Pattern Analysis Spring 2006
Problem Set Two

<div align="right">Due Friday, March 3, 2006</div>

1 Theory

Solve all the following problems:

1. Text problem 2.29

2. Text problem 2.30

3. Text problem 2.31

4. Text problem 3.10

5. Text problem 3.11

6. Text problem 3.21

7. Text problem 3.24

8. Show that

$$\langle \|x_D\|^2 \rangle = \sum_{j=1}^{D} \langle a_j^2 \rangle$$

2   Algorithms and Computing

You are encouraged to use Matlab in the following exercises.

Problem 1. Compute the best KL basis for the cat data leaving out the last cat image. Show the first four best basis vectors in image format. Using the parameters $\gamma = 0.90$ and $\delta = 0.05$ compute the KL dimensions D_γ, D_δ and D_T as defined in the text. Select a dog at random and compute its projection onto the cat basis (using D_T dimensions). Show both the projection and its residual as images. *You may use either matlab's SVD routine or the snapshot method in this calculation.*

Problem 2.

a) Write a program to repair an image of a cat with 20% of the entries randomly deleted. Apply this repair algorithm both to a cat used to generate the basis in Problem 1. as well as to a cat that was not used to generate that basis.

b) Extend the code from Problem 2 a) to repair an ensemble of gappy cats. Assume that all the data is gappy and that the basis must be generated iteratively. You may find it useful to test your code on Problem 4.21.