



Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



JUNAID GIRKAR

60004190057

TE COMPS A-4

EXPERIMENT - 11

AIM: Make use of advance modules of Python like OpenCV, Matplotlib and Numpy

Numpy:

NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays.

It is the fundamental package for scientific computing with Python. It contains various features including these important ones:

- A powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Tools for integrating C/C++ and Fortran code
- Useful linear algebra, Fourier transform, and random number capabilities

Besides its obvious scientific uses, NumPy can also be used as an efficient multi-dimensional container of generic data.

Arbitrary data-types can be defined using Numpy which allows NumPy to seamlessly and speedily integrate with a wide variety of databases.

Code:

```
import numpy as np
```

```
np.zeros((2,3))
```

```
array([[0., 0., 0.],  
       [0., 0., 0.]])
```



Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



```
np.ones((2,3))
```

```
[[1. 1. 1.]  
 [1. 1. 1.]]
```

```
np.linspace(0, 50, 11)
```

```
array([ 0.,  5., 10., 15., 20., 25., 30., 35., 40., 45., 50.])
```

```
np.arange(12).reshape(4, 3)
```

```
array([[ 0,  1,  2],  
       [ 3,  4,  5],  
       [ 6,  7,  8],  
       [ 9, 10, 11]])
```

```
np.sin(np.pi/2)
```

```
1.0
```

```
np.cos(np.pi/2)
```

```
6.123233995736766e-17
```

```
a = np.array([[1,4,5],[8,2,4]])  
b = np.array([[9,6,7],[0,3,5]])
```

```
np.multiply(a,b)  # element wise
```



```
array([[ 9, 24, 35],  
       [ 0,  6, 20]])
```

```
np.matmul(a,b.transpose())    # matrix multiplication
```

```
array([[ 68, 37],  
       [112, 26]])
```

PANDAS

Pandas is an open-source library that is built on top of NumPy library. It is a Python package that offers various data structures and operations for manipulating numerical data and time series. It is mainly popular for importing and analyzing data much easier. Pandas is fast and it has high-performance & productivity for users.

Code:

```
import pandas as pd
```

```
data = [[23, 9.5],  
        [23, 26.5],  
        [27, 7.8],  
        [27, 17.8],  
        [39, 31.4],  
        [41, 25.9],  
        [47, 27.4],  
        [49, 27.2],  
        [50, 31.2],  
        [52, 34.6],  
        [54, 42.5],  
        [54, 28.8],  
        [56, 33.4],  
        [57, 30.2],  
        [58, 34.1],
```



Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



```
[58, 32.9],  
[60, 41.2],  
[61, 35.7]]
```

```
df = pd.DataFrame(data)  
df.columns = ['age', '%fat']
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 18 entries, 0 to 17  
Data columns (total 2 columns):  
#   Column  Non-Null Count  Dtype  
--  --  
0   age      18 non-null    int64  
1   %fat     18 non-null    float64  
dtypes: float64(1), int64(1)  
memory usage: 416.0 bytes
```

```
df.head()
```

	age	%fat
0	23	9.5
1	23	26.5
2	27	7.8
3	27	17.8
4	39	31.4

```
df.describe()
```

	age	%fat
count	18.000000	18.000000
mean	46.444444	28.783333
std	13.218624	9.254395



Shri Vile Parle Kelavani Mandal's

DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING

(Autonomous College Affiliated to the University of Mumbai)

NAAC Accredited with "A" Grade (CGPA : 3.18)



min	23.000000	7.800000
25%	39.500000	26.675000
50%	51.000000	30.700000
75%	56.750000	33.925000
max	61.000000	42.500000

MATPLOTLIB

Matplotlib is an amazing visualization library in Python for 2D plots of arrays. Matplotlib is a multi-platform data visualization library built on NumPy arrays and designed to work with the broader SciPy stack. It was introduced by John Hunter in the year 2002.

One of the greatest benefits of visualization is that it allows us visual access to huge amounts of data in easily digestible visuals. Matplotlib consists of several plots like line, bar, scatter, histogram etc.

Code:

```
%matplotlib inline
```

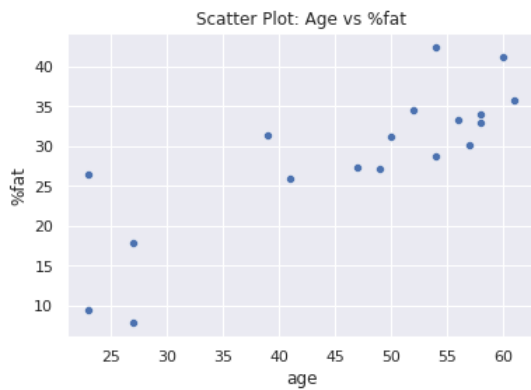
```
import seaborn as sns
```

```
import matplotlib.pyplot as plt
```

```
sns.set()
```

```
sns.scatterplot(x=df['age'], y=df['%fat'])
```

```
plt.title('Scatter Plot: Age vs %fat')
```



OpenCV

OpenCV is a huge open-source library for computer vision, machine learning, and image processing. OpenCV supports a wide variety of programming languages like Python, C++, Java, etc. It can process images and videos to identify objects, faces, or even the handwriting of a human. When it is integrated with various libraries, such as Numpy which is a highly optimized library for numerical operations, then the number of weapons increases in your Arsenal i.e whatever operations one can do in Numpy can be combined with OpenCV.

Code:

```
import cv2
```

```
img = np.ones([1000,2700,3], dtype=np.uint8)*255
```

```
# Letter E
```

```
cv2.line(img, (200, 250), (500, 250), (255, 0, 0), 20)
```

```
cv2.line(img, (200, 250), (200, 750), (255, 0, 0), 20)
```

```
cv2.line(img, (200, 750), (500, 750), (255, 0, 0), 20)
```

```
cv2.line(img, (200, 500), (500, 500), (255, 0, 0), 20)
```

```
# Letter X
```

```
cv2.line(img, (700, 250), (1000, 750), (255, 0, 0), 20)
```

```
cv2.line(img, (1000, 250), (700, 750), (255, 0, 0), 20)
```



Letter P

```
cv2.line(img, (1200, 250), (1500, 250), (255, 0, 0), 20)
```

```
cv2.line(img, (1200, 250), (1200, 750), (255, 0, 0), 20)
```

```
cv2.line(img, (1200, 500), (1500, 500), (255, 0, 0), 20)
```

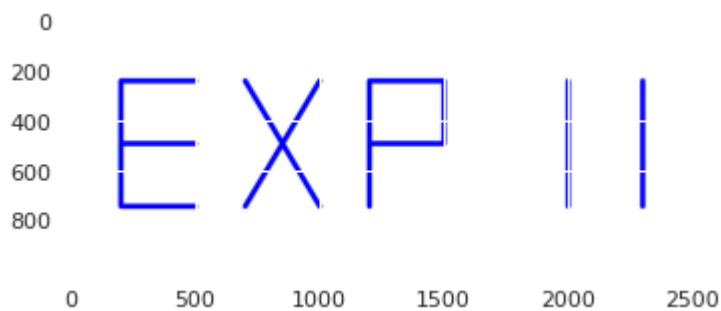
```
cv2.line(img, (1500, 250), (1500, 500), (255, 0, 0), 20)
```

Number 1

```
cv2.line(img, (2000, 750), (2000, 250), (255, 0, 0), 20)
```

```
cv2.line(img, (2300, 750), (2300, 250), (255, 0, 0), 20)
```

```
plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))
```



Conclusion: We learnt about different python modules like Numpy, Pandas, OpenCV and Matplotlib. We then implemented these modules in a python program.