

# 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  $\Pr(2 \leq X \leq 4)$  equals .....

## 2 SOLUTION

Let

$$X \in \{0, 1, 2, 3, 4, 5, \dots\} \quad (2.0.1)$$

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

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

CDF is:

$$F(X = k) = \sum_{x=0}^k \left( \frac{\lambda^x e^{-\lambda}}{x!} \right) \quad (2.0.3)$$

And also,

$$\Pr(x < X \leq y) = F(y) - F(x) \quad (2.0.4)$$

Now by using (2.0.4),

$$\Pr(2 \leq X \leq 4) = \Pr(1 < X \leq 4) \quad (2.0.5)$$

$$= F(4) - F(1) \quad (2.0.6)$$

$$= \frac{65}{24e} - \frac{2}{e} \quad (2.0.7)$$

$$= \frac{17}{24e} \quad (2.0.8)$$

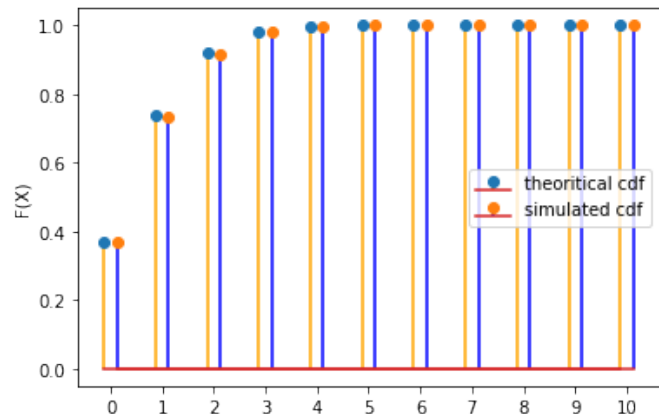


Fig. 0: Theoretical CDF vs Simulated CDF

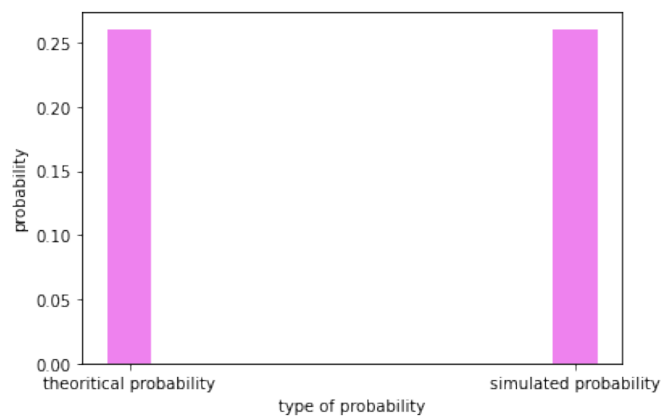


Fig. 0: Theoretical result vs Simulated result