Department of Engineering Sciences and Technology,

Second Year Btech in Computer Science

Project Based Learning-Python

Assignment - 08

Name - Paritosh kolwadkar

SRN – 31231313

Roll no – 39

Batch – D2

Problem statement : Write a program in Python to install NumPy, create arrays using lists and built-in functions, and display the created arrays and their attributes.

Pre-requisites: Python installed on your system (preferably Python 3.6 or above).

Basic understanding of Python lists and arrays.

Ability to use the command line for installing Python libraries.

Code:

```
# Prerequisite: Install NumPy

# Run the following command in your terminal or command prompt to install NumPy:

# pip install numpy


import numpy as np


# Create arrays using lists

list_array = np.array([1, 2, 3, 4, 5])

print("Array created from a list:")

print(list_array)
```

```
print(f"Attributes: Shape={list_array.shape}, Data Type={list_array.dtype},
Size={list_array.size}, Dimensions={list_array.ndim}\n")


# Create arrays using built-in functions

zeros_array = np.zeros((2, 3))

print("Array of zeros:")

print(zeros_array)

print(f"Attributes: Shape={zeros_array.shape}, Data Type={zeros_array.dtype},
Size={zeros_array.size}, Dimensions={zeros_array.ndim}\n")


ones_array = np.ones((3, 2), dtype=int)

print("Array of ones:")

print(ones_array)

print(f"Attributes: Shape={ones_array.shape}, Data Type={ones_array.dtype},
Size={ones_array.size}, Dimensions={ones_array.ndim}\n")


arange_array = np.arange(0, 10, 2)

print("Array created with arange:")

print(arange_array)

print(f"Attributes: Shape={arange_array.shape}, Data Type={arange_array.dtype},
Size={arange_array.size}, Dimensions={arange_array.ndim}\n")


random_array = np.random.rand(2, 2)

print("Randomly generated array:")

print(random_array)

print(f"Attributes: Shape={random_array.shape}, Data Type={random_array.dtype},
Size={random_array.size}, Dimensions={random_array.ndim}")
```

Comparison and Output:

- **Installation of NumPy**:
  - Before executing the program, install NumPy using the command `pip install numpy`.
- **Creating Arrays**:
  - **Using Lists**:
    - `np.array()` converts a Python list into a NumPy array.
  - **Using Built-in Functions**:
    - `np.zeros((rows, columns))`: Creates an array filled with zeros.
    - `np.ones((rows, columns), dtype=type)`: Creates an array filled with ones, with an optional specified data type.
    - `np.arange(start, stop, step)`: Generates a sequence of numbers in array form.
    - `np.random.rand(rows, columns)`: Creates an array of the given shape with random values between 0 and 1.
- **Displaying Array Attributes**:
  - `shape`: Returns the dimensions of the array.
  - `dtype`: Returns the data type of elements in the array.
  - `size`: Total number of elements in the array.
  - `ndim`: Number of dimensions (axes) in the array.
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Output:

Array created from a list:

[1 2 3 4 5]

Attributes: Shape=(5,), Data Type=int64, Size=5, Dimensions=1

Array of zeros:

[[0. 0. 0.]

[0. 0. 0.]]

Attributes: Shape=(2, 3), Data Type=float64, Size=6, Dimensions=2

Array of ones:

[[1 1]

[1 1]

[1 1]]

Attributes: Shape=(3, 2), Data Type=int32, Size=6, Dimensions=2

Array created with arange:

[0 2 4 6 8]

Attributes: Shape=(5,), Data Type=int64, Size=5, Dimensions=1

Randomly generated array:

[[0.5488135 0.71518937]

 [0.60276338 0.54488318]]

Attributes: Shape=(2, 2), Data Type=float64, Size=4, Dimensions=2

Output Explained:

- **Array from a List**: Displays a 1D array with the specified attributes.
- **Zeros Array**: A 2D array filled with zeros.
- **Ones Array**: A 2D array of ones with an integer data type.
- **Arange Array**: A 1D array created with a range of values.
- **Random Array**: A 2D array with random float values.

The attributes (`shape`, `dtype`, `size`, `ndim`) provide essential details about the structure and content of the arrays.

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