

1. How do you control for biases?

To control for biases in a study, researchers implement various strategies such as randomization to distribute any confounding factors evenly between the groups being studied, blinding to prevent participants and researchers from knowing which group participants belong to (thus reducing bias in behavior and assessment), and selecting a representative sample to ensure the results can be generalized to the wider population.

2. What are confounding variables?

Confounding variables are extraneous variables that correlate (directly or inversely) with both the dependent variable and the independent variable. They can potentially lead to a false assumption of causality between the independent and dependent variables. Effective control measures include matching, stratification, and using statistical methods like regression to adjust for these variables.

3. What is A/B testing?

A/B testing, also known as split testing, is a randomized control experiment where two versions (A and B) are compared to determine which performs better on a specific metric. This method is widely used in web design, marketing, and product development to make data-driven decisions.

4. When will you use Welch t-test?

The Welch t-test is used when you want to compare the means of two groups that may have different variances and possibly different sample sizes. It is an adaptation of the Student's t-test and more reliable when the assumption of equal variances is violated.

5. A company claims that the average time its customer service representatives spend on the phone per call is 6 minutes. You believe that the average time is actually higher. You collect a random sample of 50 calls and find that the average time spent on the phone per call in your sample is 6.5 minutes, with a standard deviation of 1.2 minutes. Test whether there is sufficient evidence to support your claim at a significance level of 0.05.

Run my code: question_5.py

T-statistic: 2.946278254943948

P-value: 0.0024555744280253533

The computed t-statistic is approximately 2.95, and the one-tailed p-value is about 0.0025. Since the p-value is less than the significance level of 0.05, we reject the null hypothesis. This suggests that there is sufficient evidence to support the claim that the average time customer service representatives spend on the phone per call is higher than 6 minutes.

6. A researcher wants to determine whether there is a difference in the mean scores of two groups of students on a math test. Group A consists of 25 students who received traditional teaching methods, while Group B consists of 30 students who received a new teaching method. The average score for Group A is 75, with a standard deviation of 8, and the average score for Group B is 78, with a standard deviation of 7. Test whether there is a significant difference in the mean scores of the two groups at a significance level of 0.05.

Run my code: question_6.py

T-statistic: -1.4650132801342768

P-value: 0.14941450596390293

Degrees of Freedom: 48.16767771755786

The computed t-statistic is approximately -1.47, and the two-tailed p-value is about 0.149, with around 48 degrees of freedom. Since the p-value is greater than the significance level of 0.05, we do not reject the null hypothesis. This suggests that there is not sufficient evidence to conclude that there is a significant difference in the mean scores of the two groups of students taught by traditional and new teaching methods.