

How can a Repeated Measures ANOVA be performed in Python?

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A Repeated Measures Analysis of Variance (ANOVA) is a statistical test used to compare the means of three or more groups that are measured repeatedly over time. This test allows for the examination of the changes within groups over time, as well as the differences between groups. In Python, this test can be performed using the SciPy library, specifically the function "scipy.stats.f_oneway." This function takes in the data for each group and calculates the F-statistic and p-value, which can be used to determine if there are significant differences between groups. Additionally, the statsmodels library provides a more comprehensive tool for conducting a Repeated Measures ANOVA, allowing for the inclusion of covariates and post-hoc tests. Overall, Python offers various options for performing a Repeated Measures ANOVA, providing researchers with a powerful tool for analyzing data with repeated measurements.

Perform a Repeated Measures ANOVA in Python

A is used to determine whether or not there is a statistically significant difference between the means of three or more groups in which the same subjects show up in each group.

This tutorial explains how to conduct a one-way repeated measures ANOVA in Python.

Example: Repeated Measures ANOVA in Python

Researchers want to know if four different drugs lead to different reaction times. To test this, they measure the reaction time of five patients on the four different drugs.

Since each patient is measured on each of the four drugs, we will use a repeated measures ANOVA to determine if the mean reaction time differs between

drugs.

Use the following steps to perform the repeated measures ANOVA in Python.

Step 1: Enter the data.

First, we'll create a pandas DataFrame to hold our data:

```
import numpy as np
import pandas as pd
```

```
#create data
```

```
df = pd.DataFrame({'patient': np.repeat(, 4),
'drug': np.tile(, 5),
'response': })
```

```
#view first ten rows of data
```

```
df.head
```

```
patient drug response
```

```
0 1 1 30
```

```
1 1 2 28
```

```
2 1 3 16
```

```
3 1 4 34
```

```
4 2 1 14
```

5 2 2 18

6 2 3 10

7 2 4 22

8 3 1 24

9 3 2 20

Step 2: Perform the repeated measures ANOVA.

Next, we will perform the repeated measures ANOVA using the from the statsmodels library:

```
from statsmodels.stats.anova import AnovaRM
#perform the repeated measures ANOVA
print(AnovaRM(data=df,      depvar='response',
subject='patient', within=).fit())
```

Anova

=====

F Value Num DF Den DF Pr > F

drug 24.7589 3.0000 12.0000 0.0000

=====

Step 3: Interpret the results.

A repeated measures ANOVA uses the following null and alternative hypotheses:

The null hypothesis (H_0): $\mu_1 = \mu_2 = \mu_3$ (the population means are all equal)

The alternative hypothesis: (H_a): at least one population mean is different from the rest

In this example, the F test-statistic is 24.7589 and the corresponding p-value is 0.0000.

Step 4: Report the results.

Lastly, we will report the results of our repeated measures ANOVA. Here is an example of how to do so:

A one-way repeated measures ANOVA was conducted on 5 individuals to examine the effect that four different drugs had on response time.

Results showed that the type of drug used lead to statistically significant differences in response time ($F(3, 12) = 24.75887, p < 0.001$).

The following tutorials provide additional information on repeated measures ANOVAs:

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