

Lesson 1: NumPy Basics

1. Introduction

NumPy (Numerical Python) is the foundation of data science and machine learning in Python. It provides fast and efficient arrays, matrices, and mathematical operations.

2. Installation

```
pip install numpy
```

3. Importing NumPy

```
import numpy as np
```

4. Creating Arrays

```
# 1D array  
arr = np.array([10, 20, 30, 40, 50])
```

```
# 2D array
```

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

5. Array Properties

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

```
print(arr.ndim) # Dimensions
```

```
print(arr.shape) # Shape (rows, columns)
```

```
print(arr.size) # Total elements
```

```
print(arr.dtype) # Data type
```

6. Vectorized Operations

```
arr = np.arange(0, 20, 2) # [0,2,4,...,18]  
half = arr / 2
```

```
print(half)
```

Notes:

- Vectorized operations are faster than map() or loops.
- Used extensively in ML for dataset operations.

7. Challenge

1. Create a NumPy array: [10, 20, 30, 40, 50]
2. Print its dimension, shape, size, and data type.
3. Create another array from 0 to 20 with step 2 and divide all elements by 2 (vectorized style).