

### Practical 1:

**AIM:** Python program to display details about the operating system, working directory, files and directories in the current directory, lists the files and all directories, scan and classify them as directories and files

```
import os

def scan_and_classify(path='.'):
    directories = []
    files = []
    for entry in os.listdir(path):
        full_path = os.path.join(path, entry)
        if os.path.isdir(full_path):
            directories.append(entry)
        elif os.path.isfile(full_path):
            files.append(entry)
    return directories, files

path = '.'
directories, files = scan_and_classify(path)
print("Directories:")
for directory in directories:
    print(directory)
print("\nFiles:")
for file in files:
    print(file)
```

## Output:

Directories:

.ipynb\_checkpoints

OS module

Files:

array.ipynb

array.py

Array\_to\_machine\_values.ipynb

Calculator.py

Coin flip.ipynb

l1.py

lab.py

os modules.ipynb

Pandas.ipynb

Question.txt

Random Array.ipynb

Rock Paper Scissor.ipynb

string\_symmetry.py

unit\_1.txt

Untitled.ipynb

Untitled1.ipynb

Untitled2.ipynb

## Practical 2:

**AIM:** Python program to convert an array to an array of machine values and vice versa

```
import struct

def array_to_machine_values(arr, format_char):
    return struct.pack(f'{len(arr)}{format_char}', *arr)

def machine_values_to_array(machine_values, format_char):
    num_elements = len(machine_values) // struct.calcsize(format_char)
    return list(struct.unpack(f'{num_elements}{format_char}', machine_values))

original_array = [10, 20, 30, 40]

format_char = 'i' # 'i' is for integer

machine_values = array_to_machine_values(original_array, format_char)

print(f"Machine values (bytes): {machine_values}")

restored_array = machine_values_to_array(machine_values, format_char)

print(f"Restored array: {restored_array}")
```

**Output:**

Machine values (bytes): b'\n\x00\x00\x00\x14\x00\x00\x00\x1e\x00\x00\x00(\x00\x00\x00'

Restored array: [10, 20, 30, 40]

### Practical 3:

**AIM:** Python program to get information about the file pertaining to the file mode and to get time values with components using local time and gm time.

```
import os

import time

def get_file_info(file_path):

    file_stat = os.stat(file_path)

    file_mode = oct(file_stat.st_mode) # Convert to octal string representation

    access_time = file_stat.st_atime # Time of last access

    modify_time = file_stat.st_mtime # Time of last modification

    change_time = file_stat.st_ctime # Time of last status change (creation time on Windows)

    access_time_local = time.localtime(access_time)

    modify_time_local = time.localtime(modify_time)

    change_time_local = time.localtime(change_time)

    access_time_gmt = time.gmtime(access_time)

    modify_time_gmt = time.gmtime(modify_time)

    change_time_gmt = time.gmtime(change_time)

    file_info = {

        "file_mode": file_mode,

        "access_time_local": time.strftime('%Y-%m-%d %H:%M:%S', access_time_local),

        "modify_time_local": time.strftime('%Y-%m-%d %H:%M:%S', modify_time_local),

        "change_time_local": time.strftime('%Y-%m-%d %H:%M:%S', change_time_local),

        "access_time_gmt": time.strftime('%Y-%m-%d %H:%M:%S', access_time_gmt),

        "modify_time_gmt": time.strftime('%Y-%m-%d %H:%M:%S', modify_time_gmt),

        "change_time_gmt": time.strftime('%Y-%m-%d %H:%M:%S', change_time_gmt),

    }

    return file_info
```

```
file_path = "Untitled2.ipynb"
file_info = get_file_info(file_path)
print(f"File Mode: {file_info['file_mode']}")
print(f"Access Time (Local): {file_info['access_time_local']}")
print(f"Modify Time (Local): {file_info['modify_time_local']}")
print(f"Change Time (Local): {file_info['change_time_local']}")
print(f"Access Time (GMT): {file_info['access_time_gmt']}")
print(f"Modify Time (GMT): {file_info['modify_time_gmt']}")
print(f"Change Time (GMT): {file_info['change_time_gmt']}")
```

