A **random variable** is a numerical outcome of a random experiment. It assigns a number to each possible outcome of an experiment.

**Types of Random Variables**

1. **Discrete Random Variable**
   * Takes a finite or countably infinite set of values.
   * Example: The number of heads when flipping a coin 3 times (values: 0, 1, 2, or 3).
2. **Continuous Random Variable**
   * Takes an uncountable range of values (real numbers).
   * Example: The height of a randomly selected person (values: any real number in a range).

**Probability Distribution**

* **Probability Mass Function (PMF)** (for discrete variables): P(X=x)P(X = x).
* **Probability Density Function (PDF)** (for continuous variables): f(x)f(x), where probability is computed over an interval.
* **Cumulative Distribution Function (CDF)**: P(X≤x)P(X \leq x), gives the probability that XX is less than or equal to a value.

**Expected Value & Variance**

* **Expected Value (Mean, E[X]E[X])**: The average outcome if the experiment is repeated many times.
* **Variance (Var(X)Var(X))**: Measures how spread out the values of the random variable are.