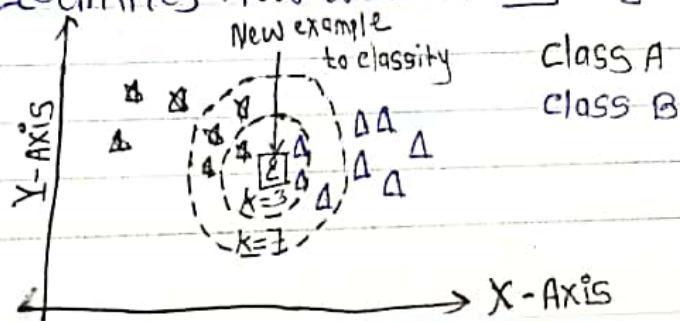


Assignment No. 8-03

- Aim :- Implement K-Nearest Neighbour algorithm.
- Problem Statement :- In the following diagram let blue circles indicate positive examples and orange squares indicate negative examples. We want to use k-NN algorithm for classifying the points. If $k=3$, find the class of the point (6,6). Extend the same example to Distance-Weighted k-NN and locally weighted Averaging.
- Prerequisite :- Basic of python, Data Mining Algorithm, Concept of KNN classification.
- Theory :-
 - K-Nearest Neighbors (KNN) Algorithm :-
 - KNN is a non parametric lazy learning algorithm. That is a pretty concise statement. When you say a technique is non parametric, it means that it does not make any assumptions on the underlying data distribution. This is pretty useful, as in the real world, most of the practical data does not obey the typical theoretical assumptions made (eg Gaussian mixture, linearly separable etc).
 - KNN Algorithm is based on feature similarity: How closely out-of-sample features resemble our training set determines how we classify a given data point.



KNN can be used for classification - the output is a class membership (predict a class - a discrete value). An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors. It can also be used for regression - Output is the value for object (predicts continuous values). This value is the average (or median) of the values of its k nearest neighbors.

- **Applications of KNN :-**

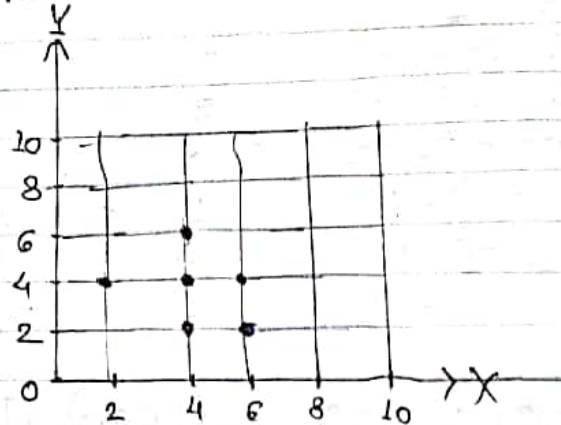
KNN is a versatile algorithm and is used in a huge number of fields.

- 1) Nearest Neighbor based Content Retrieval
- 2) Gene Expression.
- 3) Protein-Protein interaction and 3D structure prediction.
- 4) Credit ratings.
- 5) Should the bank give a loan to an individual?

- **Algorithm :-**

- ① Import the Required Packages
- ② Read Given Dataset.
- ③ Import KNeighborsClassifier and create object of it.
- ④ Predict the class for the point (6,6) w.r.t. to General KNN.
- ⑤ Predict the class for the point (6,6) w.r.t. to Distance weighted KNN.

Given Diagram Represent Positive and Negative Point with color.



In the following diagram let blue circles indicate positive examples and orange squares indicate negative examples.

Output Explanation :-

X_1	X_2	Y(class)	X_1	X_2	Squared Distance to Query instance(6,6)
2	4	Negative	2	4	$(2-6)^2 + (4-6)^2 = 20$
4	2	Negative	4	2	$(4-6)^2 + (2-6)^2 = 20$
4	4	Positive	4	4	$(4-6)^2 + (4-6)^2 = 32$
4	6	Negative	4	6	$(4-6)^2 + (6-6)^2 = 4$
6	2	Positive	6	2	$(6-6)^2 + (2-6)^2 = 16$
6	4	Negative	6	4	$(6-6)^2 + (4-6)^2 = 4$

X_1	X_2	Squared Distance to Query instance $(6,6)$	Rank Minimum Distance	Is it in nearest neighbor?
2	4	$(2-6)^2 + (4-6)^2 = 20$	3	No
4	2	$(4-6)^2 + (2-6)^2 = 20$	3	No
4	4	$(4-6)^2 + (4-6)^2 = 32$	4	No
4	6	$(4-6)^2 + (6-6)^2 = 4$	1	Yes
6	2	$(6-6)^2 + (2-6)^2 = 16$	2	Yes
6	4	$(6-6)^2 + (4-6)^2 = 4$	1	Yes.

X_1	X_2	Squared Distance to Query instance $(6,6)$	Y (class)	Is it in nearest neighbor?
4	6			
6	2			
6	4			
4	6	$(4-6)^2 + (6-6)^2 = 4$	Negative	Yes
6	2	$(6-6)^2 + (2-6)^2 = 16$	Positive	Yes
6	4	$(6-6)^2 + (4-6)^2 = 4$	Negative	Yes.

Therefore the query point $(6,6)$ belong to class Negative.

- Conclusion :- In this assignment I have learned how K-NN classification to predict the General and Distance Weighted KNN for given data point in terms of Positive or negative.
- Reference :-
- classNotes