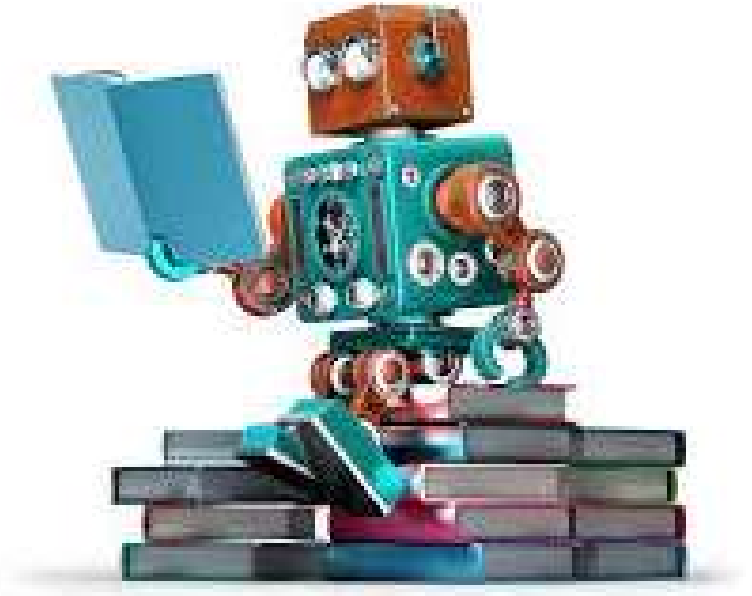


3170724-Machine Learning

Introduction to Machine Learning:

Prof. K.R. Makvana

Outline

- What is Machine Learning
- Types of Machine Learning
- Application of Machine

What is Machine Learning?

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

Arthur Samuel- 1959

Deep Blue

Chess computer

Deep Blue was a chess-playing expert system run on a unique purpose-built IBM supercomputer. It was the first computer to win a game, and the first to win a match, against a reigning world champion under regular time controls. Development began in 1985 at Carnegie Mellon University under the name ChipTest.

Evolution of Machine Learning

1763 Doctrine of Chances - Thomas Bayes

- This is the work underlying Bayes Theorem, a fundamental work on whic number of algorithms of machine learning is based upon. 1812 Bayes Th Simon Laplace

1950 Computing Machinery and Intelligence

- Turing posed the question ‘Can machines think?’ or in other w ‘Do machines have intelligence?’

1952 Arthur Samuel – Checker play

- Arthur Samuel of IBM laboratory started working on machine learning programs, and first developed programs that could p Checkers.

Evolution of Machine Learning

1957 First neural network program- Frank Rosen

- In 1957, Frank Rosenblatt designed the first neural network pr simulating the human brain.

1967 Nearest neighbour Algorithm

- Start of Pattern Recognition

1979 First Self Driving Cart – By Stanford studen

- http://watson.latech.edu/book/intelligence/videos/standfordcart.mp4
- http://watson.latech.edu/book/intelligence/intelligenceOverview5b4.html#:~:text=One%20of%20the%20first%20autonomous,connection%20to%20a%20large%

Evolution of Machine Learning

1957 First neural network program- Frank Rosenblatt

- In 1957, Frank Rosenblatt designed the first neural network pr simulating the human brain.

1982 Recurrent Neural Network

- A **recurrent neural network** (**RNN**) is a type of artificial neural network which uses sequential data or time series data

1989 Reinforcement Learning: Beginning of the Commer

- Reinforcement learning is a machine learning training method based on rewarding desired b and/or punishing undesired ones.

