

NumPy

NumPy is a [Python](#) library created in 2005 that performs numerical calculations. It is generally used for working with arrays.

NumPy also includes a wide range of mathematical functions, such as linear algebra, Fourier transforms, and random number generation, which can be applied to arrays.

What is NumPy Used for?

NumPy is an important library generally used for:

- Machine Learning
- Data Science
- Image and Signal Processing
- Scientific Computing
- Quantum Computing

Import NumPy in Python

We can import NumPy in Python using the `import` statement.

`import numpy as np`

The code above imports the `numpy` library in our program as an alias `np`.

After this import statement, we can use NumPy functions and objects by calling them with `np`.

Note:

- If we import NumPy without an alias using `import numpy`, we can create an array using the `numpy.array()` function.
- Using an alias `np` is a common convention among Python programmers, as it makes it easier and quicker to refer to the NumPy library in your code.

Create Array Using Python List

We can create a NumPy array using a [Python List](#). For example,

```
import numpy as np

# create a list named list1

list1 = [2, 4, 6, 8]

# create numpy array using list1

array1 = np.array(list1)

print(array1)

# Output: [2 4 6 8]
```

In the above example, we first imported the `numpy` library as `np` and created a list named `list1`. Notice the code `array1 = np.array(list1)`

Here, we have created an array by passing `list1` as an argument to the `np.array()` function.

Create an Array With np.arange()

The `np.arange()` function returns an array with values within a specified interval. For example,

```
import numpy as np

# create an array with values from 0 to 4

array1 = np.arange(5)

print("Using np.arange(5):", array1)

# create an array with values from 1 to 8 with a step of 2

array2 = np.arange(1, 9, 2)

print("Using np.arange(1, 9, 2):", array2)
```

Output

```
Using np.arange(5): [0 1 2 3 4]
```

```
Using np.arange(1, 9, 2): [1 3 5 7]
```

In the above example, we have created arrays using the `np.arange()` function.

- `np.arange(5)` - create an array with 5 elements, where the values range from **0** to **4**
- `np.arange(1, 9, 2)` - create an array with 5 elements, where the values range from **1** to **8** with a step of **2**.

N-D Array Creation From List of Lists

To create an N-dimensional NumPy array from a [Python List](#), we can use the `np.array()` function and pass the list as an argument.

Create a 2-D NumPy Array

Let's create a 2D NumPy array with **2** rows and **4** columns using lists.

```
import numpy as np
```

```
# create a 2D array with 2 rows and 4 columns
```

```
array1 = np.array([[1, 2, 3, 4],  
                  [5, 6, 7, 8]])
```

```
print(array1)
```

Output

```
[[1 2 3 4]
```

```
[5 6 7 8]]
```

In the above example, we first created a 2D list (list of lists) `[[1, 2, 3, 4], [5, 6, 7, 8]]` with **2** rows and **4** columns. We then passed the list to the `np.array()` function to create a 2D array.