Welcome To Numpy Tutorial

In [1]:
```
import numpy as np
```

In [2]:
```
myarr=np.array([[1,3,4,5],[1,6,9,5]],np.int64)
```

In [3]:
```
myarr[1,2]
```

Out[3]:
```
9
```

In [4]:
```
myarr.shape
```

Out[4]:
```
(2, 4)
```

In [5]:
```
myarr.dtype
```

Out[5]:
```
dtype('int64')
```

In [6]:
```
myarr[1,3]=8
```

In [7]:
```
myarr
```

Out[7]:
```
array([[1, 3, 4, 5],
       [1, 6, 9, 8]], dtype=int64)
```

Array creation :conversion from other python structure

In [8]:
```
listarray=np.array([[1,2,3],[2,3,4],[6,3,1]])
```

In [9]:
```
listarray
```

Out[9]:
```
array([[1, 2, 3],
       [2, 3, 4],
       [6, 3, 1]])
```

In [10]:
```
listarray.shape
```

Out[10]:
```
(3, 3)
```

In [11]:
```
listarray.dtype
```

Out[11]:
```
dtype('int32')
```

In [12]:
```
listarray.size
```

Out[12]:
```
9
```

In [13]:
```
np.array([2,4,6])
```

Out[13]:
```
array([2, 4, 6], dtype=object)
```

In [14]:
```
zeros=np.zeros((2,5))
```

In [15]:
```
zeros
```

Out[15]:
```
array([[0., 0., 0., 0., 0.],
       [0., 0., 0., 0., 0.]])
```

In [16]:
```
range=np.arange(15)
```

In [17]:
```
range
```

Out[17]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14])
```

In [18]:
```
lspace=np.linspace(10,50,5)   #Equal space given
```

In [19]:
```
lspace
```

Out[19]:
```
array([10. , 20. , 30. , 40. , 50.])
```

In [20]:
```
emp=np.empty((2,1))
```

In [21]:
```
emp
```

Out[21]:
```
array([[-2.85366708e+254],
       [-2.85302980e-114]])
```

In [22]:
```
id=np.identity(45)
```

In [23]:
```
id
```

Out[23]:
```
array([[1., 0., 0., ..., 0., 0., 0.],
       [0., 1., 0., ..., 0., 0., 0.],
       [0., 0., 1., ..., 0., 0., 0.],
       ...,
       [0., 0., 0., ..., 1., 0., 0.],
       [0., 0., 0., ..., 0., 1., 0.],
       [0., 0., 0., ..., 0., 0., 1.]])
```

In [24]:
```
id.shape
```

Out[24]:
```
(45, 45)
```

In [25]:
```
arrayrange=np.arange(99)
```

In [26]:
```
array
```

Out[26]:
```
array([ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33,
       34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50,
       51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67,
       68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84,
       85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98])
```

In [27]:
```
array=array.reshape(3,33)
```

In [28]:
```
array
```

Out[28]:
```
array([[ 0,  1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15,
        16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31,
        32],
       [33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48,
        49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64,
        65],
       [66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81,
        82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97,
        98]])
```

In [29]:
```
array=array.ravel()
```

In [30]:
```
array.shape
```

Out[30]:
```
(99,)
```

Numpy Axis

In [31]:
```
x=[[1,5,3],[4,9,6],[2,8,9]]
```

In [32]:
```
arr=np.array(x)
```

In [33]:
```
arr
```

Out[33]:
```
array([[1, 5, 3],
       [4, 9, 6],
       [2, 8, 9]])
```

In [34]:
```
arr.sum(axis=0)
```

Out[34]:
```
array([ 7, 22, 18])
```

In [35]:
```
arr.sum(axis=1)
```

Out[35]:
```
array([ 9, 19, 19])
```

In [36]:
```
arr.T        #Transpose to array
```

Out[36]:
```
array([[1, 4, 2],
       [5, 9, 8],
       [3, 6, 9]])
```

In [37]:
```
arr.flat
```

Out[37]:
```
<numpy.flatiter at 0x46e3a00>
```

In [38]:
```
for item in arr.flat:
    print(item)
```

