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:

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

CDF is:

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

And also,

$$\Pr(x < X \le y) = F(y) - F(x) \tag{2.0.4}$$

Now by using (2.0.4),

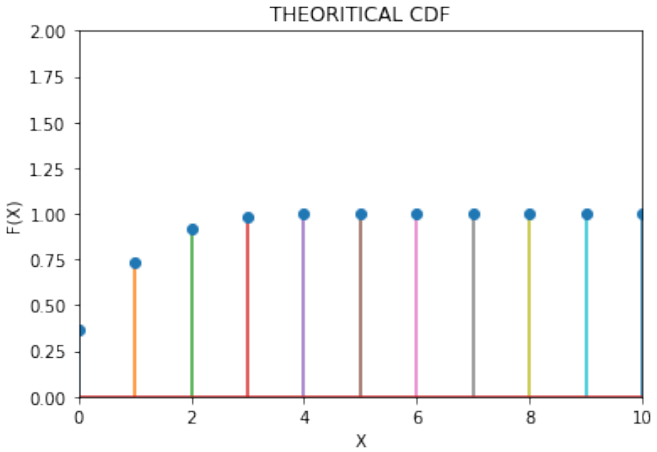
$$\Pr(2 \le X \le 4) = \Pr(1 < X \le 4) \tag{2.0.5}$$

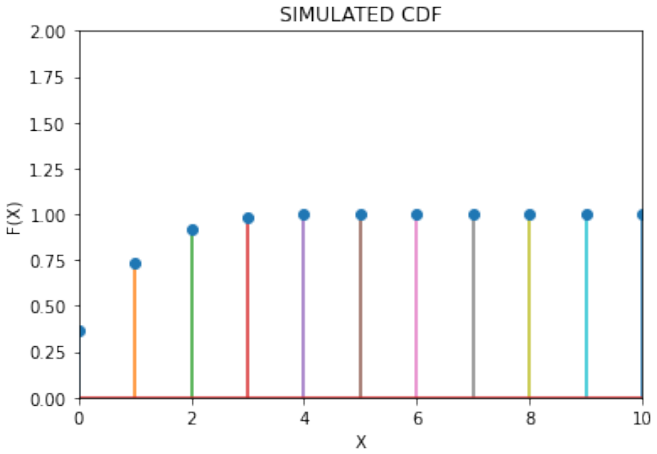
$$= F(4) - F(1) \tag{2.0.6}$$

$$= \frac{65}{24e} - \frac{2}{e} \tag{2.0.7}$$

$$= \frac{17}{24e} \tag{2.0.8}$$

The graphs of theoretical and simulated CDF's are almost equal and they are shown below:





The graph for theoretical result vs simulation is given below