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Neural Network

Project 3 report

1) LINEAR SVM :

Training the entire data set using linear svm and different values for C. Entire test set was used to validate each model. The highest accuracy obtained is 94% (941/1001) for C = 2 (2^1). The plot of parameter C vs accuracy of model with each value of parameter C is shown in Fig 1.1

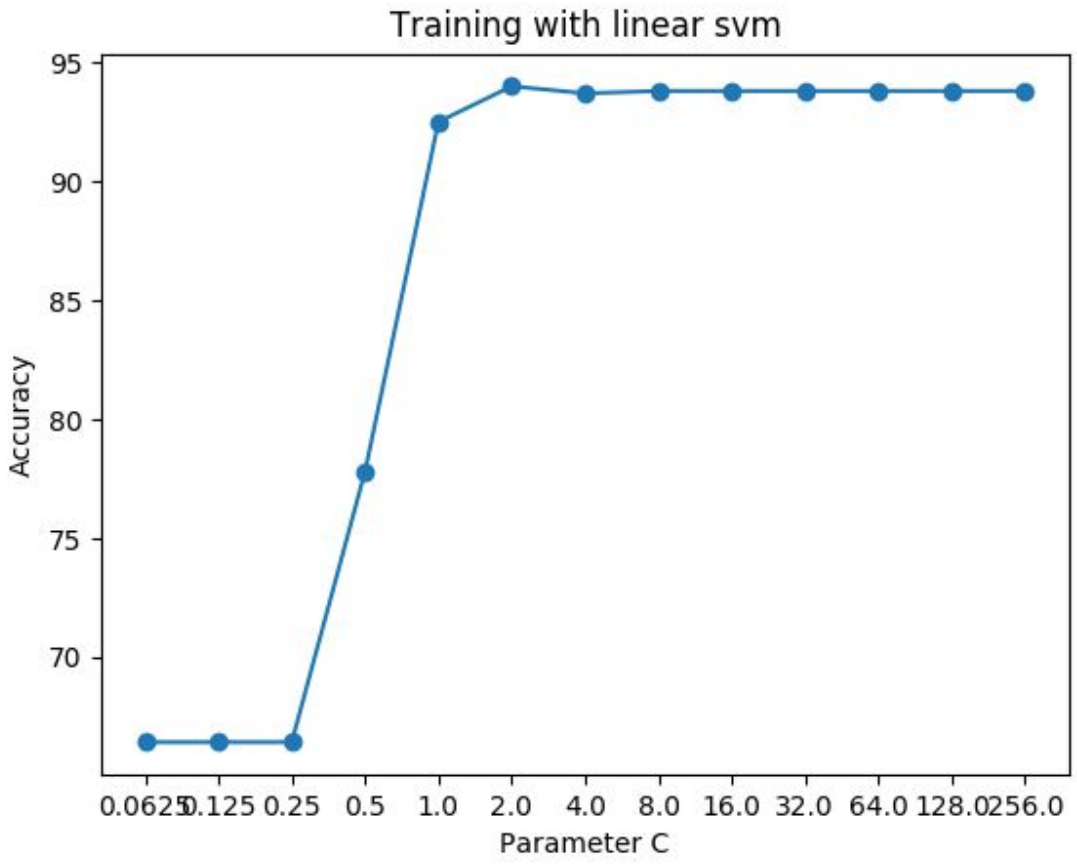

Fig 1.1 : Plot of Accuracy vs C for linear svm

2) RBF kernel :

Training using the RBF kernel for svm.

A) 5-fold cross validation :

The training data was shuffled randomly and then split into two equal parts. One of these parts was randomly chosen and further split into 5 equal data sets to perform cross validation. Five iterations were run for every combination of parameter C and alpha. In each iteration one of the five equal dataset was used as validation set and the other four as training data set, not reusing the same data set as validation set in each iteration.

The best C and alpha are the ones that give the best accuracy. Accuracy is averaged for 5 validation sets. Highest accuracy obtained with cross validation = 94.6% for C = 256 (2^8) and alpha = 0.0625 (2^-4).

Following is the matrix for accuracy for this experiment where rows represent C and alpha is along the columns.

C, α	0.0625	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256
0.0625	68	68	68	68	68	68	68	68	68	68	68	68	68
0.125	68	68	68	68	68	68	68	68	68.9	70.1	68.9	68	68
0.25	68	68	68	68	68	68	68.4	74	76	75.8	73.4	70	68.1
0.5	68	68	68	68	68.1	73	79.9	81.2	80.6	78.9	77.1	73.5	69.6
1	68	68	68	68.9	80.5	88.1	88.6	87.2	85.2	82.2	79.1	76.8	73
2	68	68	69.7	86.7	91.5	91.9	91	89.7	88	85.1	81.9	78.6	73.5
4	68	70.2	88.9	93.3	93.5	92.8	91.7	90.3	89	86.4	82.5	78.4	73.6
8	70.7	89.7	93.3	93.8	93.3	92.7	92.4	90.6	89.2	86	82.6	78.1	73.6
16	90.5	93.3	94.1	93.7	93	92.8	91.8	90	88.2	85.5	81.7	78	73.6
32	93.7	94.4	93.9	93.6	93.3	92.4	91.7	90.1	88.4	85.4	81.1	78	73.7
64	94.2	94	94.1	93.9	93.5	92.8	91.3	89.2	87.9	84.3	81.1	78.1	73.7
128	94.1	94.2	94.1	93.7	93.7	92.4	91	89.7	86.6	83.8	81	78	73.7
256	94.6	94.1	94.1	93.6	92.8	91.8	89.8	89	85.3	83.9	81.1	78	73.7

B) RBF kernel using entire training set :

SVM is trained using the best C and alpha selected in part A. Highest accuracy obtained = 94.2% (943/1001) for C = 256 (2^8) and alpha = 0.0625 (2^-4).

Linear SVM performs almost as good as RBF kernel. Training as well as testing with linear SVM is faster than with RBF kernel. Hence, linear SVM may be a better choice for this dataset.