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

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

Now,

$$E(X^2) = \sum_{k=1}^{n} X_k^2 p_X(k) \tag{3}$$
$$= 10.1 \tag{4}$$

Similarly,

$$[E(X)]^2 = [\sum_{k=1}^{n} X_k p_X(k)]^2 \tag{5}$$
$$= 9.61 \tag{6}$$

Now putting the values in eqn (2):

$$\sigma_X^2 = 10.1 - 9.61 \tag{7}$$
$$\sigma_X = 0.7 \tag{8}$$

$\therefore$ standard deviation is 0.7.