PRESIDENCY UNIVERSITY

# Laboratory Certificate

This is to certify that Mr. Raghavendra N Reg No 20201ISB0014 has satisfactorily completed the course of Experiments in DATA HANDLING AND VISUALIZATION Prescribed by the PRESIDENCY UNIVERSITY in The Laboratory of this College in the year 2023 - 2024

Signature of the Lecturer

DATE: in Charge

# INDEX

# LABSHEET-1
# INTRODUCTION TO NUMPY

```
  import numpy as np
a=np.array([1,2,3])
b=np.array([1,2,3])
add=np.add(a,b) add
```
array([2, 4,
6])
```
a=np.array([5,10,20]
)
b=np.array([4,8,10])
sub=np.subtract(a,b) sub
```
array([ 1, 2,
10])
```
a=np.array([5,10,20])
b=np.array([4,8,10])
sub=np.multiply(a,b)
sub
```
array([ 20, 80,
200])
```
```
    a=np.array([5,7,9]
)
b=np.array([4,5,6]
)
sub=np.mod(a,b) sub
```
array([1, 2, 3])
```
a=np.array([1,2,3]
)
b=np.array([1,2,3]
)
  add=np.power(a,b) add
```
array([ 1, 4,
27])

**Series creation**

```
   import pandas as pd import numpy as np
data=np.array(['a','b','c','d'])  s=pd.Series(data) print(s)
0
```
a
```
1  b


2


3  c


d


dtype: object
```
```

**Series with index**

```
import pandas as pd import numpy as np data=np.array(['a','b','c','d'])
s=pd.Series(data,index=[101,102,103,104]) print(s)
```

```
101  a
102  b
103  c
104  d
dtype:
object
```

**Series with Dictionary**

```
   import pandas as pd import numpy as
np  data={'a':  0.,'b':  1.,'c':  2.}
s=pd.Series(data) print(s)
```

```
   a
0.0
b    1.0
c    2.0
dtype: float64
```

**Series with Dictionary with index**

```
   import pandas as pd import numpy as
np
data={'a':         0.,'b':        1.,'c':        2.}
s=pd.Series(data,index=['b','c','d','a']) print(s)
```

```
   b
    1.0 c
   2.0 d
    NaN a
   0.0
dtype: float64
```

**Create Series from Scalar**

```
   import pandas as pd import numpy as
np s= pd.Series(5, index=[0,1,2,3])
print(s)
```

```
   0  5
     1     5
     2     5
     3     5
dtype: int64
```

**Retrieving data from the zeroth position**

```
import     pandas      as    pd          s=
pd.Series([1,2,3,4,5],index=['a','b','c','d','e']) print(s[0])
```

```
1
  import
pandas as pd  s=
pd.Series([100,101,102,103,104,105,106,107,108,109,110],index=['a','b','c','d','e','f'
,
' g
','h','i','j','k']
) print(s[:3])
```

```
a 100 b
     101
c    102
dtype: int64      import pandas as pd  s=
pd.Series([100,101,102,103,104,105,106,107,108,109,110],index=['a','b','c','d','e','f'
,
' g ','h','i','j','k'])
print(s[2:8])
```

```
  c
     102 d
     103 e
     104 f
     105 g
     106 h
      107
dtype: int64
```

**Using lable value**

```
import pandas as pd  s=
pd.Series([100,101,102,103,104,105,106,107,108,109,110],index=['a','b','c','d','e','f'
,
' g
','h','i','j','k']) print(s['a']) 100 import pandas as pd s=
pd.Series([100,101,102,103,104,105,106,107,108,109,110],index=['a','b','c','d','e','f'
,
' g
','
h',
'i'
,'j
','
k']
)
pri
nt(
s[[
'a'
,'e
','
i',
'd'
]])
```

```
a
100 e
104 i
108 d
103
dtype: int64
```

**Data Frames**

```
import pandas as pd
df=pd.read_csv("/content/nyc_weather.csv")
```

**Create data frame with empty data**

```
import pandas as pd
df=pd.DataFrame()  print(df)
```

```
Empty DataFrame Columns: []
Index: []
```

**Create data frame from list**

```
import  pandas  as  pd data=[1,2,3,4,5]  df=pd.DataFrame(data)
print(df)
```

```
    0
0  1
1  2
2  3
3  4
4  5
```

```
import  pandas  as  pd  data=[['Alex',10],['Bob',12],['Clarke',13]
]  df=pd.DataFrame(data,columns=['Name','Age']) print(df) Name
Age
Alex  10
Bob  12
Clarke 13
```

```
import pandas as pd  data=[['Dha',21, 10001,'A'],['Sha',23,
10002,'B'],['Dee',22, 10003,'C']]
df=pd.DataFrame(data,columns=['Name','Age','Rollno','Sec'],dtype=float) print(df)
```

```
   Name Age Rollno Sec
0  Dha 21.0 10001.0 A
1  Sha 23.0 10002.0 B
2  Dee 22.0 10003.0 C
<ipython-input-31-f22448152035>:3: FutureWarning: Could not cast to float64, falling
back to object. This behavior is deprecated. I
df=pd.DataFrame(data,columns=['Name','Age','Rollno','Sec'],dtype=float)
```

**Cretae data frame from Dictionary**

```
  import pandas as
pd
data={'Name':['Tom','Jack','Steve','Ricky'],'Age':[23,25,22,29]
}  df=pd.DataFrame(data,index=['rank1','rank2','rank3','rank4'])
print(df)
```

```
 Name Age rank1
     Tom 23 rank2
     Jack 25 rank3
```

# 20201ISB0014

Steve 22 rank4 Ricky
29

# LABSHEET-2 WORKING WITH PANDAS

```
import pandas as pd    def
load_data(): df_all =
pd.read_csv('/content/train.csv')
return df_all.loc[:300,['Survived','Pclass','Sex','Cabin','Embarked']].dropna()
df=load_data()
```

```
df.head()
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **0** | 0 | 1 | male | C30 | S |
| **1** | 1 | 1 | female | D33 | C |
| **9** | 1 | 3 | male | E121 | S |
| **10** | 1 | 1 | female | B22 | S |
| **14** | 0 | 1 | male | B51 B53 B55 | S |

**FINDING DUPLICATE ROWS**

```
df.Cabin.duplicated()
```

```
False
False
9     False
10    False
14  False
...
271  False
278  False
286  False
False
False
Name: Cabin, Length: 80, dtype: bool
df.duplicated()
False
False
9     False
10    False
14  False
...
271  False
278  False
286  False
False
False
Length: 80, dtype: bool
df.duplicated(subset=['Survived','Pclass','Sex'])
False
False
9     False
10     True
14  True
...
271  True
278  True
286  True
299   True
300   True
```

```
Length: 80, dtype: bool
```

**COUNTING DUPLICATES AND NON DUPLICATES**

```
df.Cabin.duplicated().sum()
```

```
11 df.duplicated().sum() 3
```

```
df.duplicated(subset=['Survived','Pclass','Sex']).sum()
70
(~df.duplicated()).sum() 77
EXTRACTING DUPLICATE ROWS USING
LOC      df.loc[df.duplicated(),
:]
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **138** | 1 | 2 female | F33 | S | |
| **169** | 1 | 1 female | B77 | S | |
| **237** | 1 | 1 female B96 B98 | S | | |

**USING KEEP**

```
df.loc[df.duplicated(keep='first'),
:]
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **138** | 1 | 2 female | F33 | S | |
| **169** | 1 | 1 female | B77 | S | |
| **237** | 1 | 1 female B96 B98 | S | | |

