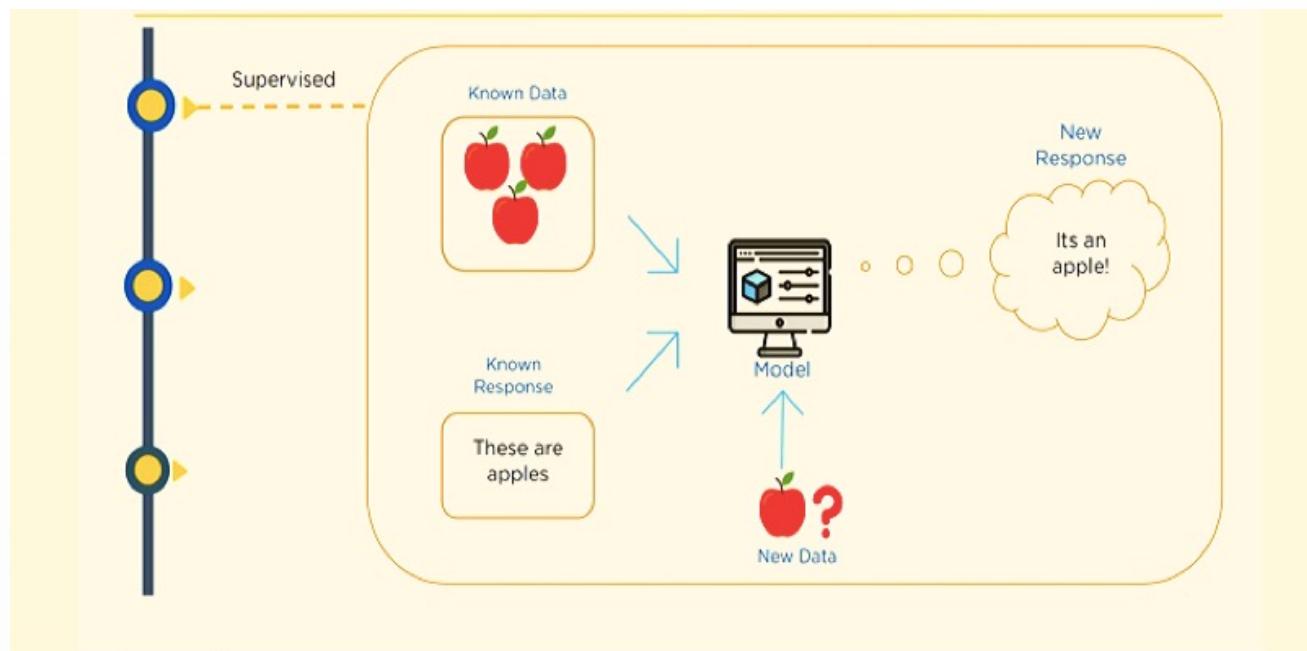
REINFORCEMENT

Learn from

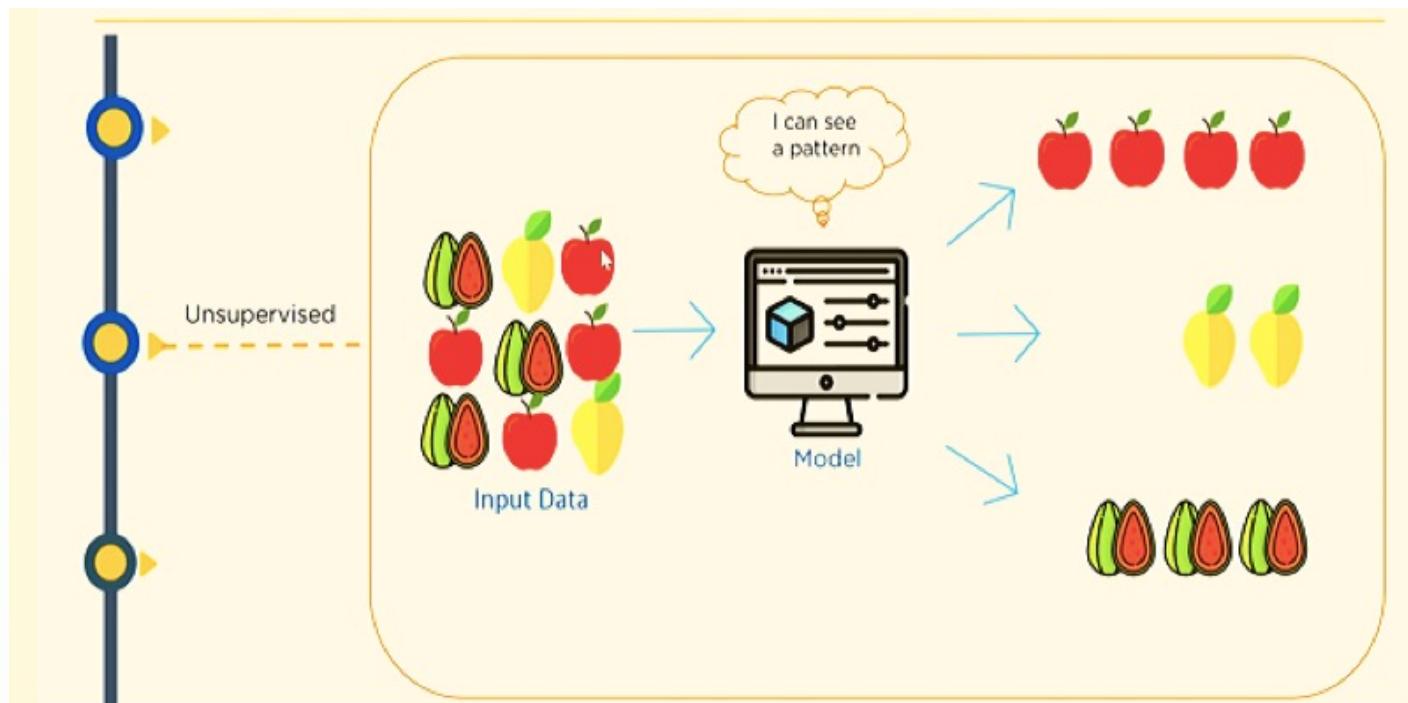
mistakes/Achievements



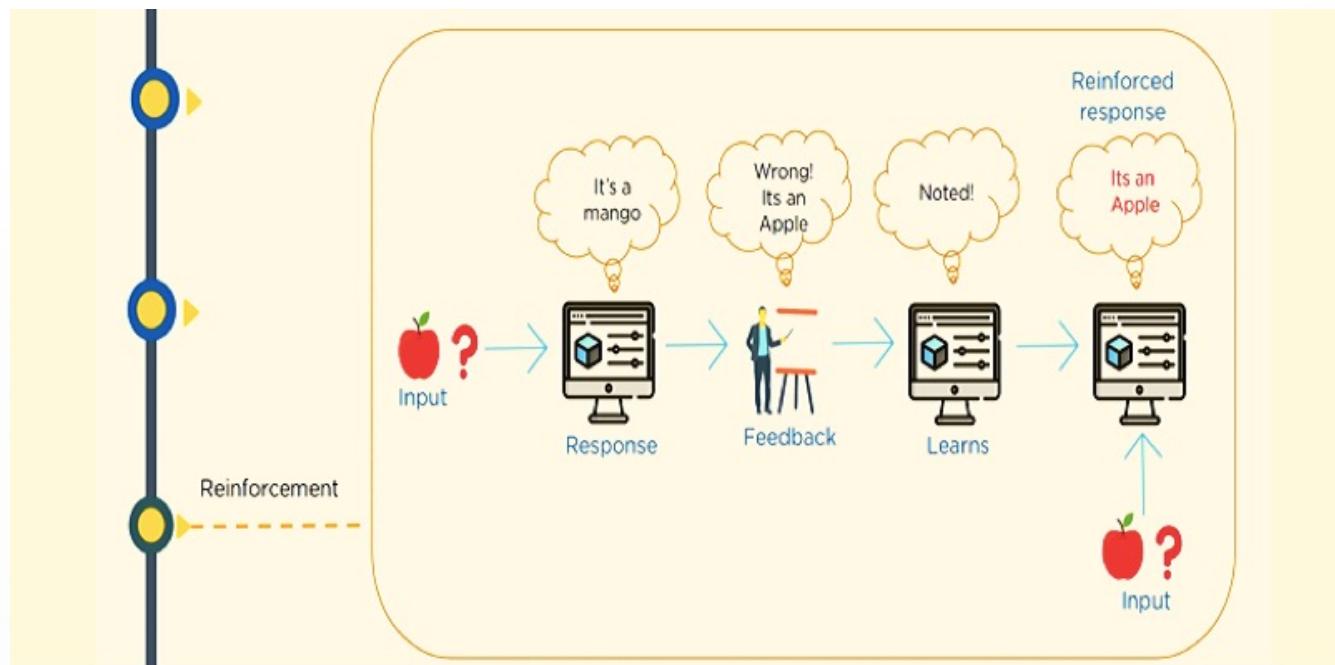
Supervised Learning



Unsupervised Learning



Reinforcement Learning



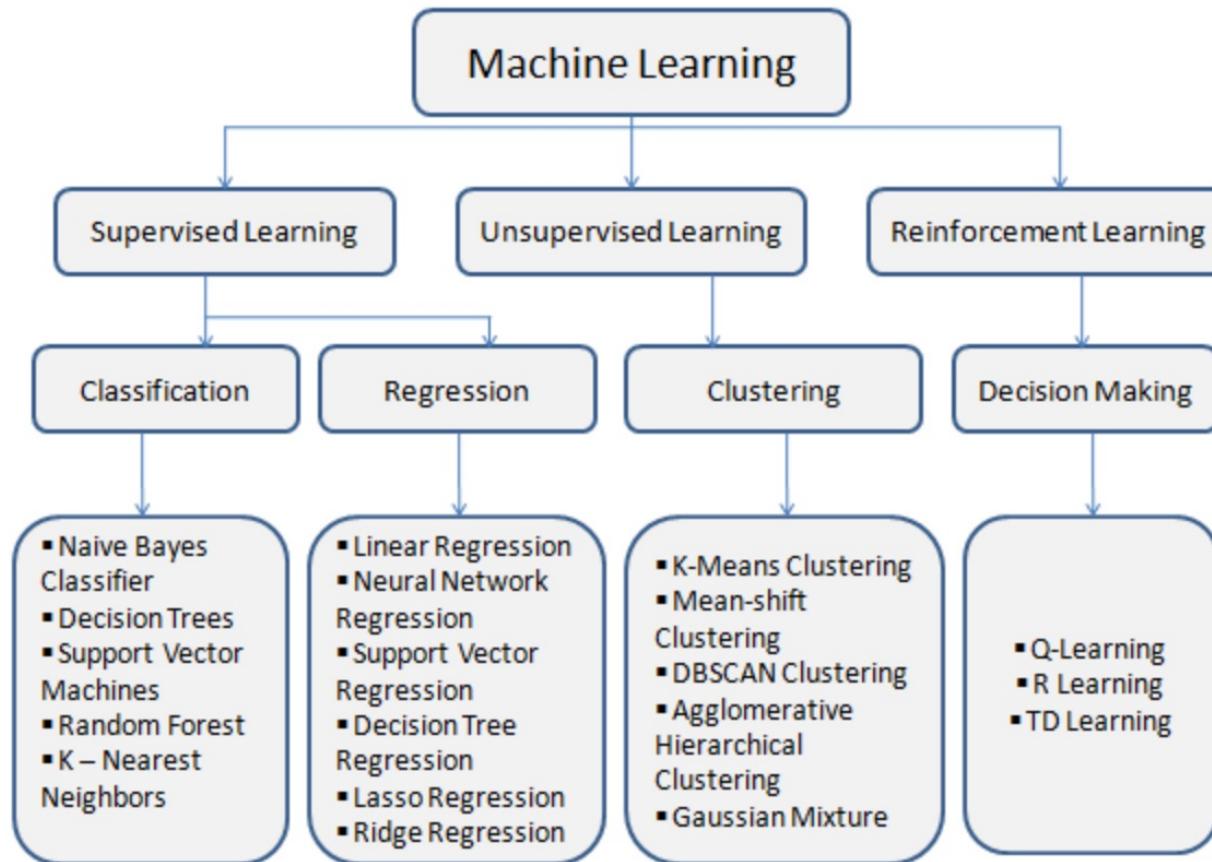


Supervised Learning

Unsupervised Learning

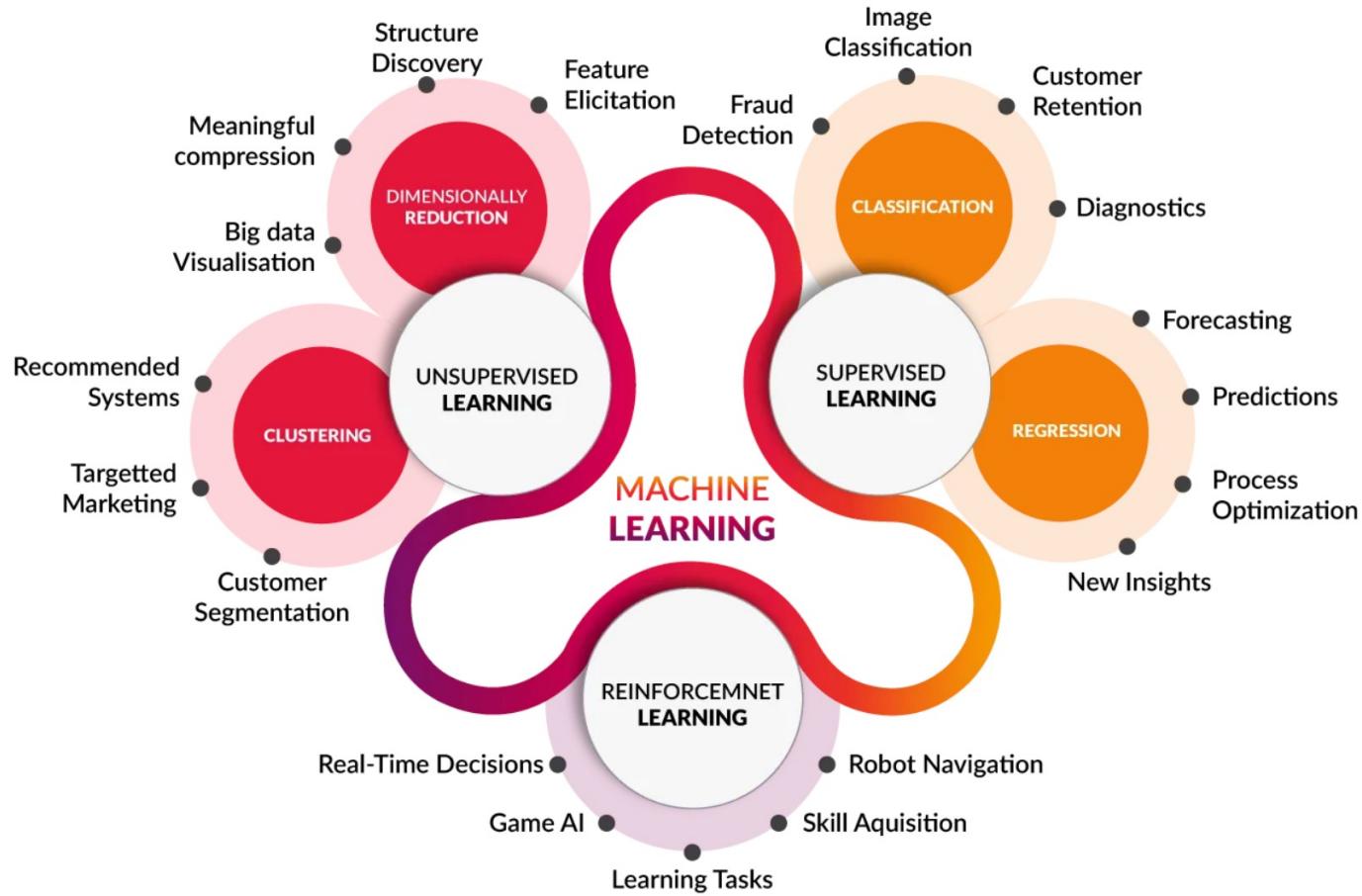


Reinforcement Learning



AI has reached everywhere...

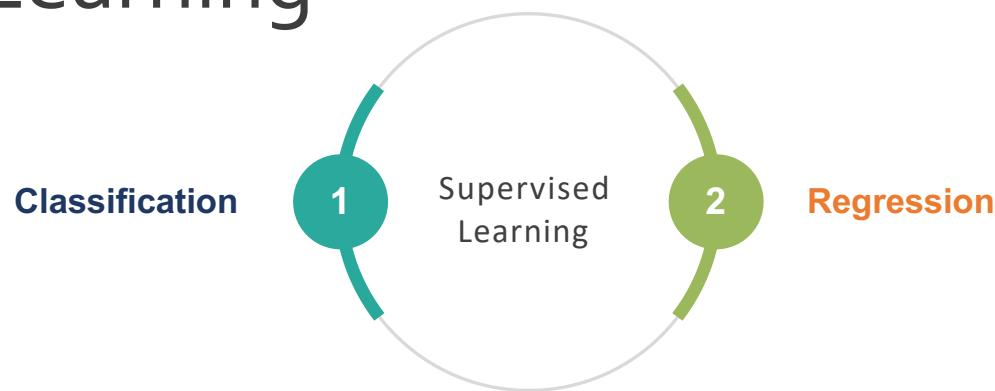






Supervised Learning

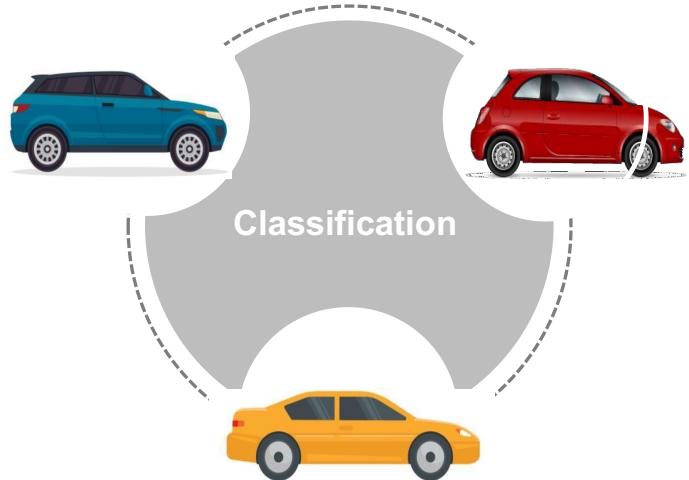
Types of Supervised Learning



In supervised learning, algorithm is selected based on target variable.

Types of Supervised Learning (Contd.)

If target variable is categorical (classes), then use classification algorithm.



