**Common probability distribution**

1. **Symmetric Distributions**:

* **Normal Distribution (Gaussian Distribution)**: The normal distribution is symmetric around its mean. It is characterized by its bell-shaped curve, with the mean, median, and mode being equal.
* Example:Heights of adult humans in a population often follow a normal distribution.
* **Uniform Distribution**: The uniform distribution is symmetric, where all outcomes within a given range have equal probability of occurring. It's characterized by a constant probability density function over the range of values.
* **Example**: Rolling a fair six-sided die produces a uniform distribution with each outcome having an equal probability of 1/6.
* **T-Distribution**: The Student's t-distribution is symmetric and bell-shaped, similar to the normal distribution, but with heavier tails. It's commonly used in hypothesis testing when the sample size is small and the population variance is unknown.
* Example: When estimating the population mean from a small sample size (e.g., n < 30) and the population standard deviation is unknown, the t-distribution is used for hypothesis testing or constructing confidence intervals.

1. **Skewed Distributions**:
   * **Positive Skew (Right Skewed)**:
     + **Exponential Distribution**: The exponential distribution is right-skewed, where the tail of the distribution extends towards higher values. It's commonly used to model waiting times and lifetimes of products.

**Example**: The time between phone calls at a call center often follows an exponential distribution.

* + - **Log-Normal Distribution**: The log-normal distribution is right-skewed, with a shape resembling the logarithm of a normal distribution. It's used to model positively skewed data such as stock prices and income distribution.

**Example**: The distribution of household incomes in a population tends to be positively skewed.

* + **Negative Skew (Left Skewed)**:
    - **Chi-Square Distribution**: The chi-square distribution can be left-skewed for small degrees of freedom but becomes more symmetric as the degrees of freedom increase. It's commonly used in hypothesis testing and confidence interval estimation.

**Example** : The chi-square distribution is commonly used in hypothesis testing, such as testing the goodness of fit or testing for independence in contingency tables.

* + - **F-Distribution**: The F-distribution is right-skewed and arises in the analysis of variance (ANOVA) and in comparing variances of two populations. It becomes more symmetric as the degrees of freedom increase.

**Example**: The F-distribution is used in analysis of variance (ANOVA) to compare variances of multiple groups.

1. **Others**:
   * **Binomial Distribution**: The binomial distribution is neither symmetric nor skewed. It represents the number of successes in a fixed number of independent Bernoulli trials and can be bell-shaped but not necessarily symmetric.
   * Example : The number of heads obtained when flipping a coin multiple times follows a binomial distribution.
   * **Poisson Distribution**: The Poisson distribution is not symmetric but has a shape that can resemble a right-skewed distribution, especially for smaller values of its parameter lambda.
   * **Example**: The number of arrivals at a website within a certain time frame can be modeled using a Poisson distribution.

Understanding the symmetry or skewness of probability distributions is crucial for interpreting data and selecting appropriate statistical methods for analysis. It helps in choosing the right probability distribution to model the underlying data and make accurate inferences or predictions.