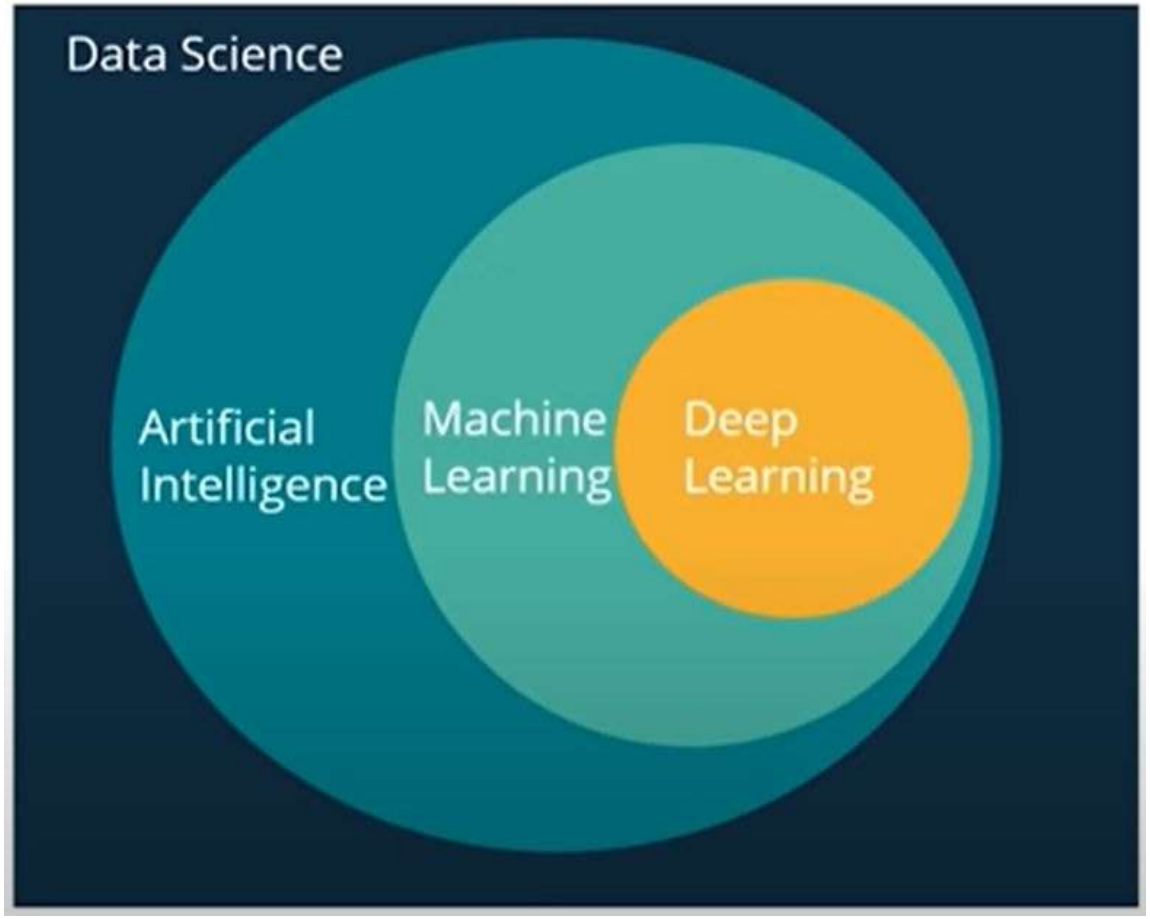
Evolution of Machine Learning

1995	Random Forest and SVM Model
1997	IBM's Deep Blue
2006	First ML competition by Netflix
2010	Kaggle launched
2014	ImageNet: Object detection competition
2016	Google's AlphaGo
2020	Chat GPT (Generative Pre-Trained Transf

Some Common terms

- **Artificial Intelligence**: Any method that tries to repl the **results** of some aspect of human cognition
- **Machine Learning**: Programs that perform better experience.
- **Artificial Neural Network(ANN):** Machine lear Algorithm.
- **Deep Learning:** A type of ANN. With more hidden laye
- **Big Data:** Using data to find unobvious patterns.

Relations between Data mining, AI, ML, a DL



Teaching Scheme

Teaching Scheme			Credits	Examination Marks			
L	T	P	C	Theory Marks		Practical Marks	
				ESE (E)	PA (M)	ESE (V)	PA (
3	0	2	4	70	30	30	

Evaluation Plan

Component	Task	Test Marks	Marks Counted for Evaluation
Progressive Assessment Theory (M) **(30)** **Minimum Passing Marks 12 out of all aggregate components**	Assignment (10 Marks) + Quiz (10 Marks)	20	**50%**
	Mid Exam	20	**50%**
	ML Project (Deadline 1 week before schedule of Viva)	20	**50%**
	Remedial Exam	30	100%
ESE Theory (E)	University Exam	70	-
Progressive Assessment Practical(I)(20)	Practical Submission	20	100%
Viva (V) (30)	Viva	30	100%
M + E (Theory)		100	**150 Marks**
I + V		50	

Course Outcome

Sr. No.	CO statement	Marks % weightage
CO-1	Explore the fundamental issues and challenges in Machine Learning including data and model selection and complexity	25
CO-2	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms	15
CO-3	Evaluate the various Supervised Learning algorithms using appropriate Dataset.	25
CO-4	Evaluate the various unsupervised Learning algorithms using appropriate Dataset.	20
CO-5	Design and implement various machine learning algorithms in a range of real-world applications.	15

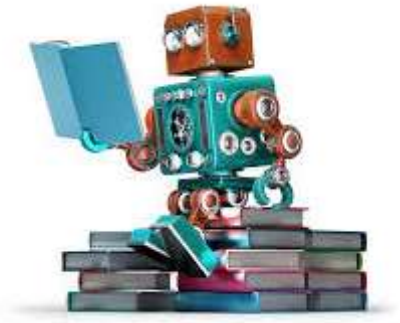
Sr. No.	Content	Total Hrs
1	**Introduction to Machine Learning:** Overview of Human Learning and Machine Learning, Types of Machine Learning, Applications of Machine Learning , Tools and Technology for Machine Learning .	02
2	**Preparing to Model:** Machine Learning activities, Types of data in Machine Learning, Structures of data, Data quality and remediation, Data Pre-Processing: Dimensionality reduction, Feature subset selection.	04
3	**Modelling and Evaluation:** Selecting a Model: Predictive/Descriptive, Training a Model for supervised learning, model representation and interpretability, Evaluating performance of a model, Improving performance of a model.	05
4	**Basics of Feature Engineering:** Feature and Feature Engineering, Feature transformation: Construction and extraction, Feature subset selection : Issues in high-dimensional data, key drivers, measure and overall process	03
5	**Overview of Probability:** Statistical tools in Machine Learning, Concepts of probability, Random variables, Discrete distributions, Continuous distributions, Multiple random variables, Central limit theorem, Sampling distributions, Hypothesis testing, Monte Carlo Approximation	04
6	**Bayesian Concept Learning:** Impotence of Bayesian methods, Bayesian theorem, Bayes' theorem and concept learning, Bayesian Belief Network	05
7	**Supervised Learning: Classification and Regression:** Supervised Learning, Classification Model, Learning steps, Classification algorithms, Regression, Regression algorithms,	10
8	**Unsupervised Learning:** Supervised vs. Unsupervised Learning, Applications, Clustering, Association rules	06
9	**Neural Network:** Introduction to neural network, Biological and Artificial Neurons, Types of Activation functions, Implementation of ANN, Architecture, Leaning process, Backpropogation, Deep Learning	06

WHAT IS HUMAN LEARNING?

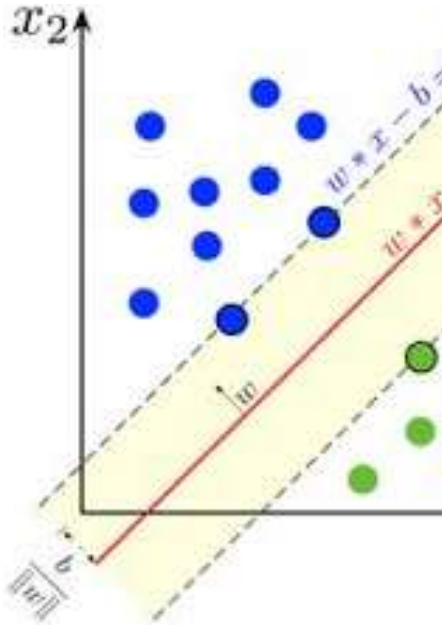
- In **cognitive science**, learning is typically referred to as the pr gaining information through observation.
- As we keep learning more or in other words acquirin information, the efficiency in doing the tasks keep improv example, with more knowledge, the ability to do homework v number of mistakes increases.
- Three Ways of Learning;
  - Directly Learn from Expert who teach us
  - Learning from Past taught by Expert
  - Self Learning