In other words, classification is applied when the output has finite and discrete values.

Example: Predict the class of car given its features like horsepower, mileage, weight, colour, etc.

The classifier will build its attributes based on these features.
Analysis has three potential outcomes - Sedan, SUV, or Hatchback

Types of Supervised Learning (Contd.)

If target variable is a continuous numeric variable (100–2000), then use a regression algorithm.



Example: Predict the price of a house given its sq. area, location, no of bedrooms, etc.

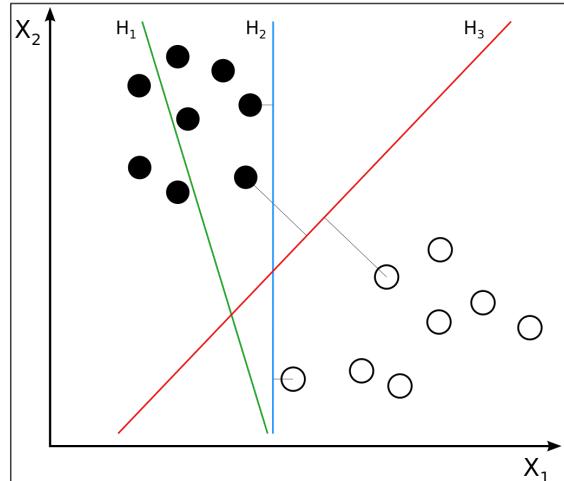
A simple regression algorithm is given below

$$y = w * x + b$$

This shows relationship between price (y) and sq. area (x)
where price is a number from a defined range.