```
1
5
3
4
9
6
2
8
9
```

In [39]:
```
arr.ndim
```

Out[39]:
```
2
```

In [40]:
```
arr.size
```

Out[40]:
```
9
```

In [41]:
```
arr.nbytes
```

Out[41]:
```
36
```

In [42]:
```
one=np.array([2,54,435,0,2,1])
```

In [43]:
```
one
```

Out[43]:
```
array([  2,  54, 435,   0,   2,   1])
```

In [44]:
```
one.argmax()
```

Out[44]:
```
2
```

In [45]:
```
one.argsort()
```

Out[45]:
```
array([3, 5, 0, 4, 1, 2], dtype=int32)
```

In [46]:
```
arr
```

Out[46]:
```
array([[1, 5, 3],
       [4, 9, 6],
       [2, 8, 9]])
```

In [47]:
```
arr.argsort()
```

Out[47]:
```
array([[0, 2, 1],
       [0, 2, 1],
       [0, 1, 2]], dtype=int32)
```

In [48]:
```
arr.argmax()
```

Out[48]:
```
4
```

In [49]:
```
arr.argmin()
```

Out[49]:
```
0
```

In [50]:
```
arr.argmax(axis=0)
```

Out[50]:
```
array([1, 1, 2], dtype=int32)
```

In [51]:
```
arr.argmin(axis=1)
```

Out[51]:
```
array([0, 0, 0], dtype=int32)
```

In [52]:
```
arr.argmax(axis=1)
```

Out[52]:
```
array([1, 1, 2], dtype=int32)
```

In [53]:
```
arr.argmin(axis=0)
```

Out[53]:
```
array([0, 0, 0], dtype=int32)
```

In [54]:
```
arr.argsort(axis=0)
```

Out[54]:
```
array([[0, 0, 0],
       [2, 1, 1],
       [1, 2, 2]], dtype=int32)
```

In [55]:
```
arr.argsort(axis=1)
```

Out[55]:
```
array([[0, 2, 1],
       [0, 2, 1],
       [0, 1, 2]], dtype=int32)
```

In [56]:
```
arr.ravel()
```

Out[56]:
```
array([1, 5, 3, 4, 9, 6, 2, 8, 9])
```

In [58]:
```
arr
```

Out[59]:
```
array([[1, 5, 3],
       [4, 9, 6],
       [2, 8, 9]])
```

In [60]:
```
arr1=np.array([[2,5,8],[9,4,0],[3,6,1]])
```

In [62]:
```
arr1
```

Out[62]:
```
array([[2, 5, 8],
       [9, 4, 0],
       [3, 6, 1]])
```

In [63]:
```
result=arr+arr1
```

In [64]:
```
result
```

Out[64]:
```
array([[ 3, 10, 11],
       [13, 13,  6],
       [ 5, 14, 10]])
```

In [65]:
```
arr*arr1
```

Out[65]:
```
array([[ 2, 25, 24],
       [36, 36,  0],
       [ 6, 48,  9]])
```

In [66]:
```
np.sqrt(arr)
```

Out[66]:
```
array([[1.        , 2.23606798, 1.73205081],
       [2.        , 3.        , 2.44948974],
       [1.41421356, 2.82842712, 3.        ]])
```

In [67]:
```
np.square(arr)
```

Out[67]:
```
array([[ 1, 25,  9],
       [16, 81, 36],
       [ 4, 64, 81]], dtype=int32)
```

In [68]:
```
arr.sum()
```

Out[68]:
```
47
```

In [69]:
```
arr.min()
```

Out[69]:
```
1
```

In [70]:
```
arr.max()
```

Out[70]:
```
9
```

In [71]:
```
arr
```

Out[71]:
```
array([[1, 5, 3],
       [4, 9, 6],
       [2, 8, 9]])
```

In [72]:
```
np.where(arr>5)
```

Out[72]:
```
(array([1, 1, 2, 2], dtype=int32), array([1, 2, 1, 2], dtype=int32))
```

In [74]:
```
np.count_nonzero(arr)
```

Out[74]:
```
9
```

In [75]:
```
np.nonzero(arr)
```

Out[75]:
```
(array([0, 0, 0, 1, 1, 1, 2, 2, 2], dtype=int32),
 array([0, 1, 2, 0, 1, 2, 0, 1, 2], dtype=int32))
```

In [76]:
```
import sys
```

In [77]:
```
py_arr=[3,6,8,3]
```

In [78]:
```
np_arr=np.array(py_arr)
```

In [80]:
```
sys.getsizeof(1)*len(py_arr)
```

Out[80]:
```
56
```

In [81]:
```
np_arr.itemsize*np_arr.size
```

Out[81]:
```
16
```