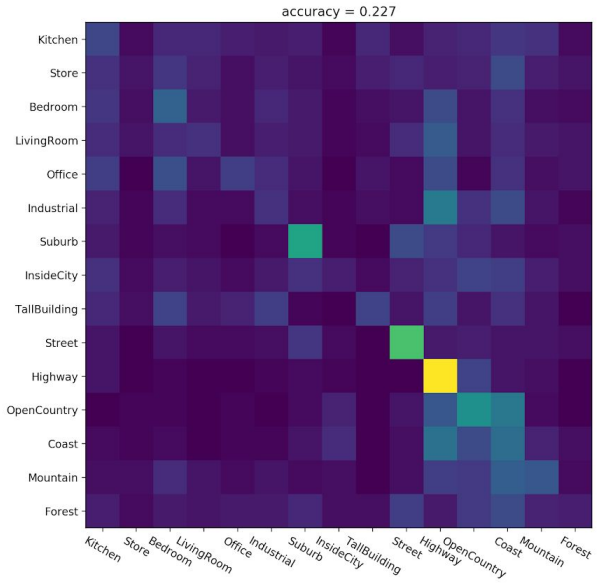
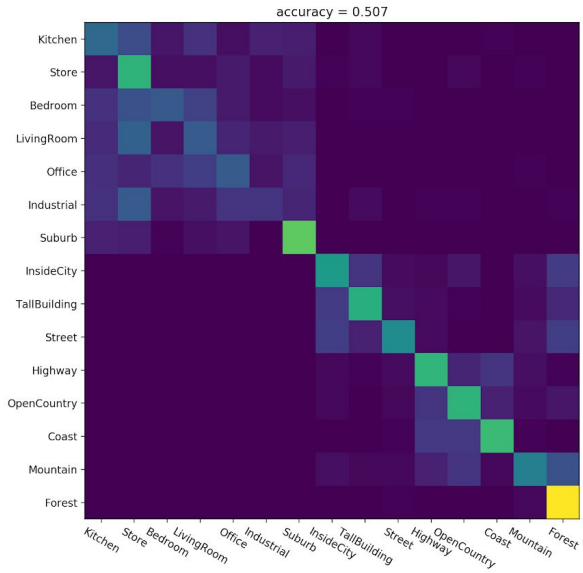
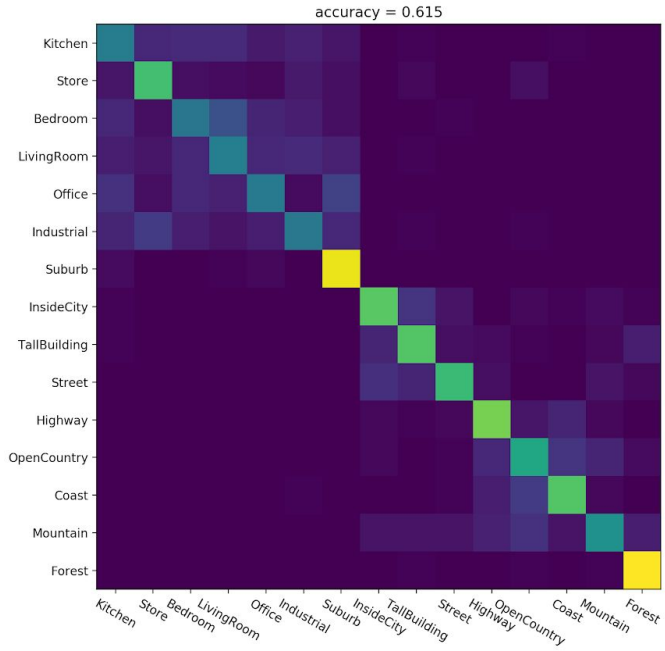
Homework-3



(a)



(b)



(c)

Figure (a) –**Confusion Matrix(KNN-Tiny)**; *Figure (b)* – **Confusion Matrix(KNN-Tiny)**; *Figure (c)* – **Confusion Matrix(KNN-Tiny)**

All confusion matrices Rows represent Actual Labels and Columns represent Predicted Labels

Summary:

Three different classification algorithms are implemented in this homework.

1. KNN classification on tiny image features:

   First each image in the training set is converted into a tiny image of size 16*16 image. The image is divided into 16*16 grid and the values inside each grid are averaged. Then the tiny image is normalized by subtracting the mean and dividing by the standard deviation. Then the test images are also converted using the same function. The training set and its labels are used to in a KNN algorithm to predict the label of test set. After testing with different values of K, K=5 gave an accuracy of 0.227. A confusion matrix is created using the predicted labels and actual labels as shown in figure(a).
2. KNN classification on Bag of words features:

   Dense Sift is performed on each image to get dense key-point vectors. 4 keypoints are chosen which are in the center of 4 parts of the grids chosen in the image if the grid was divided into 4 equal squares. The descriptors across the grids in the image are collected based on the size and stride passed to the function. All the dense_descriptors of the image are collected and used to get a vocabulary using K-means. K-means is applied over 100 iterations. The cluster centers comprises of the cluster centers obtained in the K-means. The vocab is used to generate bow_feature vectors by counting the number of times each descriptor has one of the cluster centers as the nearest neighbour. This feature is then normalized to a unit length vector. The feature vectors of all the train images and their labels is used to predict the labels of test images by using KNN classification. After playing around with the hyper-paramters, size =100, stride =30, dic_size(number of clusters in k-means) = 100 and K=5 gave an accuracy of 0.507. A confusion matrix is created using the predicted labels and actual labels as shown in figure(b).
3. SVM classification on Bag of words features:

   The KNN classification in the above method is replaced by an SVM classification. 15 one vs all svm classifiers are trained on the train feature vectors. These classfiers are used to predict labels for test images. The classifier regarding a particular label with the max score on the decision boundary is picked. After playing around with the hyper-paramters, size =100, stride =15, dic_size(number of clusters in k-means) = 100 and C=3.27 gave an accuracy of 0.615. A confusion matrix is created using the predicted labels and actual labels as shown in figure(c).