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COURSE: Diagnostic Methods **DR. R. BENTRCIA**

TD 3: KNN

Exercise:

You have the following 4 training examples:

Feature X1	Feature X2	Class
7	7	Bad
7	4	Bad
3	4	Good
1	4	Good

Use K Nearest Neighbors KNN algorithm to classify the new example with feature X1=3 and feature X2=7.

The Euclidean distances between the new example (3, 7) and the training examples are given:

Feature X1	Feature X2	Euclidean distances	Class
7	7	4	Bad
7	4	5	Bad
3	4	3	Good
1	4	3.6	Good

Assume K=3, answer the following questions:

- What are the nearest neighbors of the new example? Explain
- Find the class of the new example? Explain.
- What is the best (optimal) value of k?

Solution:

- What are the nearest neighbors of the new example? Explain

  Since K=3, we will select three nearest neighbors based on the short distances. The following examples are the three nearest neighbors of the new example:

  (3, 4)- (1, 4)- (7, 7).

- Find the class of the new example? Explain

  Based on the class of each nearest neighbor, we have 2 **Good** and 1 **Bad**. Since 2>1, we conclude that the new example (3, 7) will be classified as **Good**.

- What is the best (optimal) value of k?

  The optimal value of k is the **square root of N,** where N is the total number of samples.

  $K=\sqrt{N}=2$.