Assignment 3

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Download all python codes from

https://github.com/Dontha−Aarthi/AI1103/tree/main/Assignment3/Codes

and latex-tikz codes from

https://github.com/Dontha−Aarthi/AI1103/blob/main/Assignment3/main.tex

1 Problem

(GATE 2019-XE Q.no 1 (Page Number:4)

Let X be the Poisson random variable with parameter $\lambda = 1$. Then, the probability $\Pr(2 \le X \le 4)$ equals .....

2 solution

Let

$$X \in \{0, 1, 2, 3, 4, 5...\} \tag{2.0.1}$$

We know that, for a poisson random variable X with a given parameter λ, probability of $X = k$ is:

$$\Pr(X = k) = \left(\frac{\lambda^k e^{-\lambda}}{k!}\right) \tag{2.0.2}$$

We have to find the value of $\Pr(2 \le X \le 4)$ and given that λ=1. So,

$$\Pr(2 \le X \le 4) = \Pr(X = 2) + \Pr(X = 3) + \Pr(X = 4) \tag{2.0.3}$$

$$\begin{aligned}\Pr(2 \le X \le 4) &= \left(\frac{\lambda^2 e^{-\lambda}}{2!}\right) + \left(\frac{\lambda^3 e^{-\lambda}}{3!}\right) + \left(\frac{\lambda^4 e^{-\lambda}}{4!}\right) \\ &= \left(\frac{e^{-1}}{2!}\right) + \left(\frac{e^{-1}}{3!}\right) + \left(\frac{e^{-1}}{4!}\right) \\ &= \frac{e^{-1}}{2} + \frac{e^{-1}}{6} + \frac{e^{-1}}{24} \\ &= \frac{17}{24e}\end{aligned} \tag{2.0.4}$$

The graph for theoretical result vs simulation is given below