

AI1110

PROBABILITY AND RANDOM VARIABLES

Assignment 1

Nalavolu Chetana
CS22BTECH11042

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.

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

Cummulative distribution function of X:

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

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

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 $\Pr(X \leq 6)=F(X=6)$

$$F(X = 6) = \sum_{r=0}^{r=6} \binom{10}{r} (0.9)^r (0.1)^{10-r} \quad (4)$$

$$= 0.0128 \quad (5)$$