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

$$\sigma_X^2 = E\left[X - E\left(X\right)\right]^2 \tag{1}$$

$$= E\left(X^2\right) - \left[E\left(X\right)\right]^2 \tag{2}$$

Now,

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

$$= 10.1 \tag{4}$$

Similarly,

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

$$= 9.61 \tag{6}$$

Now putting the values in (2)

$$\sigma_X^2 = 10.1 - 9.61 \tag{7}$$

$$\implies \sigma_X = 0.7 \tag{8}$$

$\therefore$ Standard deviation is 0.7.