Mean and Variance for Discrete Random Variables

Mean of a Discrete Random Variable:

Let X be a discrete random variable with probability mass function $p(x) = P(X = x)$.

The **mean** of X is given by

$$\mu_X = \sum_x x\, P(X = x)$$

where the sum is over all possible values of X.

The mean of X is sometimes called the expectation, or expected value, of X and may also be denoted by $E(X)$.

Variance and Standard Deviation of a Discrete Random Variable:

Let X be a discrete random variable with probability mass function $p(x) = P(X = x)$.

- The **variance** of X is given by

$$\sigma_X^2 = \sum_x (x - \mu)^2 P(X = x)$$

- An alternate formula for the variance is given by

$$\sigma_X^2 = \sum_x x^2 P(X = x) - \mu_X^2$$

- The variance of X may also be denoted by $V(x)$ or by σ^2.

- The **standard deviation** is the square root of the variance:

$$\sigma_X = \sqrt{\sigma_X^2}$$