

# **Rating Scales & Parametric and Non-Parametric Statistics SWRK5001**



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SWRK-5001  
Research Methodology  
Unit- IV & V

**Data Collection, Data Analysis & Report Writing  
& Statistical Analysis**



**Topic**

**Rating Scales**

**&**

**Parametric and Non-Parametric  
Statistics**





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# Measurement

- ▶ *“Is a process of mapping aspects of a domain onto other aspects of a range according to some rule of correspondence.”*
- ▶ *“ is a process of assigning numbers to objects or observations , the level of measurement being a function of the rules under which the numbers are assigned”*

## **Measurement of scale**

- ▶ ***Nominal Scale***
- ▶ ***Ordinal Scale***
- ▶ ***Interval Scale***
- ▶ ***Ratio Scale***

## Nominal scale

*“ is simply a system of assigning number symbols to events in order to label them”.*

The numbers are used merely as a label.

Eg. Male  $\rightarrow$  1, Female  $\rightarrow$  2

UG  $\rightarrow$  1, PG  $\rightarrow$  2, M.Phil  $\rightarrow$  3 and Ph.D  $\rightarrow$  4

1,2,3 and 4 are the nominal data.

## Ordinal scale (Rank)

*Correspondence between the size of the numbers and the magnitude of the quality represented by the numbers.*

Eg. The person who came first (position 1) was faster than the person who came second (position 2), who was in turn faster than the person who came third (position 3).



## Interval scale

*A interval variable is a measurement where the difference between two values is meaningful.*

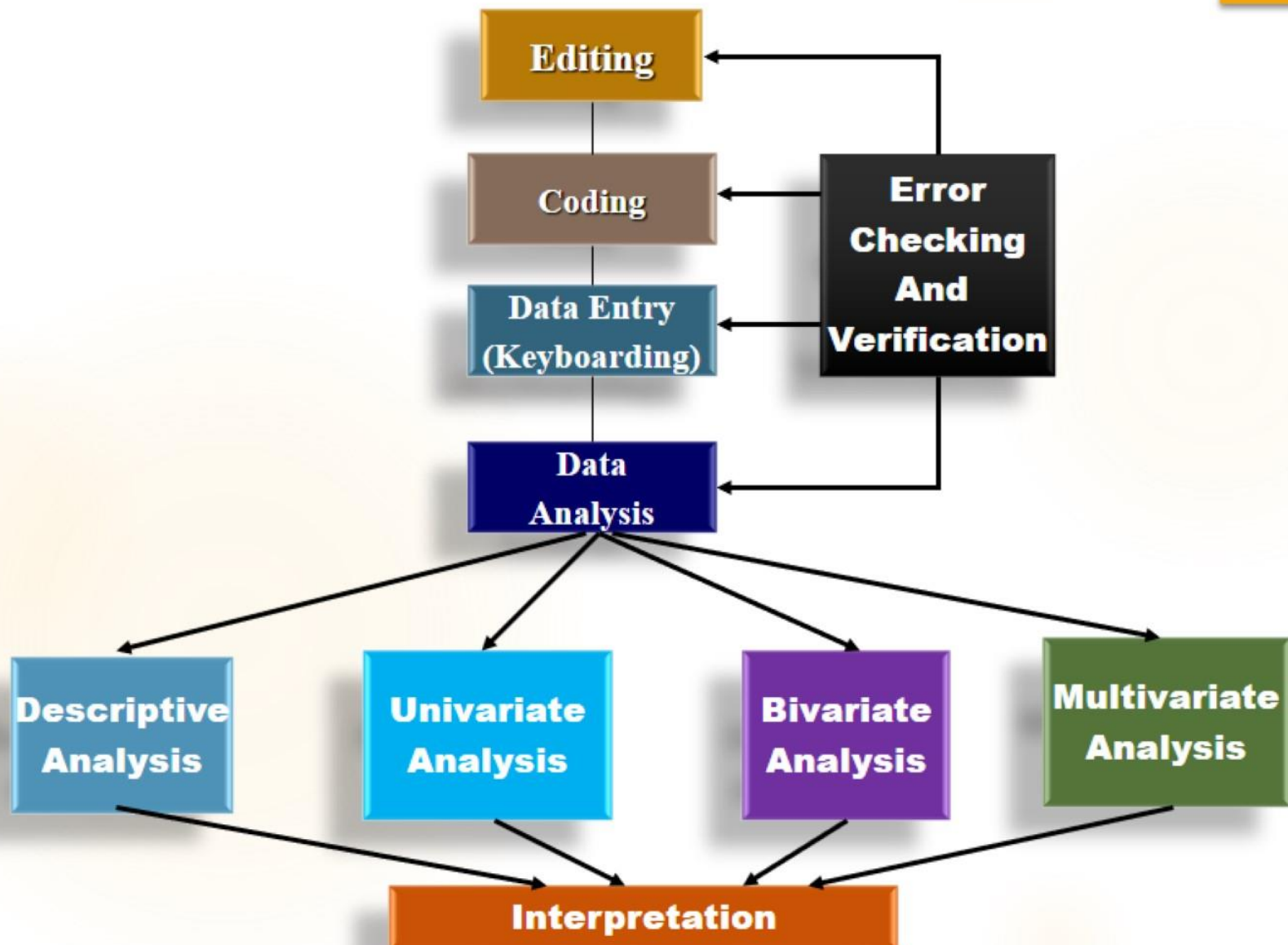
The difference between a temperature of 100 degrees and 90 degrees is the same difference as between 90 degrees and 80 degrees.

