Probability Assignment

EE22BTECH11022-G.SAI HARSHITH*

Question: Find the variance of distribution.

X	0	1	2	3	4	5
$p_X(k)$	$\frac{1}{6}$	$\frac{5}{18}$	$\frac{2}{9}$	$\frac{1}{6}$	$\frac{1}{9}$	$\frac{1}{18}$

Solution: We know mean of distribution is $E(X)$.

$$\mu = E(X) \tag{1}$$

$$= \sum_{i=0}^{5} X_i p_X(i) \tag{2}$$

$$= 0\left(\frac{1}{6}\right) + 1\left(\frac{5}{18}\right) + 2\left(\frac{2}{9}\right) + 3\left(\frac{1}{6}\right) + 4\left(\frac{1}{9}\right) + 5\left(\frac{1}{18}\right) \tag{3}$$

$$= \frac{35}{18} \tag{4}$$

Calculating $E(X^2)$

$$E(X^2) = \sum_{i=0}^{5} X_i^2 p_X(i) \tag{5}$$

$$= 0^2\left(\frac{1}{6}\right) + 1^2\left(\frac{5}{18}\right) + 2^2\left(\frac{2}{9}\right) + 3^2\left(\frac{1}{6}\right) + 4^2\left(\frac{1}{9}\right) + 5^2\left(\frac{1}{18}\right) \tag{6}$$

$$= \frac{105}{18} \tag{7}$$

From (4) and (7).

$$\sigma^2 = E(X^2) - \mu^2 \tag{8}$$

$$= \frac{105}{18} - \left(\frac{35}{18}\right)^2 \tag{9}$$

$$= \frac{665}{324} \tag{10}$$