CECS 551 Quiz 4, Spring 2017, Dr. Ebert

C. Let `df` be a data frame and m be a positive integer that does not exceed the number of rows of `df2`. Provide one or more R statements for defining a data frame `df` that consists of m randomly selected (without replacement) rows of `df` .

B. Given labeled data set $D = \{((0,0,0), y_0), ((1,0,0), y_1), ((0,1,0), y_2), ((0,0,1), y_3)$, where $y_0, y_1, y_2, y_3 \in \{-1, +1\}$, provide formulas for $\overline{w}$ and b for which

$$\text{sign}(\overline{w} \cdot \overline{x}_i - b) = y_i,$$

for $i = 0, 1, 2, 3$. Conclude that the family of planes has a VC-dimension of at least 4.

A. Given the kernel $k(\overline{x}, \overline{y}) = (\overline{x} \cdot \overline{y})^2$, where $\overline{x}, \overline{y} \in \mathcal{R}^2$, provide three different transformations Φ_1, Φ_2, and Φ_3 from $\mathcal{R}^2$ to three different higher-dimensional dot-product spaces V_1, V_2, and V_3, such that

$$\Phi_i(\overline{x}) \cdot \Phi_i(\overline{y}) = k(\overline{x}, \overline{y}),$$

for each $i = 1, 2, 3$. For each transformation Φ_i, cleary define its rule $\Phi_i(x_1, x_2)$, and a definition of the target dot-product space V_i, including the dot product being used in that space. Hint: all three were mentioned at least once in the exercises.

Φ_1.

Φ_2.

Φ_3.