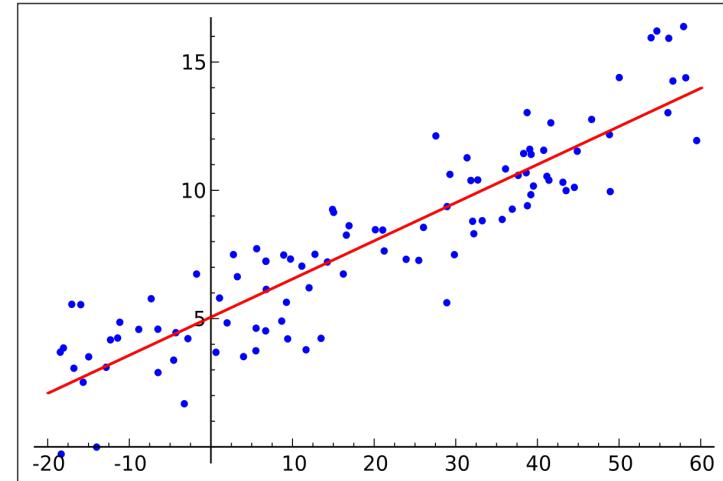
Types of Supervised Learning (Contd.)

Classification

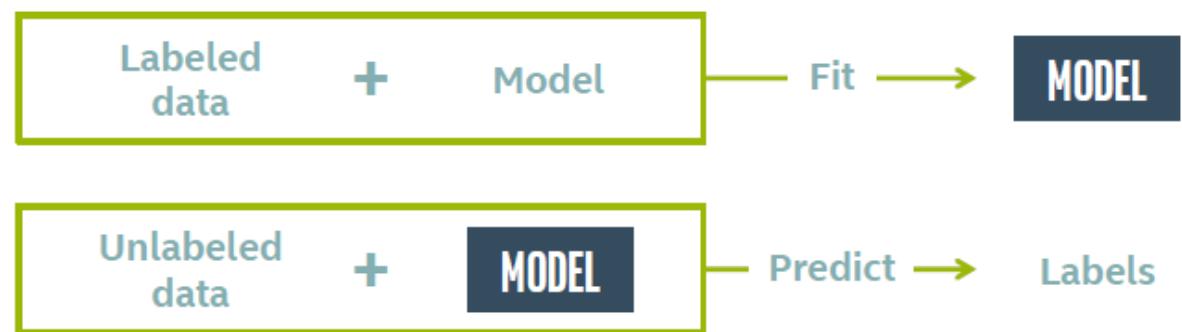
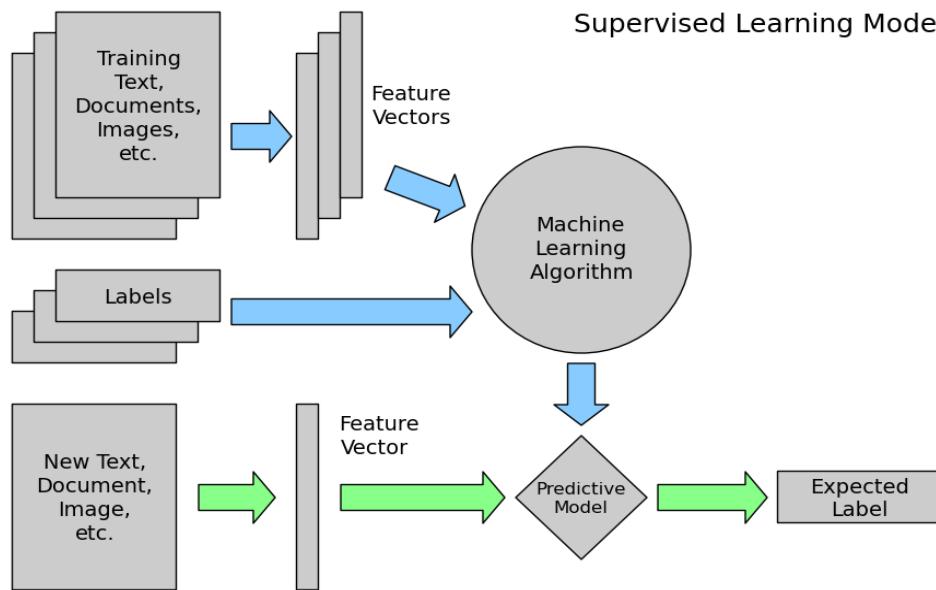


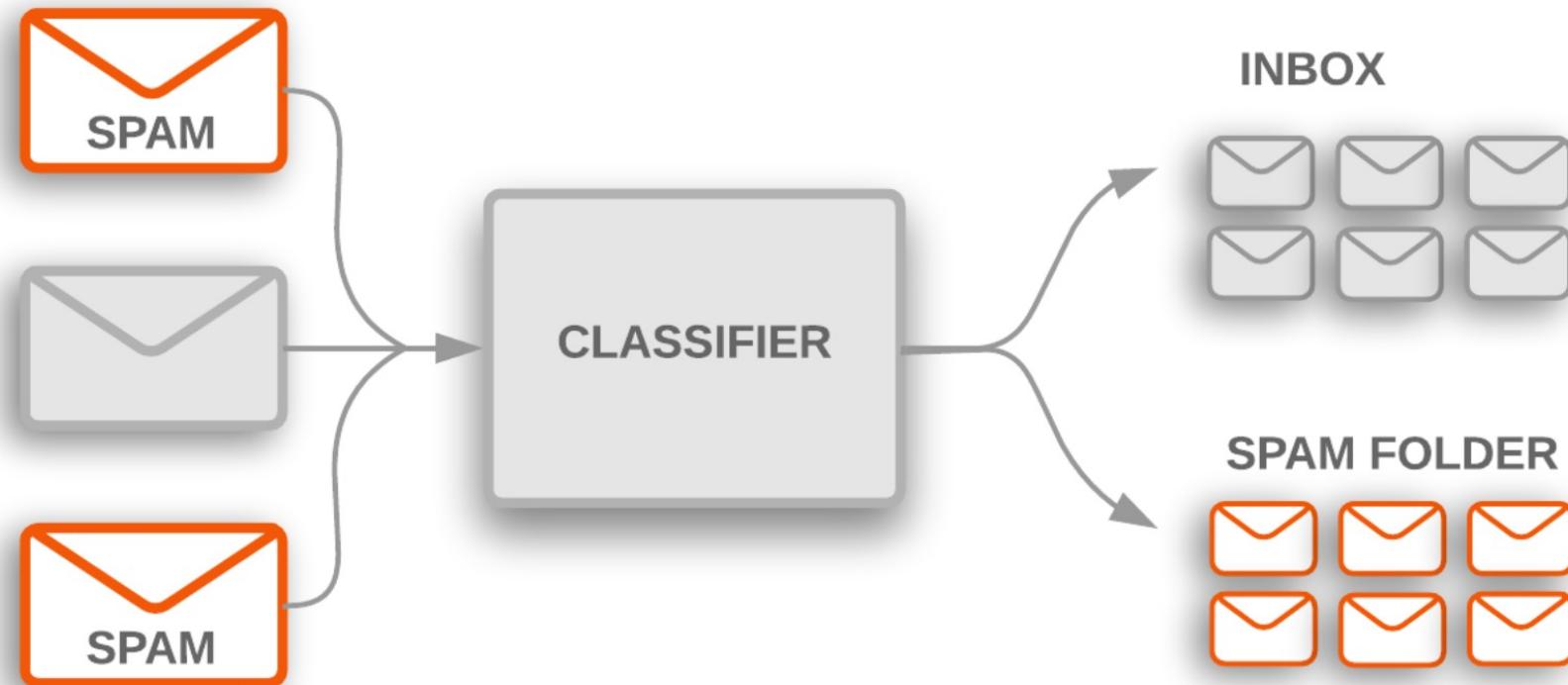
**What Class
?**

Regression

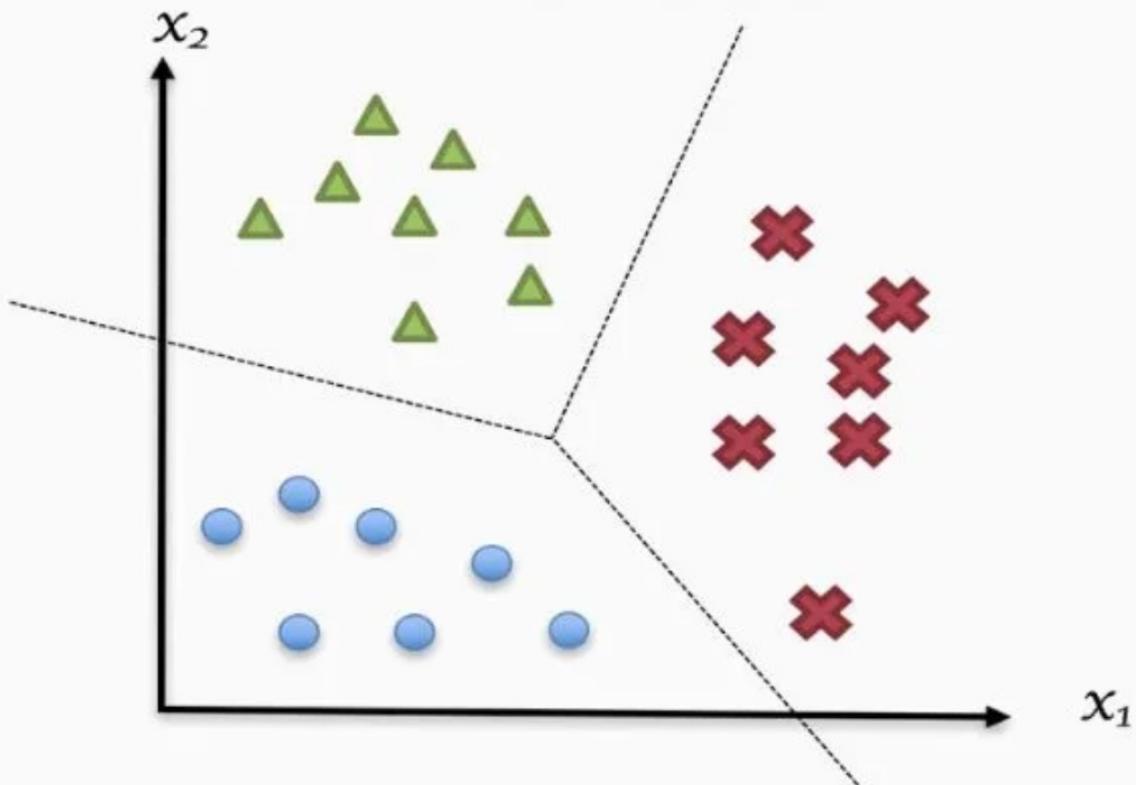


How much ?

