hw6

May 24, 2017

Problem 4

$$\begin{bmatrix} x_{i1} \\ x_{i2} \\ x_{i1}x_{i2} \\ x_{i1}^2 \\ x_{i2}^2 \\ x_{i1}^2x_{i2} \\ x_{i2}^2x_{i1} \\ x_{i1}^3 \\ x_{i2}^3 \end{bmatrix} \cdot \begin{bmatrix} x_{j1} \\ x_{j2} \\ x_{j1}x_{j2} \\ x_{j1}^2 \\ x_{j2}^2 \\ x_{j1}^2x_{j2} \\ x_{j2}^2x_{j1} \\ x_{j1}^3 \\ x_{j2}^3 \end{bmatrix} = x_{i1}x_{j1} + x_{j1}x_{j2} + x_{i1}x_{i2}x_{j1}x_{j2} + x_{i1}^2x_{j1}^2 + x_{i2}^2x_{j2}^2 + x_{i1}^2x_{i2}x_{j1}^2x_{j2} + x_{i2}^2x_{i1}x_{j2}^2x_{j1} + x_{i1}^3x_{j1}^3 + x_{i2}^3x_{j2}^3$$

I recognize that the terms appear here are the same as the terms appear in $(x_i \cdot x_j + 1)^3$ except the term 1

So this function can be the kernel function we use.

Problem 5

(a)I made a simple sketch and guess the line should about to pass the middle point between c and d, that is (3.5,4), and the point (2.5,0). So the separator is x2-4*x1+10=0. Since we made the assumption that the separator passes (3.5,4), suppose that the angle between the separator and the x1 axis is θ, and we know that $tan\theta = 4$, and hence $sin\theta = \frac{4}{\sqrt{17}}$, thus the distances between c,d and the separator are both $0.5 * sin\theta = \frac{2}{\sqrt{17}}$, and since the line passes d,e is parallel to the separator, the distance between e and the separator is also the same.

(c)I guess the separator should pass (3.5,4) and (3.5,0). And thus the distance between the separator and its closest points which are c and d are 0.5.