

Assignment

EE23010: Probability and Random Processes

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Question: For the following probability distribution determine standard deviation of the random variable X.

X	2	3	4
p_X	0.2	0.5	0.3

Solution: Given, X be the random variable and $p_X(k)$ is the probability distribution.

Variance of X is given by

$$\sigma_X^2 = E[X - E(X)]^2 \quad (1)$$

$$= E(X^2) - [E(X)]^2 \quad (2)$$

Now,

$$E(X^2) = \sum_{k=2}^4 k^2 p_X(k) \quad (3)$$

$$= 10.1 \quad (4)$$

Similarly,

$$[E(X)]^2 = \left[\sum_{k=2}^4 k p_X(k) \right]^2 \quad (5)$$

$$= 9.61 \quad (6)$$

Now putting the values in eqn (2):

$$\sigma_X^2 = 10.1 - 9.61 \quad (7)$$

$$\sigma_X = 0.7 \quad (8)$$

\therefore Standard deviation is 0.7.