Variance of a Discrete Random Variabl

The **variance** of a discrete random variable X is given by:

$$V(X) = E(x-\mu)^2 = \sum_{Range(X)} (x-\mu)^2 \cdot p(x)$$

where:

- $Range(X)$ is the range of the random variable X, that is, the set of values X assumes.
- $p(x)$ is the probability mass function of X, $p(x) = P(X = x)$.
- $\mu = E(X)$ is the expected value of the random variable X.

Variance of a Bernoulli Random Variab

The variance of a **Bernoulli** random variable X with probability of success p is given by:

$$V(X) = \sum_{x=0}^{1} (x-p)^2 \cdot p(x)$$

where:

- $p(1) = p$
- $p(0) = 1 - p$
- $E(X) = p$, the probability of success

so

$$V(X) \;=\; (1-p)^2 \cdot p(1) + (0-p)^2 \cdot p(0) \;=\; p(1-p)$$

Variance of Discrete Random Variables

Bernoulli distribution:

$$V(X) \;=\; p(1-p)$$

Variance of Discrete Random Variables

Bernoulli distribution:

$$V(X) = p(1-p)$$

Binomial distribution:

$$V(X) = np(1-p)$$

Variance of Discrete Random Variables

Bernoulli distribution:

$$V(X) \;=\; p(1-p)$$

Binomial distribution:

$$V(X) \;=\; np(1-p)$$

Poisson distribution:

$$V(X) \;=\; \lambda$$

Variance of Discrete Random Variables

Geometric distribution:

$$V(X) = \frac{1-p}{p^2}$$

Variance of Discrete Random Variables

Geometric distribution:

$$V(X) = \frac{1-p}{p^2}$$

Negative binomial distribution:

$$V(X) = \frac{r(1-p)}{p^2}$$