

SOLUTION FOR HOMEWORK ASSIGNMENT NO. 06

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Exercise 6.1

We are given the extended likelihood function \mathcal{L} for the unbinned case, i.e.

$$\mathcal{L}(\{x\}, n | \theta, \nu) = \frac{\nu^n}{n!} \prod_{i=1}^n f(x_i | \theta). \quad (1)$$

We are asked to derive the extended likelihood function for the binned case.

Exercise 6.2

Given a PDF

$$f(t | \tau) = \frac{e^{-t/\tau}}{\tau} \quad (2)$$

we are asked to generate 100 pseudo events for $\tau_{\text{true}} = 1.0 \text{ s}$. Using the unbinned maximum likelihood function we are asked to find the best fit value for τ by computing a local minimum using Minuit. Afterwards we should repeat this process for the binned case with $\Delta t = 0.5 \text{ s}$ where

$$\nu_i(\tau) = n_{\text{tot}} \int_{t_i^{\min}}^{t_i^{\max}} dt \cdot f(t | \tau). \quad (3)$$

Eventually we shall use different binning values and see what happens if $\Delta t \rightarrow 0$ and $\Delta t \rightarrow \infty$.