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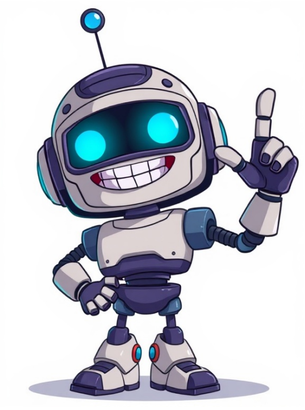

Image by Editor | MidjourneyStatistical tests help us analyze data and draw conclusions. They are of two types: parametric and nonparametric tests. Understanding the difference helps choose the appropriate test for accurate results. Each type has strengths and limitations based on the data and research question.In this article, we explore the differences, advantages, and limitations of parametric and nonparametric tests.What Are Parametric Tests?Parametric tests are statistical tests that make specific assumptions about the data. They assume the data follows a particular distribution, usually the normal distribution. These tests need the measurement scale to be interval or ratio. Parametric tests use population parameters like the mean and standard deviation in their calculations.Common Parametric Testst-test: Checks if the average of a single group is different from a known value.ANOVA (Analysis of Variance): Tests if there are differences between the averages of three or more groups.Pearson correlation coefficient: Measures the linear relationship between two continuous variables.Linear regression: Analyzes the relationship between a dependent variable and one or more independent variables.AdvantagesWhen assumptions are met, they can detect differences more easily.Give estimates of population parameters.Can handle more complex models, like regression or ANOVA.DisadvantagesNeed assumptions such as normality and interval data.Extreme values can distort results.When the sample size is small, the normality assumption may be violated.What Are Nonparametric Tests?Nonparametric tests are statistical tests that do not assume a specific distribution for the data. They are used when data do not meet the assumptions of parametric tests, like normality. These tests are often used with ordinal data or when sample sizes are small. They compare medians instead of means.Common Nonparametric TestsMannWhitney U test: Compares two separate groups to see if one tends to have higher or lower values than the other.Wilcoxon signed-rank test: Tests for differences between two related samples or matched pairs without assuming normality.KruskalWallis test: Compares three or more separate groups to see if their values are different.Friedman Test: Compares scores from the same group under three or more conditions or times.Spearmans rank correlation: Measures the strength and direction of the association between two ranked variables.Chi-square test: Examines the association between categorical variables in a contingency table.AdvantagesDo not need normal distribution or homogeneity of variance.Less affected by extreme values.Can be used with smaller sample sizes.DisadvantagesGenerally have less statistical power compared to parametric tests.Only test for differences in medians or ranks, not means.Fewer tests available for complex designs.When to Use Parametric vs. Nonparametric TestsHere are some guidelines for selecting the appropriate test:ScenarioRecommended Test TypeData is normally distributed with equal variancesParametricData is skewed or ordinalNonparametricSample size is small and normality is questionableNonparametricWant to maximize power and assumptions are metParametricData involves ranks or categoriesNonparametricConclusionParametric tests work well when data follows a normal distribution and meets certain conditions. They are effective for analyzing data with specific assumptions about its characteristics. Nonparametric tests are suitable when data does not meet these conditions, such as with small samples or ranked data. They are less affected by outliers and unusual values but may provide less precise results. Choose the test based on your data type and whether the assumptions are satisfied. Statistical analysis plays a crucial role in understanding and interpreting data across various disciplines. Two prominent approaches in statistical analysis are Parametric and Non-Parametric Methods. While both aim to draw inferences from data, they differ in their assumptions and underlying principles. This article delves into the differences between these two methods, highlighting their respective strengths and weaknesses, and providing guidance on choosing the appropriate method for different scenarios. Parametric MethodsParametric methods are statistical techniques that rely on specific assumptions about the underlying distribution of the population being studied. These methods typically assume that the data follows a known Probability distribution, such as the normal distribution, and estimate the parameters of this distribution using the available data. The basic idea behind the Parametric method is that there is a set of fixed parameters that are used to determine a probability model that is used in Machine Learning as well. Parametric methods are those methods for which we priory know that the population is normal, or if not then we can easily approximate it using a Normal Distribution which is possible by invoking the Central Limit Theorem. Parameters for using the normal distribution are as follows: Eventually, the classification of a method to be parametric completely depends on the presumptions that are made about a population. Assumptions for Parametric MethodsParametric methods require several assumptions about the data: Normality:The data follows a normal (Gaussian) distribution.Homogeneity of variance:The variance of the population is the same across all groups.Independence:Observations are independent of each other.What are Parametric Methods?Statistical Tests:t-test:Tests for the difference between the means of two independent groups.ANOVA:Tests for the