

CM146, Winter 2018
Problem Set xx: yy

1 Problem 1

(a) Problem 1a

Solution: Solution to problem 1a

(b) Problem 1b

Solution: Solution to problem 1a

2 Problem 2

Solution:

Assume that $x = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ and $z = \begin{bmatrix} z_1 \\ z_2 \end{bmatrix}$

$$K_\beta(x, z) = (1 + \beta x \cdot z)^3$$

$$K_\beta(x, z) = x_1^3 \beta^3 z_1^3 + x_2^3 \beta^3 z_2^3 + 3x_1 x_2^2 \beta^3 z_1 z_2^2 + 3x_1^2 x_2 \beta^3 z_1^2 z_2 + 3x_1^2 \beta^2 z_1^2 + 3x_2^2 \beta^2 z_2^2 + 6x_1 x_2 \beta^2 z_1 z_2 + 3x_1 \beta z_1 + 3x_2 \beta z_2 + 1$$

$$\Rightarrow \phi_\beta(\mathbf{x}) = \begin{bmatrix} 1 \\ \sqrt{3}\sqrt{\beta}x_1 \\ \sqrt{3}\sqrt{\beta}x_2 \\ \sqrt{6}\beta x_1 x_2 \\ \sqrt{3}\beta x_1^2 \\ \sqrt{3}\beta x_2^2 \\ \sqrt{3}\beta^{3/2}x_1^2 x_2 \\ \sqrt{3}\beta^{3/2}x_1 x_2^2 \\ \beta^{3/2}x_1^3 \\ \beta^{3/2}x_2^3 \end{bmatrix}$$

3 Problem 3

- (a) **Solution:**
ABC

4 Problem 4

(a) - (c)

The number of unique words in the dataset is 1811.

Hence, the dimensionality of the dataset is 1811.

(d) Hello