Applications Of Chi-Square Distribution:

1.Biostatistics: It's used in analyzing data from biological experiments, such as genetics studies, to test hypotheses about the distribution of traits or the association between genetic markers and diseases.

2.Quality Control: In manufacturing and industry, chi-square tests are employed to assess whether observed frequencies of defects or errors deviate significantly from expected frequencies, indicating potential issues in the production process.

3.Psychology: In psychological research, chi-square tests help analyze data from experiments or surveys to investigate relationships between variables, such as the association between personality traits and behavior.

4.Social Sciences: Chi-square tests are used in sociology, political science, and other social sciences to analyze categorical data and test hypotheses about relationships between social variables, such as gender and voting

STATISTICAL INFERENCE-II

CHI-SQUARE DISTRIBUTION

- Chi-square Distribution is a probability distribution that arises in statistics.
- The chi-square test is used for testing the hypothesis and is not useful for estimation.

FORMULA OF CHI-SQUARE DISTRIBUTION

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

χ^2 = chi squared
O_i = observed value
E_i = expected value

EXAMPLES OF CHI-SQUARE DISTRIBUTION:

- *Goodness of Fit Test:* In hypothesis testing, the chi-square distribution is used to assess how well an observed frequency distribution fits an expected frequency distribution. For example, testing whether the observed distribution of eye colors in a population matches the expected distribution based on genetic ratios.

- *Test of Independence:* It's used to test the independence of two categorical variables. For instance, determining if there is a relationship between smoking habits and lung cancer rates

PROPERTIES OF CHI-SQUARE DISTRIBUTION

The chi-square distribution is a continuous probability distribution that arises in the context of hypothesis testing and confidence interval estimation for the variance of a normal distribution. Here are some key properties of the chi-square distribution:

➢ **Non-negativity:** The chi-square distribution only takes non-negative values.

➢ **Skewness:** The chi-square distribution is positively skewed for low degrees of freedom but becomes increasingly symmetric as the degrees of freedom increase.

➢ **Central limit theorem:** As the degrees of freedom increase, the chi-square distribution approaches a normal distribution.

➢ **Cumulative distribution function (CDF):** The cumulative distribution function of the chi-square distribution is frequently used in hypothesis testing to determine critical values and p-values.

These properties make the chi-square distribution a fundamental tool in statistics, particularly in hypothesis testing involving variance or standard deviation.