Parametric vs Non-parametric

Parametric Hypothesis Testing:

- Parametric tests make specific assumptions about the population distribution from which the data is drawn.
- Common assumptions include normality (data follows a normal distribution) and variance is constant across groups or conditions.
- Parametric tests are typically used when the data reasonably follows the assumed distribution and other assumptions are met.
- Parametric tests tend to be more powerful (i.e., better at detecting true effects) than non-parametric tests when the assumptions are met.
- This is especially true when the sample size is large.

Non-Parametric Hypothesis Testing:

- Non-parametric tests make fewer or no assumptions about the population distribution.
- They are distribution-free or rely on fewer assumptions, such as independence of observations.
- Non-parametric tests are useful when the assumptions for parametric tests are violated.
- They are also suitable for data types that don't fit well with parametric assumptions, such as ordinal or skewed data.
- Non-parametric tests are generally less powerful than parametric tests when data conforms to parametric assumptions.
- However, they can be more robust and appropriate when dealing with non-normally distributed data.

Let's see for each test we have learned till now, indicating whether it is parametric or non-parametric and the reasons why:

- One Sample Z-Test:
    - Type: Parametric
    - Reason: Assumes a known population standard deviation and a normally distributed population.

- Two Sample Z-Test:
    - Type: Parametric
    - Reason: Similar to the one-sample Z-test, it assumes known population standard deviations and normally distributed populations.

- One Sample T-Test
    - Type: Parametric

    - Reason: Assumes a normally distributed population but does not require knowledge of the population standard deviation.

- Two Sample Independent T-Test:
    - Type: Parametric
    - Reason: Assumes normally distributed populations and equal variances between the two groups.

- Paired T-Test:
    - Type: Parametric
    - Reason: Assumes normally distributed population differences.

- One Sample Z-Test Proportion:
    - Type: Parametric
    - Reason: Assumes a known population proportion and sufficiently large sample sizes.

- Two Sample Z-Test Proportion:
    - Type: Parametric
    - Reason: Similar to the one-sample proportion test, it assumes known population proportions and sufficiently large sample sizes.

- Chi-Square Test:
    - Type: Non-parametric
    - Reason: Tests the association between categorical variables and doesn't make assumptions about the population distribution.

- One Way ANOVA:
    - Type: Parametric
    - Reason: Assumes normally distributed populations and equal variances among multiple groups.

- Kruskal-Wallis Test:
    - Type: Non-parametric
    - Reason: A non-parametric alternative to one-way ANOVA, used when the ANOVA assumptions are violated.

- Shapiro-Wilk Test:
    - Type: Parametric (test for normality)
    - Reason: Used to check the normality of data. If p-value is low, data may not be normally distributed.

- Levene's Test:
    - Type: Parametric (test for variance)

    - Reason: Used to check homogeneity of variances. If p-value is low, variances may not be equal.

- Two-Way ANOVA:
    - Type: Parametric
    - Reason: Extends one-way ANOVA to study the effects of two independent variables on a dependent variable.

- KS-Test (Kolmogorov-Smirnov Test)
    - Type: Non-parametric
    - Reason: Used to compare the distribution of two samples, making no assumptions about their population distributions.

- A/B Testing:
    - Type: Typically parametric, but can be non-parametric
    - Reason: This can involve various tests depending on the specific metric being tested and the underlying data distribution.