```
df.loc[df.duplicated(keep='last'), :]
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **36** | 1 | 1 female | B77 | S | |
| **77** | 1 | 1 female B96 B98 | S | | |
| **134** | 1 | 2 female | F33 | S | |

```
df.loc[df.duplicated(keep=False),
:]
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **36** | 1 | 1 female | B77 | S | |
| **77** | 1 | 1 female B96 B98 | S | | |
| **134** | 1 | 2 female | F33 | S | |
| **138** | 1 | 2 female | F33 | S | |
| **169** | 1 | 1 female | B77 | S | |
| **237** | 1 | 1 female B96 B98 | S | | |

**DROPPING DUPLICATED ROWS**

```
df.drop_duplicates()
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **0** | 0 | 1 | male | C30 | S |
| **1** | 1 | 1 | female | D33 | C |
| **9** | 1 | 3 | male | E121 | S |

| | | | | | | |
|---|---|---|---|---|---|---|
| **10** | 1 | 1 | female | B22 | S |
| **14** | 0 | 1 | male | B51 B53 B55 | S |
| **...** | ... | ... | ... | ... | ... |
| **271** | 1 | 1 | male | C93 | S |
| **278** | 0 | 1 | male | C111 | C |
| **286** | 1 | 1 | male | C148 | C |
| **299** | 1 | 1 | female | D21 | S |
| **300** | 1 | 2 | male | F2 | S |

77 rows × 5 columns

```
df.drop_duplicates(keep=False)
```

| | Survived | Pclass | Sex | Cabin | Embarked |
|---|---|---|---|---|---|
| **0** | 0 | 1 | male | C30 | S |
| **1** | 1 | 1 | female | D33 | C |
| **9** | 1 | 3 | male | E121 | S |
| **10** | 1 | 1 | female | B22 | S |
| **14** | 0 | 1 | male | B51 B53 B55 | S |
| **...** | ... | ... | ... | ... | ... |
| **271** | 1 | 1 | male | C93 | S |
| **278** | 0 | 1 | male | C111 | C |
| **286** | 1 | 1 | male | C148 | C |
| **299** | 1 | 1 | female | D21 | S |
| **300** | 1 | 2 | male | F2 | S |

74 rows × 5 columns

## LABSHEET-3 DATA CLEANING

```
import pandas as pd import numpy
as np
df=pd.read_csv('/content/2,1 dataset
titanic.csv')
   cols=['Name','Ticket','Cabin']
df=df.drop(cols,axis=1) df.info()
```

```
<class 'pandas.core.frame.DataFrame'> RangeIndex: 891 entries, 0 to 890 Data
columns (total 9 columns):
 #  Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0  PassengerId  891 non-null    int64
 1  Survived     891 non-null    int64
 2  Pclass       891 non-null    int64
 3  Sex          891 non-null    object
 4  Age          714 non-null    float64
 5  SibSp        891 non-null    int64
 6  Parch        891 non-null    int64
 7  Fare         891 non-null    float64
 8  Embarked     889 non-null    object dtypes: float64(2), int64(5), object(2) memory usage:
62.8+ KB     df=df.dropna()
df.info()
```

```
<class 'pandas.core.frame.DataFrame'> Int64Index: 712 entries, 0 to 890 Data
columns (total 9 columns):
 #  Column       Non-Null Count  Dtype
```

```
 0  PassengerId    712 non-null  int64
 1  Survived  712 non-null int64
 2  Pclass  712 non-null int64
 3  Sex    712 non-null object
 4  Age    712 non-null float64
 5  SibSp    712 non-null int64
 6  Parch    712 non-null int64
 7  Fare    712 non-null float64
 8  Embarked  712 non-null object dtypes: float64(2), int64(5), object(2) memory usage:
55.6+ KB   dummies=[] cols=['Pclass','Sex','Embarked'] for col in cols:
dummies.append(pd.get_dummies(df[col]))
titanic_dummies=
pd.concat(dummies,axis=1)      df=
pd.concat((df,titanic_dummies), axis=1)
df=
df.drop(['Pclass','Sex','Embarked'],axis=1
)      df['Age'] = df['Age'].interpolate()
print(df)
```

```
   PassengerId Survived Age SibSp Parch     Fare 1 2 3 female \
0  1        0 22.0  1         0 7.2500 0 0 1  0
1  2        1 38.0  1         0 71.2833 1 0 0  1
2  3        1 26.0  0         0 7.9250 0 0 1  1
3  4        1 35.0  1         0 53.1000 1 0 0  1
4  5 0 35.0 0 0 8.0500 0 0 1 0 .. ... ... ... ... ... ... ... .. .. .. ... 885 886 0 39.0 0 5 29.1250 0 0 1 1
886   887       0        27.0  0   0       13.0000 0 1 0   0
887   888    1           19.0  0          0        30.0000 1 0 0   1
889  890  1  26.0  0  0  30.0000 1 0 0  0 890  891  0  32.0  0  0
7.7500 0 0 1  0


male C Q S 0 1 0 0

1

1        0       1 0 0

2        0       0 0 1

3        0       0 0 1

4        1       0 0 1  ..        ... .. .. ..


       885  0 0 1 0
       886  1 0 0 1
       887  0 0 0 1
       889  1 1 0 0
       890  1 0 1 0
```

[712 rows x 14 columns]

**MIN MAX SCALAR STANDARDIZATION**  from sklearn.preprocessing import MinMaxScaler data=[[-1,2],[-0.5,6],[0,10],[1,18]] scaler=MinMaxScaler()
print(scaler.fit(data)) print('  ')
MinMaxScaler()
print(scaler.data_max_) print('  ')
print('scaler.transform(data)')

```
MinMaxScaler() [ 1. 18.]
```

```
scaler.transform(data)
from numpy import asarray
from sklearn.preprocessing import StandardScaler data=asarray([[100,0.001],
[8,0.05],
[50,0.005],
[88,0.07], [4,0.1]])
print(data)
scaler= StandardScaler()
scaled = scaler.fit_transform(data) print(scaled)
```

```
[[1.0e+02 1.0e-03]
[8.0e+00 5.0e-02]
[5.0e+01 5.0e-03]
[8.8e+01 7.0e-02]
[4.0e+00 1.0e-01]]
[[ 1.26398112 -1.16389967]
[-1.06174414 0.12639634]
[ 0. -1.05856939]
[ 0.96062565 0.65304778]   [-1.16286263
1.44302493]]
  from      sklearn.preprocessing     import     MinMaxScaler     data=[[-1,2],[-
0.5,6],[0,10],[1,18]] scaler=MinMaxScaler()
print(scaler.fit(data))      MinMaxScaler()
print(scaler.data_max_)
print('scaler.transform(data)')
```

```
MinMaxScaler() [ 1. 18.] scaler.transform(data)
```

## LABSHEET-4 Z-SCORE NORMALIZATION

```
import        numpy  as  np  data=
[1,2,2,2,3,1,1,15,2,2,2,3,1,1,2] mean= np.mean(data)
std= np.std(data)   print("mean of the dataset ids",
mean) print("std is", std) threshold=3 outlier=[] for
i in data: z=(imean)/std if z>threshold:
outlier.append(i)  print("outlier in dataset is",
outlier)
```

```
mean of the dataset ids
2.6666666666666665 std is
3.3598941782277745
outlier in dataset is [15]
```

**LABSHEET-5 OUTLIER DETECTION WITH IQR**

```
import numpy as np   import seaborn as
sns  data=[6,2,3,4,5,1,50]
sort_data=np.sort(data) sort_data
array([ 1, 2, 3, 4, 5, 6, 50])
```

```
Q1=-np.percentile(data, 25, interpolation = 'midpoint') Q2=-np.percentile(data, 50,
interpolation = 'midpoint') Q3=-np.percentile(data, 75, interpolation = 'midpoint')
print('Q1 25 percentile of the given data is, ', Q1) print('Q2 50 percentile of the
given
data is, ', Q2) print('Q3 75 percentile of the given data is, ',
Q3)   IQR = Q3 - Q1 print('IQR is', IQR)
Q1 25 percentile of the given data is, -2.5 Q2 50 percentile of the given data is,
4.0 Q3 75 percentile of the given data is, -5.5 IQR is -3.0
low_lim = Q1 - 1.5 * IQR up_lim = Q3 + 1.5 * IQR
```

