Assignment:- 1

AI1110: Probability and Random Variables
Indian Institute of Technology, Hyderabad

Chandrahas Gurrala
CS22BTECH11027

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Question. In a hurdle race, a player has to cross 10 hurdles. The probability that he will clear each hurdle is $\frac{5}{6}$. What is the probability that he will knock down fewer than 2 hurdles?
Answer: 0.48451

Solution:
$\Pr(E) = \frac{5}{6}$ and $\Pr(E') = 1 - \frac{5}{6} = \frac{1}{6}$
Let,
X be the number of hurdles the player knocks down.
X={0,1,2,3,4,5,6,7,8,9,10}
Using Cummulative Distribution Function(cdf),

$$F_X(r) = \Pr(X \leq r) = \sum_{i=0}^{r} \Pr(X = i) \tag{1}$$

Here,

$$F_X(r) = \sum_{i=0}^{r} {}^{10}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{10-i} \tag{2}$$

r=1 for knocking down fewer than 2 hurdles.

$$\therefore \quad F_X(1) = \sum_{i=0}^{1} {}^{10}C_i \left(\frac{1}{6}\right)^i \left(\frac{5}{6}\right)^{10-i} \tag{3}$$

$$= 0.48451 \tag{4}$$

So, the probability that the player will knock down fewer than 2 hurdles is 0.48451 or approximately 48.45%.