Types of Machine earning :
(i) Supervised
(ii) Unsupervised
(iii) Reinforcement Learning
(iv) Semi-supervised Learning

(i)   Supervised Learning :   (iii) Semi-Supervised Learning
-Regression
-Classification

(il) Unsupervised Learning :   (iv) Reinforcement Learning
-   Clustering
-   Dimensionality Reduction
-   Anomaly Detection
-   Association

Supervised Learning :
Given is the input & output , we have to find the relationship between these inputs & outputs.
Then for new input we have to predict what will be the new output.

Data:
There are two types of data :
(1) Numerical data:
Data which is in numerical form.
Ex: Age, Weight, IQ, etc.

(2) Categorical data:
Data which is in classified or categorical form.
For ex: Gender, Nation, Vehicle type, etc.

Regression:
Given: Input & output.
So for new input we have to firstly find the relation between given inputs & outputs.
Then using regression model we have to generate new numerical output for the new input.

Classification :
Given: Input & output.
So for new input we have to firstly find the relation between given inputs & outputs.
Then using regression model we have to generate new categorical output for the new input.

Unsupervised Learning:

Clustering :

Detects points to particular group. That group is called Cluster.

Dimensionality reduction:

Remove or Integrate columns according to requirement for data analysis.

Ex: There are Godowns for storing Chocolates.

Area of Godown section-A is 1500 sqft.

Area of Godown section-B is 2500 sqft.

Area of Godown section-C is 2000 sqft.

Area of Godown section-D is 3500 sqft.

For storing the pro duct we don't need to analyze each section of a particular Godown

because we just want space for storing it. Either we can directly calculate all sections of Godown

Then we can get how much products can be stored in that Godown

Hence , Calculating all sections of Godown i.e., A, B, C, D we can say that we have total of 9500 sqft area for storage.

| Godown Section - A	Godown Section - B	Godown Section - C	Godown Section - D
1500 sqft	2500 sqft	2000 sqft	3500 sqft

Total Area.
9500 sqft

These methods are called feature extraction
For this we can use PCA Algorithm

Consider we have 28 x 28 MNIST Dataset
i.e., 784 column = 784 Dimensional Space
Using Dimensionality reduction
We converted this data to 3-D i.e., x, y, z
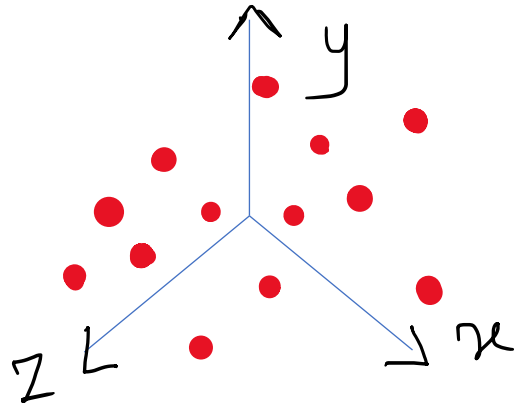
Anomaly Detection.:

Detects outliers & remove from system

might look like same as neighbour points.

This is an Anomaly.
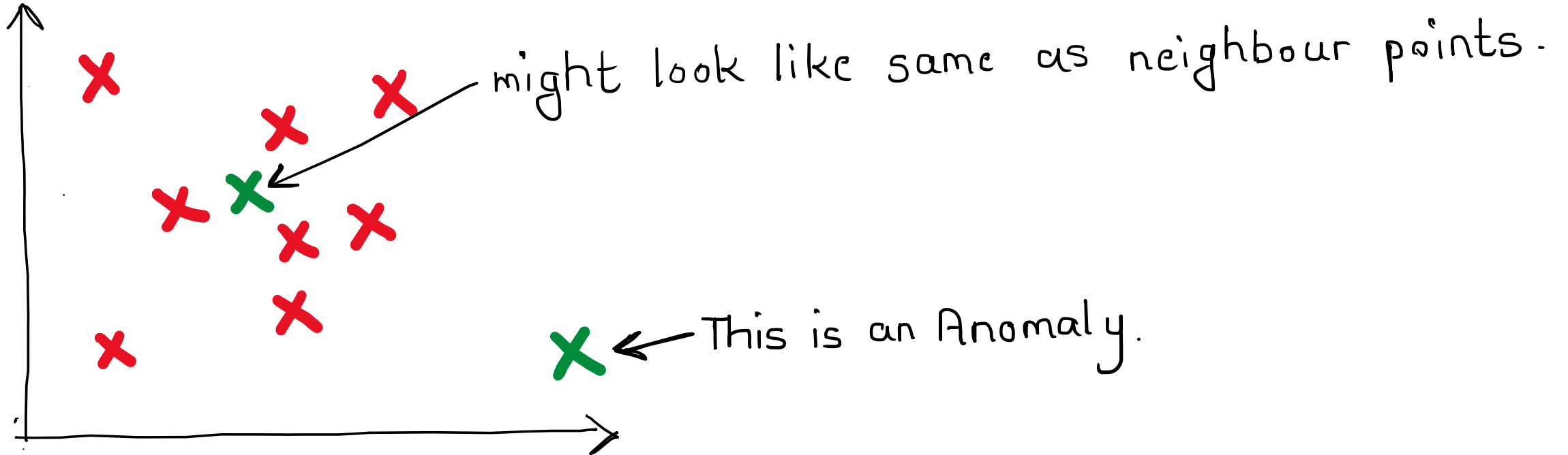
Association:

Ex:
Decision of arrangement of different kind of products in a supermarket in proper manner.

