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Started on Wednesday, 2 February 2022, 8:30 AM

State Finished

Completed on Wednesday, 2 February 2022, 9:10 AM

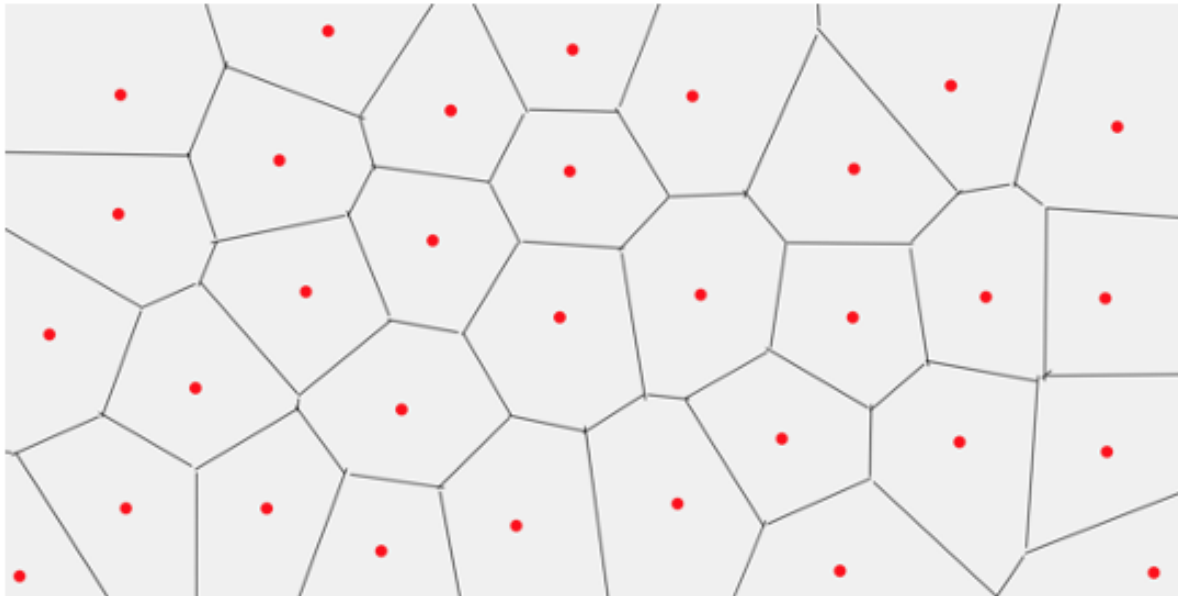
Time taken 40 mins 10 secs

Question **1**

Complete

Marked out of 2.00


You see below a Voronoi Tessellation, illustrating the decision boundary of a 1NN algorithm.



We are assuming Euclidean Distance Metric for all parts of the question. Any point within a partition will be classified with the same class, as the point in the center of the partition. Assume we are working with a dataset of N points and C classes. The Voronoi tessellation already provides the 1NN classifier. The KNN (K nearest neighbor algorithm will rely on a majority vote). Assume that at all times you have access to the dataset (N points X_1, X_2, \dots, X_N with their corresponding C classes).

1. Can we construct a Decision Tree that gives the same output as the 1NN classifier. Your answer should be Yes or No, and more importantly should be backed by an explanation.

2. Assume that you do not know how to compute the distances. However, a proxy function is given to you, which given a query point can provide you the nearest neighbor and its corresponding class. Is it possible to construct a KNN classifier using the proxy function? Explain.
3. Assume that the proxy function returns p nearest neighbors ($p \neq k$). Is it possible to construct a k -NN classifier using the proxy function? Clearly Explain.

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Question **2**

Complete

Marked out of 2.00

Consider fitting linear regression model for the following dataset (input is X and output is y):

X	-1	1	2
y	2	-1	1

(a) Fit $Y_i = \beta_0$ (degenerated linear regression). Find β_0

(b) Fit $Y_i = \beta_1 X_i$ (linear regression without constant term). Find β_1

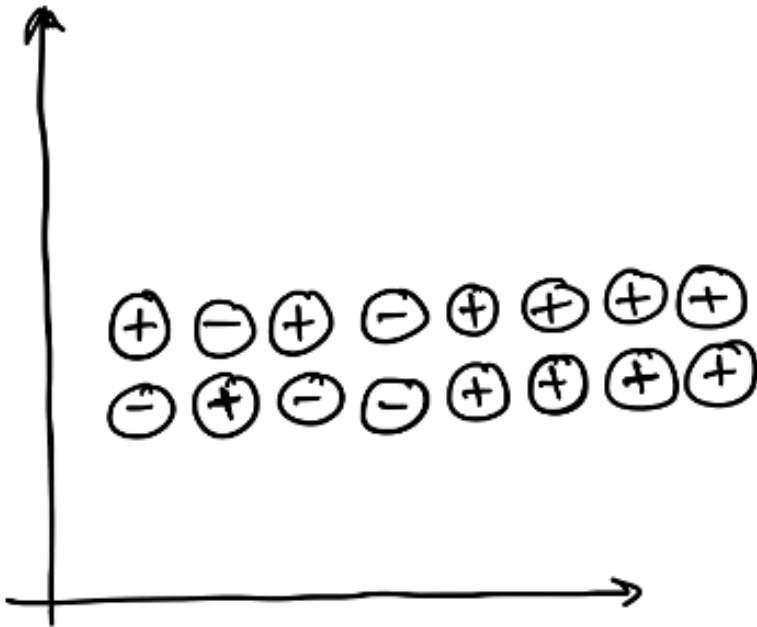
The underscore sign is used for subscript ($Y_{_i}$ is written as Y_i). Moodle does not support subscript directly.

Question **3**

Not answered

Marked out of 2.00

The figure below shows a dataset with two inputs X_1 and X_2 and one output Y , which can take on positive values (+) or negative values (-). There are 16 data points, 11 positives, and 5 are negative:



How many decision rules will be required to achieve zero training error on this dataset? Clearly show the partitions of the final tree.

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