



# ***D.ATA SCIENCE INTER.NSHIP***

***Session 3***

HDLC TECHNOLOGIES



# NumPy Introduction

- NumPy is a Python library used for working with arrays.
- It also has functions for working in domain of linear algebra, fourier transform, and matrices.
- NumPy was created in 2005 by Travis Oliphant. It is an open source project and you can use it freely.
- NumPy stands for Numerical Python.





# Why Use NumPy?

- In Python we have lists that serve the purpose of arrays, but they are slow to process.
- NumPy aims to provide an array object that is up to 50x faster than traditional Python lists.
- The array object in NumPy is called **ndarray**
- Arrays are very frequently used in data science, where speed and resources are very important.



# Installation of NumPy

- If you have Python and PIP already installed on a system, then installation of NumPy is very easy.
- Install it using this command:
- `pip install numpy`.

# ***Example***

- `import numpy as np`

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

```
print(arr)
```

```
print(type(arr))
```

# ***Tuple as an array***

- `import numpy as np`

```
arr = np.array((1, 2, 3, 4, 5))
```

```
print(arr)
```

# ***2D array***

- `import numpy as np`

```
arr = np.array([[1, 2, 3], [4, 5, 6]])
```

```
print(arr)
```

# ***3D array***

- `import numpy as np`

```
arr = np.array([[[1, 2, 3], [4, 5, 6]],  
               [[1, 2, 3], [4, 5, 6]]])
```

```
print(arr)
```



# *Printing dimensions*

```
• import numpy as np

a = np.array(42)
b = np.array([1, 2, 3, 4, 5])
c = np.array([[1, 2, 3],
              [4, 5, 6]])
d = np.array([[[1, 2, 3],
               [4, 5, 6]], [[1, 2, 3],
                             [4, 5, 6]]])

print(a.ndim)
print(b.ndim)
print(c.ndim)
print(d.ndim)
```

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# *Array Indexing*

- `import numpy as np`

```
arr = np.array([1, 2, 3, 4])
```

```
print(arr[1])
```

```
arr = np.array([[1, 2, 3, 4, 5], [6, 7, 8, 9, 10]])
```

```
print('5th element on 2nd row: ', arr[1, 4])
```

```
arr = np.array([[[1, 2, 3], [4, 5, 6]], [[7, 8, 9], [10, 11, 12]]])
```

```
print(arr[0, 1, 2])
```

# *Array slicing*

- `import numpy as np`

```
arr = np.array([1, 2, 3, 4, 5, 6, 7])
```

```
print(arr[1:5])
```

# ***Array type***

- `import numpy as np`

```
arr = np.array([1, 2, 3, 4])
```

```
print(arr.dtype)
```



# *Array copy*

- `import numpy as np`

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

```
x = arr.copy()
```

```
arr[0] = 42
```

```
print(arr)
```

```
print(x)
```

# *Array view*

- `import numpy as np`

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

```
x = arr.view()
```

```
arr[0] = 42
```

```
print(arr)
```

```
print(x)
```

# ***Array shape***

- `import numpy as np`

```
arr = np.array([[1, 2, 3, 4], [5, 6, 7, 8]])
```

```
print(arr.shape)
```

# *Array Reshape*

- `import numpy as np`

```
arr = np.array([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12])
```

```
newarr = arr.reshape(4, 3)
```

```
print(newarr)
```

```
arr = np.array([1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12])
```

```
newarr = arr.reshape(2, 3, 2)
```

```
print(newarr)
```



# *Array iterating*

- `import numpy as np`

```
arr = np.array([1, 2, 3])
```

```
for x in arr:  
    print(x)
```

# ***Array join***

- import numpy as np

```
arr1 = np.array([1, 2, 3])
```

```
arr2 = np.array([4, 5, 6])
```

```
arr = np.concatenate((arr1, arr2))
```

```
print(arr)
```

```
arr1 = np.array([[1, 2], [3, 4]])
```

```
arr2 = np.array([[5, 6], [7, 8]])
```

```
arr = np.concatenate((arr1, arr2), axis=1)
```

```
print(arr)
```

# ***Array split***

- `import numpy as np`

```
arr = np.array([1, 2, 3, 4, 5, 6])
```

```
newarr = np.array_split(arr, 3)
```

```
print(newarr)
```

# *Array search*

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

- `import numpy as np`
- `arr = np.array([1, 2, 3, 4, 5, 6, 7, 8])`
- `x = np.where(arr%2 == 0)`
- `print(x)`



# *Array sort*

- `import numpy as np`  
`arr = np.array([3, 2, 0, 1])`  
`print(np.sort(arr))`
- `import numpy as np`  
`arr = np.array(['banana', 'cherry', 'apple'])`  
`print(np.sort(arr))`
-

# *Array filter*

```
• import numpy as np

arr = np.array([41, 42, 43, 44])

x = [True, False, True, False]

newarr = arr[x]

print(newarr)
```