

Pattern Recognition Homework #5

1. Let x have an exponential density

$$p(x|\theta) = \begin{cases} \theta e^{-\theta x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

Suppose that n samples x_1, \dots, x_n are drawn independently according to $p(x|\theta)$. Show that the maximum likelihood estimate for θ is given by

$$\hat{\theta} = \frac{1}{\frac{1}{n} \sum_{k=1}^n x_k}$$

2. Assume we have training data from a Gaussian distribution of known covariance Σ but unknown mean μ . Suppose that this mean itself is random, and characterized by a Gaussian density having mean m_0 and covariance Σ_0 . What is the MAP estimator for μ ? Express your answer using "arg max" with respect to the parameter. Do not need to solve, but explain your answer.