What is Machine learning

Machine reading books



Auto text to knowledge

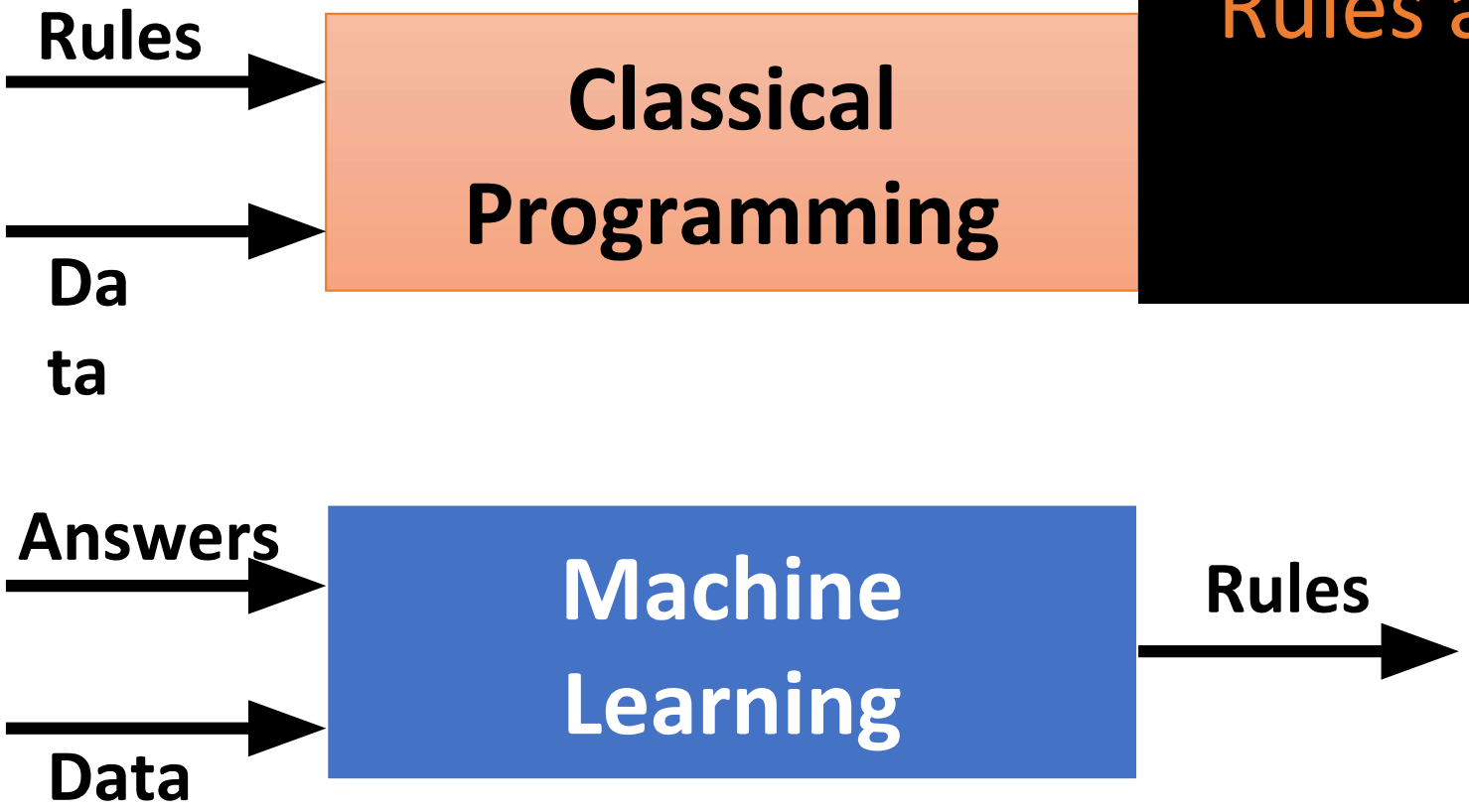


- Simple Definition: Using Data to answer questions.
- Study of Computer algorithm
  - That improve automatically
  - Through experience.
- **Formal Definition**: A computer program is said **to learn from expe** respect to **some class of tasks T** and **performance measure P** if its at tasks in T, as measured by P improves with experience E. **(*Text* ***Mitchall***)

