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**Problem 1**

**Part 1:**

The accuracy for the first part of second problem is 69.1529%.

The fitcsvm function in Matlab is used for training multi label SVM with polynomial kernel of polynomial order 2 for every class label of training data.

The predict method in Matlab is used to predict the class label for each trained SVM of appropriate class label.

The accuracy has been computed by computing the Jaccard Similarity Coefficient of the predicted class label output with that of given class labels.

**Part 2:**

The accuracy for the second part of second problem varies each time the SVM classifier is trained.

The accuracy seems to vary between 59.3164 to 60.1985.

The fitcsvm function in Matlab was used for training multi label SVM with Gaussian kernel for every class label of training data with kernel ScaleAuto.

The predict method in Matlab is used to predict the class label for each trained SVM of appropriate class label.

**Problem 2**

**Solution for KNN classifier:**

1. *“fitcknn”* function is used to generated a KNN model *“mdl”.*
2. Then the *“predict\_knn”* is calculated using “*X\_TEST”* on the generated classifier *“mdl”.*
3. These generated values are compared with actual test results of “*Y\_TEST*” and the actual accuracy “*accuracy\_knn*” is calculated.
4. Final accuracy is 95.2322%

**Solution for SVM classifier:**

1. *“fitcecoc”* function is used to generated a KNN model *“Mdl”.*
2. Then the *“predict\_svm”* is calculated using “*X\_TEST”* on the generated classifier *“Mdl”.*
3. Then “predict\_svm” is compared with “*output*” which was generated on “*Y\_TEST*” and actual accuracy “*accuracy\_kvm*” is calculated.
4. Final accuracy is 94.3402%

**Solution for feedforward Neural Network with 25 neurons**:

1. A feedforward neural network “*ffn*” is created using “*feedforwardnet*” function.
2. Training datasets are prepared by transposing “*X\_TRAIN*” and converting “*Y\_TRAIN*” to vector using “*ind2vec*” function.
3. Then this feedforward neural network is trained with prepared training datasets using “*train*” function.
4. This generated network “ffn” is tested on “X\_TEST” test dataset and compared with “Y\_TEST” to calculate the accuracy of the feedforward neural network.
5. Final accuracy of the feedforward neural network is 90.7721%.

**Solution for Ensemble of the above classifiers:**

1. Final accuracy of the Ensemble is 95.2015%.

**References**: Assignment 3 Code