Department of Computational Mathematics, Faculty of Information Technology
University of Moratuwa

Honours Degree of Bachelor of science in Information Technology & Management

Batch 21 - Level 2 (Semester II)

CM 2111: Statistical Inference

Tutorial 01

01. Suppose that $X_1, X_2, \dots, X_n$ form a random sample from a distribution for which the pdf $f(x|\theta)$ is as follows.

$$f(x|\theta) = \begin{cases} \theta x^{\theta-1}, & 0 < x < 1 \\ 0 \quad\quad , & x \leq 0 \end{cases}$$

Also suppose that the value of θ is unknown ($\theta > 0$). Find the MLE of θ.

02. Suppose that $X_1, X_2, \dots, X_n$ form a random sample of size n from a distribution with probability density function

$$f(x|\theta) = \frac{1}{2\theta^3} x^2 e^{-\frac{x}{\theta}} \; ; x > 0$$

Also suppose that the value of θ is unknown $\theta > 0$. Find the MLE of θ.

03. Suppose that $X_1, X_2, \dots, X_n$ form a random sample of size n from a distribution with probability density function

$$f(x|\theta) = \frac{2}{\theta} x e^{\frac{-x^2}{\theta}} \; ; x > 0$$

Also suppose that the value of θ is unknown $\theta > 0$. Find the MLE of θ.

04. Suppose that $X_1, X_2, \ldots, X_n$ form a random sample of size n from a distribution with probability density function

$$f(x|\theta) = \theta^{-2} x e^{\frac{-x}{\theta}} \; ; x > 0$$

Also suppose that the value of θ is unknown $\theta > 0$. Find the MLE of θ.

05. Suppose that $X_1, X_2, \ldots, X_n$ form a random sample from a distribution for which the pdf $f(x|\theta)$ is as follows.

$$f(x|\theta) = \frac{1}{2} e^{-|x-\theta|} \; ; \quad -\infty < x < \infty$$

Also suppose that the value of θ is unknown $-\infty < \theta < \infty$. Find the MLE of θ.

06. The Pareto distribution has been used in economics as a model for a density function with a slowly decaying tail.

$$f(x|x_0, \theta) = \theta x_0^{\theta} x^{-\theta-1} \; x \geq x_0 \, , \theta > 1$$

Assume that $x_0 > 0$ is given and that $X_1, X_2, \ldots, X_n$ is an iid sample. Find the MLE of θ.

07. Suppose that $X_1, X_2, \ldots, X_n$ form a random sample from a uniform distribution on the interval (θ_1, θ_2) with the pdf as follows.

$$f(x|\theta) = \begin{cases} \frac{1}{\theta_1 - \theta_2}, & \theta_1 \leq x \leq \theta_2 \\ 0 \quad , & otherwise \end{cases}$$

Also suppose that the values of θ_1 and θ_2 are unknown $(-\infty < \theta_1 < \theta_2 < \infty)$. Find the MLE's of θ_1 and θ_2.