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## LABSHEET-6 MATPLOTLIB

```
import pandas as pd  import numpy as np  import matplotlib.pyplot as plt
df=pd.read_csv("/content/Toyota.csv", index_col = 0, na_values = ['??','???'])
df.info()
```

```
<class 'pandas.core.frame.DataFrame'> Index: 1436 entries, 0 to 1435 Data columns (total 10 columns):
 #  Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0  Price       1436 non-null   int64
 1  Age         1336 non-null   float64
 2  KM          1421 non-null   float64
 3  FuelType    1336 non-null   object
 4  HP          1436 non-null   object
 5  MetColor    1286 non-null   float64
 6  Automatic   1436 non-null   int64
 7  CC          1436 non-null   int64
 8  Doors       1436 non-null   object
 9  Weight      1436 non-null   int64
dtypes: float64(3), int64(4), object(3) memory usage: 123.4+ KB
```

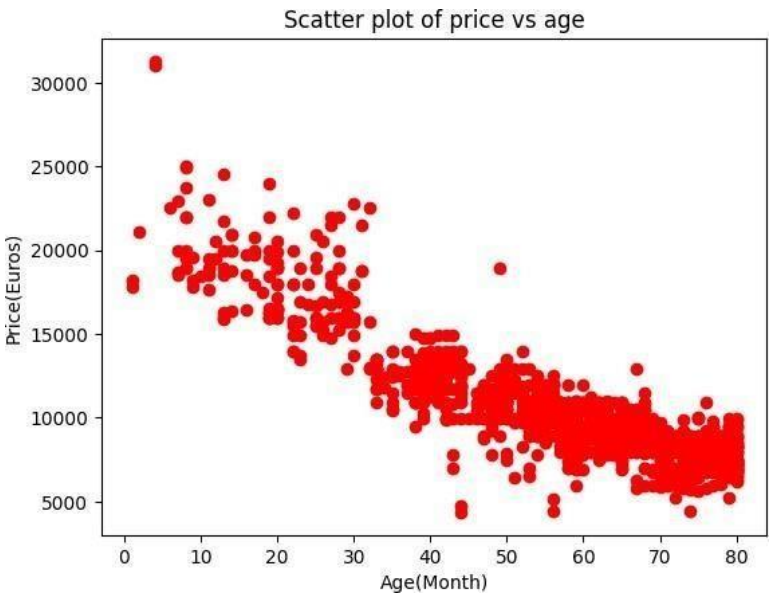
```
df.dropna(axis=0,inplace=True) df
```

| | Price | Age | KM | FuelType | HP | MetColor | Automatic | CC | Doors | Weight |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 13500 | 23.0 | 46986.0 | Diesel | 90 | 1.0 | 0 | 2000 | three | 1165 |
| **1** | 13750 | 23.0 | 72937.0 | Diesel | 90 | 1.0 | 0 | 2000 | 3 | 1165 |
| **3** | 14950 | 26.0 | 48000.0 | Diesel | 90 | 0.0 | 0 | 2000 | 3 | 1165 |
| **4** | 13750 | 30.0 | 38500.0 | Diesel | 90 | 0.0 | 0 | 2000 | 3 | 1170 |
| **5** | 12950 | 32.0 | 61000.0 | Diesel | 90 | 0.0 | 0 | 2000 | 3 | 1170 |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **1423** | 7950 | 80.0 | 35821.0 | Petrol | 86 | 0.0 | 1 | 1300 | 3 | 1015 |
| **1424** | 7750 | 73.0 | 34717.0 | Petrol | 86 | 0.0 | 0 | 1300 | 3 | 1015 |
| **1429** | 8950 | 78.0 | 24000.0 | Petrol | 86 | 1.0 | 1 | 1300 | 5 | 1065 |
| **1430** | 8450 | 80.0 | 23000.0 | Petrol | 86 | 0.0 | 0 | 1300 | 3 | 1015 |
| **1435** | 6950 | 76.0 | 1.0 | Petrol | 110 | 0.0 | 0 | | | |

1600 5 1114 1099 rows × 10 columns

**SCATTER PLOT**

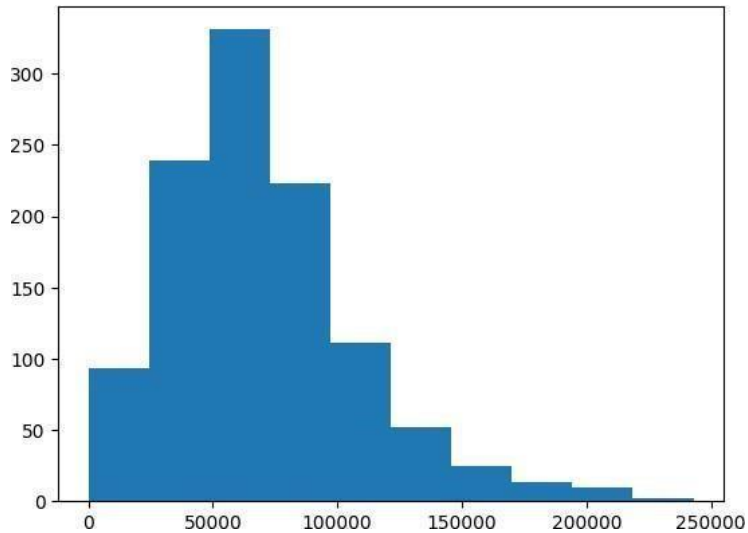
```
plt.scatter(df['Age'], df['Price'], c='red') plt.title('Scatter plot of price vs age') plt.xlabel('Age(Month)') plt.ylabel('Price(Euros)') plt.show()
```




**HISTOGRAM**

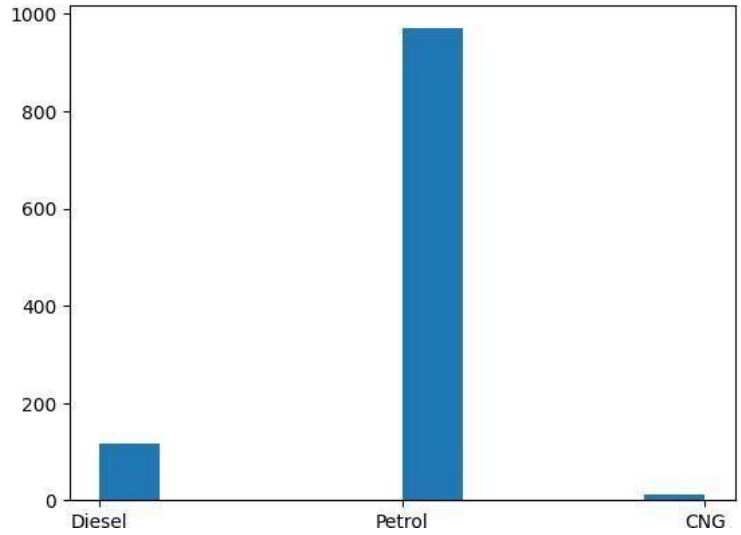
```
plt.hist(df['KM'])
```

```
(array([ 93., 239., 331., 223., 111., 52., 25., 13., 10., 2.]), array([1.000000e+00,
2.430090e+04, 4.860080e+04, 7.290070e+04,
9.720060e+04, 1.215005e+05, 1.458004e+05, 1.701003e+05,
1.944002e+05, 2.187001e+05, 2.430000e+05]), <BarContainer
object of 10 artists>)
```

