Assignment 3

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Download all python codes from

https://github.com/Ananthoju−Pranav−Sai/AI1103/tree/main/Assignment%203/Codes

and latex codes from

https://github.com/Ananthoju−Pranav−Sai/AI1103/blob/main/Assignment%203/main.tex

GATE-Problem 4

Three fair cubical dice are thrown simultaneously. The probability that all three dice have the same number of dots on the faces showing up is (up to third decimal place).

Solution

Let $X_i \in \{1,2,3,4,5,6\}$, i={1,2,3} be the random variables representing the outcome for each die. As the dice are fair the probability mass function (pmf) is expressed as

$$p_{X_i}(n) = \Pr(X_i = n) = \begin{cases} \frac{1}{6} & 1 \le n \le 6 \\ 0 & otherwise \end{cases} \tag{4.1}$$

Let E be the event “All the three dice have the same number of dots on the face showing”.

$$\Pr(E) = \sum_{i=1}^{6} \Pr(X_1 = i, X_2 = i, X_3 = i) \tag{4.2}$$

As the events $X_1 = i$,$X_2 = i$ and $X_3 = i$ are independent we have

$$\Pr(X_1 = i, X_2 = i, X_3 = i) = p_{X_1}(i).p_{X_2}(i).p_{X_3}(i) \tag{4.3}$$

$$\therefore \Pr(E) = \sum_{i=1}^{6} p_{X_1}(i).p_{X_2}(i).p_{X_3}(i) \tag{4.4}$$

$$\implies \Pr(E) = \sum_{i=1}^{6} \frac{1}{6}.\frac{1}{6}.\frac{1}{6} \tag{4.5}$$

$$\implies \Pr(E) = \frac{6}{216} \tag{4.6}$$

$$\implies \Pr(E) = 0.0277 \tag{4.7}$$

Theoretical v/s Simulated probabilities :