

Due Date: Mar. 10th 2005

Problem #1: Covariance Matrix and KLT (50%)

Readings: Lecture notes plus additional materials from Reference Book by Jain

We demonstrated the process of computing the covariance matrix and generating the eigen vectors for human faces – i.e., the eigen face representation.

In this problem, we are to explore the reconstruction process.

(a) Given a single test image (hw3-test.tif) from the course web site, compute the KLT coefficients. The KLT basis functions are indexed based on the decreasing order of the eigen values.

(b) Now keep only the first 5 KLT coefficients and use them to reconstruct the image in the pixel domain. Compare the reconstructed image with the original image and compute the SNR value between these two.

(c) Repeat (b) but change the number of coefficients to 10.

Note: You are encouraged to try the above steps on your own images. This will be fun.

Problem #2: DFT and Frequency-Domain Filters (25%)

Problem 4.5 on page 215 of G&W 2nd ed. Textbook

Problem #3: Combination of Frequency-Domain and Spatial-Domain Processing (25%)

Problem 4.17 on page 217 of G&W 2nd ed. Textbook