Consider we have collected 1000 bill for 10 days of 100 people shopping each day.
We get Some patterns that ther are 1000 bottle of milk purchased, 1000 bread packets, 3500 egg Boxes, etc.
So we can notice these kind of patterns.

Ex: Beer & Diapher Story.

Semi supervised :

It is partially unsupervised & partially supervised.

Sometimes for labelling we need human efforts . So for creating labels we need human efforts (manually).

For these kind of problems Some new techniques are used So that we can just label some data & create that label data & for remaining data it will automatically create labels.
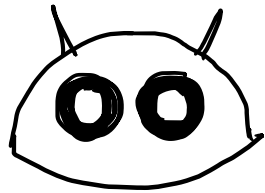
Ex: Google photos. (It will detect all the particular person from the gallery). i.e, detect & label particular person.

Reinforcement Learning:

It learns from neighbor.
Algorithm used is called "Agent".

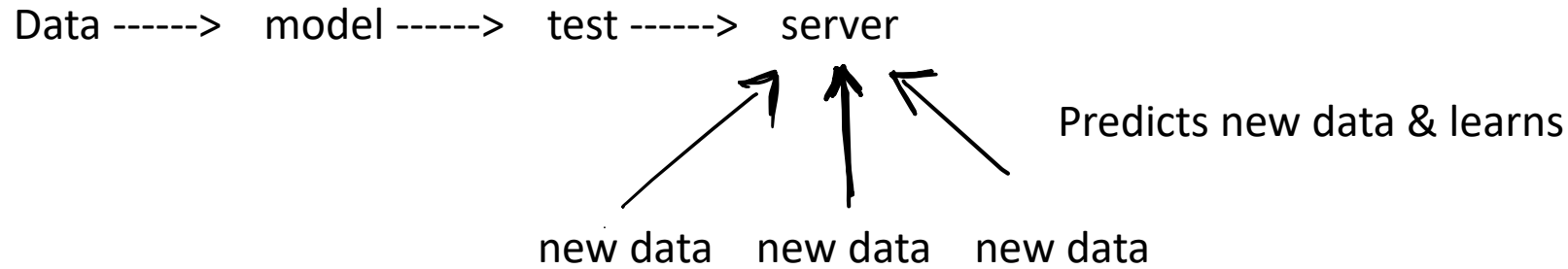Example:

 ← Fire ,Bot, Water

 ← Bot came near Fire & burnt his hand

 ← Bot understood Fire is not good for it. So he went to water & feel cool.

Online Learning:

Training model incrementally.

Data ------> model ------> test ------> server

Predicts new data & learns

new data   new data   new data

When to use :
-> Where then is concept drift
-> Cost effective
-> Faster solution

How to use ?
linear_model. SGDRegressor( )

Search about:
River
Vowpal Wabbit
Scikit learn

Learning rate :
It mean how frequently we train model
-> Remembering Learning rate & learn new things

