

# How do I calculate the magnitude of a vector using NumPy?

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## RECOMMENDED CITATION

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The process of calculating the magnitude of a vector using NumPy can be achieved by taking the square root of the sum of squared elements in the vector. This can be done by using the "np.linalg.norm()" function in NumPy, which takes in the vector as its argument and returns the magnitude. This method is commonly used in scientific and mathematical computations where vectors are involved. By utilizing NumPy's efficient and optimized functions, the magnitude of a vector can be easily and accurately calculated.

## Calculate the Magnitude of a Vector Using NumPy

The magnitude of a given vector,  $x$ , is calculated as:

$$\|x\| = \sqrt{x_1^2 + x_2^2 + x_3^2 + \dots + x_n^2}$$

For example, suppose  $x =$

The magnitude would be calculated as:

$$\|x\| = \sqrt{3^2 + 7^2 + 4^2} = \sqrt{74} = 8.602$$

You can use one of the following two methods to calculate the magnitude of a vector using the package in Python:

**Method 1: Use `linalg.norm()`**

`np.linalg.norm(v)`

**Method 2: Use Custom NumPy Functions**

```
np.sqrt(x.dot(x))
```

Both methods will return the exact same result, but the second method tends to be much faster especially for large vectors.

The following example shows how to use each method in practice.

Method 1: Use `linalg.norm()`

The following code shows how to use the `np.linalg.norm()` function to calculate the magnitude of a given vector:

```
import numpy as np

#define vector
x = np.array()

#calculate magnitude of vector
np.linalg.norm(x)
```

```
21.77154105707724
```

The magnitude of the vector is 21.77.

## Method 2: Use Custom NumPy Functions

```
import numpy as np
```

```
#define vector
```

```
x = np.array()
```

```
#calculate magnitude of vector
```

```
np.sqrt(x.dot(x))
```

```
21.77154105707724
```

The magnitude of the vector is 21.77.

Notice that this matches the value that we calculated using the previous method.

The following tutorials explain how to perform other common operations using NumPy: