Foundations of Machine Learning Lab 2 Report

Abhilash Pulickal Scaria

aps1n21@soton.ac.uk

Student Id:33124639

Observation

1)Implementing a perceptron model to classify two bivariate gaussian density with means m1 = $\left(\begin{smallmatrix} 2.5 \\ 2.5 \end{smallmatrix}\right)$, m2 = $\left(\begin{smallmatrix} 10 \\ 10 \end{smallmatrix}\right)$ and identical covariance matrix C = $\left(\begin{smallmatrix} 2 & 1 \\ 1 & 2 \end{smallmatrix}\right)$ using the same code snippet provided gives a low training accuracy(67.50%) and test accuracy(63.00%). From Figure 1 we can observe that the line seperating the two distributions need an intercept term. In order to achieve this we add a bias term. This can be done by appending a column of ones to the input data and adding a column of additional weights which acts as the bias.
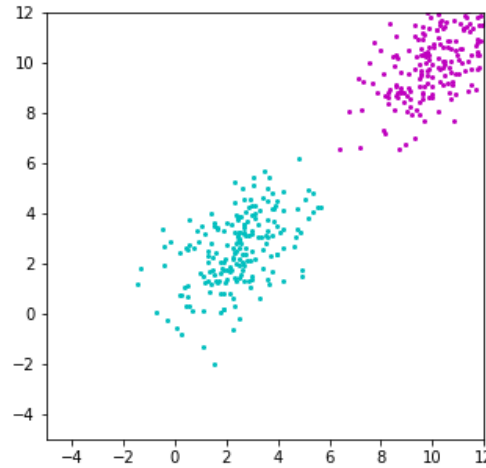

Figure 1: Scatterplot of the two distribution.

After adding bias and increasing iteration to 2000 an accuracy of 99% is achieved for both training and test set.
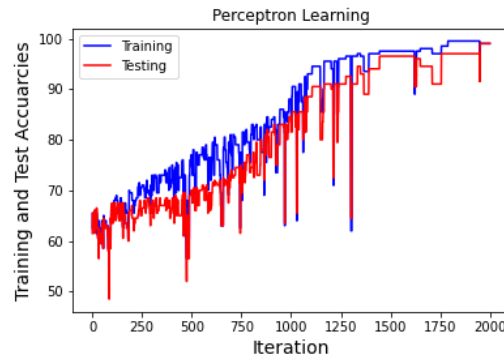

Figure 2: Learning curve.

2) Downloaded a bank authentication data (https://archive.ics.uci.edu/ml/datasets/ banknote+authentication) set from UCI machine learning repository and classified it using a perceptron model. The dataset contained 4 features which showed variance, skewness, curtosis and entropy of wavelet transformed image of a banknote. The class column(labels) indicated whether the banknote was authentic or not (1 = authentic/0=not authentic). Exploratory data analysis and data manipulation was done using pandas. The learning rate used was 0.005 and the number of iterations was 4000. There was 1372 data samples and it was split into 1272 training data and 100 test data.
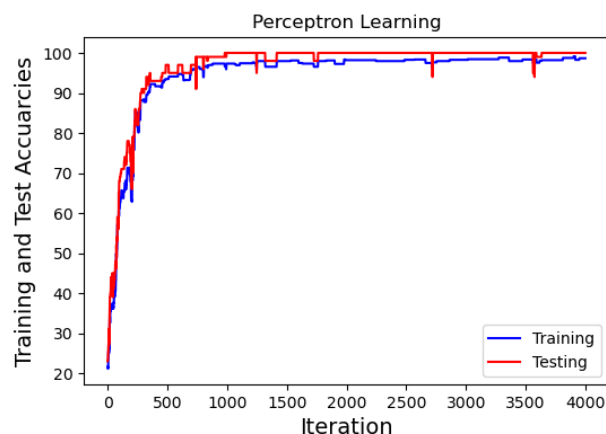

Figure 3: Learning curve.

The observed accuracies were training(98.66%) and testing(100%). Accuracy achieved was very high as the problem was not too complex.