Support Vector Machines

Methodology:

Package Used : LibSVM (in C++ Language)
In this package, We can C-SVM classifier where C is the generalisation constant.
There are two executables in this package -
i)svm-train
This takes input the training data set and generates the output learning model.
We can use this command as follows :-
svm-train -s 0 -c 11.5 -t 0 data.csv,
Where -s = 0 indicates C-SVC classifier
-c = 11.5 ,Value of generalisation constant
-t = 0 (linear kernel function)
1 (polynomial kernel function)*
2 (radial basis function)
The generated output model will be named as data.csv.model
ii)svm-predict
This takes input, the test data file, the output model file from svm-train and generates the class labels to an output file. It also gives the accuracy, if the test data file contains the output class labels also.
We can use this command line as follows -
Svm-predict test.csv data.csv.model output
Where test.csv is the test data file.

Given Below are the experimental results for the learned model and choosen training set with 3499 elements and 1102 elements in the test data file.

Experimental results:

In the linear kernel function, the best C- value is 24.
In the polynomial(Quadratic) kernel function, the best C- value is 10.
In the rbf kernel function, the best C- value is 2.5.

The following three tables are for linear, quadratic and rbf kernels respectively.

* - The degree of polynomial can be given by -d 2 in the argument.

C - Value	Accuracy	No. Of Correct instances
5.00E-05	63.70%	(702/1102)
0.0005	86.48%	(953/1102)
0.001	88.02%	(970/1102)
0.005	89.75%	(989/1102)
0.009	89.75%	(989/1102)
0.01	89.66%	(988/1102)
0.02	89.38%	(985/1102)
0.05	90.20%	(994/1102)
0.09	90.02%	(992/1102)
0.1	90.20%	(994/1102)
0.15	90.47%	(997/1102)
0.25	90.47%	(997/1102)
0.5	90.74%	(1000/1102)
0.75	90.93%	(1002/1102)
0.9	91.20%	(1005/1102)
1	91.20%	(1005/1102)
1.1	91.20%	(1005/1102)
1.2	91.20%	(1005/1102)
1.25	90.93%	(1002/1102)
1.5	90.93%	(1002/1102)
1.6	90.93%	(1002/1102)
1.8	90.93%	(1002/1102)
2	90.93%	(1002/1102)
2.5	91.02%	(1003/1102)
3	91.20%	(1005/1102)
4	91.02%	(1003/1102)
5	90.93%	(1002/1102)
6	91.11%	(1004/1102)
7	91.11%	(1004/1102)
9	91.11%	(1004/1102)
10	91.20%	(1005/1102)
12	91.29%	(1006/1102)
15	91.29%	(1006/1102)
16	91.29%	(1006/1102)
20	91.38%	(1007/1102)
22	91.38%	(1007/1102)
24	91.47%	(1008/1102)
26	91.38%	(1007/1102)
28	91.38%	(1007/1102)
30	91.38%	(1007/1102)
40	91.47%	(1008/1102)
50	91.47%	(1008/1102)
70	91.38%	(1007/1102)
60	91.47%	(1008/1102)
80	91.38%	(1007/1102)

C - Value	Accuracy	No. Of Correct instances
2.00E-05	62.34%	(687/1102)
0.0002	62.34%	(687/1102)
0.002	62.61%	(690/1102)
0.005	63.43%	(699/1102)
0.01	64.25%	(708/1102)
0.05	69.60%	(767/1102)
0.1	73.50%	(810/1102)
0.5	82.85%	(913/1102)
0.25	79.58%	(877/1102)
0.5	82.85%	(913/1102)
0.75	83.85%	(924/1102)
0.9	85.03%	(937/1102)
1	85.21%	(939/1102)
1.1	85.84%	(946/1102)
1.2	86.30%	(951/1102)
1.3	86.57%	(954/1102)
1.4	86.66%	(955/1102)
1.6	87.21%	(961/1102)
1.8	87.21%	(961/1102)
1.9	87.21%	(961/1102)
2	87.30%	(962/1102)
2.25	87.57%	(965/1102)
2.5	87.93%	(969/1102)
3.0.	87.93%	(969/1102)
4	88.66%	(977/1102)
5	89.11%	(982/1102)
6	89.11%	(982/1102)
7	89.38%	(985/1102)
8	89.20%	(983/1102)
9	89.47%	(986/1102)
10	89.75%	(989/1102)
11	89.66%	(988/1102)
15	89.29%	(984/1102)
18	89.38%	(985/1102)
20	89.29%	(984/1102)
22	89.38%	(985/1102)
24	89.47%	(986/1102)
26	89.29%	(984/1102)
28	89.38%	(985/1102)
30	89.38%	(985/1102)
35	89.20%	(983/1102)
40	89.38%	(985/1102)
45	89.11%	(982/1102)
50	89.02%	(981/1102)
75	88.38%	(974/1102)

C - Value	Accuracy	No. Of Correct instances
2.00E-05	62.34%	(687/1102)
0.0002	62.34%	(687/1102)
0.002	62.34%	(687/1102)
0.02	85.75%	(945/1102)
0.005	62.34%	(687/1102)
0.009	72.78%	(802/1102)
0.01	75.59%	(833/1102)
0.015	84.30%	(929/1102)
0.05	88.38%	(974/1102)
0.07	88.75%	(978/1102)
0.09	89.20%	(983/1102)
0.1	89.56%	(987/1102)
0.15	89.38%	(985/1102)
0.2	89.38%	(985/1102)
0.25	89.66%	(988/1102)
0.3	89.84%	(990/1102)
0.5	90.38%	(996/1102)
0.8	90.56%	(998/1102)
1	90.83%	(1001/1102)
1.5	90.93%	(1002/1102)
2	91.02%	(1003/1102)
2.5	91.20%	(1005/1102)
3	91.11%	(1004/1102)
3.5	90.83%	(1001/1102)
4	90.56%	(998/1102)
5	90.83%	(1001/1102)
7	91.11%	(1004/1102)
9	90.93%	(1002/1102)
10	90.93%	(1002/1102)
15	90.93%	(1002/1102)
20	90.74%	(1000/1102)
25	90.65%	(999/1102)
30	90.38%	(996/1102)
35	90.65%	(999/1102)
40	91.02%	(1003/1102)
45	90.74%	(1000/1102)
50	90.56%	(998/1102)
60	90.38%	(996/1102)
70	89.84%	(990/1102)