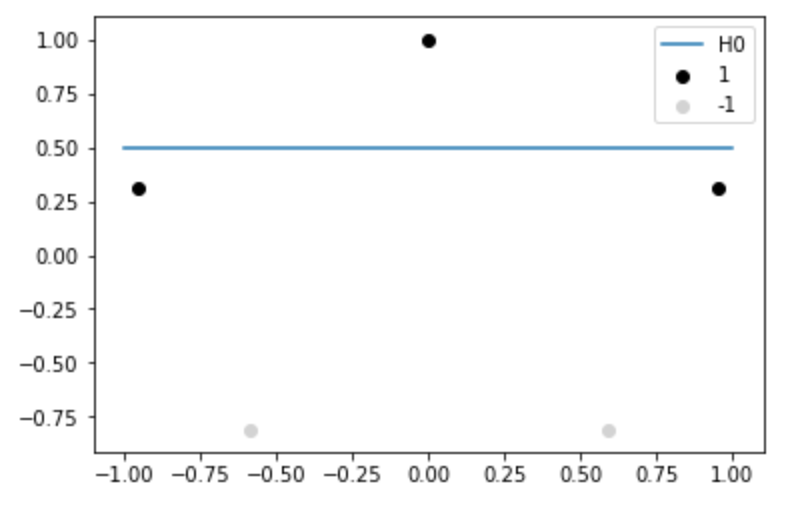
Exam 1

xian chen

**Question1 (a)**

Since , and , we have .



**(b)** We know that signed-distance of any point x to a hyperplane is .

Hence, .

**(c)**

From part(b), we know and are misclassified because and but .

Thus, contains and .

**(d)**

The sum of unsigned distances of misclassified data points is given by

Thus, for and ,

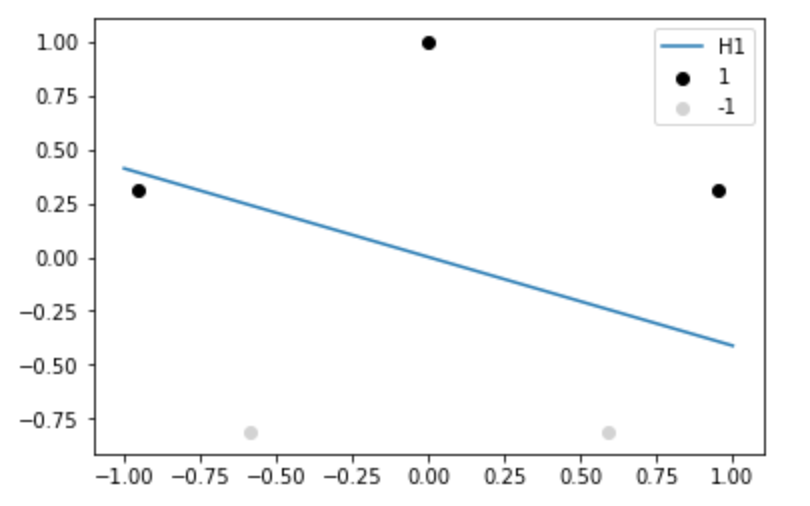
**(e)**

Given and ,

Hence, and .

**(f)**

Since , where and , we have .



**(g)**

The signed-distance of any point x to a hyperplane is .

Hence, .

**(h)**

Only is misclassified because while .

Thus, contains .

**(i)**

The sum of unsigned distances of misclassified data points is given by

Thus, for and ,

We can see that sum of unsigned distances of misclassified data points is decreased.

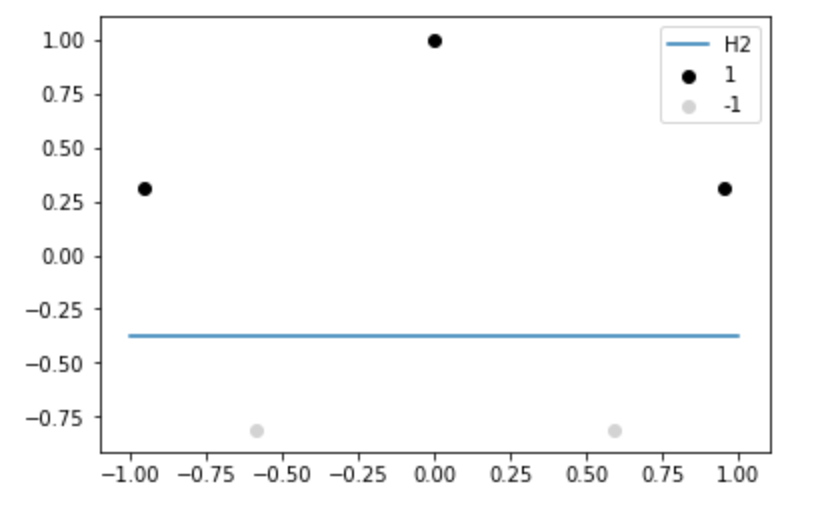
**(j)**

Given and ,

Hence, and .

**(k)**

Since , where and , we have .



**(l)**

The signed-distance of any point x to a hyperplane is .

Hence, .

**(m)**

Since the signed-distance of x1,x2 and x3 from are greater than 0 and the signed-distance of of x4 and x5 from are smaller than 0, all data points are correctly classified.

Thus, is empty.

**Question2 (a)**

since , we have . Thus, also satisfies the linear equation , for any .

**(b)**

If the columns of are linearly independent, then satisfies .

**(c)**

If the columns of are not linearly independent(), then there are can be many solutions for . , not all needs to be zero.