

# Machine learning Homework- Soft-Margin SVM and Kernels

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## Problem 1:

No it will not be the correct label. The training sample depends on the distance from the hyperplane decision boundary  $\xi$ . If  $\xi < 1$  for the training sample it gets classified correctly else it gets mis-classified.

## Problem 2:

The cost function for soft-margin SVM is

$$\min f_0(\mathbf{w}, b, \xi) = \frac{1}{2} \mathbf{w}^T \mathbf{w} + C \sum_{i=1}^N \xi_i \quad (1)$$

C is a penalizing factor on  $\xi$ .

case 1: when  $C = 0$  there is no restriction on  $\xi$  values.

case 2: when  $C \downarrow 0$  it encourages higher values of  $\xi$  and hence encouraging mis-classification.

## Problem 3:

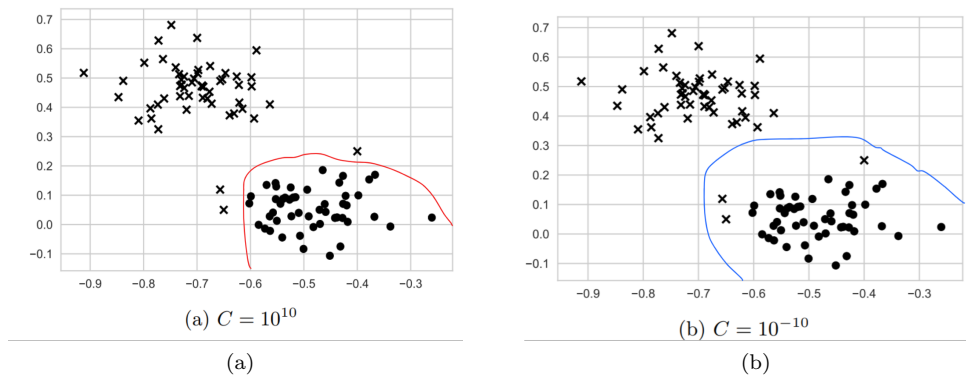


Figure 1

The first case tends to have hard margin of SVM since the C value is very big and C tends to  $\infty$ . The second figure on the right has soft margin since the C value is very less and this can take some mis-classification.

## Problem 4:

We know that  $\sum_{i=0}^N a_i (x_i^T x_j)^i$  is a polynomial kernel. by the kernel preserving operation we know that sum of valid kernel is also a valid kernel and hence  $k(x_1, x_2)$

## Problem 5:

## Problem 6:

- The algorithm is trying to find the matching characters in the given string.
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## Problem 7: