

1. How do you control for biases?

Several methods are used in hypothesis testing such as random sampling, control group or other methods to control the biases.

2. What are confounding variables?

Confounding variables are extraneous variables that have relations with both the predictor and the outcome. The existence of unprocessed confounding variables may lead to wrong conclusions towards the relation of variables that are mainly discussed.

3. What is A/B testing?

A/B testing is a testing method that is widely used in various areas. The method forms a hypothesis first, then compares the outcomes of analysis between different groups through random assignments. Statistical analysis is conducted for variants used in the testing.

4. When will you use the Welch t-test?

When it is reasonable to reduce data to sample means and the number of sample means compared in the design is more than 3.

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.

Null hypothesis is that the old and new means are the same. The Alternative hypothesis is the new average is more than the old average. A significant level of 0.05 turns out to be a critical region of  $t > 1.677$  with  $df = 49$ . The calculated the t-score for the sample which is  $(6.5-6)/(1.2/\sqrt{50}) = 2.946$ , which P is nearly zero for  $t > 2.946$ . So that I can reject the null hypothesis and conclude that there is sufficient evidence to support that the average time is actually higher than the noted average time there.

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.

Null hypothesis is that the difference of old and new means are 0. The Alternative hypothesis is that the difference of old and new means is bigger than 0. A significant level of 0.05 turns out to be a critical region of  $t > 2.011$  with  $df = 48.17$ . The calculated the t-score for the sample which is  $(78-75)/\sqrt{64/25+49/30} = 1.465$ , which P is bigger than the significance level. So that I cannot reject the null hypothesis and conclude that there is sufficient evidence to support that the average score is different between two groups.