**Task 4**

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-scale -l -1 -u 1 -s range1 trainingSet.dat > trainingSet.scale

**Result**

Scaling the trainingSet.dat into a range between -1 and 1 and saving in trainingSet.scale file.

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-scale -l -1 -u 1 -s range1 testingSet.dat > testingSet.scale

**Result**

Scaling the testingSet.dat into a range between -1 and 1 and saving in testingSet.scale file.

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-train -c 5 -g 0.01 -v 5 trainingSet.scale

**Result**

-c = cost

-g = gamma

-v 5 = 5-fold cross validation mode

\*

optimization finished, #iter = 162

nu = 0.335402

obj = -370.000436, rho = 1.289847

nSV = 123, nBSV = 116

\*

optimization finished, #iter = 177

nu = 0.266526

obj = -311.649171, rho = 5.211743

nSV = 103, nBSV = 92

\*

optimization finished, #iter = 83

nu = 0.196834

obj = -218.300311, rho = 2.841801

nSV = 74, nBSV = 65

Total nSV = 202

\*

optimization finished, #iter = 183

nu = 0.367353

obj = -401.328945, rho = 1.783974

nSV = 132, nBSV = 126

\*

optimization finished, #iter = 156

nu = 0.259661

obj = -291.257196, rho = 5.123057

nSV = 99, nBSV = 91

\*

optimization finished, #iter = 110

nu = 0.195663

obj = -207.797544, rho = 2.438169

nSV = 72, nBSV = 66

Total nSV = 205

\*

optimization finished, #iter = 148

nu = 0.352086

obj = -379.722247, rho = 1.403423

nSV = 126, nBSV = 121

\*

optimization finished, #iter = 189

nu = 0.275073

obj = -312.051263, rho = 5.590569

nSV = 104, nBSV = 95

\*

optimization finished, #iter = 77

nu = 0.204098

obj = -219.927601, rho = 3.091577

nSV = 74, nBSV = 67

Total nSV = 208

\*

optimization finished, #iter = 173

nu = 0.356864

obj = -392.964775, rho = 1.820250

nSV = 130, nBSV = 122

\*

optimization finished, #iter = 142

nu = 0.267126

obj = -302.967391, rho = 5.687023

nSV = 101, nBSV = 93

\*

optimization finished, #iter = 87

nu = 0.204167

obj = -220.501084, rho = 2.948092

nSV = 75, nBSV = 66

Total nSV = 204

\*

optimization finished, #iter = 219

nu = 0.357810

obj = -384.928211, rho = 1.898947

nSV = 131, nBSV = 121

\*

optimization finished, #iter = 177

nu = 0.261275

obj = -299.667065, rho = 5.602235

nSV = 100, nBSV = 91

\*

optimization finished, #iter = 102

nu = 0.200235

obj = -222.712295, rho = 2.870570

nSV = 75, nBSV = 66

Total nSV = 207

Cross Validation Accuracy = 97.901%

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-train -c 5 -g 0.005-v 5 trainingSet.scale