The Machine learning Parad

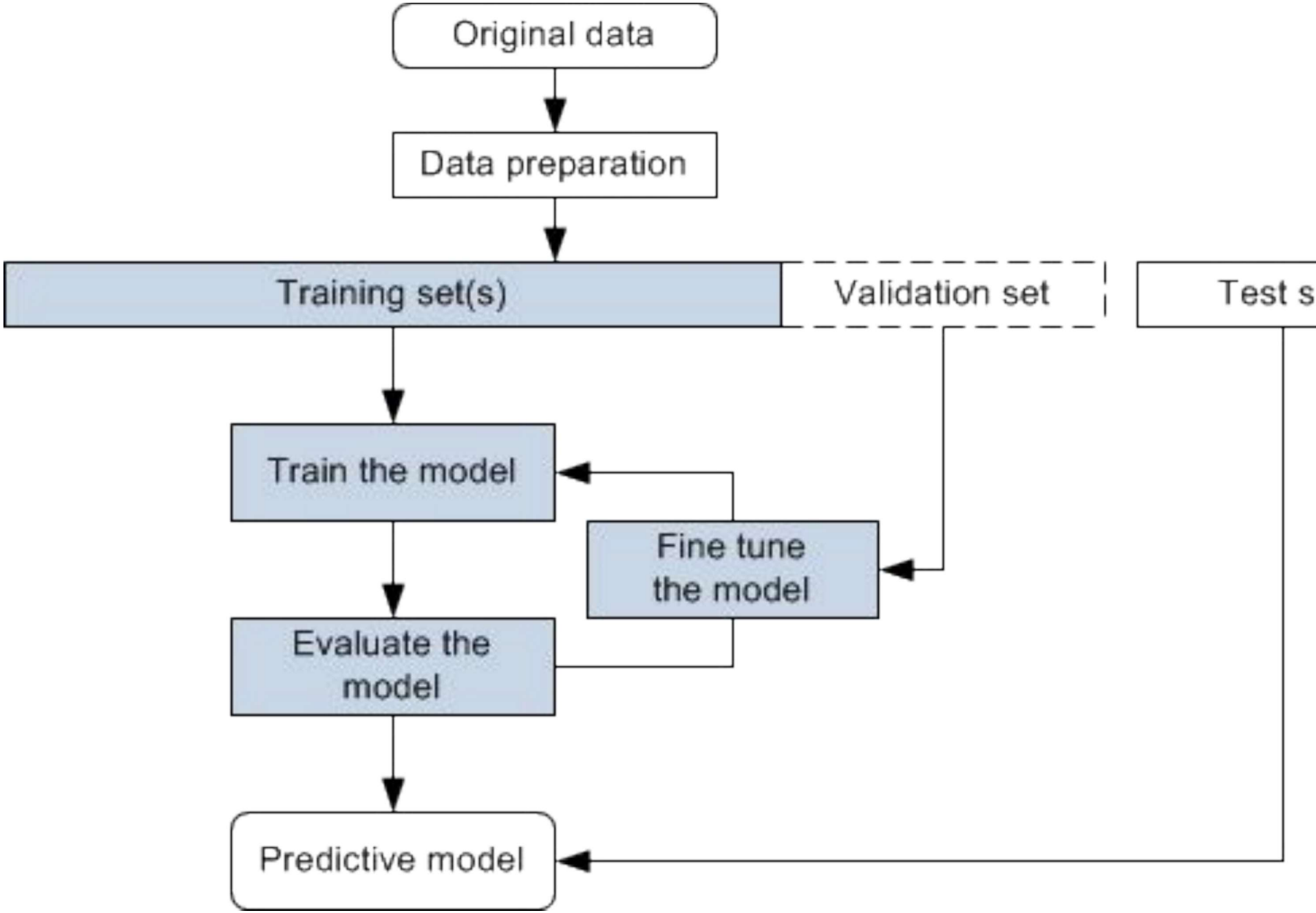
When to use ML a

Rules are diff
extrac



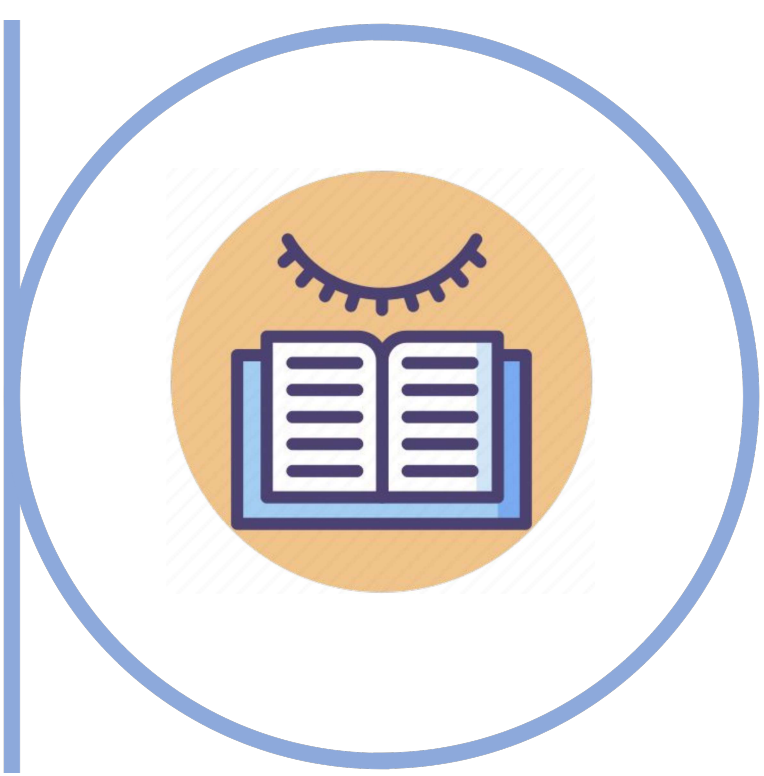
7 Steps in Machine learning

- Step 1: Gathering Data
- Step 2: Prepare data
- Step 3: Choosing Model/Algorithms
- Step 4: Training
- Step 5:Evaluate/Test
- Step 6: Hyperparameter Tuning
- Step 7: Prediction/Classification

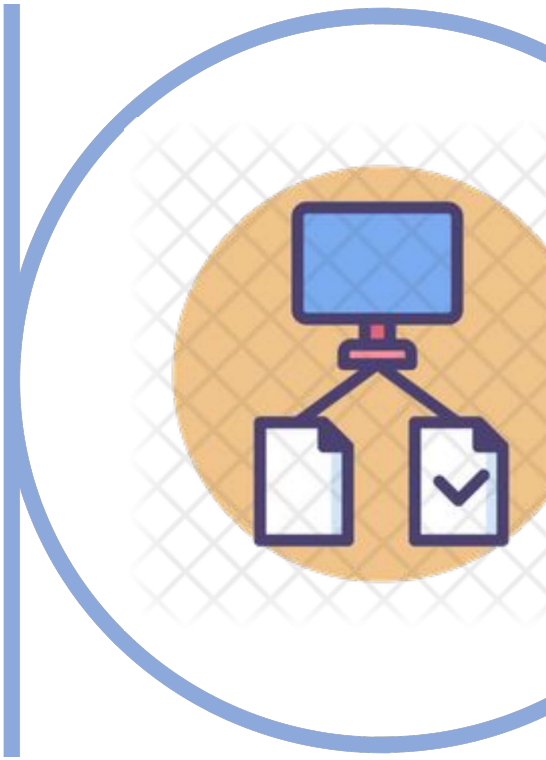

Original data
Data preparation
Training set(s)
Validation set
Test s
Train the model
Fine tune the model
Evaluate the model
Predictive model

