

EE6882 Visual Search Engine, Spring 2012

Homework #2, Image Classification

Due date: Feb. 27th, 2011

In this homework, you will learn how to implement a very simple image classification system and evaluate its performance.

Dataset: CalTech 101 Image Database, http://www.vision.caltech.edu/Image_Datasets/Caltech101/

The database includes pictures of objects belonging to 101 categories. Each category has about 40 to 800 images. The size of each image is about 300 x 200 pixels. We have sampled a subset of about 250 training images and 250 test images from 10 categories to make the computation more manageable. The subset can be downloaded at the following local site: (http://www.ee.columbia.edu/~rj2349/index_files/Homework2/)

Example images
from CalTech 101



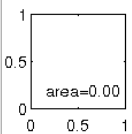

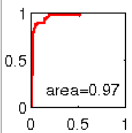
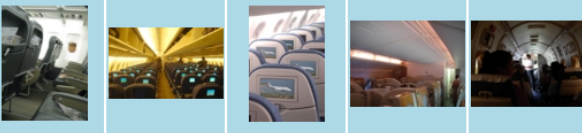
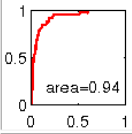
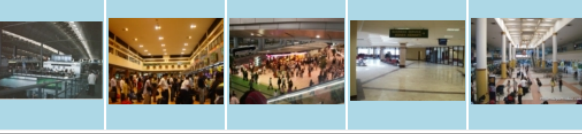
Averaged Images of
100 categories in
Caltech101



Problems:

1. Use programs you wrote in HW#1 to extract the color histogram of each image. If you have incorporated additional features such as spatial partitions, please feel free to use them.
Required submission: source code with comments
2. Use the SVM codes available from (<http://www.csie.ntu.edu.tw/~cjlin/libsvm/>) to train classification models each of the 5 categories. Each classifier should be binary, e.g., “motorbike” vs. “not-motorbike”. Choose the kernel type (linear, RBF, or others) and the parameters with justification. Use all the available training data and test on all test data.
Required submission: source code with comments

3. Report the classification performance for each category. Plot the precision-recall curve.
Required submission: source code with comments, plots of P-R curves.
4. Discuss and explain success and failure cases.
Required submission: written report (at least 1 paragraph)
5. (Bonus) improve the results by using a different feature (e.g., SIFT features) or distance metrics of your choice. Justify your choice with qualitative reasons and back it up with performance comparison results.
Required submission: source code with comments, plots or results and P-R curves, written report
6. (Bonus 2) use a more challenging dataset (MIT scene dataset) at <http://people.csail.mit.edu/jxiao/SUN/>

Class Name	Prediction Accuracy	ROC	Sample Training Images				
abbey	0%						
airplane_cabin	64%						
airport_terminal	16%						
alley	40%	