## Ratio scale

*Ratio of the numbers reflects the ratios of the attribute measured.*

Eg. An object 30 cm long is twice the length of an object 15 cm long.

## Stages in Data Analysis





## **Descriptive Statistics permissible with different type of scales**

<b>Type of scale</b>	<b>Descriptive Statistics</b>
<b>Nominal</b>	Frequency in each category, percentage in each category, mode
<b>Ordinal</b>	Median, Range, Percentile Ranking
<b>Interval</b>	Mean, SD, Variance
<b>Ratio</b>	Geometric Mean, Coefficient of Variation, Index Numbers

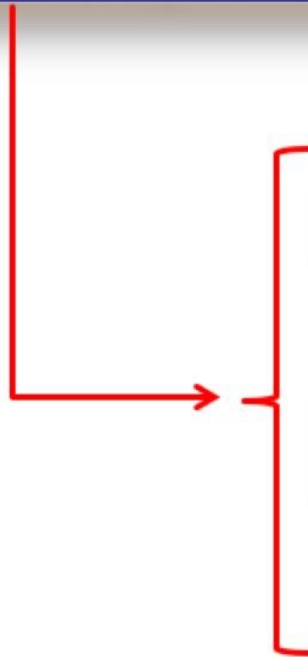
# Uni-variate Statistical Method

## Test of Statistical Significance

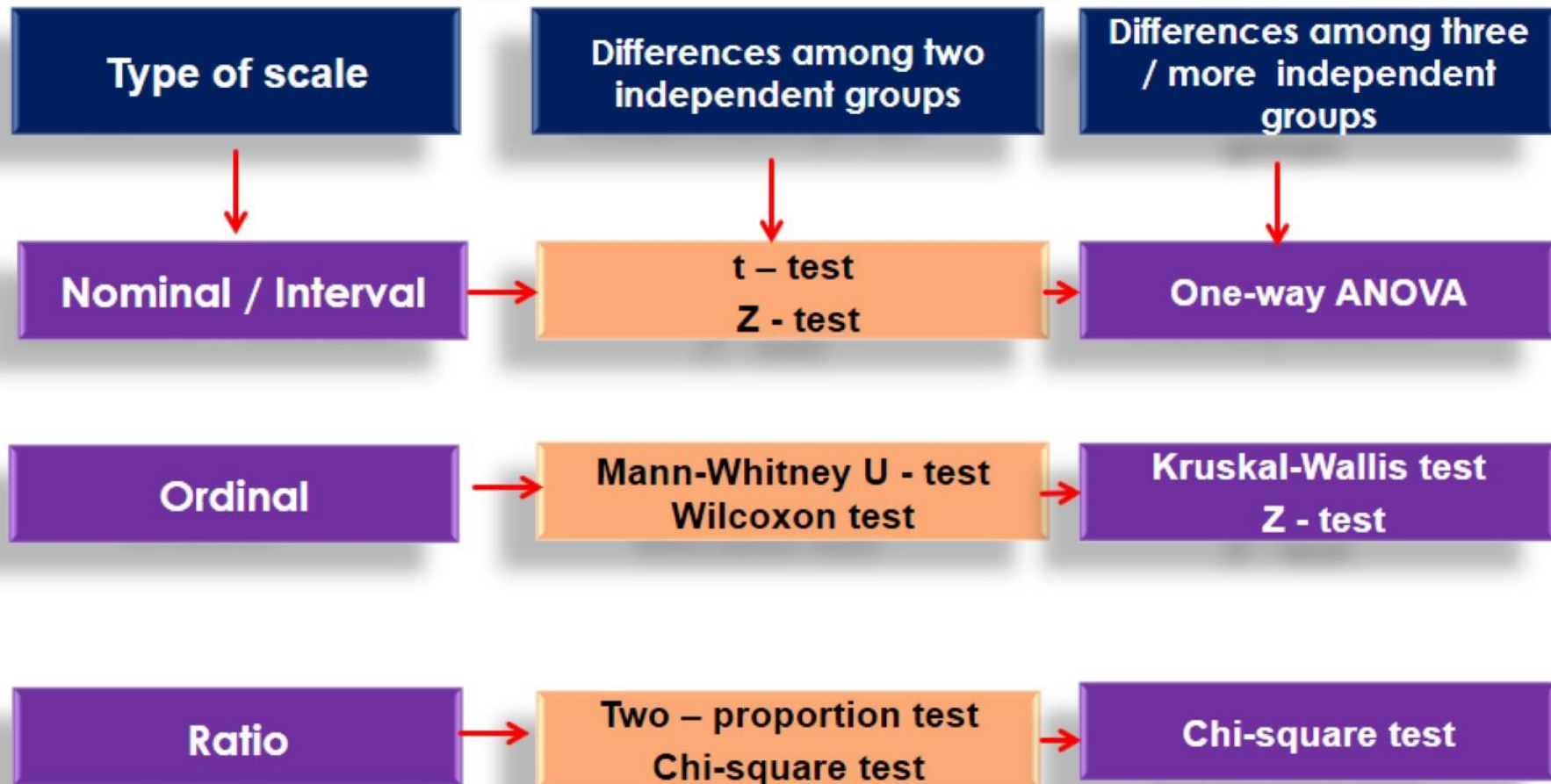
Test of a mean

Test of a proportion

Chi-square test



# Bivariate Statistical Analysis



# Multi-variate Statistical Analysis

## Multivariate Methods

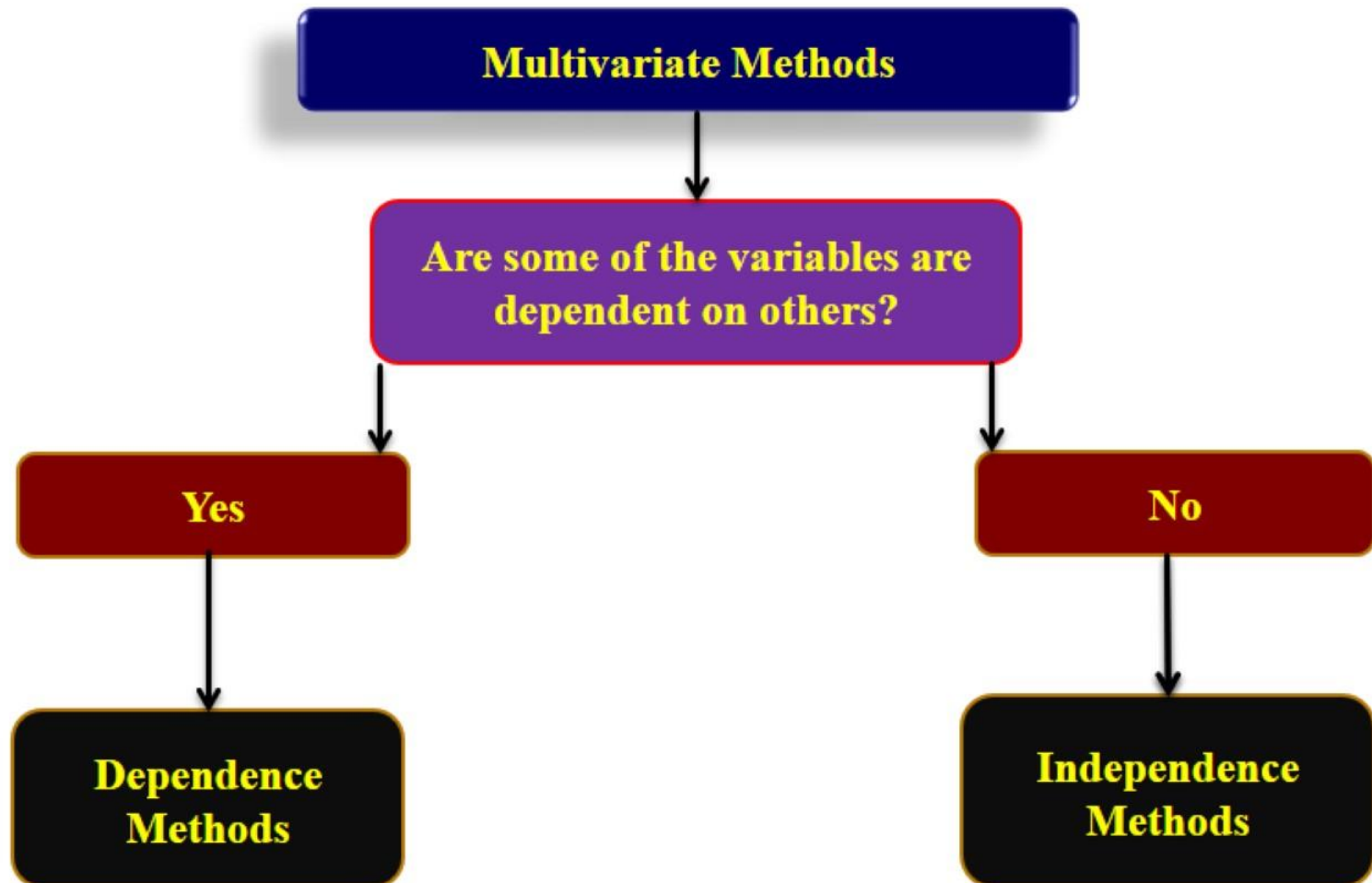
Are some of the variables are dependent on others?