Types of Machine Learning Approach

Supervised Machine Learning



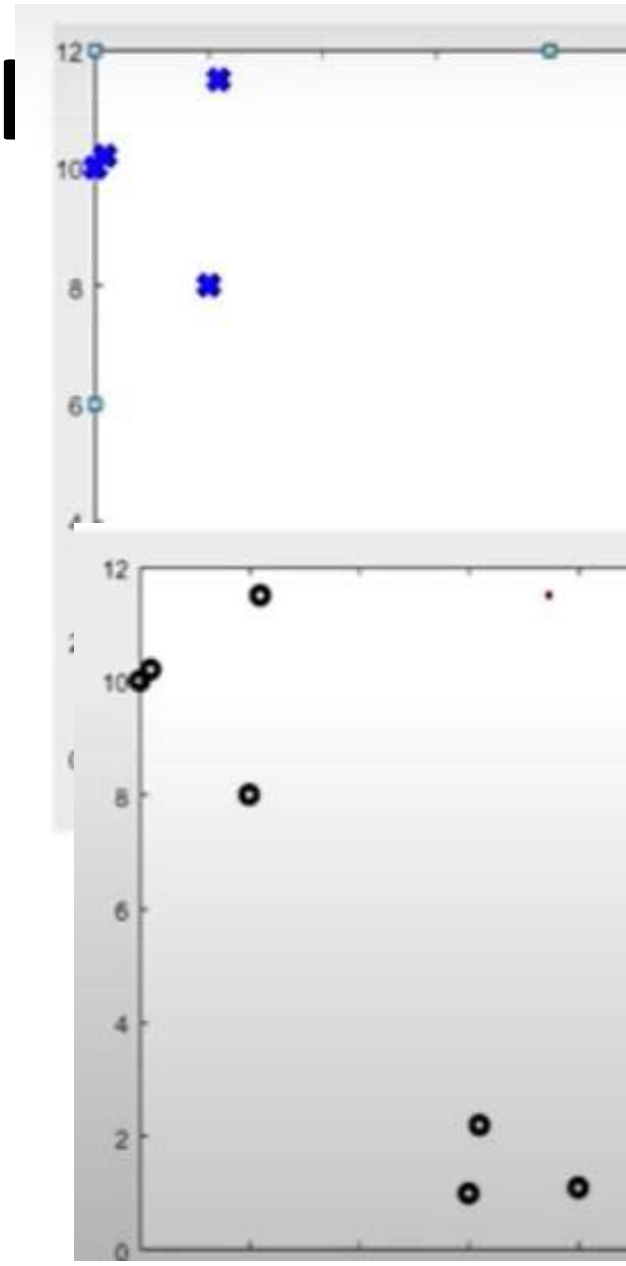
Unsupervised Machine Learning



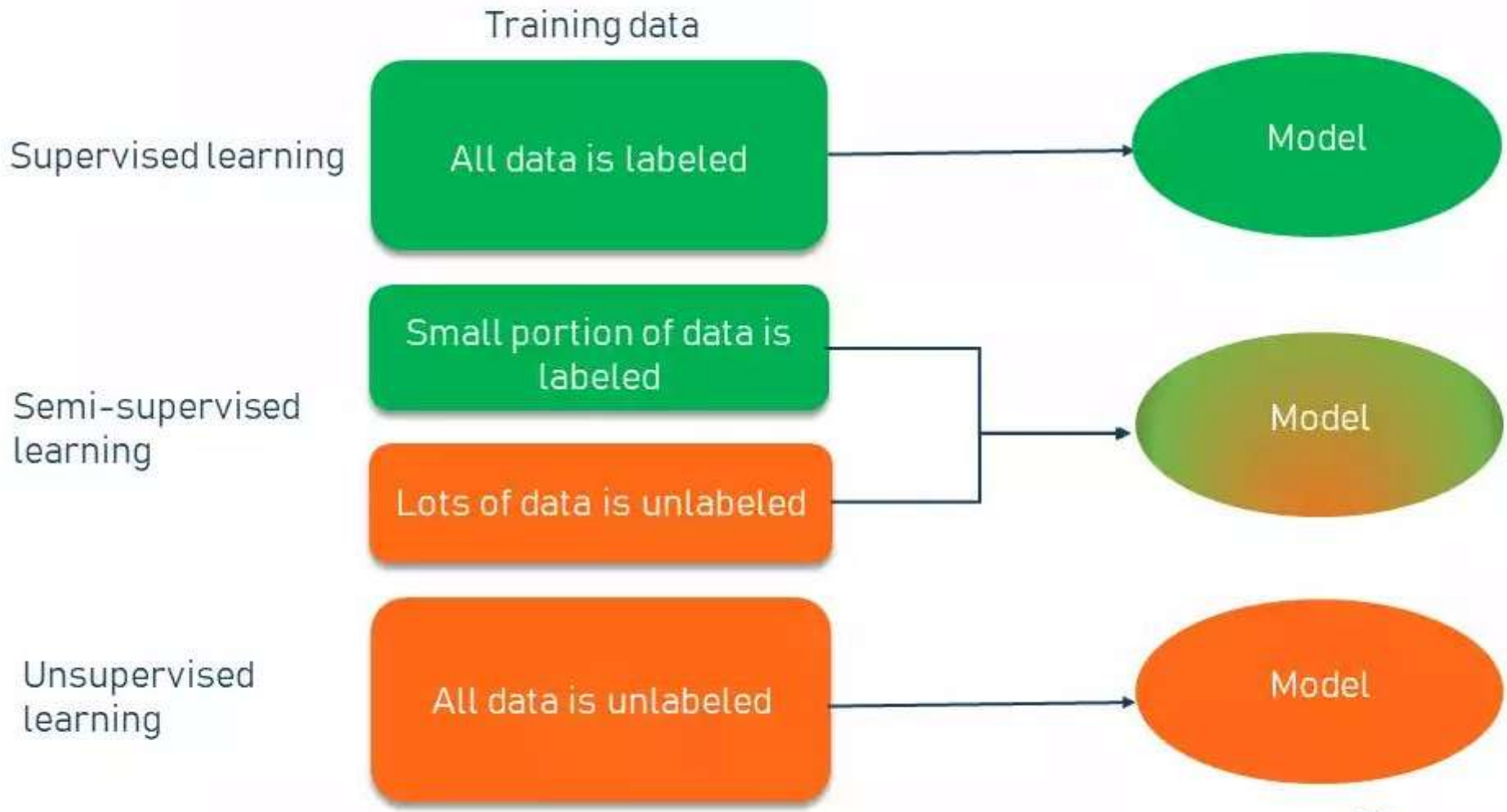
Reinforcement Lear

Machine Learning approacl

- **Supervised Learning**
  - **Data labelled by human experts**
- Unsupervised
  - Unlabelled data
- Generative approach
  - Creating a new data that is like given data
  - CHAT GPT
- Semi-supervised learning
  - Labelled + Lots of Unlabelled data
- Self Supervised learning
  - Auto-encoders
  - Recommendation system
- Reinforcement learning
  - Actions are choose based on Rewards; Chess



