AI1110
Assignment 8

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6 June 2022

Outline

Papoulis Chapter 8 problem 8.21

The random variable x has the truncated exponential density $f(x) = ce^{-c(x-x_0)}U(x - x_0)$. Find the ML estimate $\hat{c}$ of c in terms of the n samples of x_i of x.

Solution

The joint density,
$f(X, c) = c^n e^{-cn(\bar{x}-x_0)}$ and $x_i > x_0$ has an interior maximum if,

$$\frac{\partial f(X, c)}{\partial c} = 0 \tag{1}$$

$$\implies nc^{n-1} e^{-cn(\bar{x}-x_0)} + c^n e^{-cn(\bar{x}-x_0)}(-n(\bar{x} - x_0)) = 0 \tag{2}$$

$$\implies n + c(-n)(\bar{x} - x_0) = 0 \tag{3}$$

$$\therefore \hat{c} = \frac{1}{\bar{x} - x_0} \tag{4}$$