Parametric and nonparametric statistics

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Summary

It is known that the parameter statistics are more used and accurate than non-parametric, and despite this there is a lot of controversy about the use of either of these two types in multiple statistical treatments, and therefore the topic was discussed from several directions.

The parameter means an attribute or characteristic of a given population against an estimate, which is a characteristic of a sample, and the most important feature of statistics with parameterized from non-parameters is the arithmetic mean and standard deviation. From here, parameter statistics can be understood as a set of methods that require the fulfillment of specific assumptions about the population from which the sample is withdrawn. Therefore, nonparametric statistics are a set of alternative methods that are used in cases where the assumptions are about the community from which the sample was not drawn or in the case of nominal data. And ordinal, and both parametric and non-parametric statistics, each of them enjoy a certain level of confidence that is determined in light of the available data, as well as the conditions that fulfill the assumptions and therefore are inferential statistical methods whose results can be generalized to society.

Nonparametric statistics

There are a number of characteristics that are characterized nonparametric statistics, including:[3][4]

1. Lack of assumptions required:

Perhaps the most important advantage of nonparametric methods is that they do not require many assumptions about community distribution as is the case with parametric methods. This is a big advantage because the user of statistical methods may not know whether the assumptions on which they are based are fulfilled in his data, or he may know that some or all of them are not.

Also, using a parameterized method without ensuring that the assumptions it was based on are met, leading to results that may not be more accurate than the accuracy of the abstract estimate. As for nonparametric methods, the few assumptions that they may require) are usually general.

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2- Applicability to metadata and ordinal data:

In many studies, especially in the field of social sciences, we have data of a descriptive or ordinal nature. Among the metadata that represents the classification of units according to a specific criterion, for example, the classification of people according to their gender or nationality. Among the ranking data, for example, is the ranking of a group of workers according to the degree of their enthusiasm or satisfaction with their work.

3-Speed in data collection and analysis:

Since the data used in nonparametric methods are usually at lower scales such as nominal or ordinal, and since most nonparametric methods do not require large sample size or complex calculations, the data can be collected and analyzed more quickly.

4. Ease of understanding:

Most nonparametric methods are based on simple concepts that are usually based on the idea of permutations or randomization. This facilitates understanding of the logic that underpins them.

5. The possibility of giving exact probability statements:

As a result of the previous advantage, the probability distribution of many statistics in the nonparametric method is accurate, and therefore some probabilistic statements such as the p-value in the hypothesis test are exact (i.e. given exactly exact) and not approximate as is usually the case in parameter statistics where the extent of approximation depends on the fulfillment of the assumptions Underpinning the method.

6. Field of application capacity:

The possibility of applying nonparametric methods to data with lower levels of measurement such as nominal and ordinal data, and the possibility of using them in inference problems unrelated to a feature as a random test of a series of values. In addition to not being bound by many assumptions, the field of application of these methods has been wider than that of the scientific methods.

Parametric statistics

Statisticians do not disagree that there is a set of assumptions or conditions that must be met in order for us to be able to deal with the data in the methods defined by the parameters, and by disabling any of them there is a lack of confidence in the results obtained by these methods, i.e. resorting to other methods to confront them, and these conditions are :[5]

1- normal distribution:

According to the central limit theorem, the greater the sample number, the closer its variance to the population variance, and the distribution can be considered nearly normal when the sample size becomes (30) or more.

He comments on this condition that it is related to measuring the variance of the sample to the variance of the population, as he found that whenever the sample size approaches (30) and above, its variance will approximate the variance of the large size. Samples (hundreds and thousands) and from here set the cut-off limit (30) in dealing with some statistical means such as the (T) test and it was dealt with because it is given and generalized through it the idea that if the number of samples or observations is less than (30) then the state of moderation in distribution (The normal distribution) has been violated

and therefore it is necessary to move to alternative (unchanged) statistics, and the researcher partly agrees with this statement, as the condition for moderation in the distribution is satisfied with number (30) and the distribution is normal, but the conversation if the number is less than (30) and this It does not necessarily mean the loss of this condition (normal distribution. Tribution) as the matter is subject to the characteristics of the data taken from the samples, Many advise to resort to the alternative, the philosophy of assuming a normal distribution, that is, the limit (30), not the reason in itself, as it should be noted that the smaller the sample size, another type of problem will appear, which is the problem of outliers or the warping that occurs as a result of The data is not distributed normally due to its lack.

2- Independence:

The concept of independence versus the concept of correlation, if correlation means a relationship between two variables, then independence means that the value of the relationship between two variables is equal to zero when using a number of samples or observations, and this requires the two samples is chosen randomly from their communities, and for example two random samples from two different societies or two random samples from one community with no cheating between members of the two groups because it will lead to the risk of collapse of the situation that prevents the use of parameter statistics, and then resorting to inference methods Without parameters.

3- homogeneity of contrast:

This condition means that each of the two samples has a variance that does not differ from the variance of the second sample, and this lack of difference does not necessarily mean that the two variances are identical, but rather there is no significant difference between them,

4. Relative scale

It is the highest level of measurement and the most important and reliable in terms of results emanating from it. Parametric statistics such as (height - weight - distances - time) are used with it, and the zero indicates the absence of the state, and all mathematical operations can be performed on it, and the coefficient of variance is also used with it.

Hence, it is evident that the process of abandoning the number of parameters just because the number (30) is incomplete, or homogeneity of variance or independence are among the commonly used errors.

Parametric and nonparametric tests

It must be mentioned that listing a set of examples to clarify the differences between the parameter tests and the corresponding non-parametric procedures is very easy, and therefore Table (1) contains a number of examples that we can do to classify the appropriate parameterized tests and the corresponding non-parametric procedures, (the parameter procedures depend on Assuming an approximately normal distribution is achieved).[1][2]

Analysis Type	Example	Parametric Procedure	Nonparametric Procedure
Comparison of mean between two independent groups	Does the mean systolic blood pressure differ (at baseline) for two groups of patients when a placebo was applied to one group while a certain type of treatment was applied to the other group?	Two-sample t-test	Wilcoxon rank sum test
Comparison of two quantitative measures of blood pressure for the same person	After a six-month follow-up of the treatment group, is there a significant change in systolic blood pressure in the baseline and the follow-up measurement?	Paired t-test	Wilcoxon signed rank test
Comparison of the arithmetic means of three or more independent groups	Does the mean baseline systolic blood pressure differs between three groups (placebo, new drug 1, new drug 2)	Analysis of variance (ANOVA)	Kruskal-Wallis test
Estimate the degree of correlation between two quantitative variables	Is there an effect on the age of a patient with systolic blood pressure?	Pearson coefficient of correlation	Spearman's rank correlation

Results

Both the parameterized and non-parametric tests have characteristics and advantages that differ from one another from the other, and there are those who are more likely to use non-parametric methods than using the parametric methods because they do not assume certain restrictions about the community or the sample that is withdrawn from the community, with the ease of its implementation, especially in small samples.

Here, researchers must bear in mind that parameter tests are stronger and more accurate in testing statistical hypotheses than non-parametric tests because they feel the differences in the data because they deal with standard deviations, and this is This makes them more able to find differences and thus they are more efficient and able to reject the null hypothesis from nonparametric tests.

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