CS549 Homework 4

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1   Discussions

The tiny image features were easy to generate, and had nothing particularly important to point out, other than the fact that I cropped all the images instead of distorting them. For the nearest neighbors classifier, I used Euclidian Distance as the distance measurement. I also decided to add the option to use k-means to classify. I arbitrarily picked 5 as k and it worked fairly well. For building the vocabulary, I used HOG Features. I did not think about experimenting with this until just now, and so it will have to be a post-homework experiment. I used the built in kmeans function to form the vocabulary, without dropout of the most common features. Getting the bags of words initially followed the same steps as the vocab generation, but then used a nearest neighbor classifier I coded to decide which word would pair with it. I did not implement k-means for this classifier, despite now realizing that it would be a good idea. The SVM classify is a pretty straightforward multi 1-vs-all classifier, and did not have too much to change. I used fitcsvm, for reasons described in the next paragraph. I had options for KernelFunction, but stuck with the one-class default of 'rbf' (Gaussian), as it gave the best results. I am going to include the mat files that I have saved.

Before discussing, a couple of points. The version of MATLAB that I have does not have fitclinear, and so I ended up using fitcsvm instead. Unlike fitclinear, there is no lambda value in fitcsvm. I fiddled with various parameters, such as Nu, but These didn't really help that much. I suspect that this may have to do with the fact that I simply truncated the images to have the same number of features, and that I didn't drop out features that were too common, in generating the BoW. Despite this, I think I got reasonable results. I did try using the remote desktop and using fitclinear, but that took too long to run (even with a saved vocab and training + testing BoW saved), so I kept the result I have with fitcsvm.

The accuracy and confusion matrix for each of the configurations are included in the following section. A few notable things about the BoW + SVM combination:

- Forest, Office, Suburb, Highway, Coast, and Mountain had accuracies higher than 0.5. These all were fairly visually unique.

- The classifier had the hardest time with the Kitchen, Bedroom, Living room, Industrial, and TallBuilding results. The kitchen, bedroom, and living room classes are all visually fairly similar, and the same with Industrial and TallBuilding.
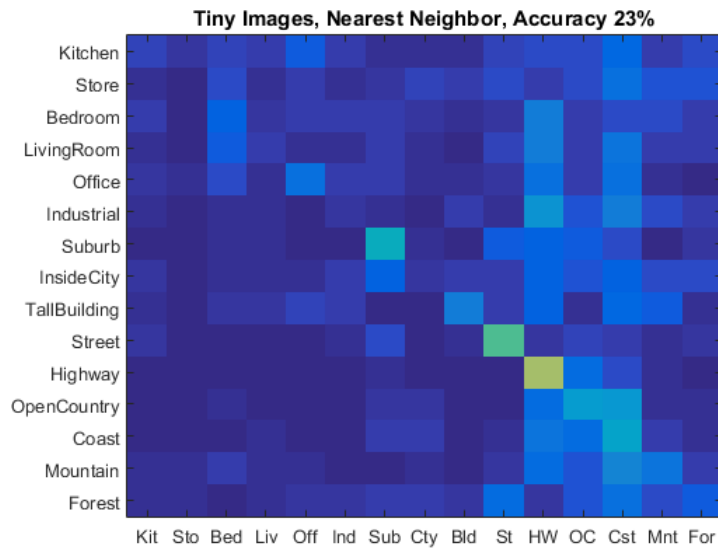
2   Performance

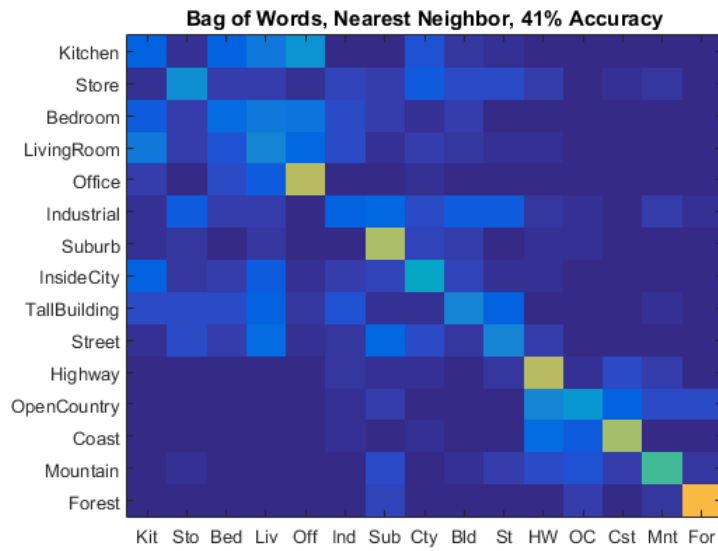Figure 1: Tiny Images Features, Nearest Neighbors Classifier, Accuracy of 0.23

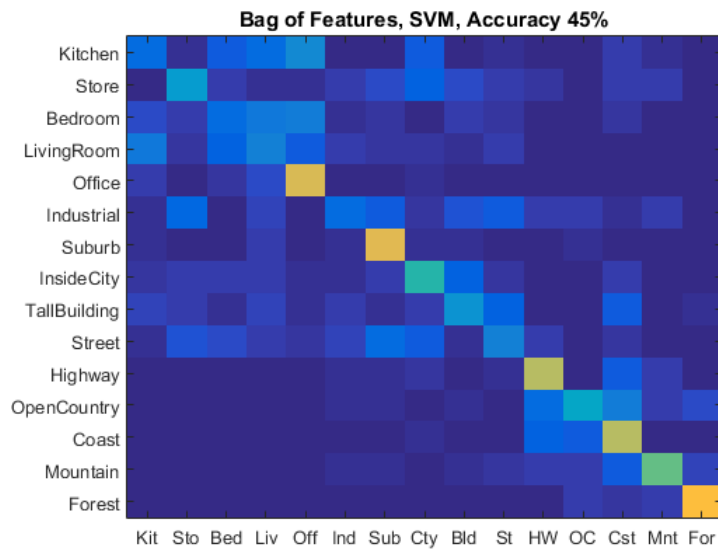Figure 2: Bag of Words Features, Nearest Neighbors Classifier, Accuracy of 0.41

Figure 3: Bag of Words Features, SVM Classifier, Accuracy of 0.45