difference between the means of three or more groups.F-test:Compares the variances of two groups.Chi-square test:Tests for relationships between categorical variables.Correlation analysis:Measures the strength and direction of the linear relationship between two continuous variables.Machine Learning Models:Linear regression:Predicts a continuous outcome based on a linear relationship with one or more independent variables.Logistic regression:Predicts a binary outcome (e.g.,yes/no) based on a set of independent variables.Naive Bayes:Classifies data points based on Bayes' theorem and assuming independence between features.Hidden Markov Models:Models sequential data with hidden states and observable outputs.some more common parametric methods available some of them are: Confidence interval used for - population mean along with known standard deviation.The confidence interval is used for - population means along with the unknown standard deviation.The confidence interval for population variance.The confidence interval for the difference of two means, with unknown standard deviation.Advantages of Parametric MethodsMore powerful:When the assumptions are met,parametric tests are generally more powerful than non-parametric tests,meaning they are more likely to detect a real effect when it exists.More efficient:Parametric tests require smaller sample sizes than non-parametric tests to achieve the same level of power.Provide estimates of population parameters:Parametric methods provide estimates of the population mean,variance,and other parameters,which can be used for further analysis.Disadvantages of Parametric MethodsSensitive to assumptions:If the assumptions of normality,homogeneity of variance,and independence are not met,parametric tests can be invalid and produce misleading results.Limited flexibility:Parametric methods are limited to the specific probability distribution they are based on.May not capture complex relationships:Parametric methods are not well-suited for capturing complex non-linear relationships between variables.Applications of Parametric MethodsParametric methods are widely used in various fields, including: Biostatistics:Comparing the effectiveness of different treatments.Social sciences:Investigating relationships between variables.Finance:Estimating risk and return of investments.Engineering:Analyzing the performance of systems.Nonparametric MethodsNon-parametric methods are statistical techniques that do not rely on specific assumptions about the underlying distribution of the population being studied. These methods are often referred to as "distribution-free" methods because they make no assumptions about the shape of the distribution. The basic idea behind the parametric method is no need to make any assumption of parameters for the given population or the population we are studying. In fact, the methods dont depend on the population. Here there is no fixed set of parameters are available, and also there is no distribution (normal distribution, etc.) of any kind is available for use. This is also the reason that nonparametric methods are also referred to as distribution-free methods. Nowadays Non-parametric methods are gaining popularity and an impact of influence some reasons behind this fame is: The main reason is that there is no need to be mannered while using parametric methods.The second important reason is that we do not need to make more and more assumptions about the population given (or taken) on which we are working on.Most of the nonparametric methods available are very easy to apply and to understand also i.e. the complexity is very low.Assumptions of Non-Parametric MethodsNon Parametric methods require several assumptions about the data: Independence:Data points are independent and not influenced by others.Random Sampling:Data represents a random sample from the population.Homogeneity of Measurement:Measurements are consistent across all data points.What is Non-Parametric Methods?Statistical Tests:Mann-Whitney U test:Tests for the difference between the medians of two independent groups.Kruskal-Wallis test:Tests for the difference between the medians of three or more groups.Spearman's rank correlation:Measures the strength and direction of the monotonic relationship between two variables.Wilcoxon signed-rank test:Tests for the difference between the medians of two paired samples.Machine Learning Models:K-Nearest Neighbors (KNN):Classifies data points based on the k nearest neighbors.Decision Trees:Makes classifications based on a series of yes/no questions about the features.Support Vector Machines (SVM):Creates a decision boundary that maximizes the margin between different classes.Neural networks:Can be designed with specific architectures to handle non-parametric data,such as convolutional neural networks for image data and recurrent neural networks for sequential data.Advantages of Non-Parametric MethodsRobust to outliers:Non-parametric methods are not affected by outliers in the data,making them more reliable in situations where the data is noisy.Widely applicable:Non-parametric methods can be used with a variety of data types,including ordinal,nominal,and continuous data.Easy to implement:Non-parametric methods are often computationally simple and easy to implement,making them suitable for a wide range of users.Diadvantages of Non-Parametric MethodsLess powerful:When the assumptions of parametric methods are met,non-parametric tests are generally less powerful,meaning they are less likely to detect a real effect when it exists.May require larger sample sizes:Non-parametric tests may require larger sample sizes than parametric tests to achieve the same level of power.Less information about the