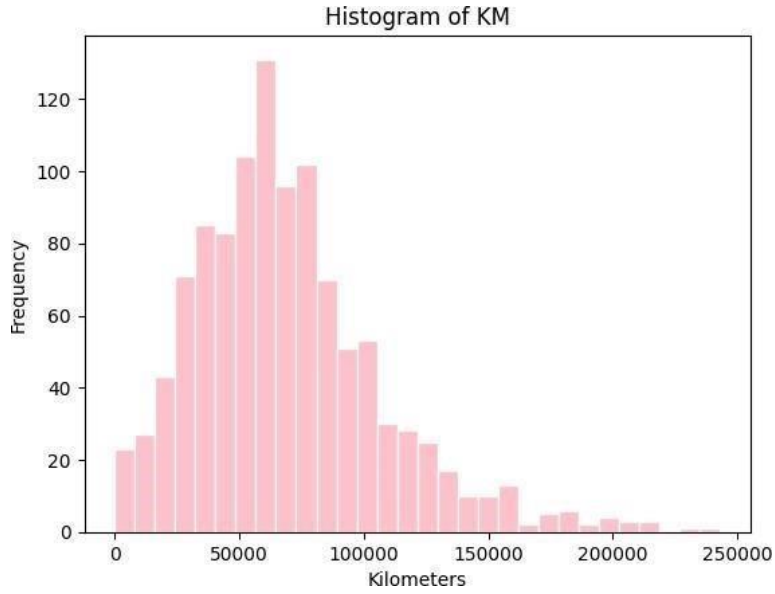



```
plt.hist(df['FuelType'])
```

```
(array([117.,  0., 0., 0., 0., 970., 0., 0., 0., 12.]),  array([0.
 , 0.2, 0.4, 0.6, 0.8, 1. , 1.2, 1.4, 1.6, 1.8, 2. ]),
 <BarContainer object of 10 artists>)
```

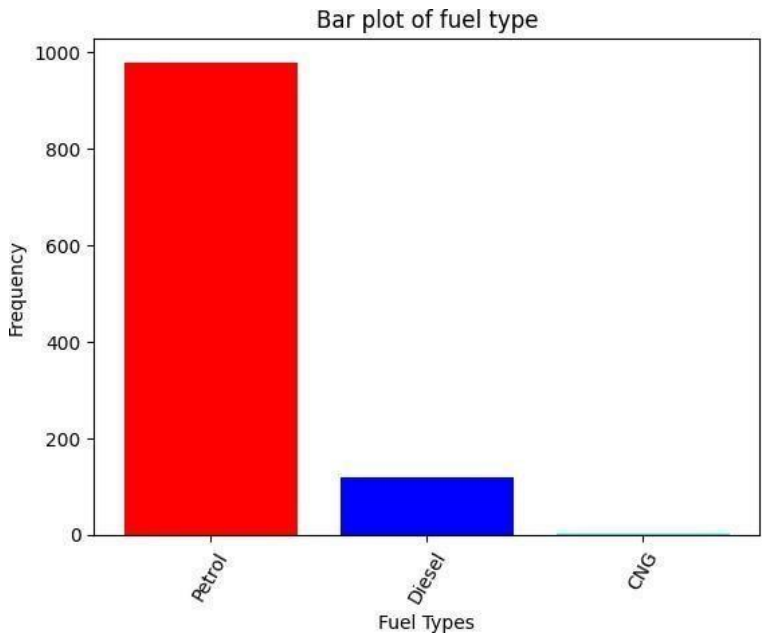



```
   plt.hist(df['KM'],color='pink',edgecolor='white',bins=30)  plt.title('Histogram  of
KM') plt.xlabel('Kilometers') plt.ylabel('Frequency') plt.show()
```




**BAR PLOT**

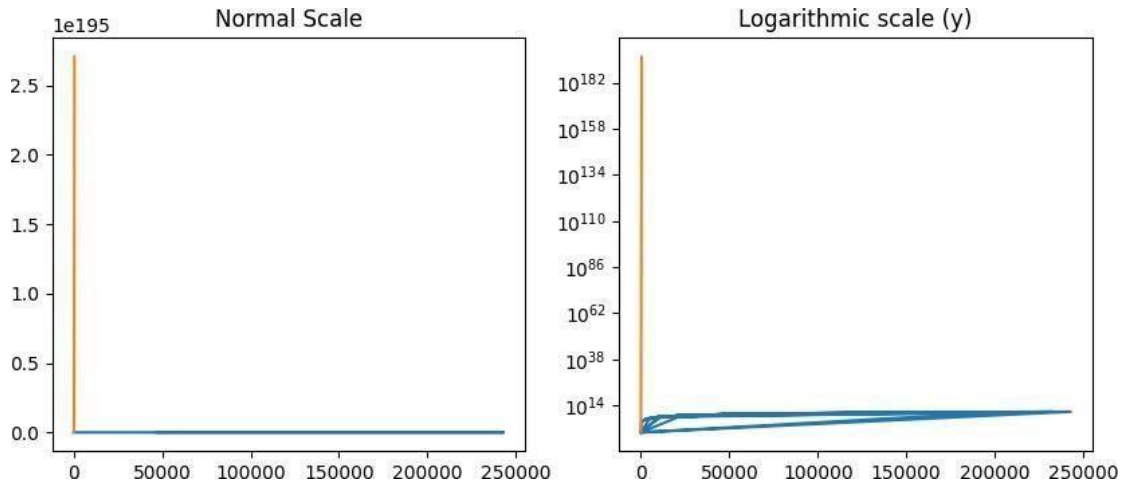
```
counts = [979,120,2] fueltype= ('Petrol','Diesel','CNG') index=
np.arange(len(fueltype))     plt.bar(index,counts,color=['red','blue','cyan'])
plt.title('Bar plot of fuel  type') plt.xlabel('Fuel Types') plt.ylabel('Frequency')
plt.xticks(index, fueltype, rotation= 60) plt.show()
```




**LINE PLOT**

```
fig, axes = plt.subplots(1, 2, figsize=(10,4)) x=df['KM']
axes[0].plot(x, x**2, x, np.exp(x)) axes[0].set_title("Normal Scale")
axes[1].plot(x, x**2, x, np.exp(x))
axes[1].set_yscale("log") axes[1].set_title("Logarithmic scale (y)")
```

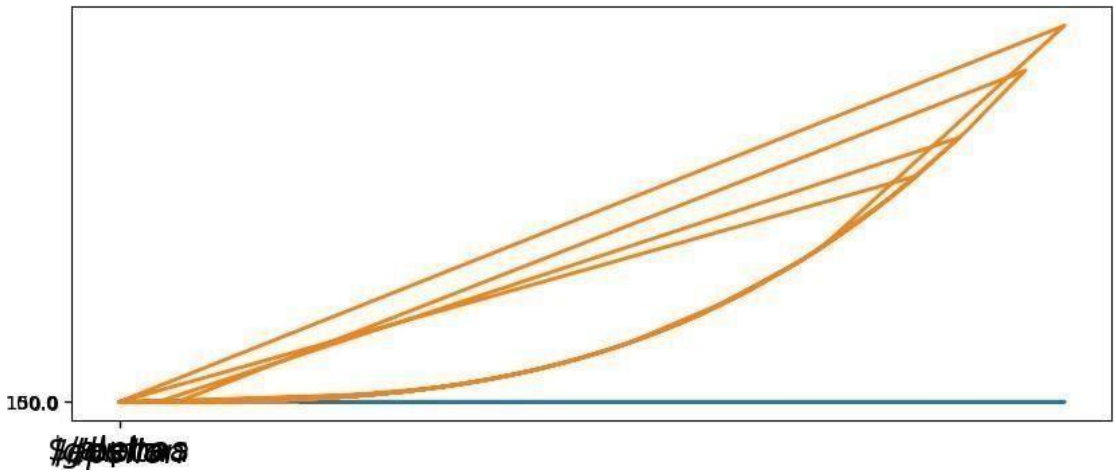
```
/usr/local/lib/python3.10/dist-packages/pandas/core/arraylike.py:396:
RuntimeWarning: overflow encountered in exp result = getattr(ufunc, method)(*inputs,
**kwargs) Text(0.5, 1.0, 'Logarithmic scale (y)')
```



