

# How can Welch's t-test be performed in Python?

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## RECOMMENDED CITATION

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Welch's t-test is a statistical method used to compare the means of two independent samples, taking into account unequal variances and unequal sample sizes. It is commonly used in research and data analysis to determine if there is a significant difference between the means of two groups.

In order to perform Welch's t-test in Python, the `scipy.stats` module provides a function called `ttest_ind()` which can be used. This function takes in two arrays of data representing the two samples and returns the t-statistic and the p-value. The t-statistic can be compared to a critical value from a t-table to determine if the difference between the means is significant.

To use the `ttest_ind()` function, the data must be cleaned and prepared, and the necessary libraries must be imported. The results can then be interpreted and visualized using various methods such as creating a box plot or calculating the confidence interval.

In summary, Welch's t-test can be performed in Python by using the `ttest_ind()` function from the `scipy.stats` module, providing a convenient and efficient way to analyze and compare two independent samples.

## Perform Welch's t-test in Python

**The most common way to compare the means between two independent groups is to use a two-sample t-test. However, this test assumes that the variances between the two groups is equal.**

**If you suspect that the variance between the two groups is *not* equal, then you can instead use Welch's t-test, which is the non-parametric equivalent of the two-sample t-test.**

**To perform Welch's t-test in Python, we can use the ttest\_ind() function from the SciPy library, which uses the following syntax:**

**ttest\_ind(a, b, equal\_var=False)**

**where:**

**a:** First array of data values  
**b:** Second array of data values  
**equal\_var:** Specifies no assumption of equal variances between the two arrays

This tutorial explains how to use this function to perform Welch's t-test in Python.

Example: Welch's t-test in Python

Suppose we want to compare the exam scores of 12 students who used an exam prep booklet to prepare for some exam vs. 12 students who did not.

The following code shows how to perform Welch's t-test in Python to determine if the mean exam scores are equal between the two groups:

```
#import ttest_ind() functionfrom scipy import stats
```

```
#define two arrays of data
```

```
booklet =
```

```
no_booklet =
```

```
#perform Welch's t-test  
stats.ttest_ind(booklet, no_booklet, equal_var = False)  
  
Ttest_indResult(statistic=2.23606797749,  
pvalue=0.04170979503207)
```

The test statistic turns out to be 2.2361 and the corresponding p-value is 0.0417.

Since this p-value is less than .05, we can reject the null hypothesis of the test and conclude that there is a statistically significant difference in mean exam scores between the two groups.

Note that the two sample sizes in this example were equal, but Welch's t-test still works even if the two sample sizes are not equal.

**[An Introduction to Welch's t-test](#)**

**[Welch's t-test Calculator](#)**

**[How to Perform Welch's t-test in Excel](#)**