Assignment -1 : Fisher's Linear Discriminant

According to the Fisher's Linear Discriminant Analysis we should try to maximize the distance between two classes(maximize their difference in mean) and minimize the distance with in the class(minimize their variance)
So after final reduction the vector becomes

$$\mathbf{w \propto S_w^{-1} \cdot (m_1 - m_2)}$$

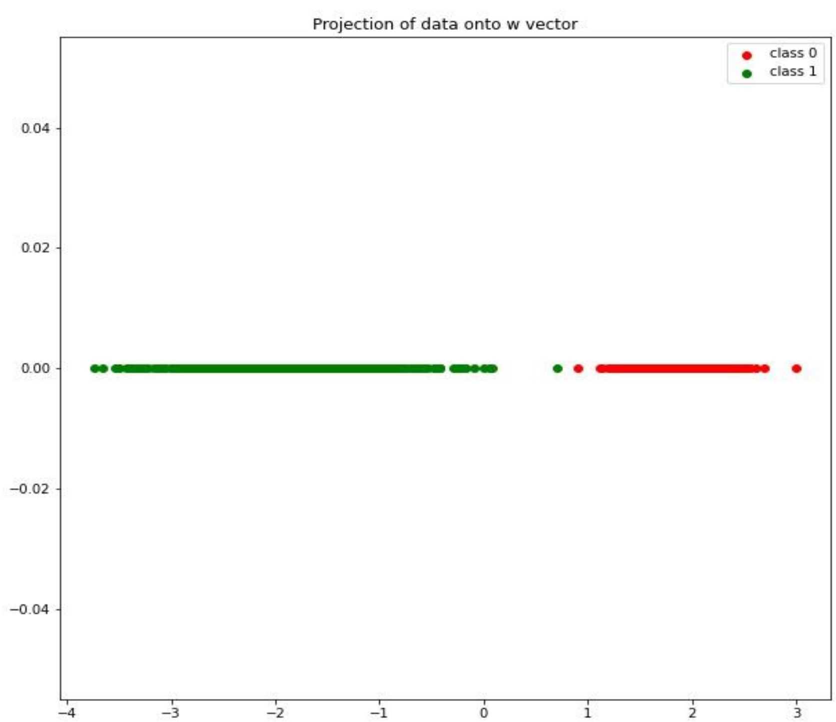
Here S_w is the sum of the covariance matrices of the negative points and the positive points and m_1 and m_2 are the vectors representing the means of positive and negative class points.
This is the basis of the Fisher's Linear Discriminant Analysis.

Analysis on Dataset:

