

## Types of statistical tests

Statistical tests are used to analyze data and make inferences about populations based on sample data. There are many different types of statistical tests, each designed for specific purposes and data scenarios. Here are some common types of statistical tests and when to use them, along with examples:

### T-Test:

- Purpose: Compare means of two groups to determine if they are significantly different.
- Example: Compare the average test scores of two different classes to see if one class performs significantly better than the other.
- Example: You want to determine if a new drug is more effective at reducing blood pressure than a placebo. You collect blood pressure measurements from two groups: one receiving the drug and the other receiving a placebo. A t-test can help determine if there's a significant difference in blood pressure reduction between the two groups.

### Chi-Square Test:

- Purpose: Assess the association between two categorical variables.
- Example: Determine if there is a significant relationship between gender (male/female) and smoking status (smoker/non-smoker) in a population.

### ANOVA (Analysis of Variance):

- Purpose: Compare means of three or more groups to determine if there are statistically significant differences.
- Example: Compare the average salaries of employees in three different departments of a company to see if there are significant differences in pay.

### Regression Analysis:

- Purpose: Examine the relationship between one or more independent variables and a dependent variable.
- Example: Determine how well SAT scores and high school GPAs predict college admission success. You use multiple regression to analyze how these two independent variables relate to the dependent variable (admission success).

### Mann-Whitney U Test (Wilcoxon Rank-Sum Test):

- Purpose: Compare two independent groups when the assumptions of the t-test are not met or when dealing with ordinal or non-normally distributed data.
- Example: Compare the exam scores of two different teaching methods in an educational study where the data is not normally distributed.

## Kruskal-Wallis Test:

- Purpose: An extension of the Mann-Whitney U test for comparing three or more independent groups.
- Example: Assess whether there are significant differences in the pain relief provided by three different pain medications.

## Paired T-Test:

- Purpose: Compare means of two related groups (e.g., before and after an intervention) to determine if there's a significant difference.
- Example: Evaluate whether a weight loss program results in a significant reduction in participants' body weight by comparing their weights before and after the program.

## Correlation Analysis:

- Purpose: Determine the strength and direction of a linear relationship between two continuous variables.
- Example: Analyze whether there is a correlation between the number of hours spent studying and final exam scores among a group of students.

## Logistic Regression:

- Purpose: Model the relationship between one or more independent variables and a binary outcome (e.g., yes/no, success/failure).
- Example: Predict whether a customer will make a purchase (yes/no) based on their demographic characteristics and browsing behavior on a website.

## Wilcoxon Signed-Rank Test:

- Purpose: Compare two related groups when the assumptions of the paired t-test are not met or when dealing with non-normally distributed data.
- Example: Assess whether there's a significant difference in the time it takes for two different assembly line processes to produce a product