## Output:

File Mode: 0o100666

Access Time (Local): 2024-09-19 20:30:25

Modify Time (Local): 2024-09-19 20:30:25

Change Time (Local): 2024-09-19 20:08:24

Access Time (GMT): 2024-09-19 15:00:25

Modify Time (GMT): 2024-09-19 15:00:25

Change Time (GMT): 2024-09-19 14:38:24

## Practical 4:

**AIM:** Python program to connect to Google using socket programming

```
import socket

def connect_to_google():

    s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

    host = 'www.google.com'

    port = 80 # HTTP port

    try:

        remote_ip = socket.gethostbyname(host)

        print(f"IP address of {host}: {remote_ip}")

        s.connect((remote_ip, port))

        print(f"Successfully connected to {host} on port {port}")

        request = "GET / HTTP/1.1\r\nHost: www.google.com\r\n\r\n"

        s.send(request.encode())

        response = b""

        while True:

            part = s.recv(4096)

            if not part:

                break

            response += part

        print(f"Received response from {host}:\n{response.decode('utf-8', errors='ignore')}")

    except socket.error as e:

        print(f"Socket error: {e}")

    finally:

        s.close()

# Run the example

connect_to_google()
```



**Output:**

```
IP address of www.google.com: 142.250.206.132
Successfully connected to www.google.com on port 80
Received response from www.google.com:
HTTP/1.1 200 OK
Date: Thu, 19 Sep 2024 15:18:54 GMT
Expires: -1
Cache-Control: private, max-age=0
Content-Type: text/html; charset=ISO-8859-1
Content-Security-Policy-Report-Only: object-src 'none';base-uri 'self';script-src 'nonce-uuc1UEABB0YXs97vNmsang' 'strict-dynamic' 'report-sample' 'unsafe-inline' 'unsafe-eval' 'unsafe-inline' https: http;;report-uri https://csp.withgoogle.com/csp/gws/other-hp
P3P: CP="This is not a P3P policy! See g.co/p3phelp for more info."
Server: gws
X-XSS-Protection: 0
X-Frame-Options: SAMEORIGIN
Set-Cookie: AEC=AVYB7cqk9cWUaJ1eJP1Br_kvdmEycxYg4iAZy7dd57mAiDBcdaPhZ0PzHU; expires=Tue, 18-Mar-2025 15:18:54 GMT; path=/; domain=.google.com; Secure; httpOnly; SameSite=lax
Set-Cookie: NID=517=YJcUaZZWPIWLoFCdUQ2ik4eGGze6wW__FdoTZEbxPz9UAFg1CT7k0fp8GExfM60jcg_wFZox0d0am-kdM9R2CrPK6h8_7uhuoaiIjhjJS_fCu002nVN5dseLXwcFKGIM28M48byY_F0pTcmzozEEJ-ch5W5gDNCgnrPlpmQxc9d2Yhz1Q1sGP44VzFyn43F1A; expires=Fri, 21-Mar-2025 15:18:54 GMT; path=/; domain=.google.com; HttpOnly
Accept-Ranges: none
Transfer-Encoding: chunked
```

