**3.Examples of SVM:**

Example 1:

Consider the following posititvely labelled data points in

And following are negatively labelled data points in



Figure 13: Sample data points in . Blue diamonds are positive and red squares are negative examples

From the figure 13 it has been observed that there are three support vectors

Vectors are augmented with a 1 as a bias input, so if it now becomes and similarly and

Using the objective function

W()= - (a)

Here, the kernel function is identity. Therefore,

W()= – (b)

= + (c )

= 2

Similarly,

=4 =11 = 9 =11

Substituting these values in equation (c ), we will get

W()= (d)

= ++ (e)

Maximize objective function of equation (e ) with respect to

w.r.to : 1 -8

-4 (f)

w.r.to : - (g)

w.r.to : -11 (h)

By adding equation (g) and (h) we get,

(i)

Put value of from equation (i) into equation (f), we get

- = (j)

Multiply equation (g) with 9 and (h) with 11, and subtracting them, we get

20 (k)

Since equation (k) becomes

20 (l)

Multiply equation (j) with 4 and add with (l), we get

and = 3.5 (m)

Now that we have the values, we can find the hyperplane that discriminates the positive from the negative examples.

=

= -3.5 + 0.75 + 0.75

= (n)

Since, the vectors are augmented with bias, the last entry in vector is the value of bias b. i.e. b=-2 and = [10]

Now, the hyperplane equation is

+ b = 0 (o)

Since, the dataset is two-dimensional, the above equation becomes as,

. (p)

Substituting values of and b

(q)

This is the equation for hyperplane. Plotting of same gives the expected decision surface.



Figure 14: shows the hyperplane for x=2

**Use of Machine:**

For example, we want to classify the point x=(4 1), then

(r )

(s)