NumPy - Complete Guide

Introduction to NumPy

NumPy (Numerical Python) is a fundamental package for scientific computing with Python. It provides support for arrays, matrices and many mathematical functions.

Why Use NumPy?

- Faster than Python lists
- Supports large multidimensional arrays and matrices
- Has a large library of high-level mathematical functions

Installing NumPy

Use the command: pip install numpy

Creating NumPy Arrays

You can create arrays using numpy.array().

Example:

import numpy as np

arr = np.array([1, 2, 3])

Array Indexing and Slicing

NumPy allows powerful indexing and slicing to access and modify data.

Example:

arr[1:3] will return elements at index 1 and 2.

Array Operations

- Arithmetic: arr1 + arr2
- Statistical: np.mean(arr)
- Shape: arr.shape
- Reshape: arr.reshape((2,3))

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Useful NumPy Functions

- np.zeros(), np.ones(), np.eye(), np.arange(), np.linspace()
- np.sum(), np.min(), np.max(), np.sort()

Broadcasting

Allows NumPy to perform arithmetic operations on arrays of different shapes.

Random Module

NumPy has its own random module: np.random

Examples:

- np.random.rand()
- np.random.randint()

Matrix Operations

- Dot Product: np.dot()
- Transpose: arr.T
- Inverse: np.linalg.inv()