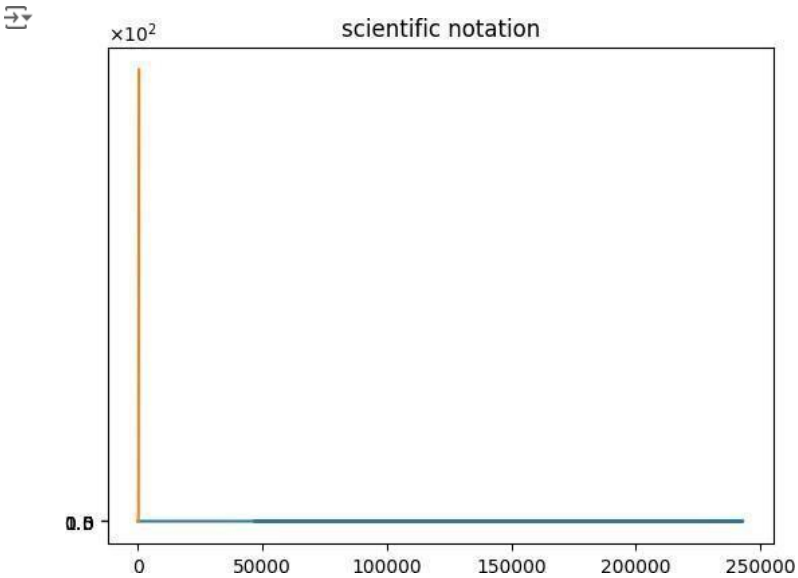

```
fig, ax = plt.subplots(figsize=(10,4)) x=df['KM'] ax.plot(x, x**2,x,x**3,
lw=2) ax.set_xticks([1,2,3,4,5])
ax.set_xticklabels([r'$/alphas',r'$/beta$',r'$/gamma$',r'$/delta$'
,  r'$/epsilon$'], fontsize=18) yticks=[0,50,100,150]
ax.set_yticks(yticks)   ax.set_yticklabels(["$%.1f$" % y for y in
yticks])
```

```
[Text(0, 0, '$0.0$'),
Text(0, 50, '$50.0$'),
Text(0, 100, '$100.0$'),
```

```
Text(0, 150, '$150.0$')]
```



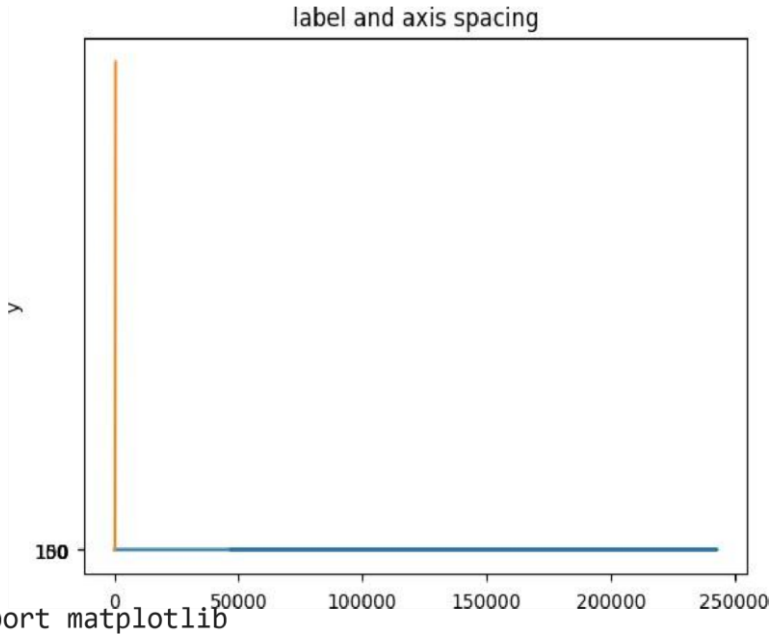

```
                                                                                fig,
                                                    ax=  plt.subplots(1,1) x=df['KM']
ax.plot(x, x**2, x,  np.exp(x))
ax.set_title("scientific notation") ax.set_yticks([0,50,100,150]) from
matplotlib import ticker
formatter  =     ticker.ScalarFormatter(useMathText=True) formatter.set_scientific(True)
formatter.set_powerlimits((-1,1)) ax.yaxis.set_major_formatter(formatter)
```




```
   import matplotlib
 matplotlib.rcParams['xtick.major.pad'] =
5 matplotlib.rcParams['ytick.major.pad']
= 5   x
=
df['KM'
]
fig, ax = plt.subplots(1, 1)
```

```
ax.plot(x, x**2, x, np.exp(x)) ax.set_yticks([0, 50, 100, 150])
ax.set_title("label and axis spacing") ax.xaxis.labelpad = 5
ax.yaxis.labelpad = 5 ax.set_ylabel("x") ax.set_ylabel("y") plt.show()
```

```
/usr/local/lib/python3.10/distpackages/pandas/core/arraylike.py:396:
     RuntimeWarning: overflow encountered in exp result = getattr(ufunc,
method)(*inputs, **kwargs)
```




```
import matplotlib

matplotlib.rcParams['xtick.major.pad'] = 3
matplotlib.rcParams['ytick.major.pad'] = 3
```

20201ISB0014

**LABSHEET-7 INTERACTING WITH WEB API**

```
 Import requests   pip install --upgrade 'library'
Collecting library
Downloading Library-0.0.0.tar.gz (1.4 kB) Preparing metadata (setup.py) ... done
Building wheels for collected packages: library
Building wheel for library (setup.py) ... done
Created wheel for library: filename=Library-0.0.0-py3-none-any.whl size=2054
sha256=33e04a1cd46e5d3b86146af77a7e80978fe44edaeba4a Stored in directory:
/root/.cache/pip/wheels/e0/71/7d/b0e29b944e43374597cd4e3b88c85197001c9bfcd5dce191f4
Successfully built library
Installing collected packages: library Successfully installed library-0.0.0


  r =
requests.get('https://www.romexchange.com/')
  r

<Response [406]>

r.status_code 406 url = 'https://www.romexchange.com/'
headers = {'Content-type': 'application/json'}
  ur
l

'https://www.romexchange.com/'
  header
s
{'Content-type': 'application/json'} r=requests.get(url, headers = headers) url
= 'https://www.romexchange.com/'
  headers = {'User-Agent': 'XY','Content-type': 'application/json'} r =
requests.get(url, headers=headers)
 url

'https://www.romexchange.com/'
  header
s

{'User-Agent': 'XY', 'Content-type': 'application/json'}
  r

<Re
spo
nse
[20
0]>

r.status_code 200 url =
'https://www.romexchange.com/api?item=mastela&exact=false' headers =
{'UserAgent':'XY','Content-type':'application/json'}


   r= requests.get(url,
headers=headers) r.status_code
```

