PartA.m: Run it to get the final result after dimensionality reduction using PCA, and the dendrogram plot of hierarchical clustering, the clustering result of hierarchical clustering, k-means and GMM.

PartB.m: Run it to get the final result after dimensionality reduction using LDA, and the dendrogram plot of hierarchical clustering, the clustering result of hierarchical clustering, k-means and GMM.

PartC_SVM.m: Run it to get the accuracy of the 5-fold cross validation, ROC curve, the average cross-validation accuracy and AUC of classification result using SVM with a RBF kernel or linear kernel. Select any line of code in the following figure to select the RBF and linear kernel, and the hyperparameter γ.

```
%-------------------------------------------------------training SVM using a RBF kernel
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.0001');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.001');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.01');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.04');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.07');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.1');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 1');

% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.02');
model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.03');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.04');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.05');
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 2 -g 0.06');

%-------------------------------------------------------training SVM using a linear kernel
% model = svmtrain(training_label_vector, training_instance_matrix, '-t 0');
```

PartC_NN.m: Run it to get the accuracy of the 5-fold cross validation, ROC curve, the average cross-validation accuracy and AUC of classification result using a neural network classifier with one hidden layer.

SVM_compare.m: Run it to get the plots of γ-accuracy and γ-AUC.

NN_compare.m: Run it to get the plots of hidden layer size-accuracy and hidden layer size-AUC.

PCA.m: A function. The input is images(784x600) in mnist-1-5-8.mat, output is a 600x2 data matrix after dimensionality reduction using PCA.

LDA.m: A function. The input is images(784x600) in mnist-1-5-8.mat, output is a 600x2 data matrix after dimensionality reduction using LDA.

HC.m: A function. The input are a 600x2 data matrix after dimensionality reduction using PCA or LDA and labels in mnist-1-5-8.mat. Output is a hierarchical cluster tree Z used for create dendrogram plot and the a 600x1 label vector c after clustering.

k_means.m: A function. The input is a 600x2 data matrix after dimensionality reduction using PCA or LDA, output are a 600x1 label vector idx representing the clustering information and a 3x2 matrix representing the cluster centroid.

ROC.m: A function. The input are predict labels and ground truth labels. The function creates a ROC curve and output the AUC.