# Assignment

## EE23010: Probability and Random Processes
## Indian Institute of Technology,Hyderabad

Aman Kumar
EE22BTECH11006

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 $p_X$ is the probability distribution.
Standard deviation is given by

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

$$= \sqrt{\sum_{i=1}^{n} X_i^2 p_{Xi} - [\sum_{i=1}^{n} X_i p_{Xi}]^2} \tag{2}$$

Now,

$$E(X^2) = \sum_{i=1}^{n} X_i^2 p_{Xi} \tag{3}$$

$$= (2)^2(0.2) + (3)^2(0.5) + (4)^2(0.3) \tag{4}$$

$$= 10.1 \tag{5}$$

Similarly,

$$E(X)^2 = [\sum_{i=1}^{n} X_i p_{Xi}]^2 \tag{6}$$

$$= [(2)(0.2) + (3)(0.5) + (4)(0.3)]^2 \tag{7}$$

$$= 9.61 \tag{8}$$

Now putting the values in eqn (2):

$$\sigma_X = \sqrt{10.1 - 9.61} \tag{9}$$

$$= 0.7 \tag{10}$$