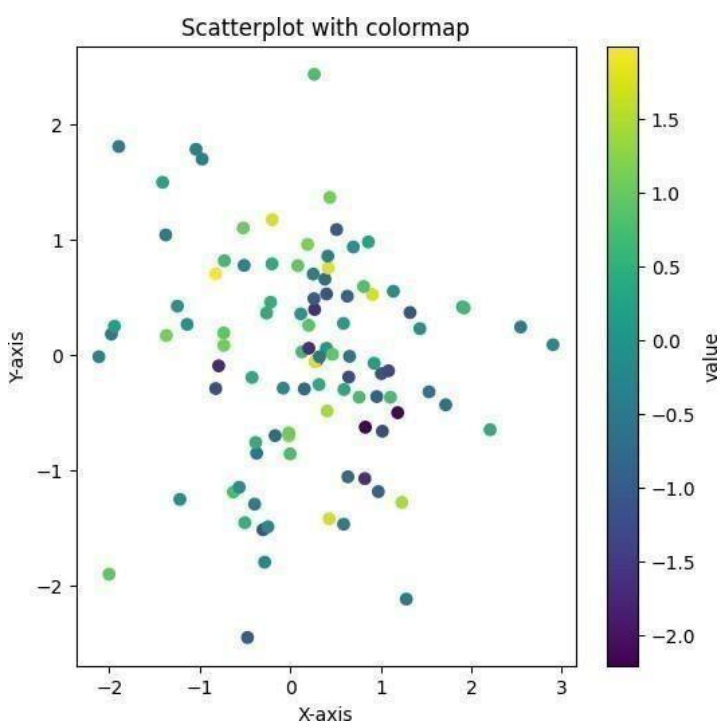
```
500
```

```
r.text
```

```
''
```

**LABSHEET-8**
**COLORMAPS**

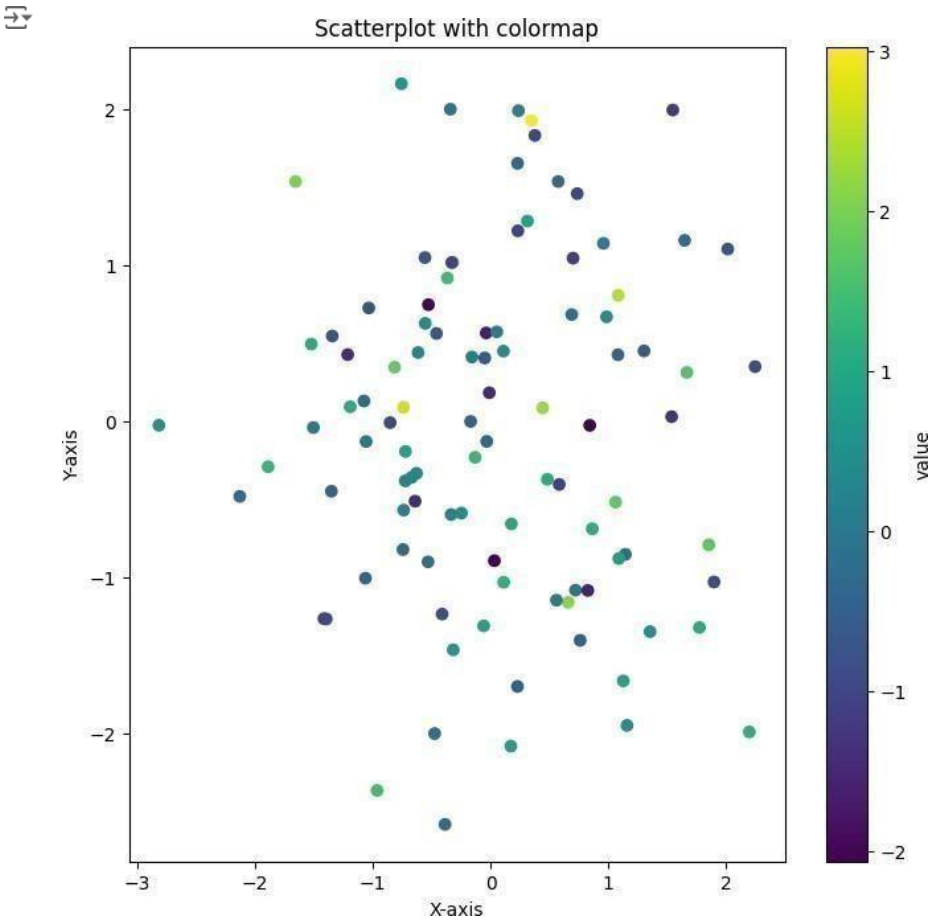
```
   import pandas as pd import numpy as
np import matplotlib.pyplot as plt
#sample    datafame    with  multiple    columns
data=pd.DataFrame({"x":np.random.randn(100),"y":np.random.randn(100),"value":np.random.
ran dn(100)}) #define the colormap and alpha values cmap="viridis" alpha=1 #create the
scatterplot plt.figure(figsize=(6,6))
plt.scatter(data["x"],data["y"],c=data["value"],cmap=cmap,alpha=alpha) #customize the
plot(optional)
plt.xlabel("X-axis") plt.ylabel("Y-axis")
plt.title("Scatterplot with colormap") plt.colorbar(label="value") #show
the plot plt.show()
```




```
   import pandas as pd import numpy as
np print(np.random.randn(100))
```

```
[-1.65970274e-01 -3.26301492e-01 -6.97091694e-01 5.29185683e-01 1.65900203e-01
2.57310809e-01 1.87945887e-01 -1.47856355e+00
1.85465880e+00 -5.74773399e-02 -7.28047219e-01 1.43513290e+00 1.16276640e-
01 3.62925427e-01 2.27296732e-01 -4.68725785e-01
-7.20465601e-01 2.31190101e-01 5.47647007e-01 6.14310198e-01
-2.88178116e-01 -2.59650445e-01 7.14726089e-02 2.91407763e-01 7.44199514e-01
1.03744520e+00 5.19583750e-02 -1.22315192e+00
2.82553552e-01 9.27484581e-01 4.68496647e-01 3.97669795e-01
-6.15495640e-01 -3.59199216e-01 1.45247374e-01 -1.61267440e-01
-1.08796055e+00 2.03942727e-01 1.33177945e-03 7.08911052e-01 1.92045492e+00
1.06460553e+00 9.71054014e-01 8.14301945e-01
1.01645092e-01 -9.38076692e-02 1.33631841e+00 2.55274328e-01
-5.17379367e-01 -1.71773916e+00 9.24194703e-01 1.67657214e-01
```

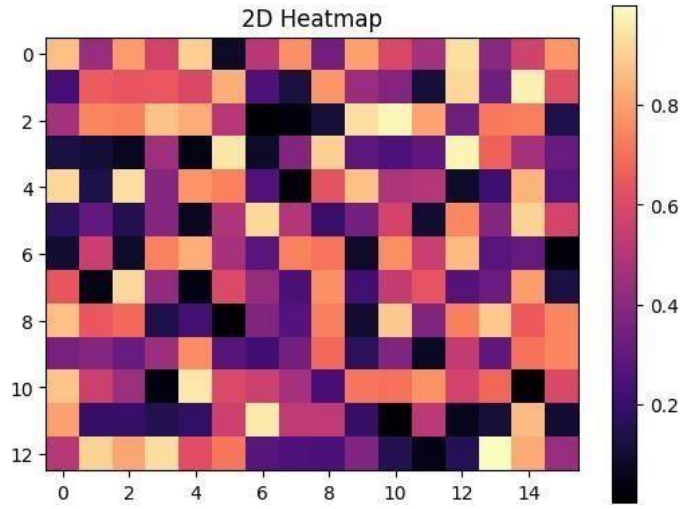
```
-1.72214971e+00 4.27042698e-01 -1.20346437e+00 2.83589309e-01 1.21334367e+00
4.14428011e-02 -1.48913563e+00 4.39560682e-01
-8.90366916e-01 -9.11298844e-01 3.62446399e-01 5.87632377e-01 1.22152619e+00
7.44396580e-01 1.75575979e+00 3.12178887e-01
-3.40512410e-01 -1.01818680e+00 4.62977518e-02 2.30443390e-01  -3.96879315e-
01 1.20713778e+00 -1.20064064e+00 -9.12708432e-01 9.06172668e-01
7.05249075e-02 -9.42170303e-01 -8.52966288e-01
1.96198904e+00 3.61012540e-02 9.66762176e-01 -4.97875528e-01
2.78681896e-01 -1.16708383e+00 7.39087305e-01 1.27038245e+00
7.81304235e-01 -4.62440127e-01 1.00117969e+00 -9.07298230e-02
-1.95950298e-01 1.59291286e+00 -1.22572212e+00 -4.62563405e-01 5.41920487e-01
7.41261996e-01 1.42219990e+00 -9.65150475e-01]   import
pandas as pd import numpy as np import
matplotlib.pyplot as plt
#sample    datafame    with  multiple    columns
data=pd.DataFrame({"x":np.random.randn(100),"y":np.random.randn(100),"value":np.random.
ran dn(100)}) #define the colormap and alpha values cmap="viridis" alpha=1 #create the
scatterplot plt.figure(figsize=(8,8))
plt.scatter(data["x"],data["y"],c=data["value"],cmap=cmap,alpha=alpha) #customize the
plot(optional)
plt.xlabel("X-axis") plt.ylabel("Y-axis")
plt.title("Scatterplot with colormap") plt.colorbar(label="value") #show
the plot plt.show()
```



