**ML Assignment 1**
**Group:**

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## Fischer's LDA

Fischer's Linear Discriminant Analysis is a classification technique that aims to find the discriminating point of the various classes after projecting the points onto 1D.

The vector on to which the points are to be projected is found by maximizing
$(m1-m2)^2/(s_1^2+s_2^2)$
where $m_1$ = mean of positive projected points
$m_2$ = mean of negative projected points
$s_1$ = standard deviation of positive projected points
$s_2$ = standard deviation of negative projected points

The vector obtained is given by
$w \propto s_w^{-1} (M_1-M_2)$

where $M_1$ and $M_2$ are the means of the positive and negative points before projection.

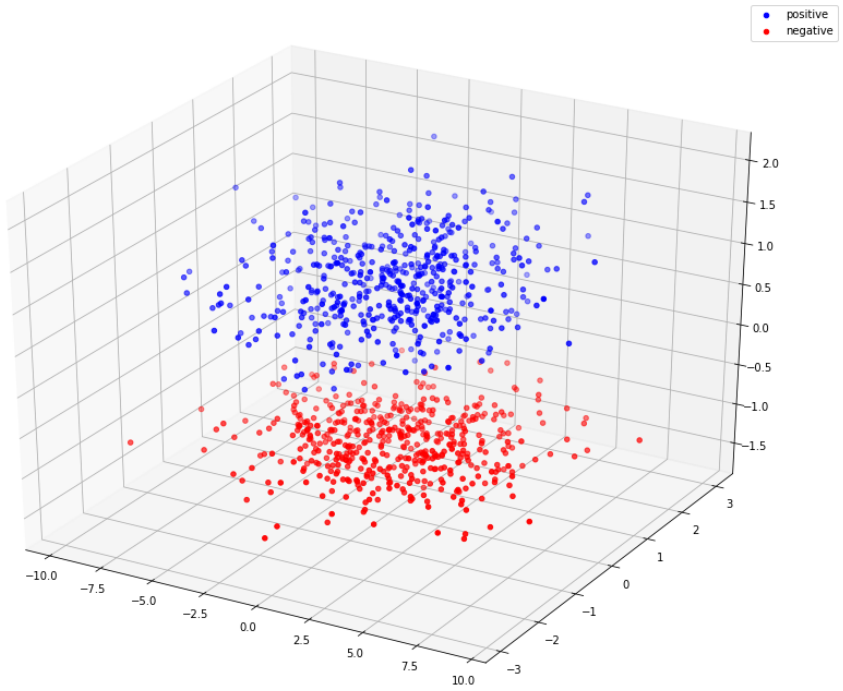


Figure 1: 3D scatter plot of the given dataset