SUPERVISED LEARNING vs SEMI-SUPERVISED LEARNING vs UNSUPERVISED LEARNING



altexs

Problems in Machine Learning

Classification

Problem with categorical solutions; like yes no true false, 0 1

Prediction

Problems where continuous value needs to be predicted like **share price**

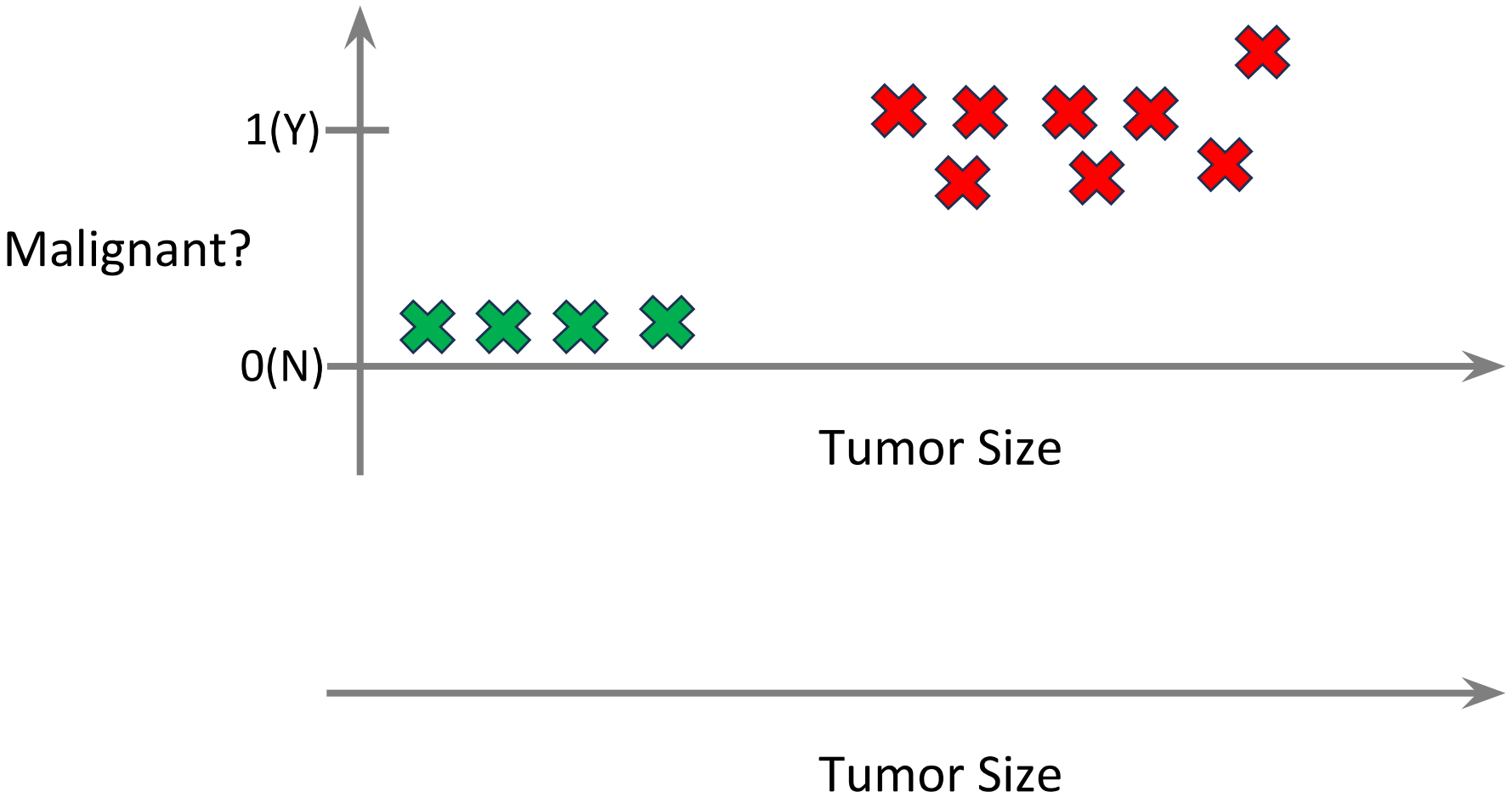
Clustering

Problems where data needs to b organized to fin specific pattern Item recommendatio

Supervised Learning

- **Supervised learning** is the process of mapping output (Y) on so
  input (X). Data labelled by human experts
- Two types of Approach: Classification and Regression

