Department of Electrical and Computer Engineering
The Johns Hopkins University
520.648 Compressed Sensing and Sparse Recovery – Spring 2013

Homework Assignment VI

Computer Assignment:

Implement the following three face-recognition algorithms as described in Lecture:

- Eigenface or more precisely, Eigenfaces with s nearest neighbors. In other words, based on the s (say $s = 10$) closest matches in the eigenface domain, construct a simple voting scheme to identify the identity of the person.
- Nearest Subspace
- Sparse Representation

The database that we will use to evaluate the performance of your algorithms is the Extended Yale Face Database B which contains 38 human subjects under different poses and illumination conditions. To reduce the computational complexity, we will only experiment with the cropped database whose images have been manually aligned, cropped, and then re-sized to 96×84. This database can be downloaded from our Lectures directory:
http://thanglong.ece.jhu.edu/Course/648/Lectures/CroppedYale_96_84_2414_subset.mat

The database is stored in one single 3D array named *faces* of size $2414 \times 96 \times 84$. The associated file *facecls* contains the ground-truth information (the correct class) of each face in the database. Also found in the Lectures directory are the original papers on Eigenfaces, Fisherfaces, and Sparse-Representation-based Classification for your convenient reference.

You should randomly partition the set of images into the training set and the testing set. Eigenfaces, subject subspaces, and sparse-representation dictionary should only be constructed from the training set.

Evaluate your algorithms by plotting the receiver operating characteristic (ROC) curve – correct classification rate versus false alarm rate – for the following three cases:

- Clean test images. No occlusion.
- Corrupted test images. Random pixel corruption of 10%, 25%, and 50%.
- Corrupted test images. Continuous occlusion such as sun-glasses and scarfs. You can simulate these test images by placing black patches of 10%, 25% and 50% the original image size at random locations in the test images.

Due date: **April 11** in lecture