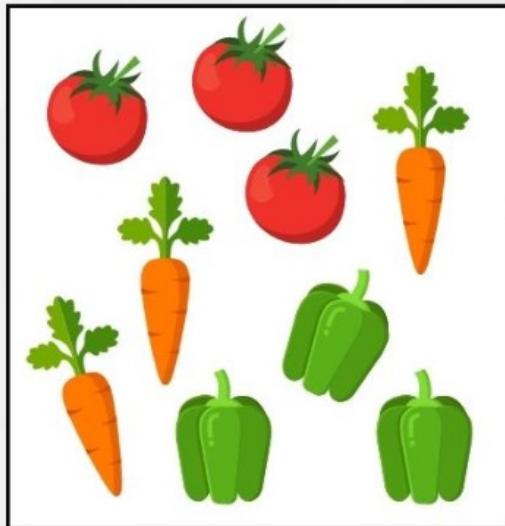




Multiclass Classification

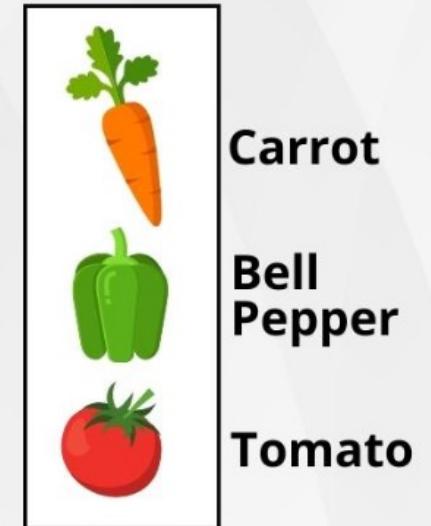


Labeled Data

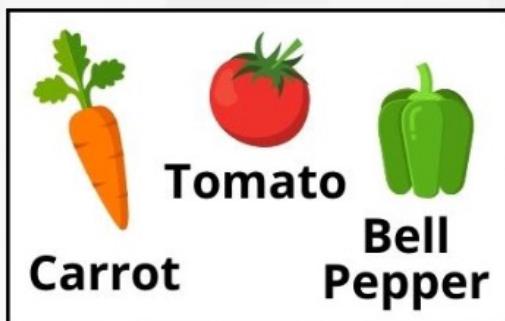


Model Training

Prediction



Labels



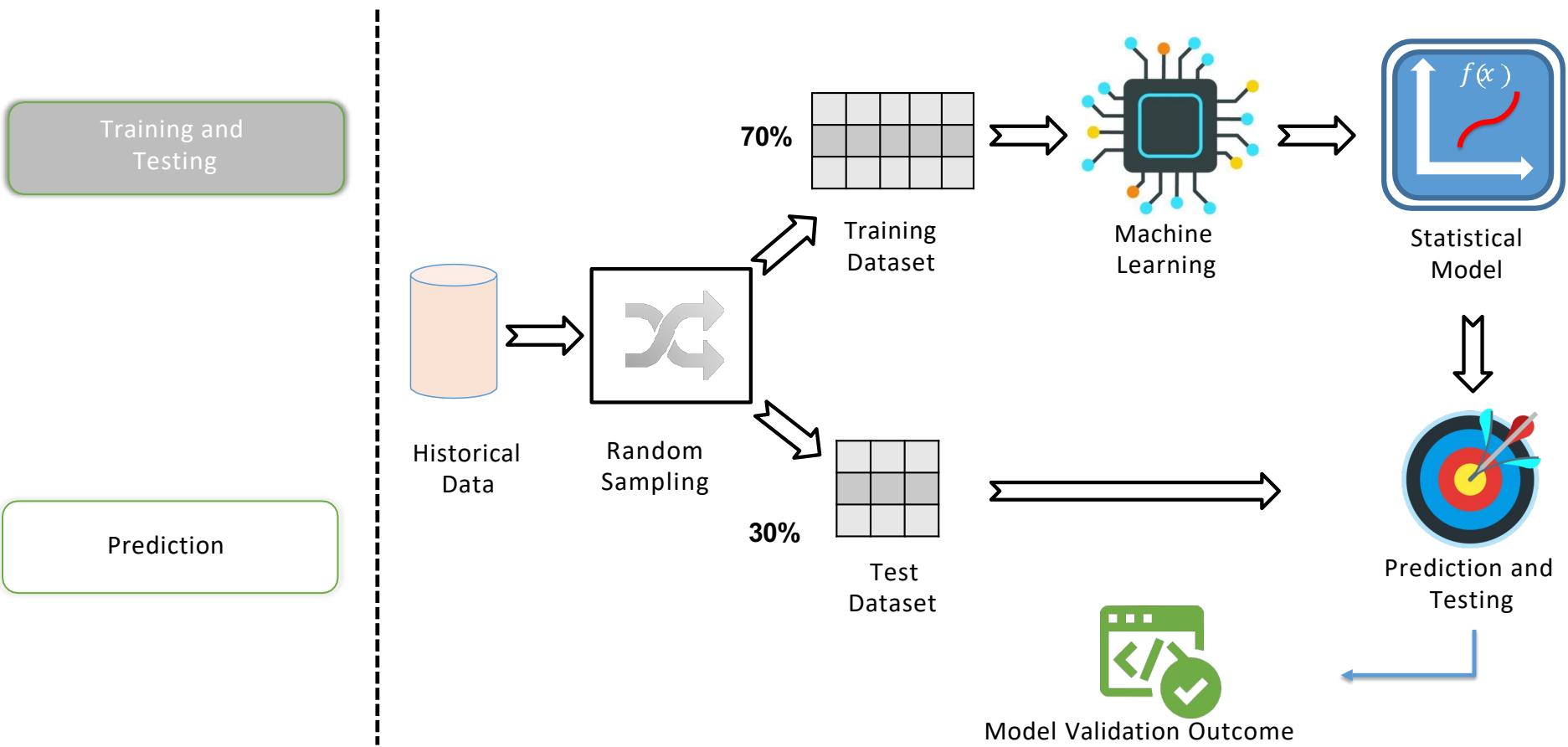
DatabaseTown

Supervised Learning: Algorithms, Examples, and How It Works 1

Test Data



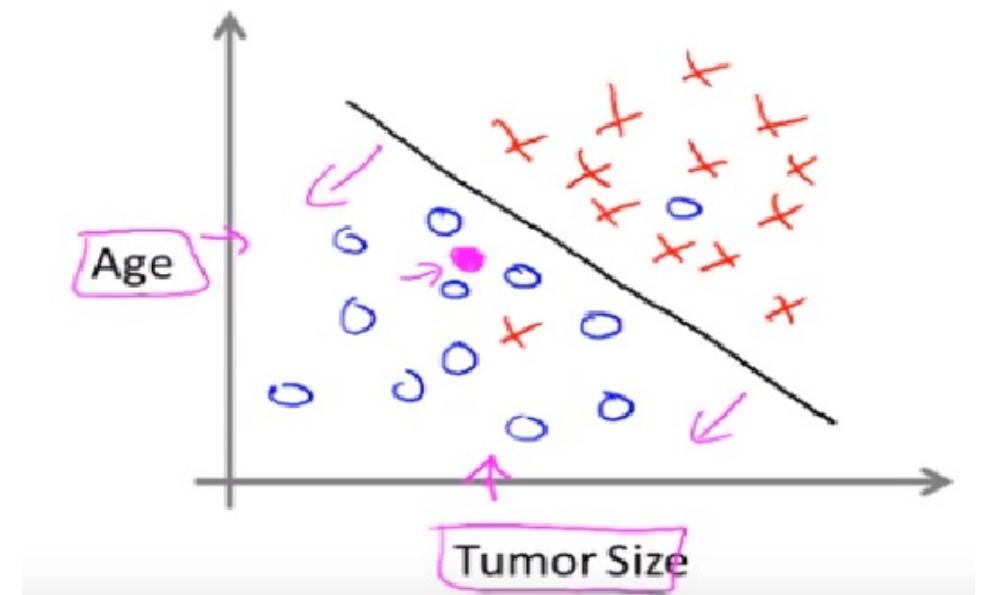
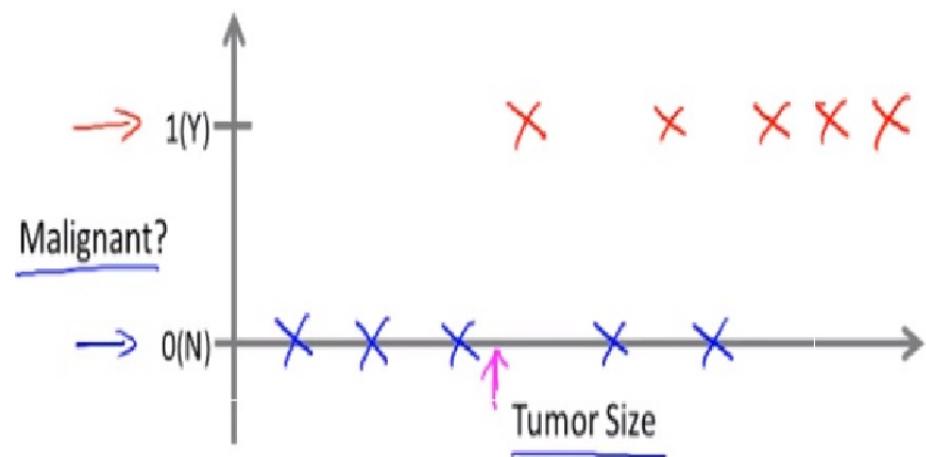
Supervised Learning Flow



