

AI1110

PROBABILITY AND RANDOM VARIABLES

Assignment 1

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Question(12.13.6.4): Suppose that 90% of people are right-handed. What is the probability that at most 6 of a random sample of 10 people are right-handed?

Answer-0.0128.

Solution:

Let us consider a Binomial random variable X,

X=number of right-handed people among a random sample of 10 people.

$$X=\{0,1,2,3,4,5,6,7,8,9,10\}$$

$$X=\text{Bin}(n,p)$$

Given that 90% of the people are right-handed.

Let p be the probability that the picked person is right-handed and q be the probability that the picked person is left-handed.

$$\Pr(X = k) = {}^nC_r p^k q^{n-k} \quad (1)$$

Cummulative distribution function of X:

$$F_X(k) = \Pr(X \leq k) \quad (2)$$

$$F_X(k) = \sum_{r=0}^{r=k} \Pr(X = r) = \sum_{r=0}^{r=k} {}^nC_r p^r q^{n-r} \quad (3)$$

Where

$$n = 10$$

$$p = 0.9$$

$$q = 0.1$$

k denotes the values that the random variable X can take.

Probability that atmost 6 are right-handed among 10 is $\Pr(X \leq 6)$

$$F_X(6) = \sum_{r=0}^{r=6} {}^{10}C_r (0.9)^r (0.1)^{10-r} \quad (4)$$

$$= 0.0128 \quad (5)$$