Assignment 6

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Download all python codes from

```
https://github.com/Dhatri−nanda/AS6/blob/main/
    Assignment6/code.py
```

and latex-tikz codes from

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https://github.com/Dhatri−nanda/AS6/blob/main/
    Assignment6/Assignment6.tex
```

1 Problem

Suppose customers arrive at an ATM facility according to Poisson process with rate 5 customers per hour. The probability (rounded off to two decimal places) that no customer arrives at the ATM facility from 1:00pm to 1:18pm.

2 Solution

Given, Poisson rate

$$\lambda = 5 \tag{2.0.1}$$

The time interval is given as 1:00 pm to 1:18 pm Then, the length of the interval

$$\tau = \frac{18}{60} - \frac{0}{60} \tag{2.0.2}$$

$$= \frac{3}{10} \tag{2.0.3}$$

Thus, if X is the number of arrivals in that interval, we can write

$$X \sim Poisson\left(\lambda\tau\right) = Poisson\left(\frac{3}{2}\right) \tag{2.0.4}$$

We know that, if $X(n)$ has a Poisson distribution whose parameter is k then

$$\Pr\left(X = n\right) = \left(\frac{k^n e^{-k}}{n!}\right) \tag{2.0.5}$$

CDF is:

$$F(X = n) = \sum_{x=0}^{n} \left(\frac{k^n e^{-k}}{n!}\right) \tag{2.0.6}$$

And also,

$$\Pr\left(x < X \leq y\right) = F\left(y\right) - F\left(x\right) \tag{2.0.7}$$

Given,

$$n = 0 \tag{2.0.8}$$

So from (2.0.7)

$$\Pr\left(X = 0\right) = F\left(0\right) \tag{2.0.9}$$

Therefore, the probability that no customer arrives at the ATM facility from 1:00pm to 1:18pm is $\Pr\left(X = 0\right)$

$$= \frac{e^{\frac{-3}{2}}\left(\frac{3}{2}\right)^0}{0!} \tag{2.0.10}$$

$$= e^{-3/2} \tag{2.0.11}$$

$$\sim 0.22 \tag{2.0.12}$$

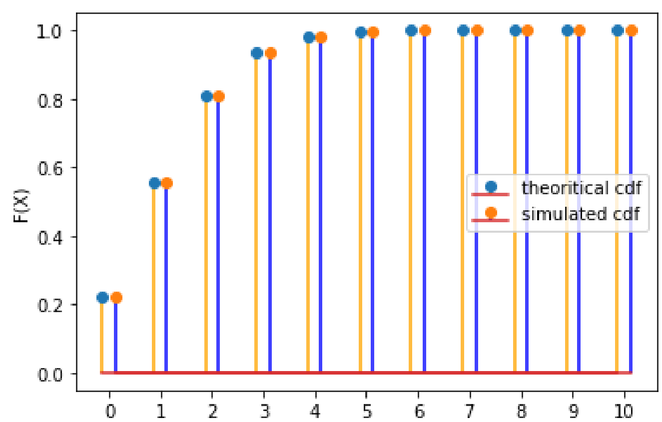

Fig. 0: Theoretical CDF Vs Simulated CDF

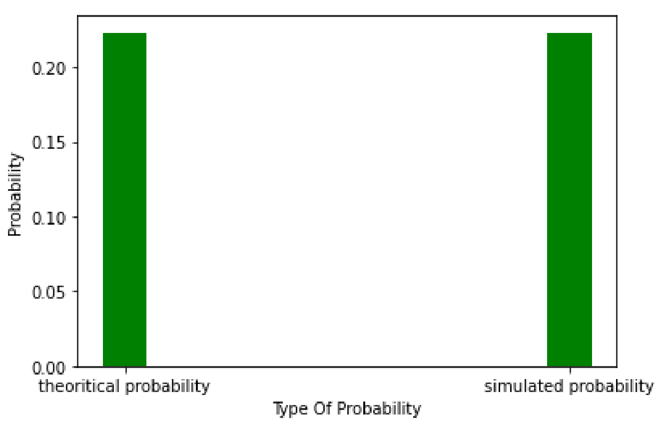

Fig. 0: Theoretical result Vs Simulated result