5e5d

```
<doctype html><html itemscope="" itemtype="http://schema.org/WebPage" lang="en-IN"><head><meta content="text/html; charset=UTF-8" http-equiv="Content-
pe"><meta content="/images/branding/googleg/1x/googleg_standard_color_128dp.png" itemprop="image"><title>Google</title><script nonce="uucUEAB0YXs9Y7Vn
ang">(function(){var _g={kEI: '3kDsZpQoEMXP1e8P8sb52A8', kEXPI: '0, 3700262, 687, 432, 3, 48, 448480, 93005, 2891, 89155, 18161, 162437, 23024, 6699, 41946, 57737, 2, 2, 1,
632, 8155, 22350, 22436, 9779, 62657, 6050, 27515, 42644, 15816, 1804, 7734, 40983, 13493, 15783, 11106, 3075, 1490, 6109, 5303, 5213674, 146, 3, 56, 5991227, 2841670, 109, 27980,
6, 16672, 43887, 3, 1603, 3, 2124363, 23029351, 8163, 10336, 10736, 2728, 147, 58705, 22465, 11650, 10973, 15164, 8182, 49429, 21675, 6749, 155, 2, 2482, 13416, 5294, 2530, 9138, 74,
0, 2, 2, 3856, 328, 3217, 4, 1238, 1766, 1117, 19484, 4858, 5, 821, 36, 1669, 5633, 687, 2749, 2, 5045, 3, 5, 3010, 2695, 4479, 1892, 24, 4167, 5074, 710, 682, 283, 168, 213, 5844, 2005, 51,
7, 56, 353, 1860, 2, 9, 739, 4, 2350, 2121, 6, 3, 3296, 39, 716, 4134, 2379, 1484, 981, 528, 2767, 9672, 4826, 1342, 685, 1539, 1712, 2464, 797, 2545, 489, 2749, 2900, 1, 2642, 573, 1935, 5,
0, 2086, 156, 4, 3, 567, 2, 6485, 625, 3179, 376, 4144, 287, 2, 3, 126, 2, 3281, 831, 1344, 883, 1326, 2, 304, 256, 597, 1801, 301, 202, 14, 399, 120, 266, 14, 646, 612, 755, 3, 2, 1015, 25, 80,
580, 893, 293, 2740, 250, 3668, 224, 2, 3, 1451, 41, 685, 1228, 4, 2, 3, 640, 497, 230, 2, 2249, 81, 1018, 14, 2, 293, 1220, 2, 46, 299, 217, 5, 3144, 1358, 257, 126, 65, 2, 76, 2, 1827, 123,
2, 471, 259, 372, 12, 900, 47, 4, 253, 1025, 192, 219, 597, 621, 4, 94, 402, 3, 170, 124, 59, 162, 1346, 607, 54, 595, 105, 62, 92, 468, 146, 908, 40, 40, 390, 430, 516, 2, 145, 1, 771, 33, 135,
39, 140, 338, 508, 2, 5, 2, 431, 4, 1, 6, 173, 1549, 132, 144, 155, 116, 323, 74, 262, 2, 45, 1, 3, 7, 232, 16, 614, 66, 1465, 49, 75, 346, 119, 389, 556, 9, 389, 1056, 601, 1, 6, 85, 1017, 2399, 1,
9, 5, 425, 17, 1324, 342, 2, 21455626, 3, 1423, 3, 14475, 3, 16997, 18, 150, 438, 2685, 983275', kBL: '5q5S', kOPI: 89978449});(function(){var a;((a=window.google)==null?0:a.s
vsc)?google.kEI=_g.kEI:window.google=_g;}).call(this);})();(function(){google.sn='webhp';google.kHL='en-IN';})();(function(){
var h=this||self;function l(){return window.google!=""&&window.google.kOPI!=""&&window.google.kOPI!=0?window.google.kOPI:null;var m,n,=[];fun
tion p(a){for(var b;a&&(!a.getAttribute||!(b=a.getAttribute("eid"))));a=a.parentNode;return b||m}function q(a){for(var b=null;a&&(!a.getAttribute||!(b=a
getAttribute("leid"))));a=a.parentNode;return b}function r(a){/^http/i.test(a)&&window.location.protocol=="https:"&&(google.ml&&google.ml(Error("a"),
1, a, window.location))}});(function(){var a;((a=window.google)==null?0:a.svsc)?google.kEI=_g.kEI:window.google=_g;}).call(this);})();(function(){google.sn='webhp';google.kHL='en-IN';})();(function(){
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1, a, window.location))}});(function(){var a;((a=window.google)==null?0:a.svsc)?google.kEI=_g.kEI:window.google=_g;}).call(this);})();(function(){google.sn='webhp';google.kHL='en-IN';})();(function(){
var h=this||self;function l(){return window.google!=""&&window.google.kOPI!=""&&window.google.kOPI!=0?window.google.kOPI:null;var m,n,=[];fun
tion p(a){for(var b;a&&(!a.getAttribute||!(b=a.getAttribute("eid"))));a=a.parentNode;return b||m}function q(a){
```

