IE406: Machine Learning Lab

Assignment 5

(Date: 12/10/2021)

1. Perform SVM on iris dataset.

   (a) Use sklearn SVM classifier and perform classification on dataset.

   (b) normalize the data and then perform same experiment on normalized data

   (c) use the given SVM kernels and perform svm classification.

   I. Linear
   II. poly
   III. bf
   IV. Sigmoid
   V. Precomputed

2. Perform SVM on https://drive.google.com/file/d/13nw-uRXPY8XIZQxKRNZ3yYlho-CYm_Qt

   (a) Use sklearn SVM classifier and perform classification on dataset.

   (b) normalize the data and then perform same experiment on normalized data

   (c) use the given SVM kernels and perform svm classification.

   VI. Linear
   VII. poly
   VIII. bf
   IX. Sigmoid
   X. precomputed

3. You may find this tutorial on using CVXPY for Ridge regression very useful as a fully worked out example for the problems in this assignment.

   A. Implement a function for hard margin SVM in primal form using cvxpy. For keeping this task simple assume w is two dimensional, i.e. $(x) = SIGN(w_1 x_1 + w_2 x_2 + b)$ where x and w are both two dimensional vectors.

   B. Show the usage of your implementation on the IRIS dataset. We will only be making use of sepal-length and petal-width as the two features. We have only two classes - Setosa and Not-Setosa. This problem is linearly separable.

   C. Plot the decision boundary (separating hyperplane) in dark black and the margins in dotted lines. Encircle the support vector points.

   D. Plot the decision boundary in dark black and the margins in dotted lines. This time use SKlearn's SVM with a linear kernel. Encircle the support vector points. Do you get the same answer as when you use your own SVM?

   E. If you throw away all the points except the support vectors does your decision boundary remain the same? Why?

Note:
Submission Deadline: 11:59 PM, Tuesday, 18 October 2021
strictly follow the submission guidelines given in the classroom.