ML Assignment 3
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Perceptron algorithm

The perceptron algorithm aims to find the equation of the line that separates the positive and the negative labelled points, provided the two classes are completely linearly separable.

If the line of separation is w, $t_n w^T phi(x_n) >= 0$ if the point is correctly classified, $t_n w^T phi(x_n) < 0$ if the point is not correctly classified.

The algorithm first assumes the line of separation of two classes w. Then the input dataset is scanned point by point, if the point is correctly classified, it is left alone, or else it is used to update w. The updation equation is given by,

$w^{(t+1)} = w^{(t)} - eta*(-t_n\ phi(x_n))$

If the dataset is completely linearly separable, the algorithm ends in a finite number of iterations.

Accuracy of the model:

Dataset 1: 99.27%

Dataset 2: 100%

Dataset which is more linearly separable

Dataset 2 is more linearly separable because it has a classification accuracy of 100% with respect to the perceptron model. This means that the data points are completely linearly separable, whereas dataset 2 is not completely linearly separable because the perceptron algorithm was not able to identify a line that completely separates the two classes.

Major limitations of the perceptron algorithm

The perceptron algorithm requires the dataset to be completely linearly separable. If the dataset is not so, the algorithm will not terminate unless we give an explicit termination condition in the form of number of iterations. Also if we specify the maximum number of iterations, we might end up with a sub-optimal discriminant line because the optimal line would have been discovered a few iterations after the maximum number of iterations.