NumPy

LESSON 3

What is NumPy?

- NumPy in Python is a library that is used to work with arrays and was created in 2005 by Travis Oliphant.
- NumPy library in Python has functions for working in domain of Fourier transform, linear algebra, and matrices.
- Python NumPy is an open-source project that can be used freely. NumPy stands for Numerical Python

How to install NumPy Python?

- pip install numpy
- import numpy
- numpy.__version__
- NumPy is a library for the Python programming language, designed to help you work with data.
- With NumPy, you can easily create arrays, which is a data structure that allows you to store multiple values in a single varia

Creating an Array:

- import numpy as np
- arr = np.array([1, 2, 3, 4, 5])
- print(arr)

Dimensions- Arrays:

- The following code will create a zero-dimensional array with a value 36.
- import numpy as np
- arr = np.array(36)
- print(arr)

Dimensions- Arrays:

- 1-Dimensional Array:
- Two Dimensional Arrays:
- Three Dimensional Arrays:
- To identify the dimensions of the array, we can use ndim as shown below:
- import numpy as np
- a = np.array(36)
- d = np.array([[[1, 2, 3], [4, 5, 6]], [[1, 2, 3], [4, 5, 6]]])
- print(a.ndim)
- print(d.ndim)

Operations using NumPy

- Using NumPy, a developer can perform the following operations –

  - Mathematical and logical operations on arrays.
  - Fourier transforms and routines for shape manipulation.
  - Operations related to linear algebra. NumPy has in-built functions for linear algebra and random number generation.

NumPy – Data Types

- Here is a list of the different Data Types in NumPy:

- bool_
- int_
- intc
- intp
- int8
- int16
- float_
- float64
- complex_
- complex64
- complex128

Data Type Objects (dtype)

- A data type object describes the interpretation of a fixed block of memory corresponding to an array, depending on the following aspects –

- Type of data (integer, float or Python object)
- Size of data
- Byte order (little-endian or big-endian)
- In case of structured type, the names of fields, data type of each field and part of the memory block taken by each field.
- If the data type is a subarray, its shape and data type

ndarray.shape

- ndarray.shape
- This array attribute returns a tuple consisting of array dimensions. It can also be used to resize the array.
- import numpy as np
- a = np.array([[1,2,3],[4,5,6]])
- print a.shape

ndarray.ndim

- # an array of evenly spaced numbers
- import numpy as np
- a = np.arange(24)
- print a

Some more NumPy

- numpy.itemsize
- numpy.flags
- NumPy – Array Creation Routines
- numpy.zeros
- NumPy – Indexing & Slicing
- NumPy – Advanced Indexing

NumPy – Advanced Indexing

- Integer Indexing
- Boolean Array Indexing
- NumPy – Broadcasting
- NumPy – Iterating Over Array
- NumPy – Array Manipulation

NumPy – Mathematical Functions

- Trigonometric Functions
- Functions for Rounding

Some more NumPy

- NumPy – Statistical Functions
- NumPy – Copies & Views
- numpy.matlib.eye()
- NumPy – Matplotlib
  - Matplotlib is a plotting library for Python. It is used along with NumPy to provide an environment that is an effective open-source alternative for MatLab. It can also be used with graphics toolkits like PyQt and wxPython.

In Class Activity

- Practice Exercise