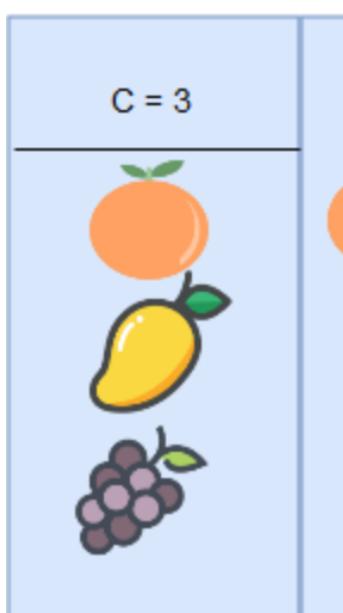
Pooja Kamat

Original Source: Simplilearn.com

Breast Cancer (Malignant , Benign)



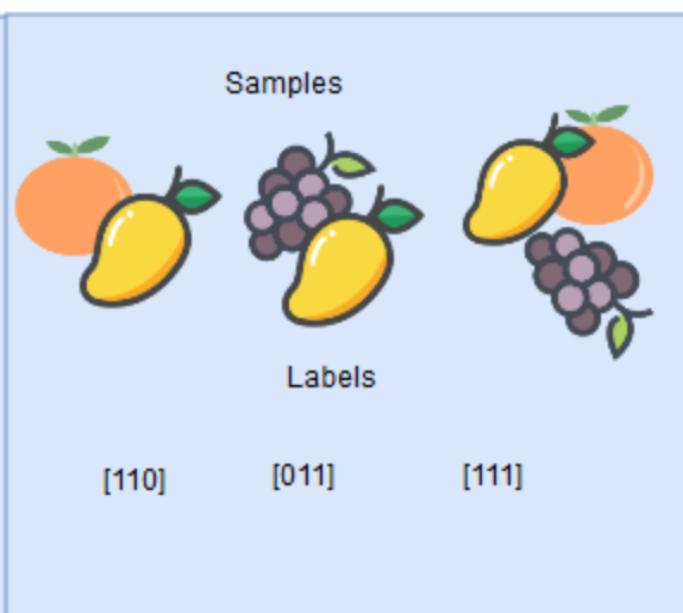
Multi-Class



Samples

	Labels
	[100]
	[010]
	[001]

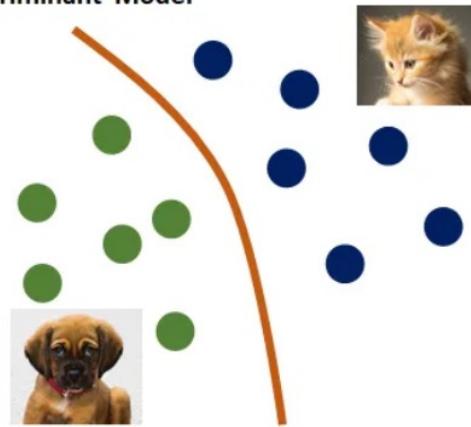
Multi-Label



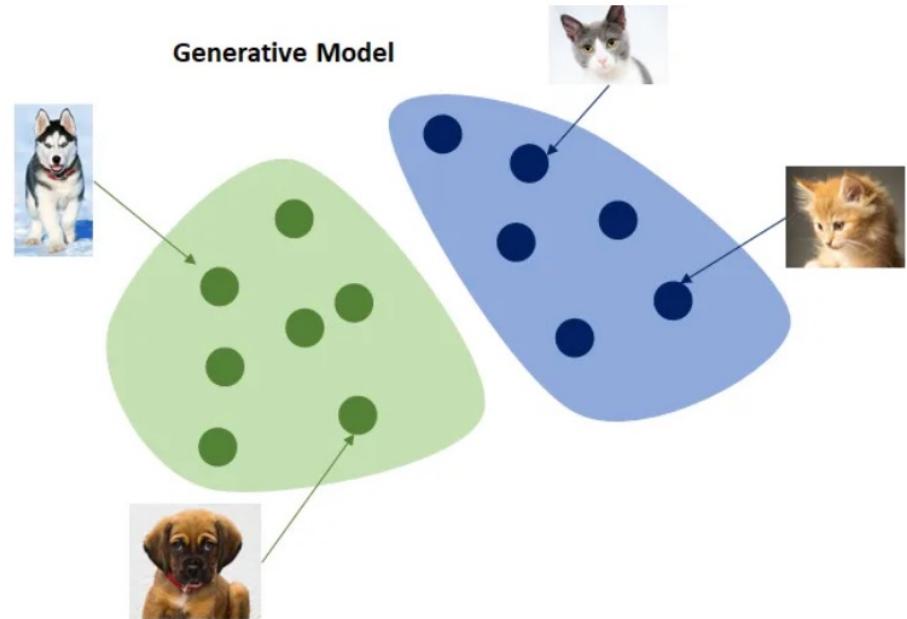
Samples

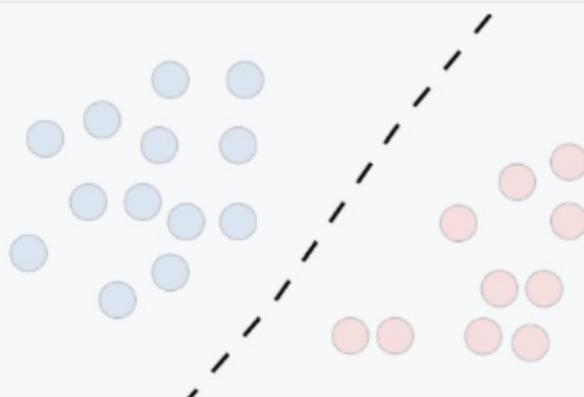
	Labels
	[110]
	[011]
	[111]

