1. A model is trained using the Perceptron algorithm, a binary classification system, to make predictions based on a set of data points.

The Perceptron algorithm's fundamental goal is to identify a hyperplane that can distinguish between two groups of data points. The weight vector w and bias b used to represent the hyperplane are adjusted iteratively by the algorithm until it discovers a hyperplane that can accurately identify the input points.

Training Procedure:

Initialize the weight vector w and the bias b to zeros or small random values.

For each data point (x, y), do the following steps:

a. Calculate the predicted class y\_pred as the sign of (w.T \* x + b), where T is the transpose operator.

b. Update the weight vector and bias if y\_pred is not equal to y:

i. w = w + y \* x

ii. b = b + y

Repeat step 2 for a fixed number of epochs or until the algorithm converges.

Test Procedure:

Given a new data point x, calculate the predicted class y\_pred as the sign of (w.T \* x + b).

Return y\_pred as the predicted class.

1. The accuracy for class-1 and class-2 is 100.0

The accuracy for class-2 and class-3 is 92.5

The accuracy for class-1 and class-3 is 89.74358974358974

Classes 1 and 3 are difficult to separate.

1. he 1-vs-rest approach consist of a binary classifier is trained to differentiate each class from all other classes for each class. The binary classifier in the Perceptron algorithm learns a weight vector that divides the input data into two classes: the positive instances from the current class and the negative examples from all other classes.

The accuracy for class-1 vs rest is 93.22033898305085

The accuracy for class-2 vs rest is 93.22033898305085

The accuracy for class-3 vs rest is 66.10169491525424

1. Below are the accuracies for class1 vs rest using l2 regularization [.01, 0.1, 1.0, 10.0, 100.0]

The Accuracy is 86.44067796610169

The Accuracy is 67.79661016949153

The Accuracy is 32.20338983050848

The Accuracy is 32.20338983050848

The Accuracy is 32.20338983050848

Below are the accuracies for class2 vs rest using l2 regularization [.01, 0.1, 1.0, 10.0, 100.0]

The Accuracy is 33.898305084745765

The Accuracy is 33.898305084745765

The Accuracy is 66.10169491525424

The Accuracy is 66.10169491525424

The Accuracy is 66.10169491525424

Below are the accuracies for class3 vs rest using l2 regularization [.01, 0.1, 1.0, 10.0, 100.0]

The Accuracy is 66.10169491525424

The Accuracy is 66.10169491525424

The Accuracy is 33.898305084745765

The Accuracy is 33.898305084745765

The Accuracy is 33.898305084745765