## Practical 5

**AIM:** Python program to perform Array operations using Numpy package

```
import numpy as np
```

```
def array_operations():
```

```
    arr1 = np.array([10, 20, 30, 40])
```

```
    arr2 = np.array([50, 60, 70, 80])
```

```
    print("Array 1:", arr1)
```

```
    print("Array 2:", arr2)
```

```
    arr_add = np.add(arr1, arr2)
```

```
    print("\nAddition of arrays:", arr_add)
```

```
    arr_sub = np.subtract(arr2, arr1)
```

```
    print("Subtraction of arrays:", arr_sub)
```

```
    arr_mul = np.multiply(arr1, arr2)
```

```
    print("Multiplication of arrays:", arr_mul)
```

```
    arr_div = np.divide(arr2, arr1)
```

```
    print("Division of arrays:", arr_div)
```

```
    arr_dot = np.dot(arr1, arr2)
```

```
    print("\nDot product of arrays:", arr_dot)
```

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

```
    print("\nConcatenation of arrays:", arr_concat)
```

```
    arr_reshaped = np.reshape(arr_concat, (2, 4))
```

```
    print("\nReshaped array (2x4):\n", arr_reshaped)
```

```
    arr_transposed = np.transpose(arr_reshaped)
```

```
    print("\nTransposed array (4x2):\n", arr_transposed)
```

```
    max_element = np.max(arr1)
```

```
    print("\nMaximum element in Array 1:", max_element)
```

```
    min_element = np.min(arr2)
```

```
    print("Minimum element in Array 2:", min_element)
```

```
sum_elements = np.sum(arr1)
print("Sum of elements in Array 1:", sum_elements)
mean_elements = np.mean(arr2)
print("Mean of elements in Array 2:", mean_elements)
arr_slice = arr_concat[2:6]
print("\nSliced array (from index 2 to 5):", arr_slice)
array_operations()
```

## Output:

Array 1: [10 20 30 40]

Array 2: [50 60 70 80]

Addition of arrays: [ 60 80 100 120]

Subtraction of arrays: [40 40 40 40]

Multiplication of arrays: [ 500 1200 2100 3200]

Division of arrays: [5. 3. 2.33333333 2. ]

Dot product of arrays: 7000

Concatenation of arrays: [10 20 30 40 50 60 70 80]

Reshaped array (2x4):

[[10 20 30 40]

[50 60 70 80]]

Transposed array (4x2):

[[10 50]

[20 60]

[30 70]

[40 80]]

Maximum element in Array 1: 40

Minimum element in Array 2: 50

Sum of elements in Array 1: 100

Mean of elements in Array 2: 65.0

Sliced array (from index 2 to 5): [30 40 50 60]

## Practical 6

**AIM:** Python program to perform Data Manipulation operations using Pandas package.

```
import pandas as pd
import numpy as np

data = {
    'Name': ['Mayank', 'Nilesh', 'Taniya', 'Suhani', 'Rakesh'],
    'Age': [20, np.nan, 20, 19, 46],
    'City': ['Dwarka', 'Gurugram', 'Delhi', 'Chennai', 'Farrukhnagar'],
    'Salary': [90000, 80000, np.nan, 60000, 75000]
}

df = pd.DataFrame(data)

# 2. Basic DataFrame Operations
print("DataFrame:")
print(df)
print("\nFirst 3 rows:")
print(df.head(3))
print("\nDataFrame info:")
print(df.info())
print("\nDescriptive statistics:")
print(df.describe())

# 3. Indexing and Selection
print("\nSelecting 'Name' and 'City':")
print(df[['Name', 'City']])
```

