11.16.3.9

EE24BTECH11007 - Arnav Makarand Yadnopavit

Question: If $\frac{1}{12}$ is the probability of an event, what is the probability of the event 'not A'.

Solution:

Let us solve the problem using a Bernouli random variable.

The Bernoulli R.V is defined as,

$$X_i = \begin{cases} 0 & \text{not A} \\ 1 & \text{A} \end{cases} \tag{1}$$

The PMF of Bernoulli R.V is given by,

$$p_X(x) = \begin{cases} 1-p & x = 0 \\ p & x = 1 \end{cases} \tag{2}$$

- The probability of A occurring is given as $P(A) = \frac{1}{12}$. Therefore, $p_X(1) = P(A) = \frac{1}{12}$.
- The probability of the complement of A (denoted as "not A") is $P(A') = p_X(0)$. Using the rule of complementary probabilities:
$$P(A') = 1 - P(A).$$
- Substitute $P(A) = \frac{1}{12}$ into the equation:
$$P(A') = 1 - \frac{1}{12} = \frac{11}{12}.$$

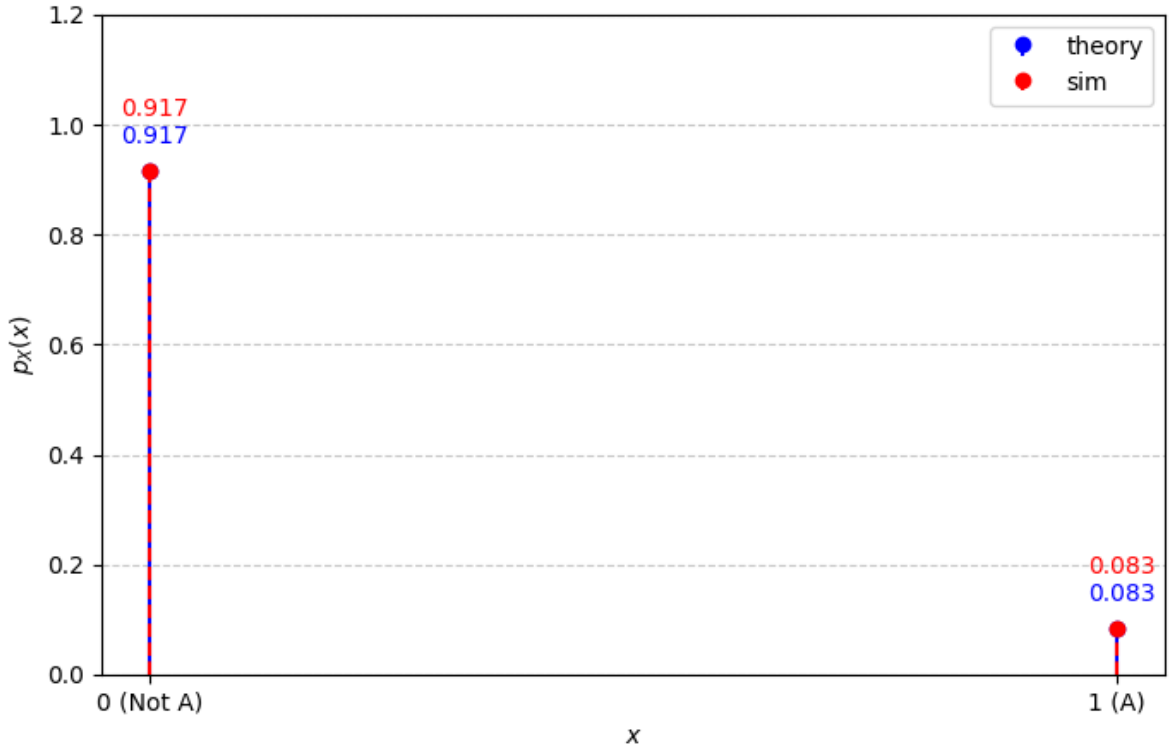
Thus, the probabilities for the Bernoulli random variable X are: The PMF of Bernoulli R.V is given by,

$$p_X(x) = \begin{cases} \frac{11}{12} & x = 0 \\ \frac{1}{12} & x = 1 \end{cases} \tag{3}$$

Hence probability of the event 'not A' is $\frac{11}{12}$.

Stem Plot of the PMF

Below is the stem plot for the PMF of the Bernoulli random variable:


theory
sim
0.917
0.917
0.083
0.083
1.2
1.0
0.8
0.6
0.4
0.2
0.0
$p_X(x)$
0 (Not A)
1 (A)
x