

# ASSIGNMENT 1

## 1. What is NumPy? Why should we use it?

NumPy is a popular Python library used for numerical and scientific computing. It provides a powerful array object, called ndarray, which supports efficient operations on large, multi-dimensional arrays and matrices. NumPy also includes mathematical functions to perform operations on arrays, such as linear algebra, statistical operations, and more.

### Why Use NumPy?

- **Performance:** NumPy arrays are more efficient than Python lists, especially when performing mathematical computations on large datasets.
- **Functionality:** Provides extensive support for mathematical and logical operations, Fourier transforms, and random number generation.
- **Convenience:** Simplifies operations on large datasets with vectorization, which allows for concise and readable code.
- **Integration:** Works well with other Python libraries such as pandas, matplotlib, and SciPy, making it ideal for data science and machine learning applications.

## 2. Write the steps to create 2D, and 3D array with output.

Here's how to create a 2D array (a matrix) with NumPy:

### Creating a 2D Array in NumPy

```
import numpy as np

# Creating a 2D array
array_2d = np.array([[1, 2, 3], [4, 5, 6]])
print("2D Array:")
print(array_2d)
```

#### Output:-

```
2D Array:
[[1 2 3]
 [4 5 6]]
```

### Creating a 3D Array in NumPy

For a 3D array, you can specify multiple layers, each containing a 2D matrix:

```
# Creating a 3D array
array_3d = np.array([[[1, 2, 3], [4, 5, 6]], [[7, 8, 9], [10, 11, 12]]])
print("3D Array:")
print(array_3d)
```

#### Output:

```
3D Array:
[[[ 1  2  3]
 [ 4  5  6]]

 [[ 7  8  9]
 [10 11 12]]]
```

**Explanation**

- **2D Array:** A collection of rows and columns, resembling a matrix or table structure.
- **3D Array:** An array containing multiple 2D arrays (or matrices), adding an extra dimension for depth.