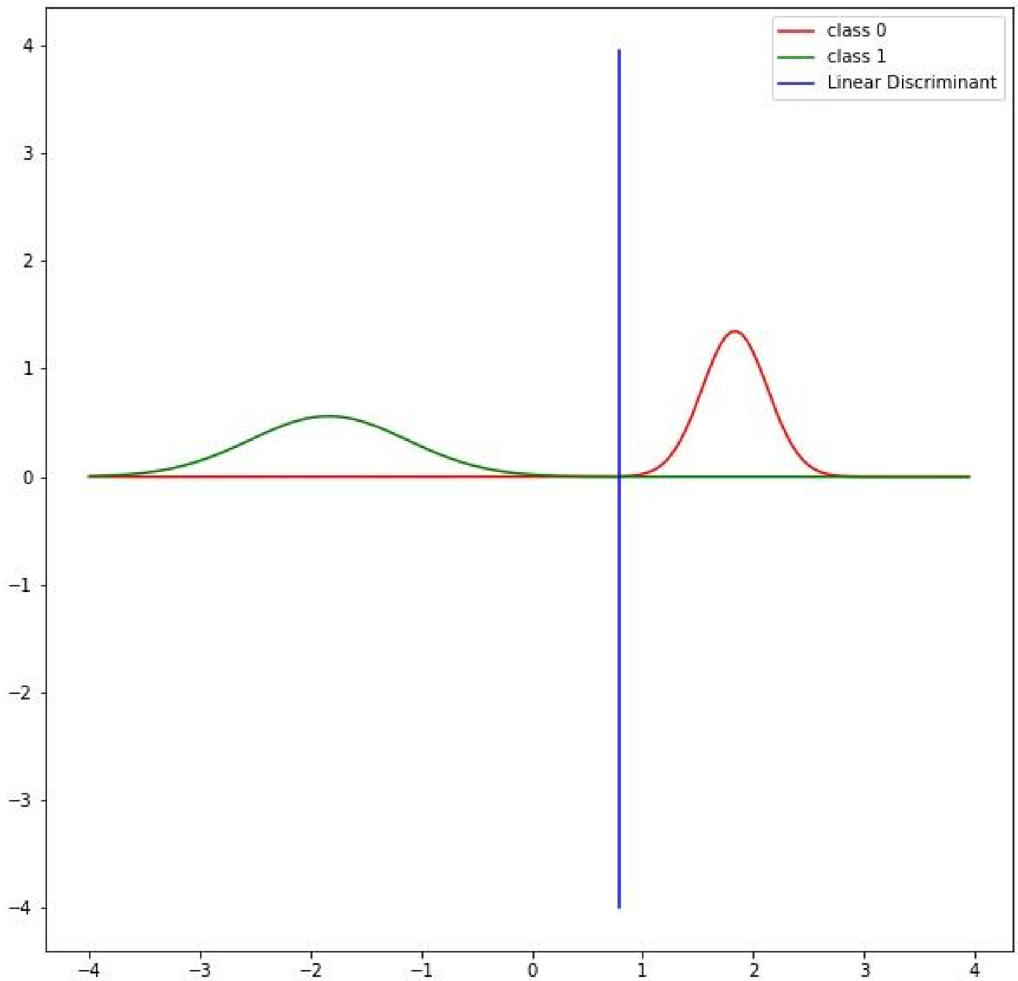
After finding inverse of covariance matrix and difference of means of the two classes we get the resulting vector

W = [0.01206137 0.0334413 -1.8218901]

Projections on the point are:



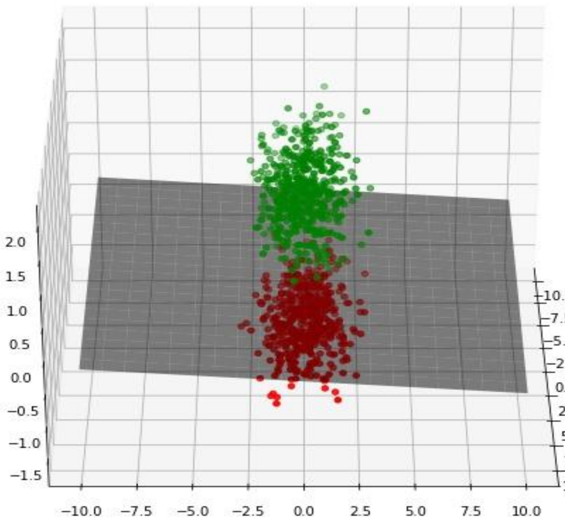
The normal distributions for the and negative points were upon projecting on the vector were:

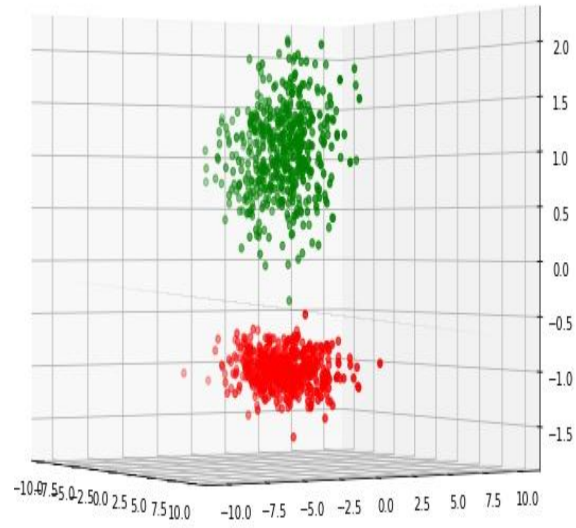


The two normal distributions intersect at the point x = 0.79 which becomes the linear discriminant for the 1d plane

The hyperplane that discriminants is given by the equation:

0.01206137 * x1 + 0.0334413 * x2 + -1.8218901 * x3 >= 0.79 implies that it belongs to the one class else it belongs to the other





Results:

The accuracy of the model is 100%
it divides the the data into two different classes