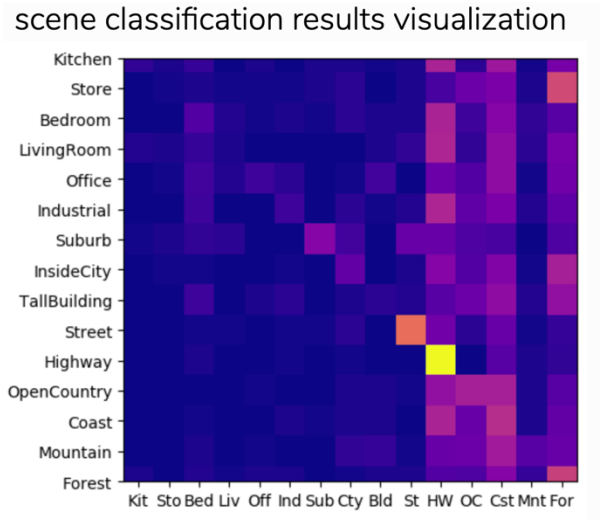
Assignment 3 Writeup

Pascale Walters

Tiny Image Features and Nearest Neighbour Classifier

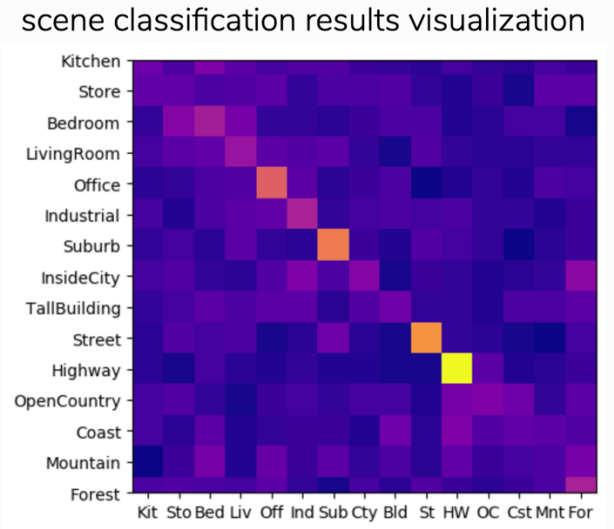
Using the tiny image features and the nearest neighbour classifier gives an accuracy of 20.467%. Nearest neighbour classification was performed with k = 5 and the image was resized to 16x16 pixels, rather than being cropped. The confusion matrix is as follows:



Classification was quite successful on the highway scenes, and slightly better on outdoor scenes than indoor ones, but overall rather inaccurate.

Tiny Image Features and Linear SVM Classifier

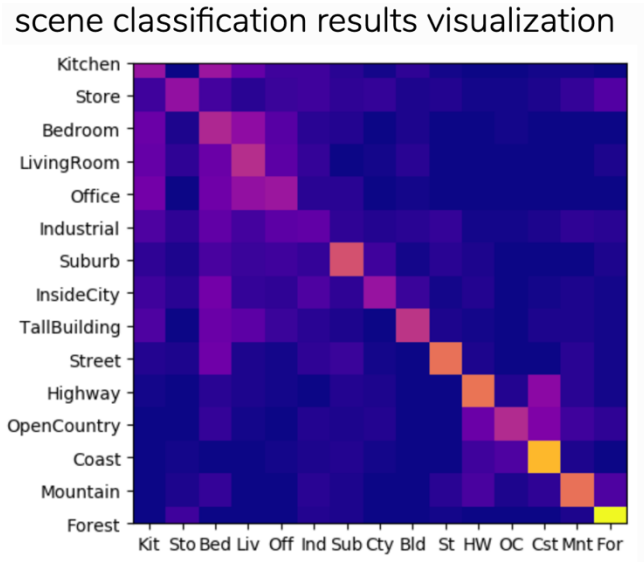
Using the tiny image features and the linear SVM classifier gives an accuracy of 21.93%. The confusion matrix is as follows:



Again, classification was most successful for the highway scene class, but there is a more even distribution among the classes than in the previous case.

Bag of Words Features and Nearest Neighbour Classifier

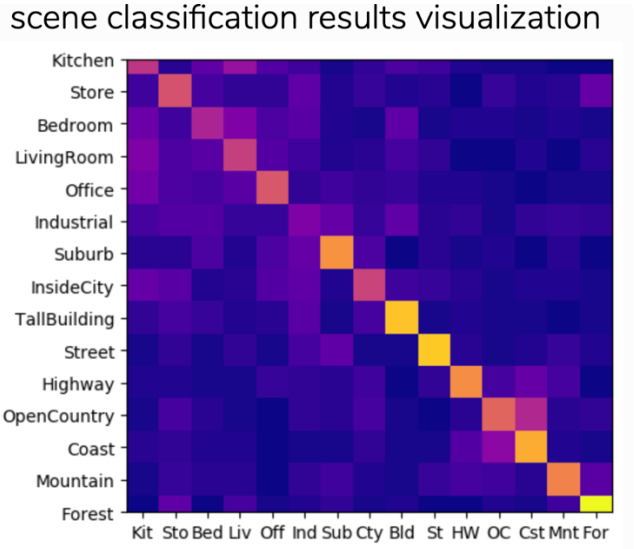
The bag of words vocabulary contains 200 words generated using histogram of gradients features. While generating the features, the images are resized to 64x64 to handle any images that are different sizes and to get a reasonable number of features. Generating a larger vocabulary or using larger resized images significantly increased computation time. The confusion matrix is as follows:



The forest scenes were classified the most successfully. Accuracy is 41.667%.

Bag of Words Features and Linear SVM Classifier

The bag of words features were generated in the same way as the previous section. Accuracy for this method is 39.9%. The confusion matrix is as follows:



This method should have obtained a higher accuracy than the previous method that used the nearest neighbours classifier. Visually, it appears as though the confusion matrix has brighter colours across the diagonal, signifying higher accuracy uniformly across all classes, and darker colours on the off-diagonal, signifying higher specificity. Therefore, using the one vs. all linear SVM gives better specificity, but lower accuracy, than using the $k = 5$ nearest neighbour approach. Results likely could be improved by using a larger dictionary or more features, which would require more computational resources. In

addition, more training data or data augmentation could potentially increase generalization, and further increase testing accuracy.