Non-parametric tests are advanced tools and it is covered in Black Belt course in detail. In this lecture, you will be aware of these tools and as to where it can be used.

Non-parametric tests are a type of hypothesis tests similar to t-tests, ANOVA and chi-square tests. They are used to validate our assumptions by checking for statistical significance.

Non-parametric tests are sometimes called distribution-free tests because they are based on fewer assumptions (e.g., they do not assume that the outcome is approximately normally distributed). Parametric tests involve specific probability distributions (e.g., the normal distribution) and the tests involve estimation of the key parameters of that distribution (e.g., the mean or difference in means) from the sample data.

The cost of fewer assumptions is that non-parametric tests are generally less powerful than their parametric counterparts.

Commonly used parametric tests are Mann-Whitney, Kruskal-Wallis, Mood's Median, Friedman,1 Sample Sign & 1 Sample Wilcoxon.

Mann-Whitney Test: is used to compare two sample means that come from the same population, and used to test whether two sample means are equal or not. Usually, the Mann-Whitney U test is used when the data is ordinal or when the assumptions of the t-test are not met. Mann-Whitney U test is a non-parametric test, so it does not assume any assumptions related to the distribution of parameters. There are, however, some assumptions such as the sample drawn from the population is random and samples are independent of each other.

Kruskal-Wallis Test: is a non-parametric (distribution free) test, and is used when the assumptions of one-way ANOVA are not met. Both the Kruskal-Wallis test and one-way ANOVA assess for significant differences on a continuous dependent variable by a categorical independent variable (with two or more groups). In the ANOVA, we assume that the dependent variable is normally distributed and there is approximately equal variance on the scores across groups. However, when using the Kruskal-Wallis Test, we do not have to make any of these assumptions. Therefore, the Kruskal-Wallis test can be used for both continuous and ordinal-level dependent variables. However, like most non-parametric tests, the Kruskal-Wallis Test is not as powerful as the ANOVA.

1 Sign Test Test: is a non-parametric alternative of the 1-sample t-test because it does not require the data to come from a normally distributed population, as the t-test does. Furthermore, the 1-sample sign test does not make assumptions about population symmetry.

1 Sign Wilcoxon Test: is a more powerful than the 1-Sample Sign Test. It does not break the data into binary categories like a 1 Sign test. However it assumes that the population to be symmetric (not necessarily normal).

Mood's Median Test: is used to determine whether the median of two independent samples are equal.It is closely related to the one-sample sign test, and shares the latter's properties of robustness. The median test is very robust against outliers, and fairly robust against differences in the shapes of the distributions.

Friedman test: is the non-parametric alternative to the one-way ANOVA with repeated measures. It is used to test for differences between groups when the dependent variable being

measured is ordinal. It can also be used for continuous data that has violated the assumptions necessary to run the one-way ANOVA with repeated measures (e.g., data that has marked deviations from normality).