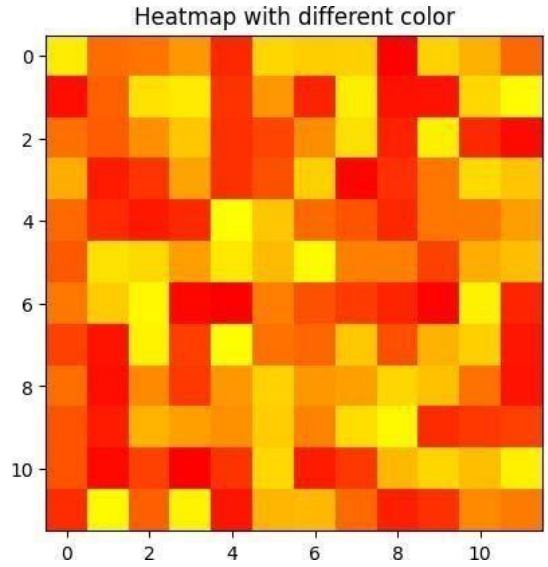

**LABSHEET-9 HEATMAPS**

```
    import numpy as np     import matplotlib.pyplot as plt data=
np.random.random((13,16))
```

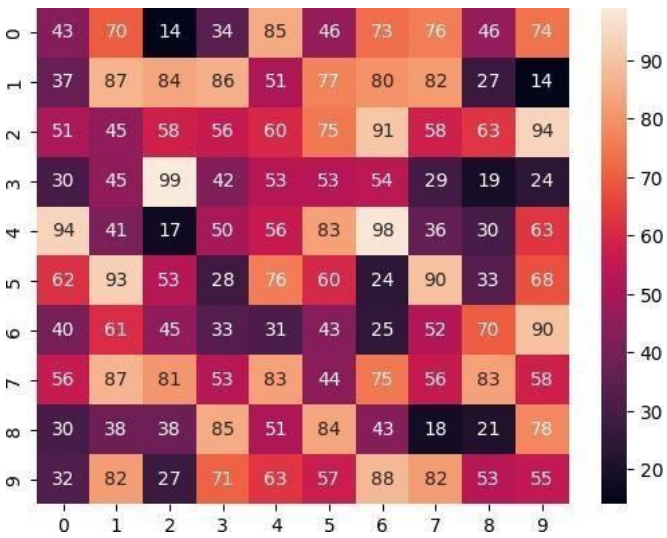
```
plt.imshow(
data,cmap="magma") plt.title("2D Heatmap") plt.colorbar() plt.show()
```



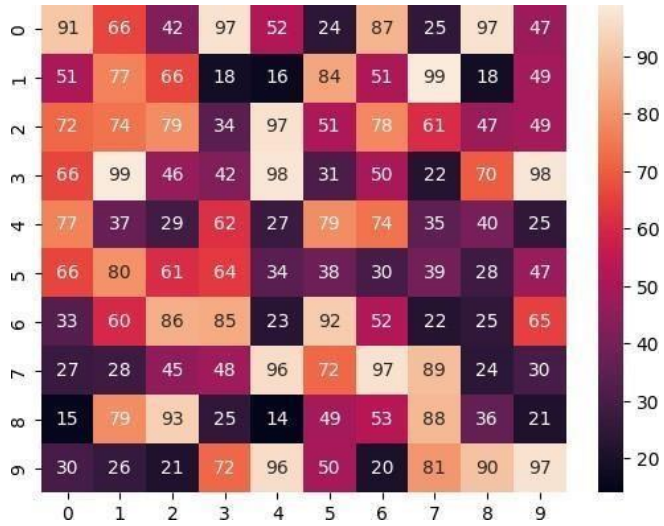

```
   import numpy as np   import matplotlib.pyplot as plt
data=np.random.random((12,12)) plt.imshow(data, cmap='autumn')
plt.title("Heatmap with different color") plt.show()
```




```
  import numpy as np import seaborn as sns import matplotlib.pyplot
as plt  data=
np.random.randint(low=14,high=100, size=(10,10))
hm=sns.heatmap(data=data, annot=True) plt.show()
```



```
  import pandas as pd import numpy as
np
df=pd.read_csv('/content/train.csv'
)      df= np.random.randint(low=55
, high=60, size=(8,8))
hm=sns.heatmap(data=data, annot=True) plt.show()
```




**LABSHEET-10 SEABORN COLOR PALLETTES**

```
import numpy as np   import pandas as pd  import matplotlib.pyplot as plt import seaborn
as sns
%matplotlib inline
sns.set(rc={"figure.figsize":
(6,6)})
```

**BUILDING COLOR PALLETTES**

```
current_palette = sns.color_palette()
sns.palplot(current_palette)
```

```
sns.palplot(sns.color_palette("hls", 8))
```

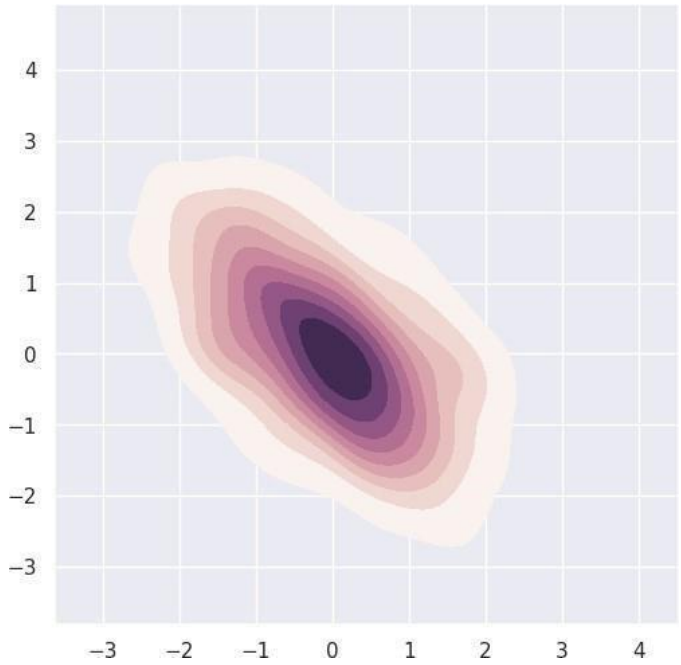
```
sns.palplot(sns.color_palette("husl", 8))
```

```
sample_colors =
["windows blue", "amber", "greyish", "faded green", "dusty purple",
"pale red", "medium green", "denim blue"] sns.palplot(sns.xkcd_palette(sample_colors))
```