Discriminant Model

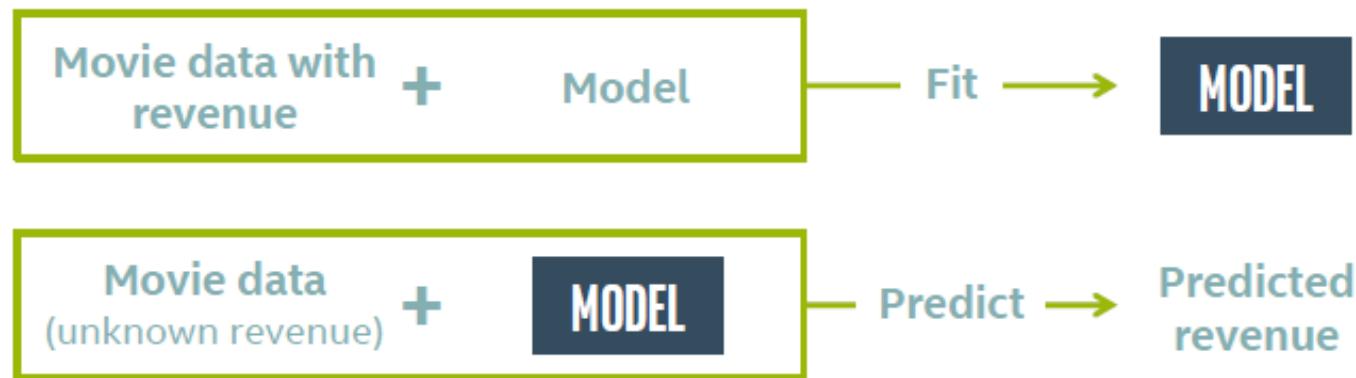


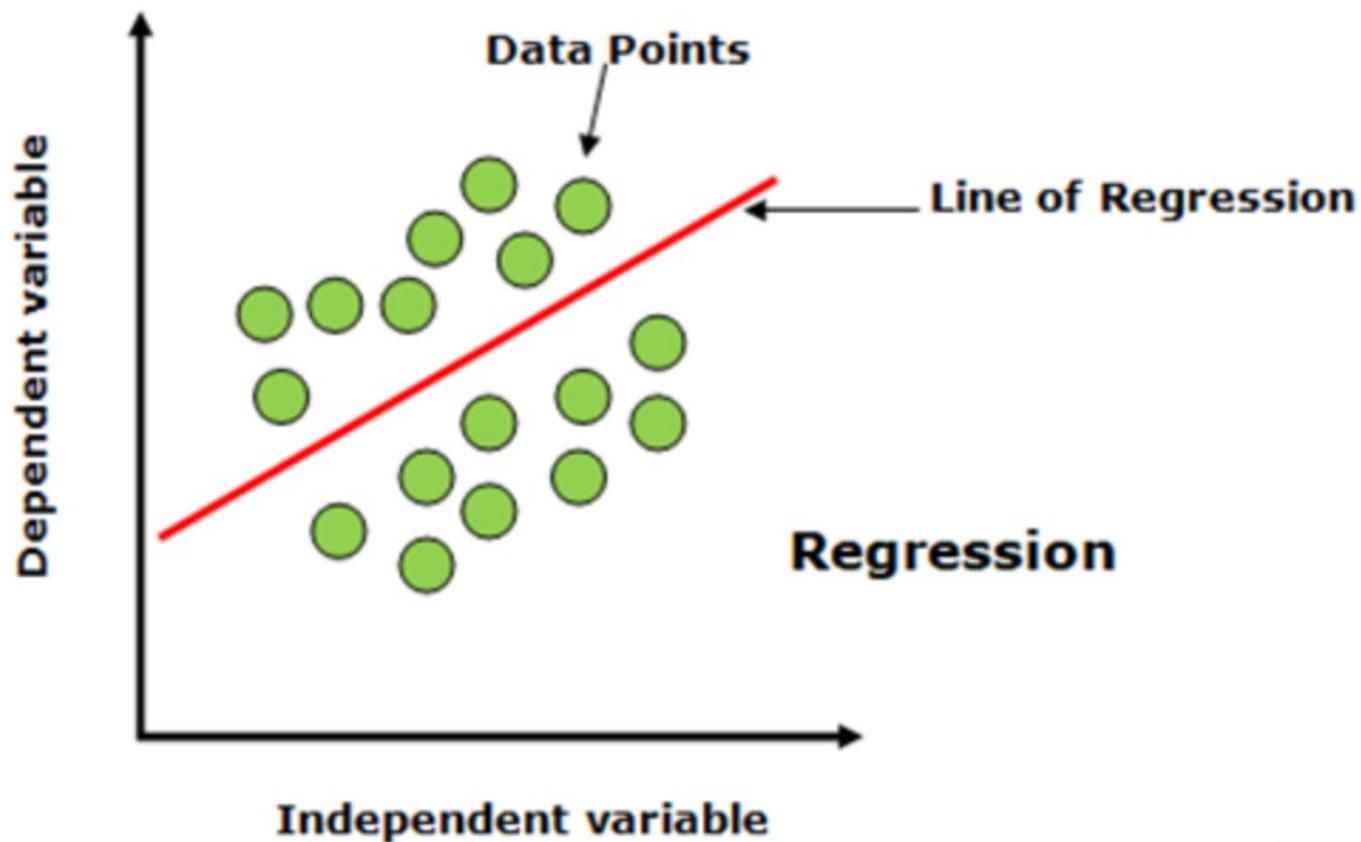
Generative Model



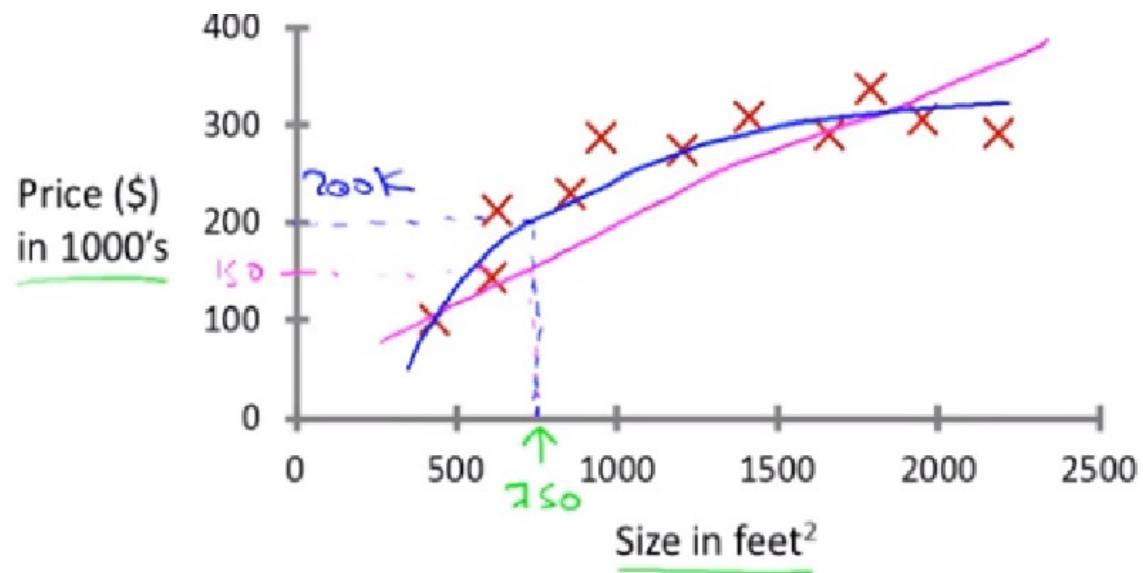
	Discriminative model	Generative model
Goal	Directly estimate $P(y x)$	Estimate $P(x y)$ to then deduce $P(y x)$
What's learned	Decision boundary	Probability distributions of the data
Illustration		
Examples	Regressions, SVMs	GDA, Naive Bayes

Regression

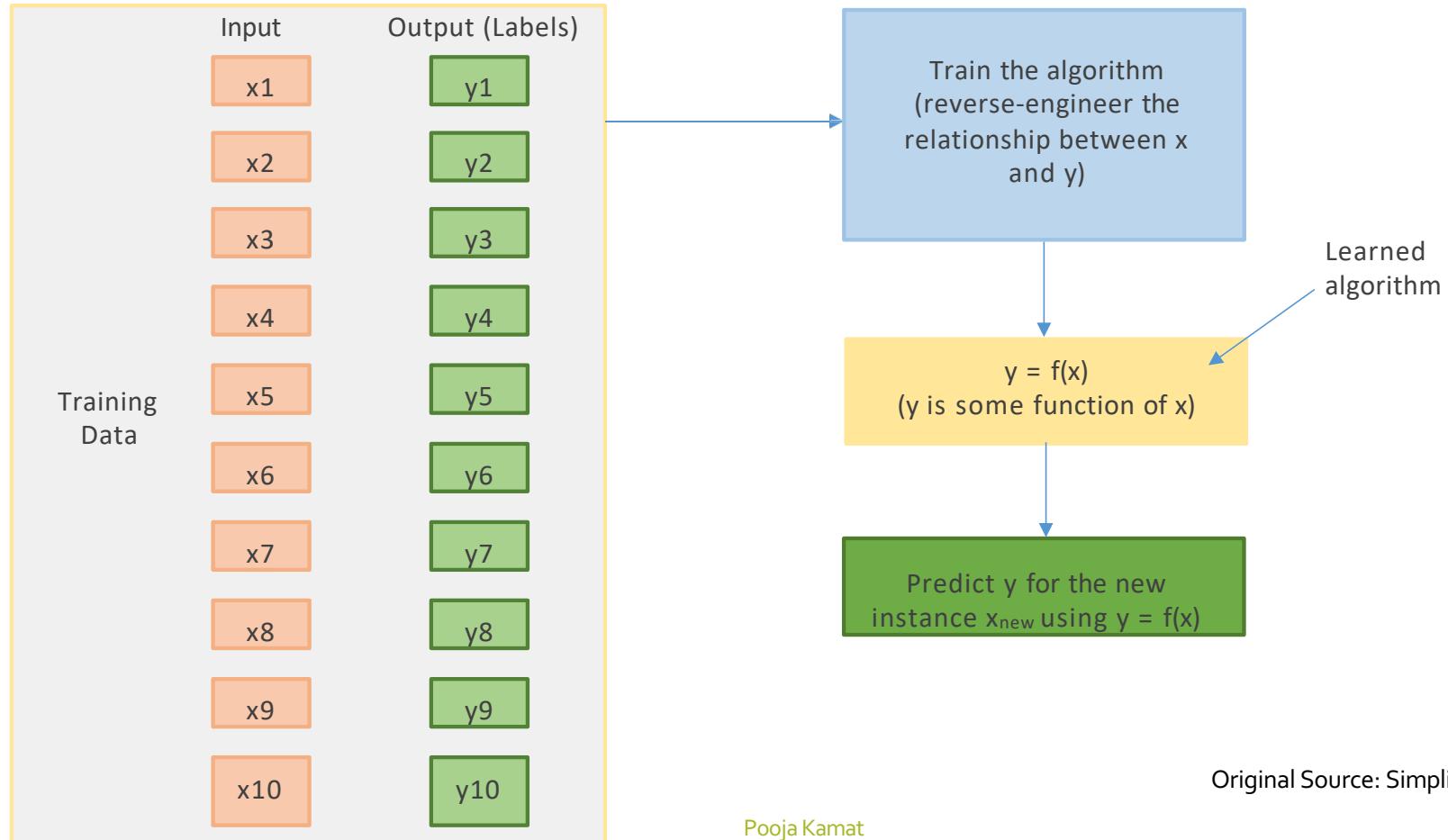


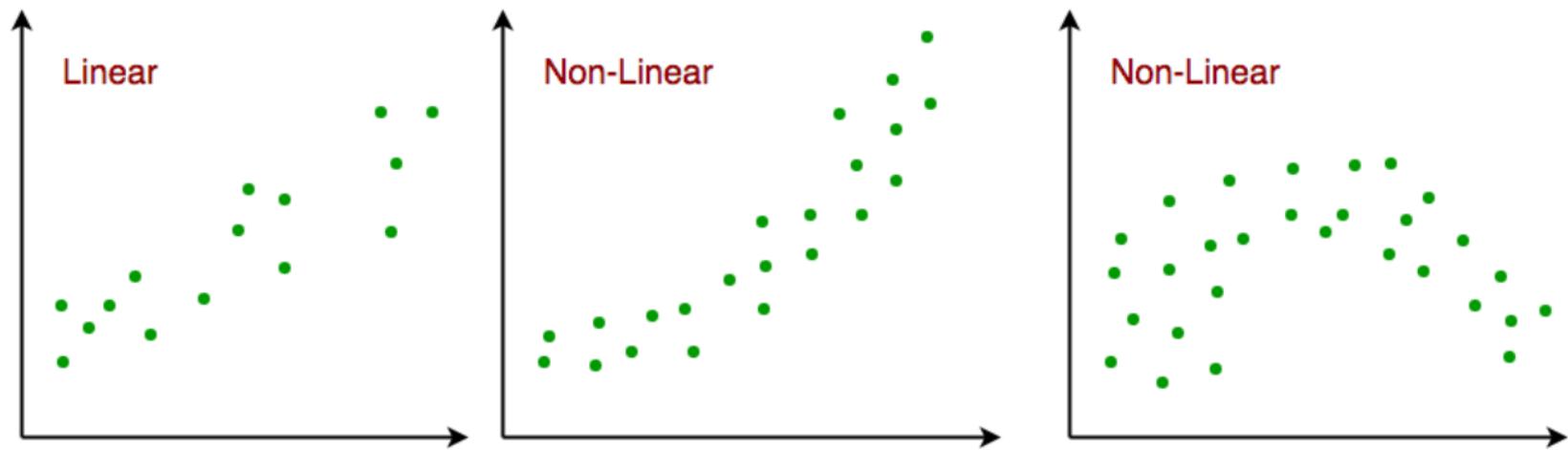


Housing Price Prediction



Understanding the Algorithm





Regression



What will be the temperature tomorrow?



Fahrenheit

Classification



Will it be hot or cold tomorrow?



