What is the definition of Fisher Z-Transformation and can you provide an example?

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The Fisher Z-Transformation is a statistical method used to transform a set of data with a non-normal distribution into a set of data with a normal distribution. This transformation is particularly useful in analyzing data that follows a non-normal distribution, as it allows for the use of traditional statistical tests and techniques that assume a normal distribution. The transformation is achieved by taking the natural logarithm of the data and then calculating the inverse hyperbolic tangent. This results in a new set of data that follows a normal distribution. An example of using the Fisher Z-Transformation would be in analyzing the correlation between two variables that have a non-normal distribution. By transforming the data using this method, the correlation coefficient can be accurately calculated and interpreted.

Fisher Z-Transformation: Definition & Example

The Fisher Z transformation is a formula we can use to transform Pearson's correlation coefficient (r) into a value (zr) that can be used to calculate a confidence interval for Pearson's correlation coefficient.

The formula is as follows:

zr = ln((1+r) / (1-r)) / 2

For example, if the Pearson correlation coefficient between two variables is found to be r = 0.55, then we would calculate zr to be:

zr = ln((1+r) / (1-r)) / 2zr = ln((1+.55) / (1-.55)) / 2zr = 0.618

It turns out that the of this transformed variable follows a .

This is important because it allows us to calculate a confidence interval for a Pearson correlation coefficient.

Without performing this Fisher Z transformation, we would be unable to calculate a reliable confidence interval for the Pearson correlation coefficient.

The following example shows how to calculate a confidence interval for a Pearson correlation coefficient in practice.

Example: Calculating a Confidence Interval for Correlation Coefficient

Suppose we want to estimate the correlation coefficient between height and weight of residents in a certain county. We select a random sample of 60 residents and find the following information:

Sample size n = 60Correlation coefficient between height and weight r = 0.56

Here is how to find a 95% confidence interval for the population correlation coefficient:

Step 1: Perform Fisher transformation.

Let zr = ln((1+r) / (1-r)) / 2 = ln((1+.56) / (1-.56)) / 2 = 0.6328

Step 2: Find log upper and lower bounds.

Let L = zr - (z1-α/2 /√n-3) = .6328 - (1.96 /√60-3) = .373

Step 3: Find confidence interval.

Confidence interval =

Confidence interval = =

Note: You can also find this confidence interval by using the .

This interval gives us a range of values that is likely to contain the true population Pearson correlation coefficient between weight and height with a high level of confidence.

Note the importance of the Fisher Z transformation: It was the first step we had to perform before we could actually calculate the confidence interval.

Additional Resources