
NumPy

What is NumPy

NumPy is an extension to the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large library of high-level mathematical functions to operate on these arrays.

--Wikipedia

→ NumPy is the fundamental library needed for scientific computing with Python

→ This contains:
- » N-dimensional array object
- » Array slicing methods
- » Array reshaping methods

→ Numerical routines in numpy:
- » Linear algebra functions
- » Fourier transforms
- » Random number capabilities

Why Numpy

→Arithmetic Operations can not applied directly on lists

Example:

```
>>> # List 1
>>> list1 = [9,8,7,6,5]
>>> # List 2
>>> list2 = [1,2,3,4,5]
>>> # Trying to Add the corresponding values in lists
>>> listSum = list1 + list2
>>> # Instead we receive the Union of list1 and list2
>>> print listSum
[9, 8, 7, 6, 5, 1, 2, 3, 4, 5]
```

→Hence we need efficient arrays with arithmetic and better multidimensional tools

→Numpy package provides arrays which are similar to lists, but much more capable, except fixed size

Numpy - ndarray

→ NumPy's main object is ndarray(homogeneous multidimensional array)

- » This is a table of elements (usually numbers), all of the same type, indexed by a tuple of positive integers
- » Dimensions → usually called axes,
- » Rank → number of axes

→ Examples of multidimensional arrays include vectors, matrices, images and spreadsheets

[9, 1, -1] → An array of rank 1 i.e. A matrix with 1 row and 3 columns

[[10 , 0.21, -30] , → An array of rank 2 (A matrix with 2 rows and 3 columns)
[1.9, 7.4 , 1.9]]