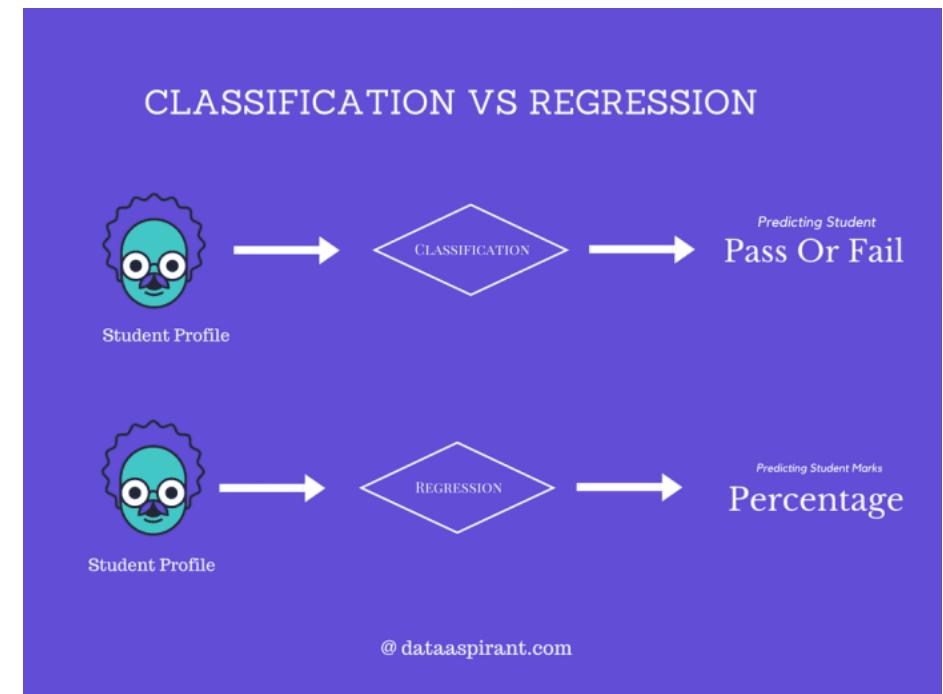
Fahrenheit

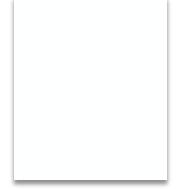
Supervised Learning

Classification Vs Regression

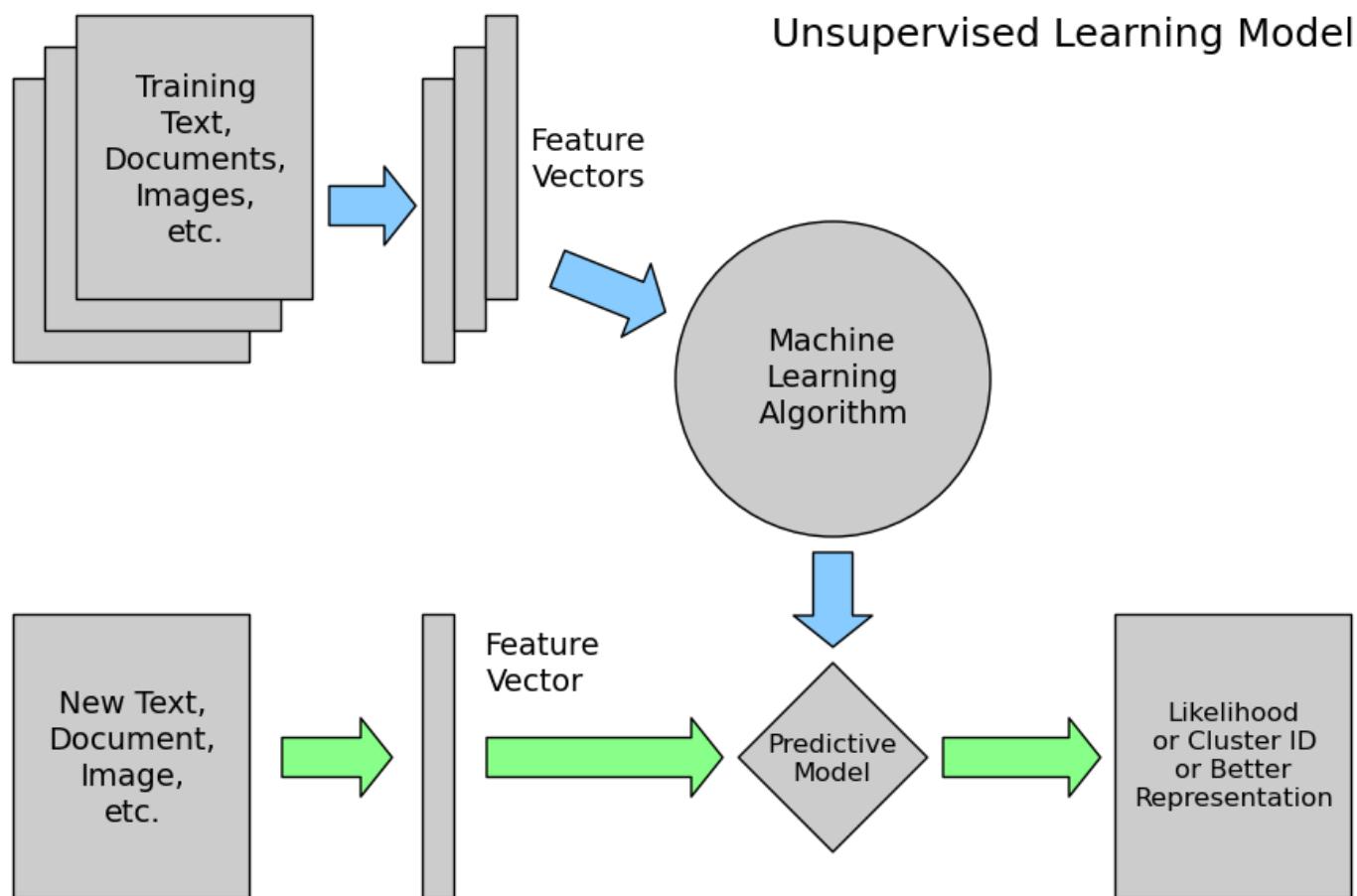
Regression: outcome is numerical, prediction of continuous valued output

Classification : Outcome is a category

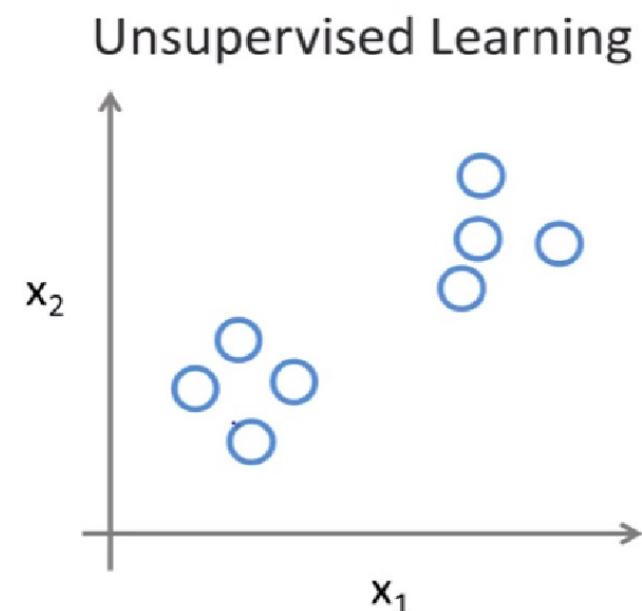
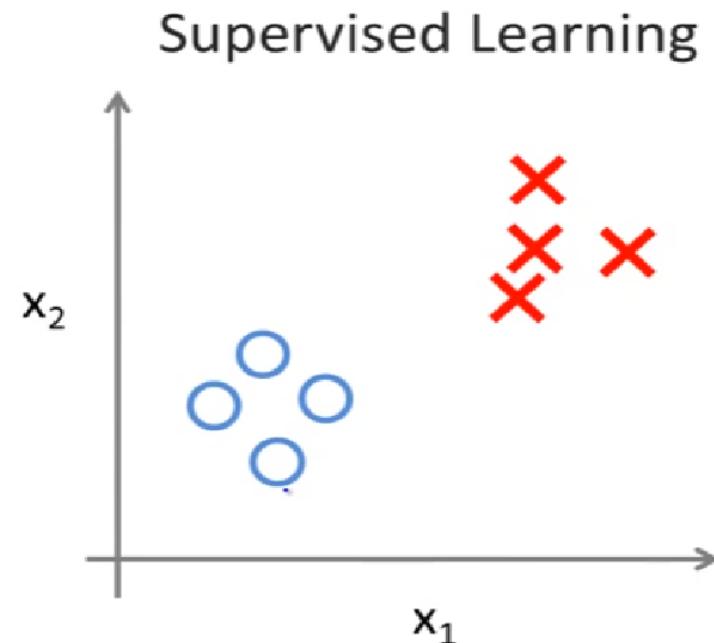