#### # 4. Data Cleaning

```
print("\nDropping rows with missing values:")
df_cleaned = df.dropna()
print(df_cleaned)
print("\nFilling missing 'Age' with mean:")
df['Age'].fillna(df['Age'].mean(), inplace=True)
print(df)
```

#### # 5. Data Transformation

```
print("\nSorting by 'Salary':")
df_sorted = df.sort_values(by='Salary')
print(df_sorted)
print("\nGrouping by 'City' and calculating mean salary:")
print(df.groupby('City')['Salary'].mean())
```

#### # 6. Adding/Removing Columns

```
df['Experience'] = [2, 3, 1, 5, 4] # Adding a new column
print("\nDataFrame after adding 'Experience':")
print(df)
df.drop(columns=['Experience'], inplace=True) # Removing the 'Experience' column
print("\nDataFrame after dropping 'Experience':")
print(df)
```

#### # 7. Filtering and Boolean Indexing

```
print("\nFiltering for Age > 25:")
filtered_df = df[df['Age'] > 25]
print(filtered_df)
```

#### # 8. Merging and Joining

```
data2 = {  
    'City': ['New York', 'Los Angeles', 'Chicago', 'Houston', 'Phoenix'],  
    'State': ['NY', 'CA', 'IL', 'TX', 'AZ']  
}  
  
df2 = pd.DataFrame(data2)  
  
print("\nMerging DataFrames on 'City':")  
  
merged_df = pd.merge(df, df2, on='City')  
  
print(merged_df)
```

#### # 9. Time Series

```
date_range = pd.date_range(start='2024-01-01', periods=5)  
  
time_df = pd.DataFrame({'Date': date_range, 'Value': [10, 20, 30, 40, 50]})  
  
time_df.set_index('Date', inplace=True)  
  
print("\nTime Series DataFrame:")  
  
print(time_df)  
  
print("\nResampling to get monthly sum:")  
  
print(time_df.resample('M').sum())
```

#### # 10. Exporting Data

```
df.to_csv('output.csv', index=False)  
  
print("\nDataFrame exported to 'output.csv'.")
```

## Output:

```
Selecting 'Name' and 'City':
   Name      City
0  Mayank    Dwarka
1  Nilesch  Gurugram
2  Taniya    Delhi
3  Suhani    Chennai
4  Rakesh  Farrukhnagar

Dropping rows with missing values:
   Name  Age      City  Salary
0  Mayank  20.0    Dwarka  90000.0
3  Suhani  19.0    Chennai  60000.0
4  Rakesh  46.0  Farrukhnagar  75000.0

Filling missing 'Age' with mean:
   Name  Age      City  Salary
0  Mayank  20.00    Dwarka  90000.0
1  Nilesch  26.25  Gurugram  80000.0
2  Taniya  20.00    Delhi    NaN
3  Suhani  19.00    Chennai  60000.0
4  Rakesh  46.00  Farrukhnagar  75000.0

Sorting by 'Salary':
   Name  Age      City  Salary
3  Suhani  19.00    Chennai  60000.0
4  Rakesh  46.00  Farrukhnagar  75000.0
1  Nilesch  26.25  Gurugram  80000.0
0  Mayank  20.00    Dwarka  90000.0
2  Taniya  20.00    Delhi    NaN

Grouping by 'City' and calculating mean salary:
City
Chennai    60000.0
Delhi      NaN
Dwarka     90000.0
Farrukhnagar  75000.0
Gurugram   80000.0
Name: Salary, dtype: float64

DataFrame:
   Name  Age      City  Salary
0  Mayank  20.0    Dwarka  90000.0
1  Nilesch  NaN  Gurugram  80000.0
2  Taniya  20.0    Delhi    NaN
3  Suhani  19.0    Chennai  60000.0
4  Rakesh  46.0  Farrukhnagar  75000.0

First 3 rows:
   Name  Age      City  Salary
0  Mayank  20.0    Dwarka  90000.0
1  Nilesch  NaN  Gurugram  80000.0
2  Taniya  20.0    Delhi    NaN

DataFrame info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5 entries, 0 to 4
Data columns (total 4 columns):
#   Column  Non-Null Count  Dtype
---  -
0   Name    5 non-null      object
1   Age     4 non-null      float64
2   City    5 non-null      object
3   Salary  4 non-null      float64
dtypes: float64(2), object(2)
memory usage: 292.0+ bytes
None

Descriptive statistics:
      Age  Salary
count  4.000000    4.0
mean   26.250000  76250.0
std    13.175103  12500.0
min    19.000000  60000.0
25%    19.750000  71250.0
50%    20.000000  77500.0
75%    26.500000  82500.0
max    46.000000  90000.0
```