Classification: Breast cancer (malignant, ben

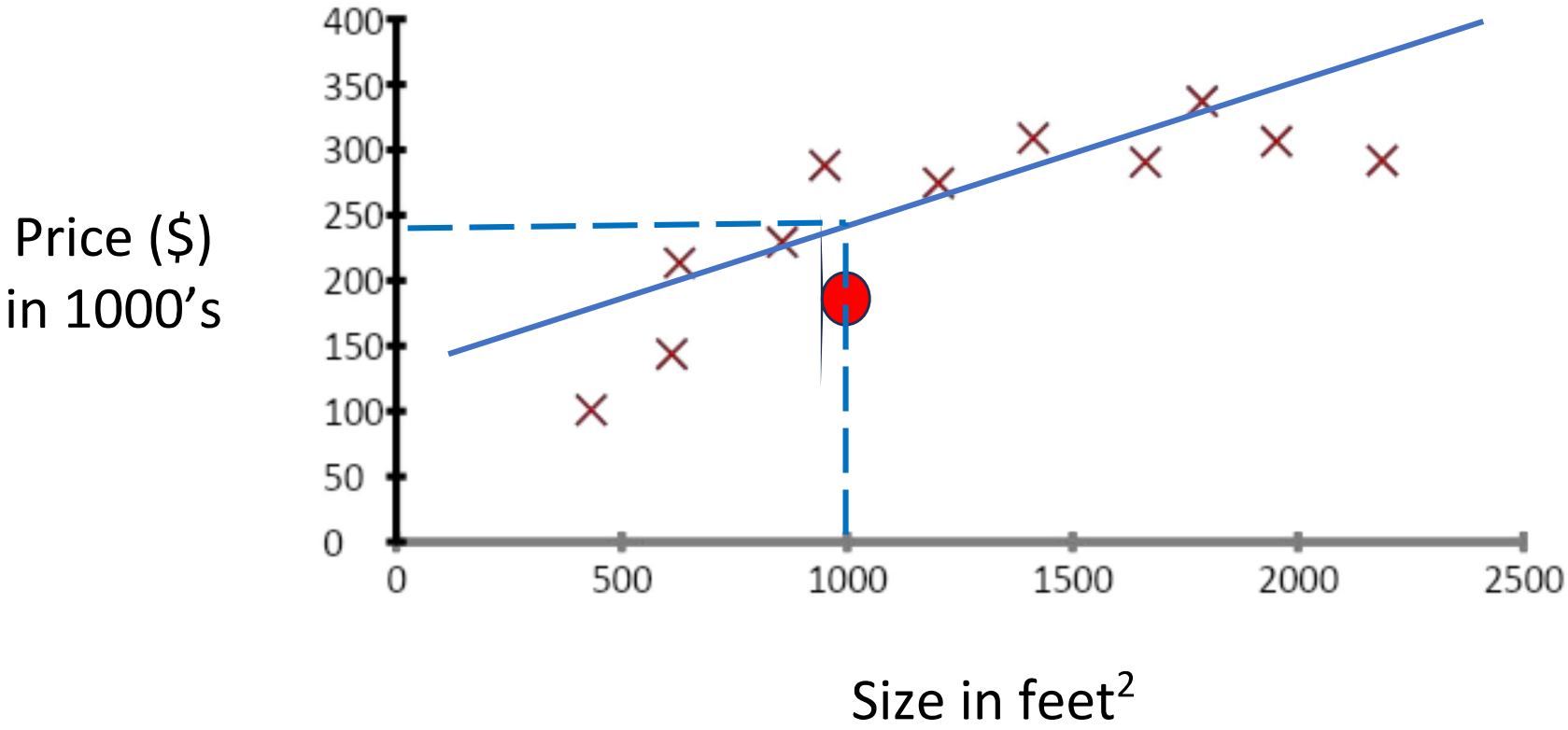


Class

Discr

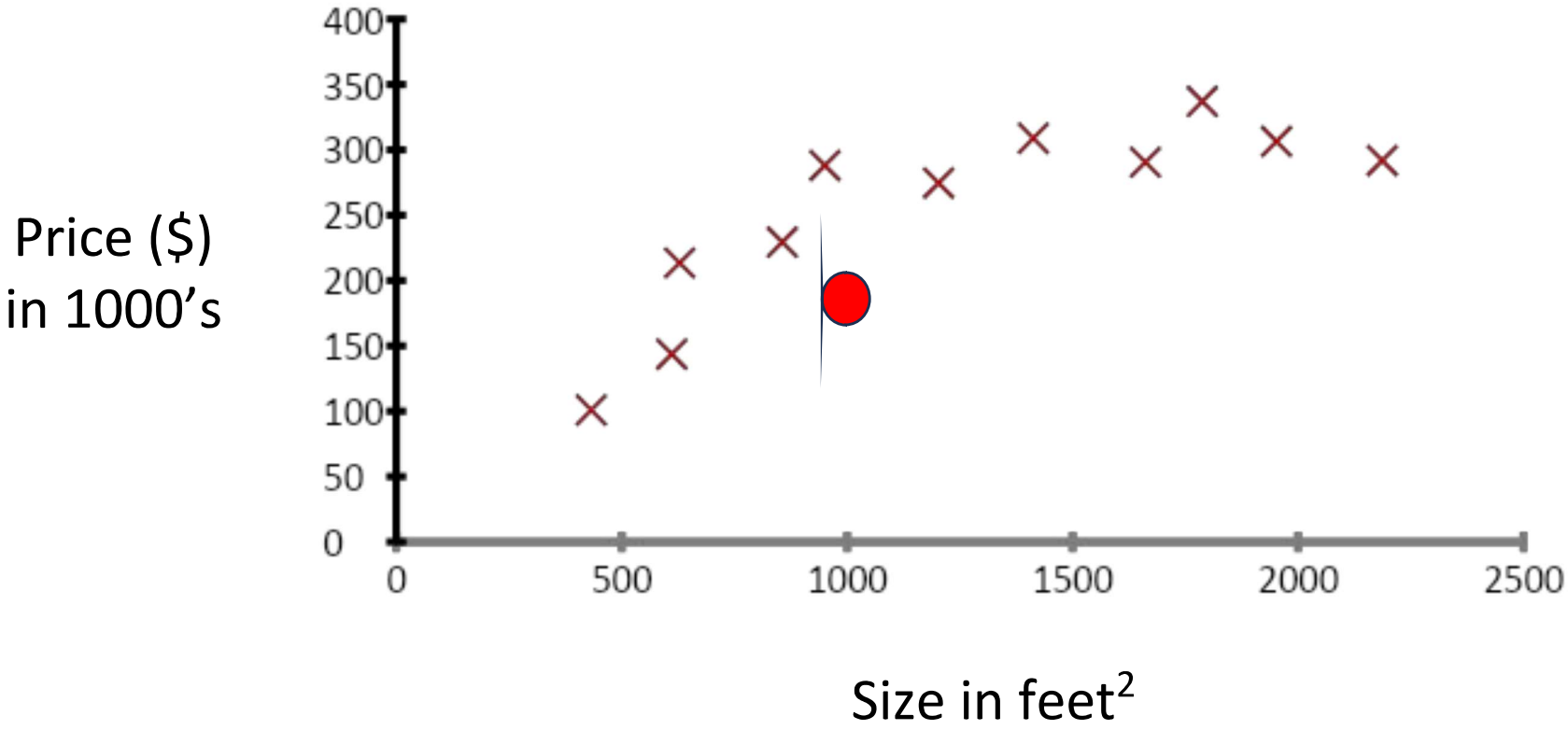
outpu

Prediction: Housing price prediction.



Regression: Predict continuous valued output (pric

Housing price prediction.