population:Non-parametric methods provide less information about the population parameters than parametric methods.Applications of Non-Parametric MethodsNon-parametric methods are widely used in various fields, including: Medicine:Comparing the effectiveness of different treatments.Psychology:Investigating relationships between variables.Ecology:Analyzing environmental data.Computer science:Developing machine learning algorithms.Difference Between Parametric and Non-ParametricThere are several Difference between Parametric and Non-Parametric Methods are as follows: Parametric Methods uses a fixed number of parameters to build the model.Non-Parametric Methods use the flexible number of parameters to build the model.Parametric analysis is to test group means.A non-parametric analysis is to test medians.It is applicable only for variables.It is applicable for both Variable and Attribute.It always considers strong assumptions about data.It generally fewer assumptions about data.Parametric Methods require lesser data than Non-Parametric Methods.Non-Parametric Methods requires much more data than Parametric Methods.Parametric methods assumed to be a normal distribution.There is no assumed distribution in non-parametric methods.Parametric data handles Intervals data or ratio data.But non-parametric methods handle original data.Here when we use parametric methods then the result or outputs generated can be easily affected by outliers.When we use non-parametric methods then the result or outputs generated cannot be seriously affected by outliers.Parametric Methods can perform well in many situations but its performance is at peak (top) when the spread of each group is different.Similarly, Non-Parametric Methods can perform well in many situations but its performance is at peak (top) when the spread of each group is the same.Parametric methods have more statistical power than Non-Parametric methods.Non-parametric methods have less statistical power than Parametric methods.As far as the computation is considered these methods are computationally faster than the Non-Parametric methods.As far as the computation is considered these methods are computationally slower than the Parametric methods.Examples: Logistic Regression, Nave Bayes Model, etc.Examples: KNN, Decision Tree Model, etc.ConclusionParametric and non-parametric methods offer distinct advantages and limitations. Understanding these differences is crucial for selecting the most suitable method for a specific analysis. Choosing the appropriate method ensures valid and reliable inferences, enabling researchers to draw insightful conclusions from their data. As statistical analysis continues to evolve, both parametric and non-parametric methods will play crucial roles in advancing knowledge across various fields. home / algebra / expressions and equations / parametricIndependent variables that describe a system that is modeled by equations are referred to as parameters. A parametric equation is an equation that is used to define a group of quantities as functions of parameters. The two figures are formed using multiple sets of parametric equations. Formal definition Given two continuous functions, f and g, written in terms of t over some interval, are a set of parametric equations where t is the parameter. The curve formed by the set of points is typically denoted as C. Parametric equations are useful for writing equations of curves that are not functions, such as the figures depicted above. Example Graph the curve given the set of parametric equations One way to graph the curve is to create a table of the x and y values and then plot them: t x(t) y(t) -3 2.5 -2 -2 0 -1 -1 -1.5 0 0 -2 1 1 -1.5 2 2 0 3 3 2.5 4 4 6 5 In the figure above, we can see that the path of t forms a parabolic curve over the given interval. The arrows in red indicate the direction in which the curve is mapped out in the coordinate plane. In order to graph this same curve in rectangular rather than parametric form, we would need to use the following two equations: and The graphs of f and g over their respective domains are shown below: Notice that the two curves look identical. The key difference between how the graph is formed in parametric or rectangular form is the direction in which the graph is mapped. For the graph in rectangular form, the curves formed by f and g are both mapped from left to right, while the graph of the parametric equation starts from the right, moves left, then loops back around to the right. One example of the application of parametric equations is its use in modeling the motion of an object over time. A ball that is hit with a bat at a certain angle and speed can be modeled with the rectangular equation, , which is graphed as follows: While the graph shows the path as well as the horizontal and vertical position after the ball is hit, it does not show the position of the ball at a given time. In parametric form however, the position of the ball at a given time can also be shown using the following equations: To determine where the ball is at a given point in time, plug the time into these equations. For example, given t in seconds and distance in ft, at 1 second, x(1) = 25 ft and y(1) = 23.36 ft. With these equations, we can also determine information such as how long the ball remains in the air by solving for y = 0, which will yield the time that the ball hits the ground: Solving for t yields t = -0.11 or 2.32. Since time cannot be negative, the ball remains in the air for 2.32 seconds before hitting the ground. The graph of the parametric equations showing the path of the ball is the same as the graph in rectangular form, and is shown below along with red arrows indicating the mapping of the graph: Eliminating