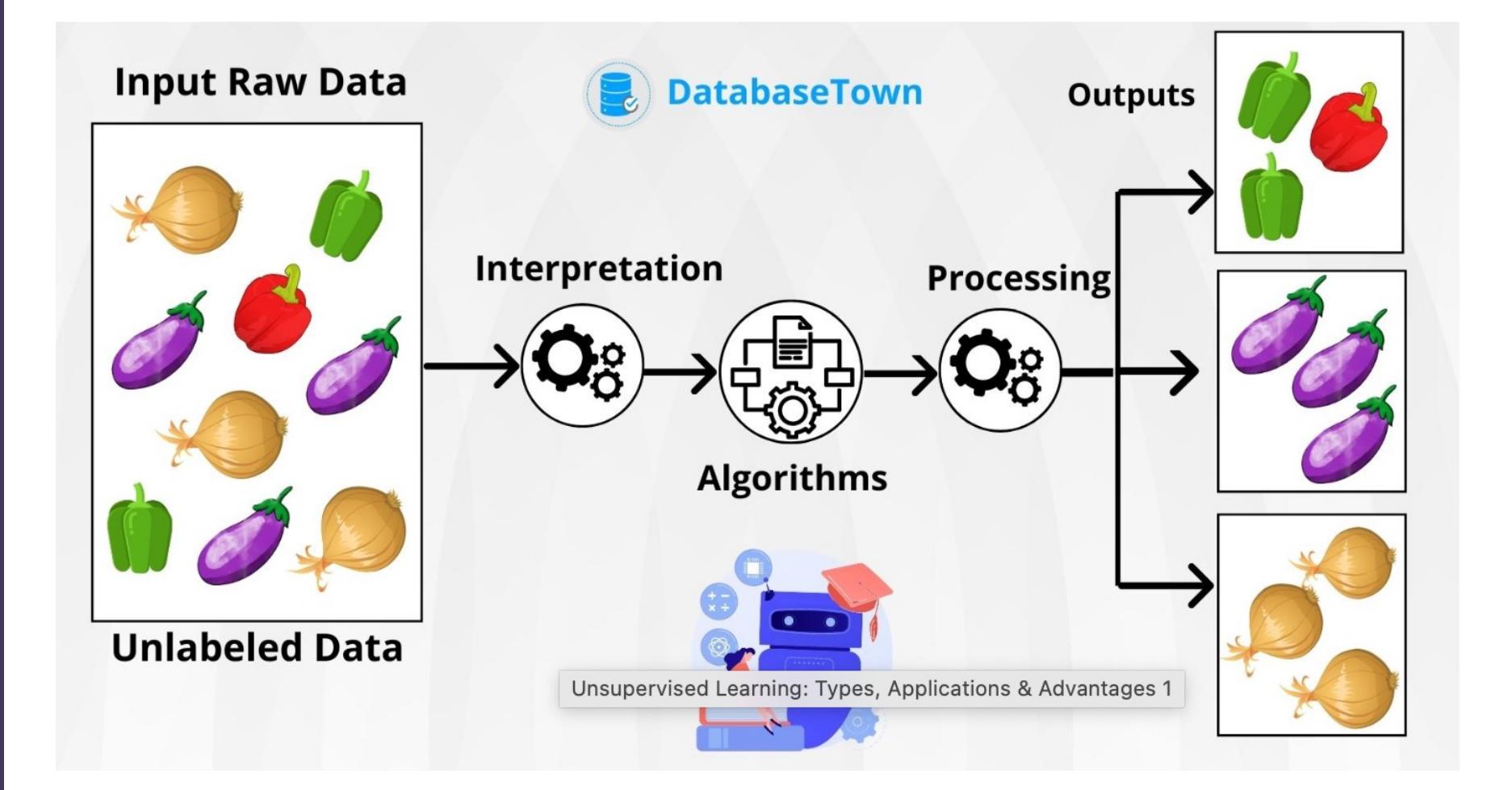


Unsupervised Learning

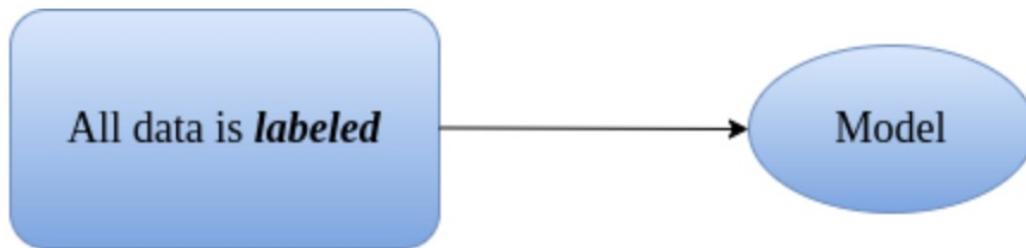


Supervised Vs Unsupervised

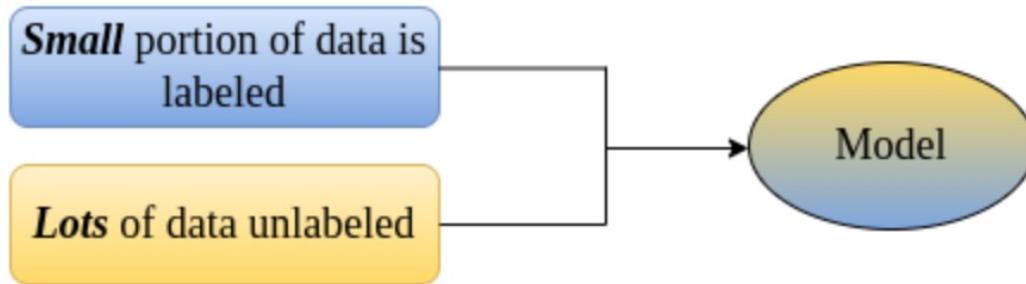




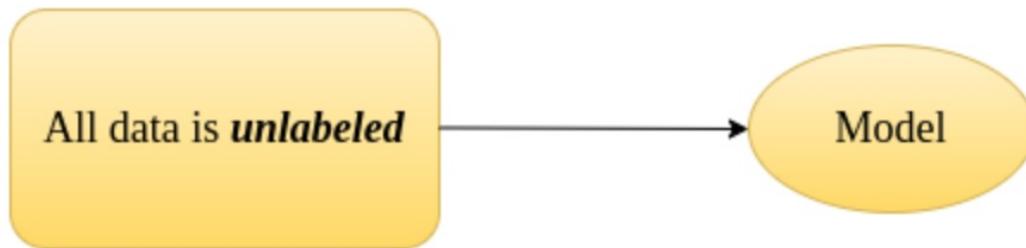
Supervised Learning

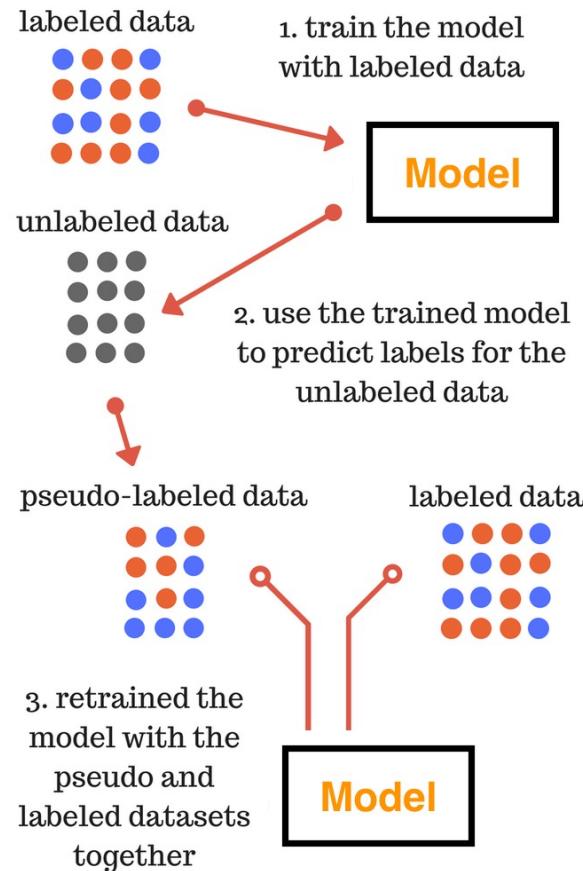


Semi-supervised Learning



Unsupervised Learning





Classical Machine Learning

Task Driven

Supervised Learning

(Pre Categorized Data)



Classification

(Divide the socks by Color)

Eg. Identity Fraud Detection



Regression

(Divide the Ties by Length)

Eg. Market Forecasting

Data Driven

Unsupervised Learning

(Unlabelled Data)



Clustering

(Divide by Similarity)

Eg. Targeted Marketing



Association

(Identify Sequences)

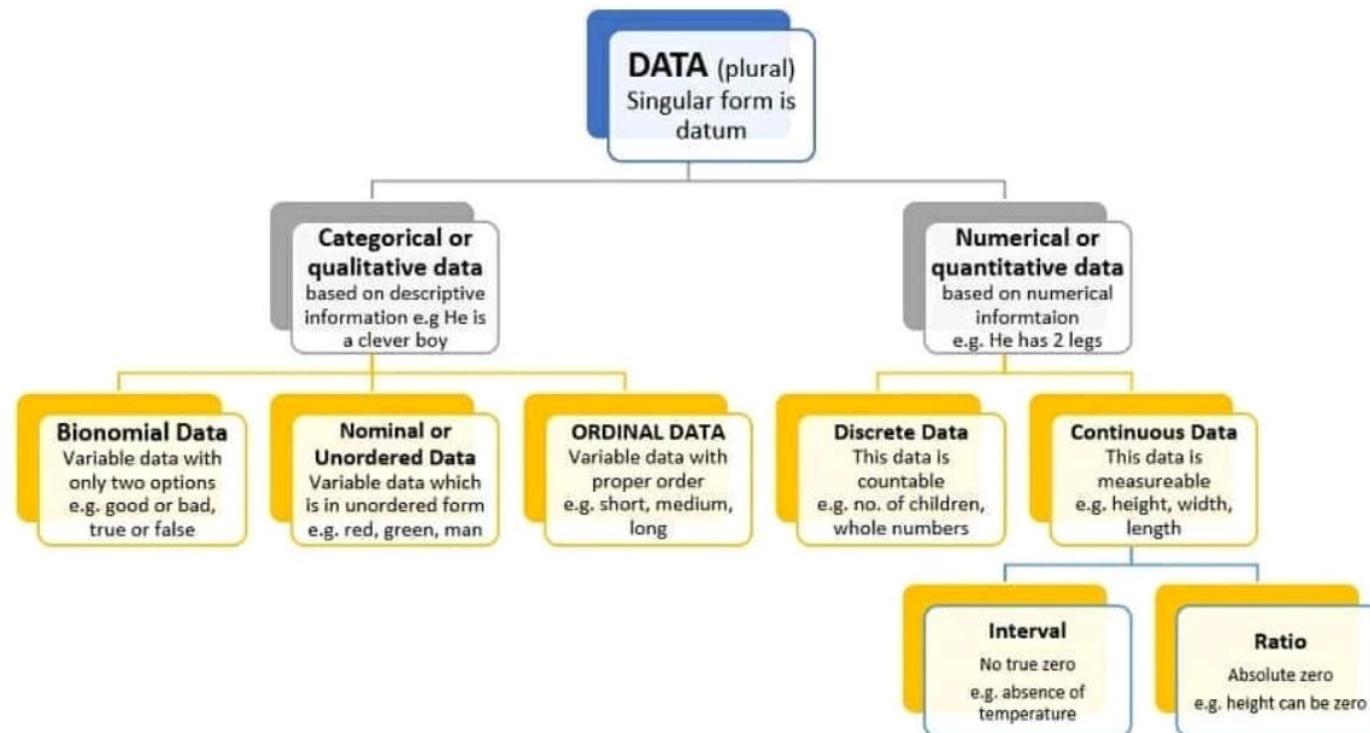
Eg. Customer Recommendation

Dimensionality Reduction

(Wider Dependencies)

Eg. Big Data Visualization

TYPES OF DATA





Thank you!

Questions

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Symbiosis Centre for Applied Artificial Intelligence (SCAAI)
Symbiosis International (Deemed University)