Foundations Of Machine Learning

Assignment-2

ES19BTECH11003

REPORT ANALYSIS

4)

Initially, I defined an extract_data_from_txt() function in which I have extracted data from the files and stored it in lists, and returns all the 4 lists containing X_train,Y_train, X_test, and Y_test where X_train contains attributes and Y_train contains actual digits.

a)for the linear kernel I defined a linear_SVM function which takes all 4 data sets as input and this function returns no of support vectors and accuracy.

Output:

```
no_of_SV's     Accuracy
     28         0.9787735849056604
```

b)

Samples for train	No of SV's	Accuracy
50	2	0.9811320754716981
100	4	0.9811320754716981
200	8	0.9811320754716981
800	14	0.9811320754716981

c)Given,
To compare train_error,test_error,accuracy,no_of_SV's when degree=2 and degree=5 when C variates from 0.0001 to 1
i)When C = 0.0001, training error is higher at Q = 5.(False)
training_error_Q5=0.051889814221652 84
training_error_Q2=0.340807174887892 36
ii)When C = 0.001, the number of support vectors is lower at Q = 5.(True)
SV's for Q5=158
SV's for Q2=558
iii)When C = 0.01, training error is higher at Q = 5.(True)
training_error_Q5=0.008327994875080 07
training_error_Q2=0.008327994875080 07

iv)When C = 1, test error is lower at Q = 5.(True)
test_error_Q5=0.016509433962264 12
test_error_Q2=0.018867924528301 883

d)radial basis function (RBF) kernel K(xn, xm) = e^(−||xn − xm||)2

C_value	Training_error	Test_error
0.01	0.005124919923126248	0.01650943396226412
1	0.004484304932735439	0.021226415094339646
100	0.003843689942344630 2	0.018867924528301883

10000	0.0038436899423446302	0.021226415094339646
10^6	0.004484304932735439	0.021226415094339646

5)

a)

The training error, test error, and the number of support vectors, for the linear kernel for 6000 samples, is

Training error:0.0

Test_error:0.02400000000000002

No_of_support_vectors:1084

Accuracy:0.976

b)

Polynomial kernel function considering degree=2 and coef0=1

Training error:0.00049999999999449

Test_error:0.02000000000000018

No_of_support_vectors:1332

Accuracy:0.98

RBF kernel function considering gamma=0.001

Training error:0.0

Test_error:0.5

No_of_support_vectors:6000

Accuracy:0.5