**Question:**

We are interested in classifying our dataset into three colors green, red and blue, represented as label . We are also interested in estimating the real-valued label . You are given the following labelled dataset with four features . Use 4NN classification to classify the two test vectors into the correct label class and simple unweighted 4NN regression to estimate the value of . You may Back-off to (k-1)NN to resolve ties. You need to repeat the process using Euclidean and Chebyshev distances. Show all calculated distances and calculations for the classification and regression. Write your answers to **3 decimal places** e.g. 0.000

**Training Set:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sr.** |  |  |  |  |  |  |
| 1 | 20 | 0.1 | 5 | 2 | red | 5.1 |
| 2 | 24 | 0.3 | 7 | 1 | red | 5.4 |
| 3 | 17 | 0.15 | 3 | 3 | red | 5.2 |
| 4 | 11 | 0.2 | 9 | 1 | red | 5 |
| 5 | 50 | 0.42 | 25 | 6 | green | 5.8 |
| 6 | 45 | 0.39 | 19 | 4 | green | 5.9 |
| 7 | 53 | 0.56 | 30 | 5 | green | 5.7 |
| 8 | 57 | 0.61 | 27 | 4 | green | 5.9 |
| 9 | 83 | 0.93 | 46 | 7 | blue | 6.3 |
| 10 | 76 | 0.79 | 49 | 9 | blue | 6.7 |
| 11 | 92 | 0.86 | 39 | 9 | blue | 6.8 |
| 12 | 87 | 0.89 | 41 | 8 | blue | 6.1 |

**Test Set:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr.** |  |  |  |  |
| 1 | 79 | 0.1 | 11 | 6 |
| 2 | 30 | 0.1 | 22 | 1 |

**Answer**:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  | **Test point 1** | | **Test point 2** | |
| **Sr.** |  |  |  |  |  |  | **Euclidean** | **Chebyshev** | **Euclidean** | **Chebyshev** |
| 1 | 20 | 0.1 | 5 | 2 | red | 5.1 | **59.439** | **59.000** | **19.748** | **17.000** |
| 2 | 24 | 0.3 | 7 | 1 | red | 5.4 | **55.372** | **55.000** | **16.157** | **15.000** |
| 3 | 17 | 0.15 | 3 | 3 | red | 5.2 | **62.586** | **62.000** | **23.108** | **19.000** |
| 4 | 11 | 0.2 | 9 | 1 | red | 5 | **68.213** | **68.000** | **23.022** | **19.000** |
| 5 | 50 | 0.42 | 25 | 6 | green | 5.8 | **32.204** | **29.000** | **20.835** | **20.000** |
| 6 | 45 | 0.39 | 19 | 4 | green | 5.9 | **34.987** | **34.000** | **15.591** | **15.000** |
| 7 | 53 | 0.56 | 30 | 5 | green | 5.7 | **32.221** | **26.000** | **24.682** | **23.000** |
| 8 | 57 | 0.61 | 27 | 4 | green | 5.9 | **27.281** | **22.000** | **27.627** | **27.000** |
| 9 | 83 | 0.93 | 46 | 7 | blue | 6.3 | **35.252** | **35.000** | **58.495** | **53.000** |
| 10 | 76 | 0.79 | 49 | 9 | blue | 6.7 | **38.242** | **38.000** | **53.940** | **46.000** |
| 11 | 92 | 0.86 | 39 | 9 | blue | 6.8 | **31.025** | **28.000** | **64.789** | **62.000** |
| 12 | 87 | 0.89 | 41 | 8 | blue | 6.1 | **31.123** | **30.000** | **60.495** | **57.000** |

**List 4 nearest neighbors and the decision label () of test point 1 w.r.t Euclidean and Chebyshev distance:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **4NN** | **Euclidean** |  |  | **Chebyshev** |  |  |
| **Sr.** | **Distance** |  |  | **Distance** |  |  |
| 1 | **27.281** | **green** | **5.9** | **22.000** | **green** | **5.9** |
| 2 | **31.025** | **blue** | **6.8** | **26.000** | **green** | **5.7** |
| 3 | **31.123** | **blue** | **6.1** | **28.000** | **blue** | **6.8** |
| 4 | **32.204** | **green** | **5.8** | **29.000** | **green** | **5.8** |
|  | **Decision** | **blue** | **6.150** | **Decision** | **green** | **6.050** |

**List 4 nearest neighbors and the decision label () of test point 2 w.r.t Euclidean and Chebyshev distance:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **4NN** | **Euclidean** |  |  | **Chebyshev** |  |  |
| **Sr.** | **Distance** |  |  | **Distance** |  |  |
| 1 | **15.591** | **green** | **5.9** | **15.000** | **red** | **5.4** |
| 2 | **16.157** | **red** | **5.4** | **15.000** | **green** | **5.9** |
| 3 | **19.748** | **red** | **5.1** | **17.000** | **red** | **5.1** |
| 4 | **20.835** | **green** | **5.8** | **19.000** | **red** | **5.2** |
|  | **Decision** | **red** | **5.550** | **Decision** | **red** | **5.400** |