Quiz 1

MACHINE LEARNING, SUMMER 2019

Name: UID:

Problem 1.(2 =.5+.5+1 points.)

1a. Let say $\boldsymbol{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$ be a vector containing n observations and $\mathbf{1} = \begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix}$ be vector of ones of size n. is mean of $x_1, \cdots, x_n$ is given by $\frac{\boldsymbol{x}^T\mathbf{1}}{\mathbf{1}^T\mathbf{1}}$? (True/False) True

$$\therefore \quad \frac{X^T 1}{1^T 1} = \frac{x_1 + x_2 + \cdots + x_n}{\underbrace{1+1+\cdots 1}_{n \text{ times}}} = \sum_{i=1}^{n} \frac{x_i}{n}$$

1b. What is the support of binomial random variable with parameters N(Total trials) and p (probability of success). Recall by support, we mean the values taken by a random variable.

Support binomial$(N, p) = \{0, 1, 2, \cdots N\}$

1c. Let say $\boldsymbol{D} = \left[\boldsymbol{a}_1, \boldsymbol{a}_2, \cdots, \boldsymbol{a}_k\right]$ be the matrix with k columns $\boldsymbol{a}_i$ for $i \in \{1, \cdots, k\}$. Let $\boldsymbol{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$ be a vector. Write the expression for $\boldsymbol{Dx}$(Matrix, vector product) using $\boldsymbol{a}_i$ (columns of matrix) and x_i(coordinates of vector $\boldsymbol{x}$).

$$Dx = \sum_{i=1}^{k} a_i x_i \quad \text{or} \quad \sum_{i=1}^{n} a_i x_i$$

Note there is a typo either $k=n$ or $n=k$ both answers are ok

Problem 2.(1 point) What do you understand by MAP(maximum a posteriori estimate) estimate. Just write one line to explain it.

MAP is mode of the posterior distribution (modeling parameters to be estimated)
or any other similar definition is ok