the parameter Given a set of parametric equations for x and y in terms of t, we can convert the equations to rectangular form by eliminating the parameter. There are a few ways to do this. Substitute one parametric equation into the other First solve one of the parametric equations for t, then substitute this value into the other equation in the set. For example, let x(t) = 2t and y(t) = t2 + 1 be a set of parametric equations. Solving the first equation for t yields t = x/2, and plugging this into y(t) yields: In some cases, the domain of the rectangular equation needs to be modified for its graph to be exactly the same as it is in parametric form. Example Convert and to rectangular form. Solving x(t) for t yields: Substituting this into the second equation yields , which is a graph of a parabola that is defined for all real numbers, x. Looking at the equation for x(t) in the parametric set of equations, the domain is restricted to all real numbers t 4, which means that x(t) 0, so the domain for the rectangular equation must be restricted to x 0 to match. This is depicted in the figure below: Using identities We can also eliminate parameters using identities. For example, let x() = 3cos() and y() = 3sin() be a set of parametric equations where 0 < 2. Solving the equations for cos() and sin() yields: Substituting these values into the identity yields which is the equation of a circle with radius 9 centered at the origin. The range of values for x(t) on the interval 0 < 2 is -3 x(t) 3, so the domain of the rectangular form of the equation is -3 x 3. Example Find the rectangular form of the following parametric equation: Solving each equation for sec() and tan() yields: Then, substituting these into the identity yields which is a hyperbola in standard form. The graph of its transverse axis is along the x-axis, and its center is at the origin. The range of values for x() over the interval of 0 < 2 is x() -4 or x() 4, so the domain for the rectangular form of the equation of the hyperbola is x -4 or x 4. Equation of a line in 3D In the three-dimensional (3D) coordinate plane, vectors are used to express the equation of a line. Let line AB contain point B = (x1, y1, z1) and let AB be parallel to vector . If A = (x, y, z) is any point on line AB, then vector , and vector AB is parallel to v. Vector AB can be written as some scalar multiple of v; given that t is the scalar, Thus, for line AB, x - x1 = tv1, y - y1 = tv2, and z-z1 = tv3, which can be written as the following set of parametric equations: Example Write the equation of line ST in parametric form given point S = (-10, -6, -14) and point T = (8, 8, -6). First, find vector v: Using point S, line ST is: Note that when t = 0 and 1, we get our two given points: The graph of line ST is shown in the figure below: Also found in: Thesaurus, Medical, Financial, Encyclopedia, Wikipedia. (p-rm-tr)n.1. Mathematics a. A constant in an equation that varies in other equations of the same general form, especially such a constant in the equation of a curve or surface that can be varied to represent a family of curves or surfaces.b. One of a set of independent variables that express the coordinates of a point.2. a. One of a set of measurable factors, such as temperature and pressure, that define a system and determine its behavior and are varied in an experiment.b. Usage Problem A factor that restricts what is possible or what results: "all the parameters of shelterwhere people will live, what mode of housing they will choose, and how they will pay for it" (New York).c. A factor that determines a range of variations; a boundary: an experimental school that keeps expanding the parameters of its curriculum.3. Statistics A quantity, such as a mean, that is calculated from data and describes a population.4. Usage Problem A distinguishing characteristic or feature.[New Latin parametrum, a line through the focus and parallel to the directrix of a conic : Greek para-, beside; see para-1 + Greek metron, measure; see -meter.]parametric (pr-mtrk), parametrical adj.Usage Note: The term parameter, which originates in mathematics, has a number of specific meanings in fields such as astronomy, electricity, crystallography, and statistics. Perhaps because of its ring of technical authority, people have applied parameter more generally in recent years to refer to any factor that determines a range of variations and especially to a factor that restricts what results from a process or policy. In this use, the word parameter is used to mean "the particular value of a parameter," and comes close to meaning "a set limit or boundary." For example, a budget can be thought of as a set of parameters that determine a range of activity, much like a set of mathematical parameters that establish the range of effects, or limits, of other variables. The sentence A budget is a framework that defines the financial parameters within which an organization operates was considered acceptable by 81 percent of the Usage Panel in our 2004 survey. Parameter is sometimes used incorrectly when it does not denote a range of variation, as if it were a technical-sounding synonym for characteristic. In 1988, 88 percent of the Usage Panel rejected the sentence The Judeo-Christian ethic is one of the important parameters of Western culture. In 2004, 77 percent rejected this same sentence, suggesting that familiarity has not bred tolerance of this usage.American Heritage Dictionary of the English Language, Fifth Edition. Copyright 2016 by Houghton Mifflin Harcourt Publishing Company. Published by Houghton Mifflin Harcourt Publishing Company. All rights reserved. Adj.1.parametric - of or relating to or in terms of a parameter; "parametric equation"Based on WordNet 3.0, Farlex clipart collection. 