

# How can we perform the Nemenyi Post-Hoc Test in Python?

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April 28, 2024

## RECOMMENDED CITATION

stats writer (2024). *How can we perform the Nemenyi Post-Hoc Test in Python?*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=140402>

The Nemenyi Post-Hoc Test is a statistical method used to compare multiple groups after conducting an ANOVA (Analysis of Variance) test. In order to perform this test in Python, there are several steps that need to be followed.

Firstly, the data must be imported into Python and organized into a suitable format. This typically involves converting the data into a pandas dataframe.

Next, the ANOVA test must be conducted using a suitable package, such as Statsmodels or Scipy. The results of the ANOVA test will provide the necessary information, such as the F-statistic and p-value, to determine if there is a significant difference between the groups.

If the ANOVA test shows a significant difference, the Nemenyi Post-Hoc Test can be performed using the Pingouin package. This package provides a function specifically for conducting the Nemenyi test, which takes in the relevant data and outputs a visual representation of the results, such as a plot or a table.

In summary, the Nemenyi Post-Hoc Test can be performed in Python by importing the data, conducting an ANOVA test, and using the Pingouin package to run the Nemenyi test and visualize the results.

## Perform the Nemenyi Post-Hoc Test in Python

**The is a non-parametric alternative to the . It 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.**

**If the p-value of the Friedman test is statistically significant, we can then perform the Nemenyi post-hoc test to determine exactly which groups are different.**

**The following step-by-step example shows how to**

## perform the Nemenyi test in Python.

### Step 1: Create the Data

Suppose a researcher wants to know if the reaction times of patients is equal on three different drugs. To test this, he measures the reaction time (in seconds) of 10 different patients on each of the three drugs.

We can create the following three arrays that contain the response times for each patient on each of the three drugs:

```
group1 =
```

```
group2 =
```

```
group3 =
```

### Step 2: Perform the Friedman Test

Next, we'll perform the Friedman Test using the from the `scipy.stats` library:

```
from scipy import stats
```

```
#perform Friedman Test
```

```
stats.friedmanchisquare(group1, group2, group3)
```

```
FriedmanchisquareResult(statistic=13.3513513,  
pvalue=0.00126122012)
```

**The Friedman Test uses the following null and alternative hypotheses:**

**The null hypothesis (H0): The mean for each population is equal.**

**The alternative hypothesis: (Ha): At least one population mean is different from the rest.**

**In this example, the test statistic is 13.35135 and the corresponding p-value is 0.00126. Since this p-value is less than 0.05, we can reject the null hypothesis that the mean response time is the same for all three drugs.**

**In other words, we have sufficient evidence to conclude that the type of drug used leads to statistically significant differences in response time.**

**Step 3: Perform the Nemenyi Test**

**Next, we can perform the Nemenyi post-hoc test to determine exactly which groups have different means.**

## **pip install scikit-posthocs**

**Next, we'll use the `posthoc_nemenyi_friedman()` function to perform the Nemenyi post-hoc test:**

```
import scikit_posthocs as sp  
import numpy as np  
  
#combine three groups into one array  
data = np.array()  
  
#perform Nemenyi post-hoc test  
sp.posthoc_nemenyi_friedman(data.T)  
  
0 1 2  
0 1.000000 0.437407 0.065303  
1 0.437407 1.000000 0.001533  
2 0.065303 0.001533 1.000000
```

**Note: We had to transpose the numpy array (`data.T`) in order to perform the post-hoc test correctly.**

**The Nemenyi post-hoc test returns the p-values for each pairwise comparison of means. From the output we can see the following p-values:**

**P-value of group 0 vs. group 1: 0.4374  
P-value of group 0 vs. group 2: 0.0653  
P-value of group 1 vs. group 2: 0.0015**

**At  $\alpha = .05$ , the only two groups that have statistically significantly different means are group 1 and group 2.**

***Note: The Nemenyi test converted the group number from 1, 2, 3 into 0, 1, 2. Thus, the groups from the original data that are significantly different are groups 2 and 3.***