Problem 1

Problem 2 – LFD problem 3.19

(a) The transformation can become problematic if the data set size becomes large.

In short, the data is transformed into the space whose dimension is totally dependent on the size of the data set. For a data size of size , we have

That is, each data point represents one dimension in the transformed space and there are no duplicate transformed data inputs. Therefore, the maximum dichotomies can be .

As a result, the VC dimension is and when the sample size is large, the VC dimension is also large.

Therefore the transformation is problematic when sample size is large.

(b) is a valid radial basis function and it calculates the distance between and in the transformed space. RBF is a wildly used kernel function.

(c) Similarly, is also a valid radial basis function.

Problem 3 – LDF exercise 4.5

(a) It is very clear that . Therefore, the constraint becomes .

With the Tikhonov regularization constraint , it is clear that is an identity matrix .

(b) The constraint implies that, in Tikhonov regularization constraint , . That is, is a matrix of ones .

Problem 4 – LDF problem 4.8

Compute the gradient of the augmented error , we have

The update rule therefore can be rewritten as: