UNIT-IV: Discrete Probability Distributions

Author : Generated by AI   **Date :** 2025

Discrete Probability Distributions

A probability distribution that shows the probabilities of outcomes of a discrete random variable.

Probability Mass Function (PMF)

Defines the probability that a discrete random variable takes a specific value.
Formula: $P(X = x)$ for all values of X.

Probability Density Function (PDF)

Describes the likelihood of a random variable falling within a particular range of values.

Distribution Functions

Functions that define the probabilities of events within a discrete probability distribution.

Binomial Distribution

Used for experiments with only two possible outcomes (success/failure) in repeated independent trials.
Formula: $P(X = k) = (nCk) * p^k * (1-p)^{(n-k)}$.

Geometric Distribution

Represents the probability of observing the first success on the k-th trial.
Formula: $P(X = k) = (1 - p)^{(k-1)} * p$.

Negative Binomial Distribution

Generalizes the geometric distribution by counting the number of trials until a fixed number of successes occurs.
Formula: $P(X = k) = (k-1)C(r-1) * p^r * (1-p)^{(k-r)}$.

Poisson Distribution

Used for counting the number of events occurring within a fixed interval of time or space.
Formula: $P(X = k) = (\lambda^k * e^{-\lambda}) / k!$.