

ANOVA(Analysis of Variation)

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What is ANOVA?

Analysis of Variance (ANOVA) is a parametric statistical method used to evaluate the statistics sets. This method became invented with the aid of using R.A. Fisher, consequently it's also referred as Fisher's ANOVA. It is comparable strategies including t-take a look at and z-take a look at, to evaluate approach and additionally the relative variance among them.

Types of ANOVA

1. One-Way ANOVA

One-way ANOVA is mostly the foremost used method of performing the ANOVA test. it's also mentioned as one-factor ANOVA, between-subjects ANOVA, and an independent factor ANOVA. It's used to compare the means of two independent groups using the F-distribution.

Two do the one-way ANOVA test, you must necessarily have just one variable quantity with a minimum of two levels. One-way ANOVA doesn't differ much from t-test.

Example where one-way ANOVA is used

Suppose an educator wants to understand how good he has been in teaching with the scholars. So, he can split the scholars of the category into different groups and assign different projects associated with the topics taught to them.

He can use one-way ANOVA to check the common score of every group. He can get a rough understanding of topics to show again. However, he won't be able to identify the scholar who couldn't understand the subject.

2. Two-Way ANOVA

Two-way ANOVA is administered once you have two independent variables. It is an extension of one-way ANOVA. You can use the two-way ANOVA test when your experiment features a quantitative outcome and there are two independent variables.

3. N-Way ANOVA (MANOVA)

When we've more than one or greater than independent variables, we use MANOVA. The most important reason of the MANOVA take a look at is to discover the impact on dependent/reaction variables towards a change in the IV.

Assumptions for ANOVA

Though it has been discussed in the conceptual part just to reiterate it should be ensured that the following assumptions must be fulfilled:

1. The populations from where samples have been drawn should follow a normal distribution.
2. The samples have been selected randomly and independently.
3. Each group should have common variance i.e. should be homoscedastic i.e. the variability in the dependent variable values within different groups is equal.

It should be noted that the Linear Model used in ANOVA is not affected by minor deviations in the assumptions especially if the sample is large.

Steps to be Followed

1. Import Required Libraries
2. Load the Dataset
3. Interpretation
4. Test ANOVA Assumptions
5. Conclusion

Uses of ANOVA

- To test correlation and regression.

- To study the homogeneity in the case of two-way classification.
- To test the significance of the multiple correlation coefficient.
- To test the linearity of regression.

Advantages

- Suitable for multidimensional variables.
- Analysis of various factors at a time.
- Can be used in 3 or more than 3 groups

Disadvantages

- It is difficult to analyze ANOVA under strict assumptions regarding the nature of data.
- It is not so helpful in comparison with the t-test that there is no special interpretation of the significance of two means.
- The requirement of the post-ANOVA t-test for further testing.

Applications

- Lean-Six Sigma/operational efficiency.
- Comparing the gas mileage of different vehicles, and also the same vehicle under different fuel types.

- Understanding the impact of temperature, pressure, or chemical reaction (power reactors, chemical plants, etc).
- Understanding the performance, quality, or speed of manufacturing processes based on the number of cells.

Conclusion

ANOVA-based approaches require at least interval data for the dependent variable.