2003-2012 Princeton University, Farlex Inc. Want to thank TFD for its existence? Tell a friend about us, add a link to this page, or visit the webmaster's page for free fun content. Link to this page: Custom portfolio solutions We offer investors the precise market exposures they seek while helping manage risk, reduce tax and elevate outcomes. Discover tailored, transparent, systematic solutions: Custom portfolio solutions We offer investors the precise market exposures they seek while helping manage risk, reduce tax and elevate outcomes. Discover tailored, transparent, systematic solutions: of or relating to a parameter, mathematical or statistical variable.For the statistical analysis, we used a parametric approach, estimating the parameters of a probability distribution. It's very easy to confuse parameter with perimeter. Not only do the two words sound the same, they both connote a boundary or limit. When parameter is used to mean "a boundary or limit," it is usually in its plural form, and often as the object of a preposition such as within or beyond: Let's face it, managing weight loss or maintenance can be trying enough within the parameters of a daily routine. Geoff Kerr, Weight Watchers, November 1991 Though candor sometimes encourages Bruno to "stray beyond the parameters of good taste," his interaction with Lydia is always convincingly portrayed as a loving, tender relationship. Ron Charles, The Washington Post, 8 Feb. 2011 In geometry, perimeter refers to the boundary of a closed plane figure. You might remember calculating perimeters in school. If each side of an equilateral triangle measures 9 feet, then the perimeter of the triangle measures 27 feet. In more general use, perimeter describes an outer stretch, as in "The college president lived in a house on the perimeter of the campus." Parameter originally had a meaning pertaining to mathematics as well. The dictionary defines it as "an arbitrary constant whose value characterizes a member of a system (as a family of curves); also : a quantity (as a mean or variance) that describes a statistical population" as well as "an independent variable used to express the coordinates of a variable point and functions of them." Some twentieth-century usage commentators objected to the use of a scientific-sounding word like parameter in general contexts (as in the examples above), especially to mean "a limit or boundary," theorizing that perimeter must have been what the speaker or writer intended. However, perimeter was not often used in the phrasings that parameter is used in (that is, as the object of within or beyond) until much later. In fact, a word such as bounds or range or confines often serves as a more appropriate equivalent for parameter than the marginal connotations of perimeter: But a true novel is an extended piece of fiction: Length is clearly one of its parameters. Anthony Burgess, The New York Times Book Review, 5 Feb. 1984 Shields will then subsume that request in the overall City operating budget that he will recommend to the City Council in mid-March, and the Council will make its final decisions on the parameters of the budget, including any tax increases or cuts, by the end of April. Nicholas F. Benton, The Falls Church News Press, 6 Jan. 2016Look up parametric in Wiktionary, the free dictionary.Parametric may refer to:Parametric equation, a representation of a curve through equations, as functions of a variableParametric statistics, a branch of statistics that assumes data has come from a type of probability distributionParametric derivative, a type of derivative in calculusParametric model, a family of distributions that can be described using a finite number of parametersParametric oscillator, a harmonic oscillator whose parameters oscillate in timeParametric surface, a particular type of surface in the Euclidean space R3Parametric family, a family of objects whose definitions depend on a set of parametersParametric process, in optical physics, any process in which an interaction between light and matter does not change the state of the materialSpontaneous parametric down-conversion, in quantum optics, a source of entangled photon pairs and of single photonsOptical parametric amplifier, a type of laser light source that emits light of variable wavelengthsStatistical parametric mapping, a statistical technique for examining differences in brain activity recorded during functional neuroimagingParametric searchParametric contract, a financial or investment contractParametric insurance, insurance that agrees to make a payment upon the occurrence of a triggering eventParametric feature based modeler, a modeler using features defined to be parametric shapes associated with attributesParametric polymorphism, a feature of some type systems in computer programmingParametric animation, a computer-animation techniqueParametric Technology Corporation, an American technology companySoftware parametric models, a set of related mathematical equations that incorporates variable parametersParametric feature based modeler, a modeler using features defined to be parametric shapes associated with attributesParametric determinism, a Marxist interpretation of the course of historyParametric equalizer, a multi-band variable equalizerParametric array, a nonlinear transduction mechanismParametric design, a design processParameter (disambiguation)Topics referred to by the same termThis disambiguation page lists articles associated with the title Parametric.If an internal link led you here, you may wish to change the link to point directly to the intended article.Retrieved from " designer jobs. 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