	Name	Age	City	Salary	Experience
0	Mayank	20.00	Dwarka	90000.0	2
1	Nilesh	26.25	Gurugram	80000.0	3
2	Taniya	20.00	Delhi	NaN	1
3	Suhani	19.00	Chennai	60000.0	5
4	Rakesh	46.00	Farrukhnagar	75000.0	4

DataFrame after dropping 'Experience':

	Name	Age	City	Salary
0	Mayank	20.00	Dwarka	90000.0
1	Nilesh	26.25	Gurugram	80000.0
2	Taniya	20.00	Delhi	NaN
3	Suhani	19.00	Chennai	60000.0
4	Rakesh	46.00	Farrukhnagar	75000.0

Filtering for Age > 25:

	Name	Age	City	Salary
1	Nilesh	26.25	Gurugram	80000.0
4	Rakesh	46.00	Farrukhnagar	75000.0

Merging DataFrames on 'City':

Empty DataFrame

Columns: [Name, Age, City, Salary, State]

Index: []

Time Series DataFrame:

	Value
Date	
2024-01-01	10
2024-01-02	20
2024-01-03	30
2024-01-04	40
2024-01-05	50

Resampling to get monthly sum:

	Value
Date	
2024-01-31	150

DataFrame exported to 'output.csv'.

## Practical 7

**AIM:** Python program to display multiple types of charts using Matplotlib package.

```
import pandas as pd

import matplotlib.pyplot as plt

import seaborn as sns

data=pd.read_csv(r"D:\Programming\Datasets\Dataset_1\dataset_1.csv")

top_7=data.sort_values(by='Revenue',ascending=False).head(7)

print("The top 7 sorted data of csv file : \n \n",top_7)

#Line plot

plt.plot(top_7['Revenue'],top_7['Country'],marker="o",color="Green")

plt.xlabel("Revenue")

plt.ylabel("Country")

#Bar Plot

plt.bar(top_7['Country'],top_7['Revenue'],width=0.5,color="Blue",alpha=0.75)

plt.xlabel("Country")

plt.ylabel("Revenue")

#Scatter Plot

plt.scatter(top_7['Revenue'],top_7['Country'],marker="o",color="Green")

plt.xlabel("Revenue")

plt.ylabel("Country")

#Histogram plot

plt.hist(top_7['Revenue'],bins=7,color="cyan",edgecolor="Red")

#Pie plot

plt.pie(top_7['Revenue'],labels=top_7['Country'],autopct='%1.1f')

#Area plot

plt.stackplot(top_7['Revenue'],top_7['Country'],color="Green",alpha=0.5)

plt.xlabel("Revenue")

plt.ylabel("Country")

#KDE plot
```

```
sns.kdeplot(top_7['Revenue'], fill=True, color="Blue", alpha=0.5,bw_adjust=0.5)
plt.show()
```

## Output:

The top 7 sorted data of csv file :

	Country	Revenue	Nüfus	Per person	Continent
0	USA	20410000	323766	63039	North America
1	China	14090000	1415045	9957	Asia
2	Japan	5170000	127185	40649	Asia
3	Germany	4210000	82293	51158	Europe
4	England	2940000	66573	44162	Europe
5	France	2930000	65233	44915	Europe
6	India	2850000	1354051	2104	Asia