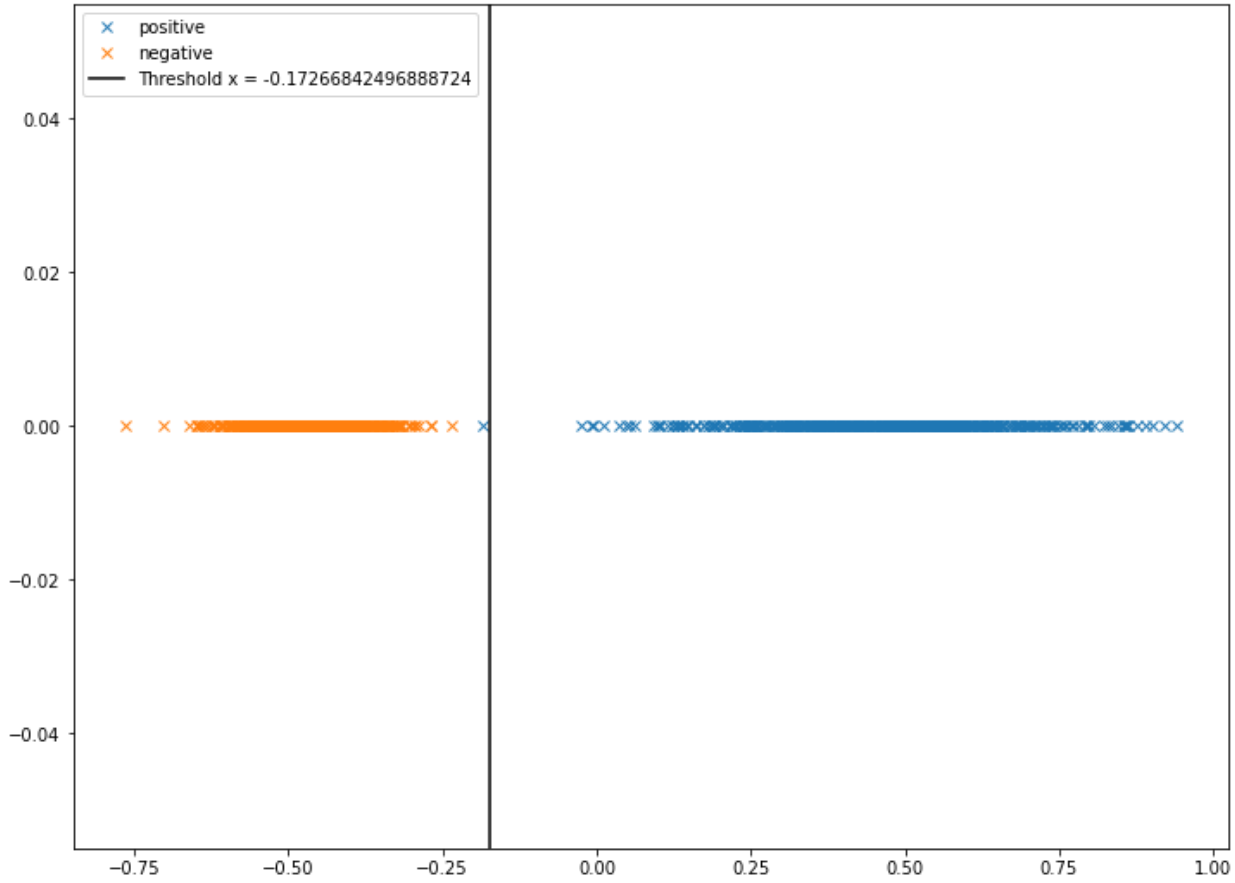

Figure 2: 1D scatter plot of the points projected onto w along with the discriminating line

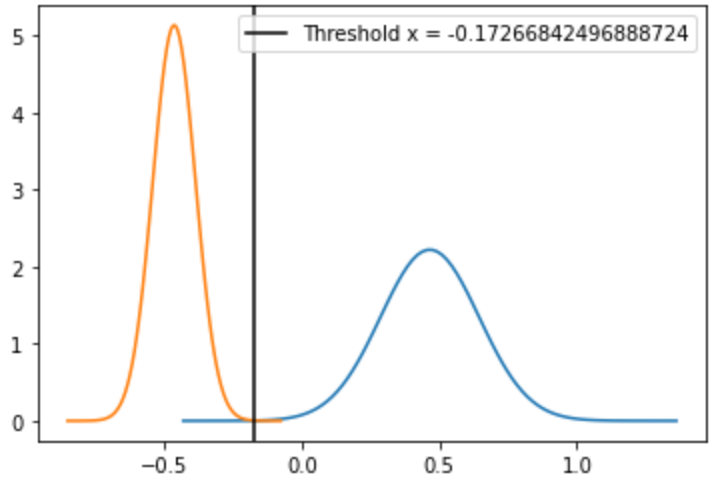


Figure 3: Plot of the normal distributions of the two reduced clusters along with the discriminating line

**Results:**

The vector w on which the points are to be projected was obtained to be

w = [[-0.00637337],[-0.01597961],[ 0.46139333]]
(Unit vector w = [[-0.01380373],[-0.03460934],[ 0.99930558]])

The threshold point on w was obtained to be -0.17266842496888724.

The unit vector in 3D is [[-0.01380373],[-0.03460934],[ 0.99930558]] (w which is the normal direction to the plane)

The unit vector in 1D is [-0.17266842496888724].

**Accuracy:**

The Fischer's LDA model achieved an accuracy of 99.9% on the dataset