The goal of this computer assignment is to study PCA (or KLT) for the purpose of image data reduction and facial pattern representation. The “Yalefaces” image database (see course web page under Images) is used for this assignment.

1. KLT is used here for facial pattern representation using the algorithm covered in Lecture 14. The Yale University face database http://cvc.yale.edu/projects/yalefaces/yalefaces.html which contains 165 images for 15 subjects taken under 11 different conditions (center, glasses, sad, happy, sleepy, etc.). The new "Yale Database B" (5850 images) also provides the coordinates of the face features in each image apart from the image itself. This can be used for centering the face image. Description: http://vision.ucsd.edu/~leekc/ExtYaleDatabase/Yale%20Face%20Database.htm Images: ftp://plucky.cs.yale.edu/CVC/pub/images/yalefacesB/TarSets/ Cropped Coordinates of the face: ftp://plucky.cs.yale.edu/CVC/pub/images/yalefacesB/CropCoords/ Start by choosing only 15 training images (same condition or pose) and train the PCA-based system by finding the eigen-images. Test the quality of the reconstruction of some randomly picked training samples using only the most dominant PC’s and display the results. Comment on the reconstruction ability both visually and using SNR measure. Test the reconstruction (or representation) ability of the trained system on some randomly picked (at least 4) test cases (remainder of data not used for training) and comment on the results. Then, choose 4/5 of the data set as training and the keep the remainder as testing and repeat the same process. You should also try to test the capabilities of the latter system on a new face (e.g., yours) taken under different conditions.

2. Provide a detailed discussion on the effectiveness of this transform for image data reduction and facial representation in a report. Please read the guidelines for preparing your report.