Section 10.1 — Fundamentals of Hypothesis Testing

Chris Godbout

Outline

Hypotheses

Interpreting Results

Errors

Hypotheses

Definition

Definition (Hypothesis)

A hypothesis is a claim or statement about a property of a population.

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A hypothesis is a claim or statement about a property of a population.

Definition (Hypothesis Test)

A hypothesis test (or test of significance) is a procedure for testing a claim about a property of a population.

Null and Alternative Hypotheses

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Definition (Null Hypothesis)

The null hypothesis is the mathematical opposite of the alternative hypothesis. It is denoted H_0.

Sportball!

A sports analyst is testing their claim that the mean weight of this year's NFL linemen is heavier than in past years. Suppose that over the past five years, the mean weight of NFL linemen was 320.0lbs. What are the null and alternative hypotheses?

Seawater

According to the WHO, seawater is believed to have a mean fluoride concentration of 1.3 mg/L. A marine biologist is concerned that the level of fluoride is too high in a particular area and is killing the ocean life. What are the null and alternative hypotheses?

Shoe size

Based on past sales, a shoe manufacturer considers the mean shoe size of women to be 7.50. They want to test to see if this still accurate. What are the null and alternative hypotheses?

Interpreting Results

Statistical Significance

Definition (Test Statistic)

A test statistic is the value used to make a decision about the null hypothesis and is derived from the sample statistic.

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Definition (Statistical Significance)

A sample statistic is statistically significant if it is far enough away from the presumed value of the population parameter to conclude that it would be unlikely for the sample statistic to occur by chance if the null hypothesis is true.

The level of significance, denoted α, is the probability of making the error of rejecting a true null hypothesis.

Possible Conclusions

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- Reject the null hypothesis and support the alternative.
- Fail to reject the null hypothesis

Sportball!

A sports analyst is testing their claim that the mean weight of this year's NFL linemen is heavier than in past years. Suppose that over the past five years, the mean weight of NFL linemen was 320.0lbs. After performing a test a the 0.05 level of significance, the analyst rejects the null hypothesis. What does this mean about the claim?

Shoe size

Based on past sales, a shoe manufacturer considers the mean shoe size of women to be 7.50. They want to test to see if this still accurate. After performing a test at the 0.01 significance level, the manufacture decides to fail to reject the null hypothesis. What does this mean about the claim?

Errors

Error types

Definition (Errors)

- A type I error is the mistake of rejecting the null hypothesis when it is true. The probability of this happening is α.
- A type II error is he mistake of failing to reject the null hypothesis when it is false. The probability of this happening is denoted β.