Yes

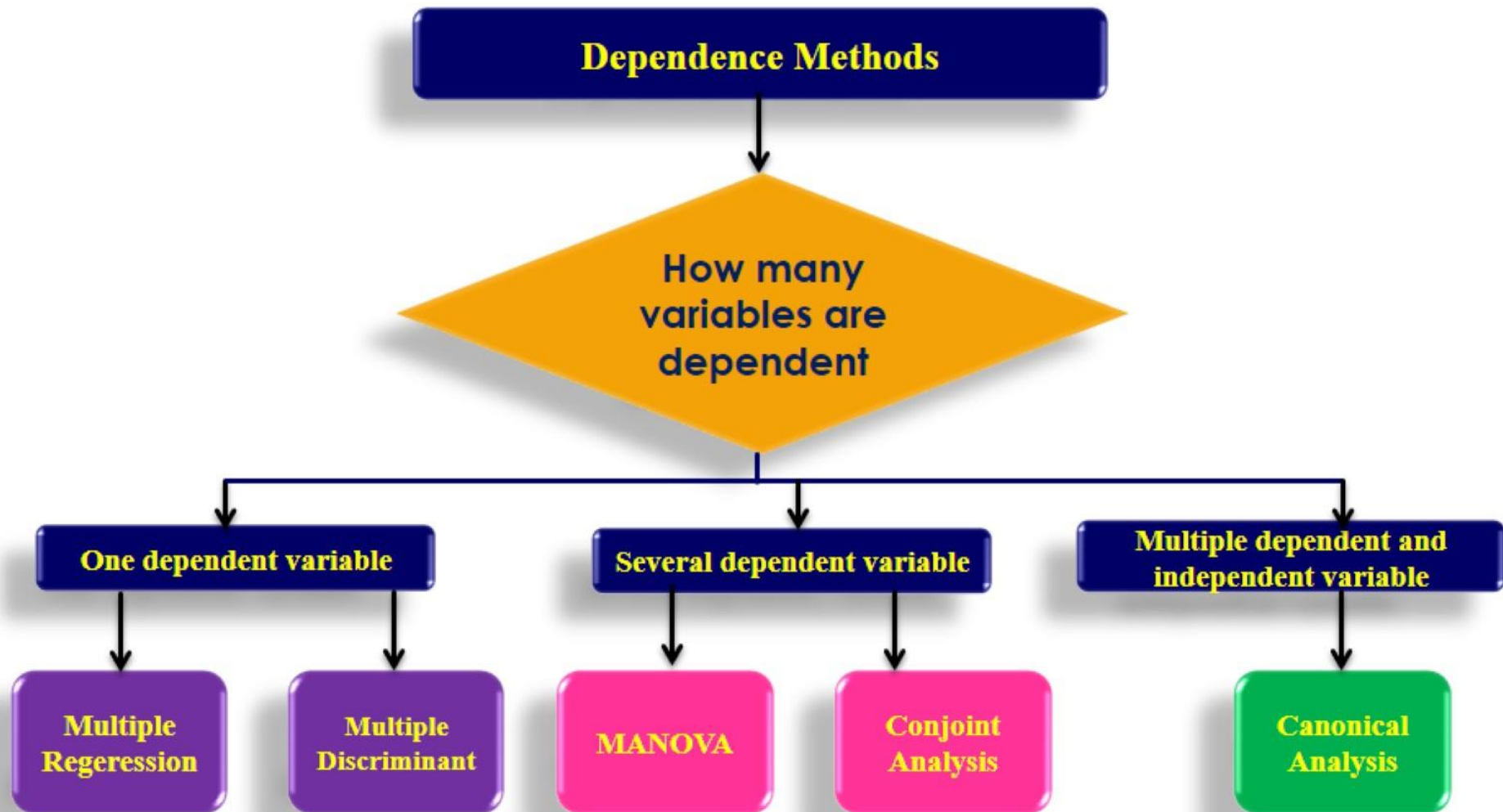
Dependence  
Methods

No

Independence  
Methods



# Multi-variate Statistical Analysis – Dependence methods





**Multiple regression** is an extension of simple **linear regression**. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we want to predict is called the dependent variable

Discriminant Analysis finds a set of prediction equations based on independent variables that are used to classify individuals into groups.

Multivariate analysis of variance (**MANOVA**) is simply an ANOVA with several dependent variables. That is to say, ANOVA tests for the difference in means between two or more groups, while **MANOVA** tests for the difference in two or more vectors of means.

**Conjoint analysis'** is a survey-based statistical technique used in market research that helps determine how people value different attributes (feature, function, benefits) that make up an individual product or service.

**Canonical analysis** is a multivariate technique which is concerned with determining the relationships between groups of variables in a data set. The data set is split into two groups X and Y, based on some common characteristics.



# **Multi-variate Statistical Analysis – Independence methods**

## **Independence Methods**

```
graph TD; A[Independence Methods] --> B[Factor Analysis]; A --> C[Cluster Analysis]; A --> D[Multi-dimensional scaling];
```

**Factor Analysis**

**Cluster Analysis**

**Multi-dimensional  
scaling**

**Factor Analysis** is a technique that is used to reduce a large number of variables into fewer numbers of factors

**Cluster analysis** or **clustering** is the task of grouping a set of objects in such a way that objects in the same group (called a **cluster**) are more similar (in some sense) to each other than to those in other groups (**clusters**).

**Multidimensional scaling** (MDS) is a technique that creates a map displaying the relative positions of a number of objects, given only a table of the distances between them. The map may consist of one, two, three, or even more dimensions.

## **Statistical tests**

- **Parametric Tests**