**Result**

optimization finished, #iter = 166

nu = 0.459095

obj = -538.303123, rho = 1.195103

nSV = 164, nBSV = 158

\*

optimization finished, #iter = 169

nu = 0.398871

obj = -485.301827, rho = 4.655920

nSV = 151, nBSV = 143

\*

optimization finished, #iter = 90

nu = 0.285265

obj = -325.954160, rho = 2.525384

nSV = 104, nBSV = 97

Total nSV = 287

\*

optimization finished, #iter = 136

nu = 0.496729

obj = -586.651648, rho = 1.261533

nSV = 179, nBSV = 173

\*

optimization finished, #iter = 215

nu = 0.398704

obj = -469.296697, rho = 4.970614

nSV = 150, nBSV = 142

\*

optimization finished, #iter = 97

nu = 0.297378

obj = -326.401555, rho = 2.249209

nSV = 108, nBSV = 101

Total nSV = 294

\*

optimization finished, #iter = 135

nu = 0.480656

obj = -560.091805, rho = 0.962368

nSV = 172, nBSV = 166

\*

optimization finished, #iter = 187

nu = 0.417715

obj = -492.562871, rho = 5.102860

nSV = 154, nBSV = 148

\*

optimization finished, #iter = 99

nu = 0.299855

obj = -338.724184, rho = 2.759554

nSV = 110, nBSV = 101

Total nSV = 291

\*

optimization finished, #iter = 169

nu = 0.484205

obj = -571.230826, rho = 1.446649

nSV = 172, nBSV = 169

\*

optimization finished, #iter = 183

nu = 0.404822

obj = -478.656457, rho = 5.219608

nSV = 151, nBSV = 144

\*

optimization finished, #iter = 83

nu = 0.298510

obj = -338.750212, rho = 2.671740

nSV = 107, nBSV = 102

Total nSV = 285

\*

optimization finished, #iter = 187

nu = 0.482364

obj = -567.211371, rho = 1.356565

nSV = 173, nBSV = 167

\*

optimization finished, #iter = 185

nu = 0.406241

obj = -474.252594, rho = 5.282170

nSV = 151, nBSV = 144

\*

optimization finished, #iter = 86

nu = 0.293642

obj = -333.085761, rho = 2.436665

nSV = 105, nBSV = 99

Total nSV = 288

Cross Validation Accuracy = 94.3028%

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-train -c 5 -g 0.005-v 5 trainingSet.scale

**Result**

\*

optimization finished, #iter = 168

nu = 0.885243

obj = -1109.084991, rho = 0.019596

nSV = 315, nBSV = 312

\*

optimization finished, #iter = 219

nu = 0.707235

obj = -953.594727, rho = 1.282090

nSV = 262, nBSV = 256

\*

optimization finished, #iter = 114

nu = 0.573672

obj = -711.761527, rho = 1.131979

nSV = 203, nBSV = 199

Total nSV = 473

\*

optimization finished, #iter = 166

nu = 0.914773

obj = -1169.910227, rho = 0.041472

nSV = 322, nBSV = 322

\*

optimization finished, #iter = 168

nu = 0.708585

obj = -953.358933, rho = 1.277948

nSV = 261, nBSV = 257

\*

optimization finished, #iter = 106

nu = 0.591461

obj = -736.143935, rho = 1.011486

nSV = 209, nBSV = 206

Total nSV = 473

\*

optimization finished, #iter = 160

nu = 0.897727

obj = -1140.992640, rho = -0.010966

nSV = 317, nBSV = 315

\*

optimization finished, #iter = 178

nu = 0.728912

obj = -987.500817, rho = 1.325035

nSV = 267, nBSV = 263

\*

optimization finished, #iter = 112

nu = 0.595678

obj = -745.023613, rho = 1.214672

nSV = 211, nBSV = 207

Total nSV = 474

\*

optimization finished, #iter = 164

nu = 0.907633

obj = -1151.896424, rho = 0.093363

nSV = 321, nBSV = 318

\*

optimization finished, #iter = 174

nu = 0.700515

obj = -953.865505, rho = 1.408698

nSV = 258, nBSV = 254

\*

optimization finished, #iter = 106

nu = 0.571599

obj = -724.443980, rho = 1.077121

nSV = 203, nBSV = 199

Total nSV = 471

\*

optimization finished, #iter = 176

nu = 0.900717

obj = -1149.666960, rho = -0.031223

nSV = 319, nBSV = 314

\*

optimization finished, #iter = 176

nu = 0.694524

obj = -932.729066, rho = 1.355707

nSV = 255, nBSV = 251

\*

optimization finished, #iter = 106

nu = 0.564220

obj = -715.578315, rho = 1.040158

nSV = 199, nBSV = 194

Total nSV = 471

Cross Validation Accuracy = 79.3103%

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-train -c 5 -g 0.01 trainingSet.scale trainingSet.model

**Result**

Training of the training set with parameter with cost = 5 and gamma = 0.01

\*

optimization finished, #iter = 204

nu = 0.314540

obj = -421.538646, rho = 1.873802

nSV = 142, nBSV = 135

\*

optimization finished, #iter = 159

nu = 0.235516

obj = -333.008497, rho = 5.817821

nSV = 111, nBSV = 103

\*

optimization finished, #iter = 137

nu = 0.177886

obj = -238.880668, rho = 3.078280

nSV = 82, nBSV = 72

Total nSV = 227

**Command**

D:\Matlab\Data\_Analysis\libsvm-3.22\windows>svm-predict testingSet.scale trainingSet.model predicted.output

**Result**

Classification of model on the test set and storing on predicted.output gives

Accuracy = 98.1982% (327/333)