model

evaluate

server

offline
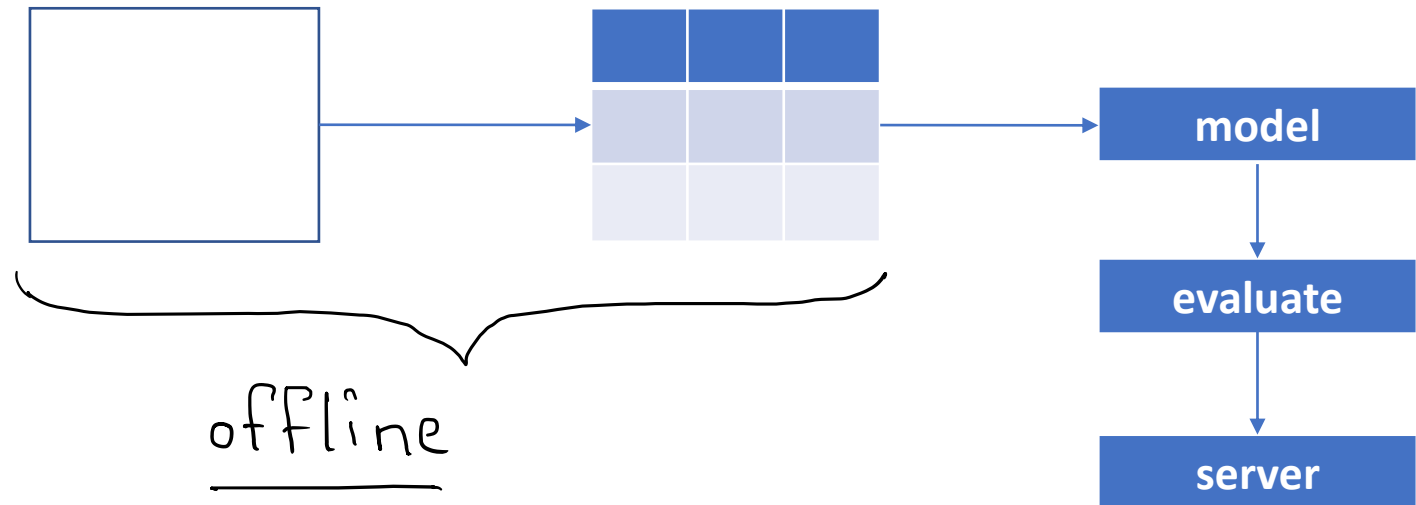
Instance Based Learning. :
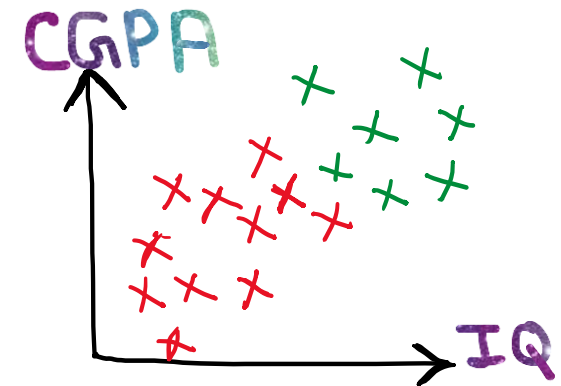
Learning:
(1) Memorizing (Instance based learning)
(2) Generalizing /understanding concepts (model based learning)

EX:

IQ	CGPA	placement
80	8	Y
70	7	N

Classify & predict whether student will get placed / not :

x — not placed

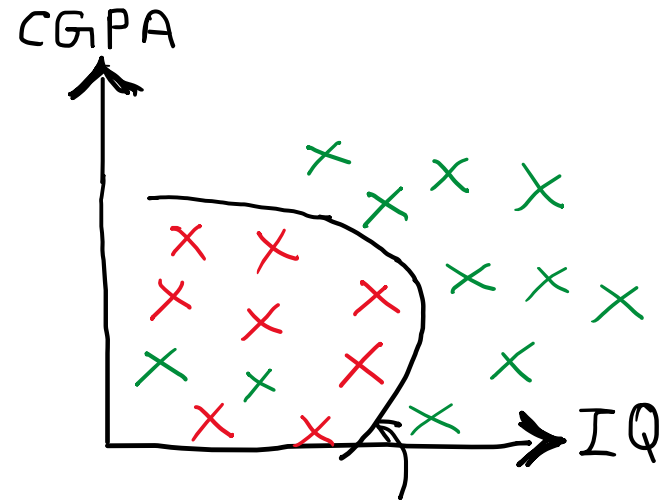x — placed

If IQ = 103, CGPA=7.5

Then we will be finding similarity of this point among all other point by observing & finding distance.

Finding nearest points & distance between if neighboring points showing good probability of getting placed then our new point will be placed (if more nearest points are of "placed".

No training or learning concept , just holding data points & predicting output for new point.

Model Based Learning :
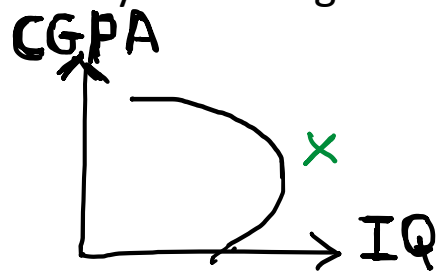
Ex, IQ   CGPA   PLACEMENT

Boundary:

Shows if student having point which is at right side of curve. He/She will get placed.

This model is predicting by learning, training, running on data.
By observing some mathematical relationship between input & output which results to the decision like this .

He will get placed

He won't get placed.

Model Based :

(i)   Prepare data for model training

(ii)   Train model from training data to estimate model parameters i.e, discovered points.

(iii)   Store model in suitable form.

(iv)   Generalize rules in form of model, even before scoring Instance is seen.

(v)   Predict for unseen scoring instance using model

(vi)   Can throw away input training data after model training

(vii)   Requires known model form.

(viii) Storing models generally requires less storage.

Instance Based:

(i)   Prepare data for model training (No difference here).

(ii)   Do not train model – Pattern discovery postponed until scoring query received.

(iii) There is no model to store.

(iv)   No generalization before scoring. Only generalize for each Scoring instance individual as when seen.

(v)   Predict for unseen Scoring instance using training data directly.

(vi)   Input / training data must be kept since each query uses part or full set of training observations.

(vii) May not have explicit model form.

(viii) Storing training data generally requires more storage.