- **Non-parametric Tests**

## **Parametric Tests**

### **Large Sample Tests (Sample size exceeds 30)**

- **Z – test**

### **Small Sample Tests (Sample size less than 30)**

- **One sample mean test**
- **Independent samples t-test**
- **Paired samples t –test**
- **One-way ANOVA**

# Non-Parametric Tests

**1-sample sign test.** Use this test to estimate the median of a population and compare it to a reference value or target value.

**1-sample Wilcoxon signed rank test.** With this test, you also estimate the population median and compare it to a reference/target value. However, the test assumes your data comes from a symmetric distribution (like the Cauchy distribution or uniform distribution).

**Kruskal-Wallis test.** Use this test instead of a one-way ANOVA to find out if two or more medians are different. Ranks of the data points are used for the calculations, rather than the data points themselves.

**Mann-Whitney test.** Use this test to compare differences between two independent groups when dependent variables are either ordinal or continuous.

**Spearman Rank Correlation.** Use when you want to find a correlation between two sets of data.



NONPARAMETRIC TEST	PARAMETRIC ALTERNATIVE
1-sample sign test	One-sample Z-test, One sample t-test
1-sample Wilcoxon Signed Rank test	One sample Z-test, One sample t-test
Friedman test	Two-way ANOVA
Kruskal-Wallis test	One-way ANOVA
Mann-Whitney test	Independent samples t-test
Mood's Median test	One-way ANOVA
Spearman Rank Correlation	Correlation Coefficient



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