Chapter - 9: NumPy

Access NumPy Array Elements

- Array elements can be accessed by its index number.
- Array index start with 0.
- Arrays also have the negative index , last element has index -1

1-D Array

Array a	1	2	3	4
Index	0	1	2	3
Negative Index	-4	-3	-2	-1

Example

```
import numpy as np
a = np.array([1, 2, 3, 4])
print('First Element : ', a[0])
print('Last Element : ', a[3])
print('Last Element : ', a[-1])
```

Output

```
First Element :  1
Last Element :  4
Last Element :  4
```

2-D Array

Index	**0**	**1**
0	1	2
1	3	4

Index for First Row Values 1- (0, 0) 2 – (0 , 1)
Index for Second Row Values 3- (1, 0) 4 – (1 , 1)

Negative Index for the Elements
Index for First Row Values 1- (-2, -2) 2 – (-2 , -1)
Index for Second Row Values 3- (-1, -2) 4 – (-1 , -1)

Example

```
import numpy as np
a = np.array([ [1, 2],[3, 4] ])
print('Array Elements')
print(a)

print('Array Elements using Index')
print( a[0, 0] , a[0, 1])
print( a[1,0],  a[1,1])

print('Array Elements using Negative Index')
print( a[-2, -2],  a[-2, -1])
print( a[-1,-2],  a[-1,-1])
```

Output

```
Array Elements
[ [ 1 2 ]
  [ 3 4 ] ]

Array Elements using Index
1  2
3  4

Array Elements using Negative Index
1  2
3  4
```

Slicing for Accessing Array Elements

We can access the elements of array by using the slicing [**start**: **end**] or [**start** : **end** : **step**].

[1 : 4]	means starting from 1 to 3 (4 is not included).
[: 4]	means starting from 0 to 3.
[1:]	means starting from 1 upto end.
[1 : 4 : 1]	means 1 , 2 , 3 . step 1 indicates the change in the index value
[1 : 4 : 2]	means 1, 3 . step value is 2.
[3 : 0 : -1]	means 3, 2,1 . step value is -1.
[-1 : -3 : -1]	means -1, -2. step value is -1.

Example -1

```
import numpy as np
a = np.array([ 1, 2, 3, 4 ])
print('Array Elements')
print(a)
print('Array Elements using Slicing Index')
print( a[1:4])
print(a[ :4])
print(a[1: ])
print(a[ : ])
print(a[1:4:1])
print(a[1:4:2])
print(a[3:0:-1])
print(a[-1:-3:-1])
```

Output

```
Array Elements
[1 2 3 4]
Array Elements using Slicing Index
[2 3 4]
[1 2 3 4]
[2 3 4]
[1 2 3 4]
[2 3 4]
[2 4]
[4 3 2]
[4 3]
```

Example -2

```
import numpy as np
a = np.array([ [1, 2, 3,4,5] , [6,7,8,9,10] ])
print('Array Elements')
print(a)
print('Array Elements using Slicing Index')
print('L-1 :', a[1,1:4])
print('L-2 :', a[1,:4])
print('L-3 :', a[1,1:])
print('L-4 :', a[1,:])
print('L-5 :', a[1,1:4:1])
print('L-6 :', a[1,1:4:2])
print('L-7 :', a[1,3:0:-1])
print('L-8 :', a[1,-1:-3:-1])
print('L-9 :', a[ 0:2 , 0:2])
```

Output

```
Array Elements
[ [ 1  2  3  4  5]
 [ 6  7  8  9 10] ]

Array Elements using Slicing Index
L-1 : [7 8 9]
L-2 : [6 7 8 9]
L-3 : [ 7  8  9 10]
L-4 : [ 6  7  8  9 10]
L-5 : [7 8 9]
L-6 : [7 9]
L-7 : [9 8 7]
L-8 : [10  9]
L-9 : [ [1 2]
        [6 7] ]
```

Example -3

```
import numpy as np

a = np.array([1, 2, 3,4,5])
print('Values of Array')
print(a)
print('Dimension of Array: ', a.ndim)

a = np.array([[1, 2], [3, 4]])
print('Values of Array')
print(a)
print('Dimension of Array: ',a.ndim)

a = np.array([1, 2, 3,4,5], ndmin = 2)
print('Values of Array')
print(a)
print('Dimension of Array: ',a.ndim)
```

Output

```
Values of Array
[1 2 3 4 5]
Dimension of Array:  1

Values of Array
[[1 2]
 [3 4]]
Dimension of Array:  2

Values of Array
[[1 2 3 4 5]]
Dimension of Array:  2
```