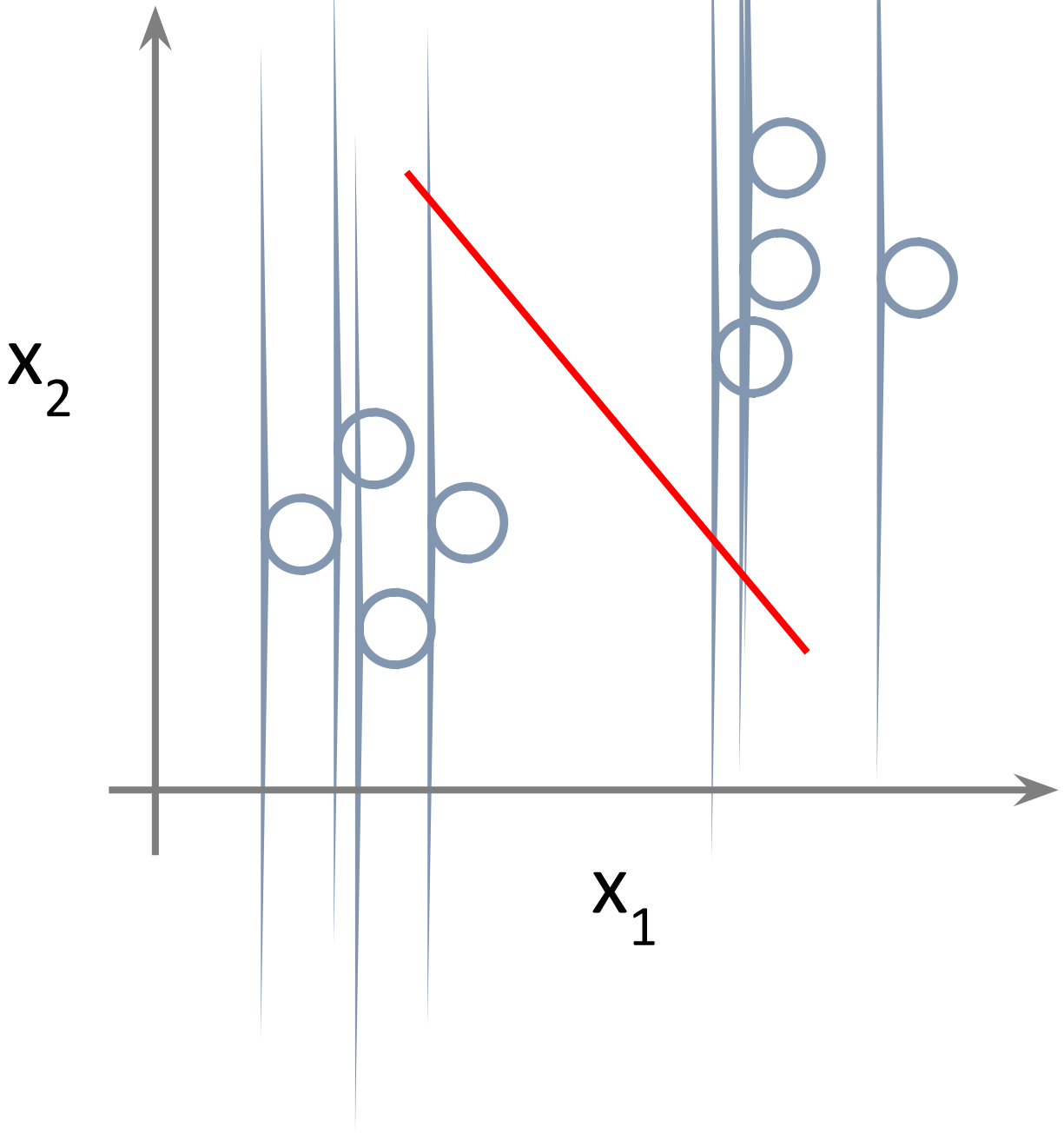


Regression: Predict continuous valued output (pric

Applications: Supervised Learning

Input(X)	Output(Y)	Application
Email	Spam/Not Spam	Spam Filtering
Audio	Text transcript	Speech recognition
English Text	Gujarati Text	Machine Translation
Ad, user info	Click? (0/1)	Online Advertisement
Image	Cat/Dog	Image Classification
Image, Radar info	Position of Car	Autonomous Driving car
Image of Phone	Defected/not working	Visual Inspection

Unsupervised Learning



Google news

Home For you Following News Showcase | India World Local Business Technology Entertainment Sports Science Health

Your briefing

Wednesday, 19 July

Bhavnagar
28°C
More on weather.com

Top stories >

Hindustan Times

15 die in Chamoli after getting electric shock from railing at Namami Gange site

2 hours ago

News18

Chamoli Accident: 17 Killed as Power Transformer Explodes at Namami Gange Project Site

29 minutes ago

The Indian Express

15 electrocuted to death after power transformer explosion in Uttarakhand's Chamoli

37 minutes ago

CNBCTV18

Uttarakhand: At least 15 electrocuted, several injured in Chamoli

1 hour ago

Full coverage

Picks for you

koimoi.com

Karan Johar's Attack On Katrina Kaif & Vijay Sethupathi's Merry Christmas Gets A Stern Reply...

16 hours ago

After Chandrayaan 3, ISRO to launch 'Aditya L1' mission to the Sun on August 26

21 hours ago

Forbes

Deep Neural Networks Enable Robots To Make Pizza

12 hours ago

UNSUPERVISED LEARNING VS SUPERVISED LEARNING

Properties	Unsupervised learning	Supervised learning
Definition	Unsupervised learning is the type of machine learning that happens without human supervision. A machine tries to find any patterns in data by itself.	Supervised learning is the type of machine learning that happens under human supervision, meaning people label input data with answer keys showing a machine the desired outputs.
Input data	Unlabeled	Labeled
Use of data	A model is given only input variables (X) and no corresponding output data.	A model is given input variables (X), output variables (Y), and an algorithm to learn the function from input to output.
When to use	You don't know what you're looking for in data.	You know what you're looking for in data.
Applicable in	Clustering and association problems	Classification and regression problems
Accuracy of the results	May provide less accurate results	Provides more accurate results
Algorithms	• K-Means • Gaussian Mixture Models • Frequent Pattern (FP) Growth • Principal Component Analysis	• Support vector machines • Decision trees • Random forest • Naïve Bayes
Use cases	• Recommender systems • Anomaly detection • Customer segmentation • Preparing data for supervised learning	• Spam filters • Demand forecasting • Price prediction • Image recognition

altexsoft
software r&d engineering