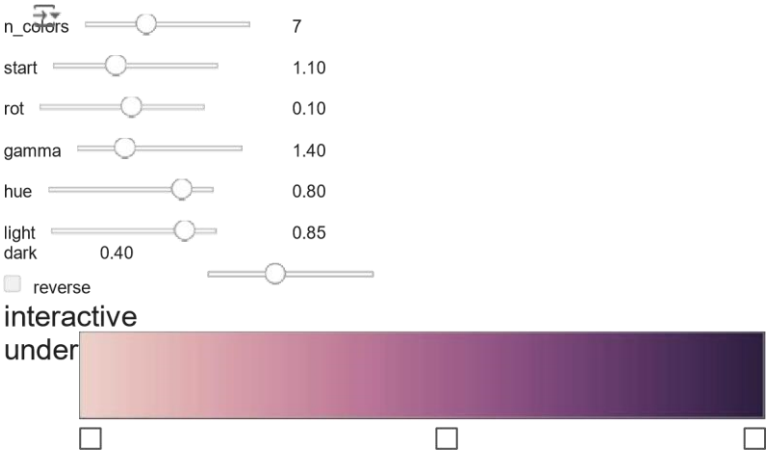
```
sns.palplot(sns.color_palette("cubehelix", 8))
```

```
sns.palplot(sns.cubehelix_palette(8))
```

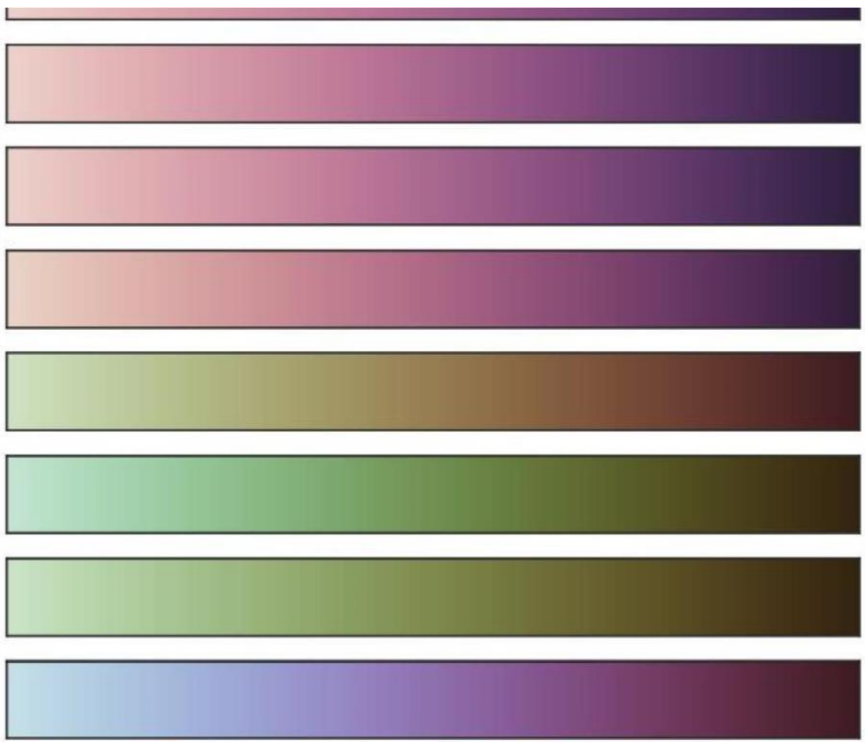
```
x,y = np.random.multivariate_normal([0,0], [[1,-.5],[-.5,1]], size=300).T sample_cmap = sns.cubehelix_palette(light=1, as_cmap=True)  sns.kdeplot(x=x,y=y,cmap=sample_cmap, shade=True)   <ipython-input-16-534ef71d14c3>:3:
FutureWarning:
`shade` is now deprecated in favor of `fill`; setting `fill=True`.   This will become an error in seaborn v0.14.0; please update your code.
sns.kdeplot(x=x,y=y,cmap=sample_cmap,
shade=True) <Axes: >
```

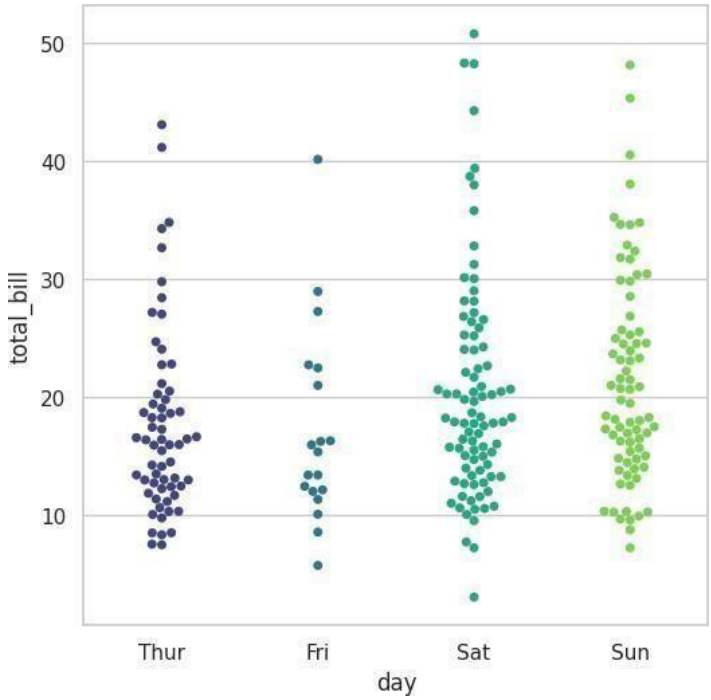



```
sns.choose_cubehelix_palette(as_cmap=True)
```

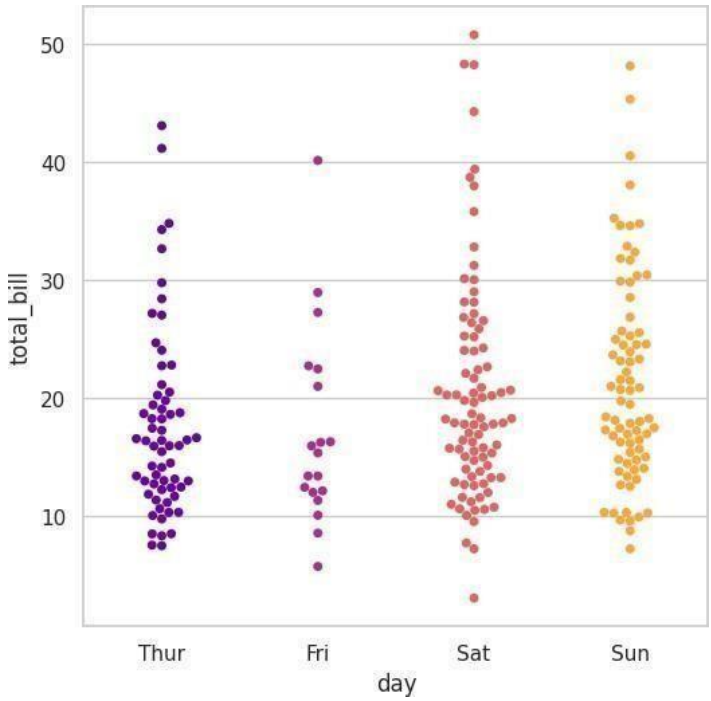



```
 sns.set_style('whitegrid')
sns.swarmplot(x="day", y="total_bill", data=tips, palette="viridis") <ipython-
input231576c2e5eda7>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `x` variable to `hue` and set `l sns.swarmplot(x="day", y="total_bill",
data=tips, palette="viridis")
<Axes: xlabel='day', ylabel='total_bill'>
```

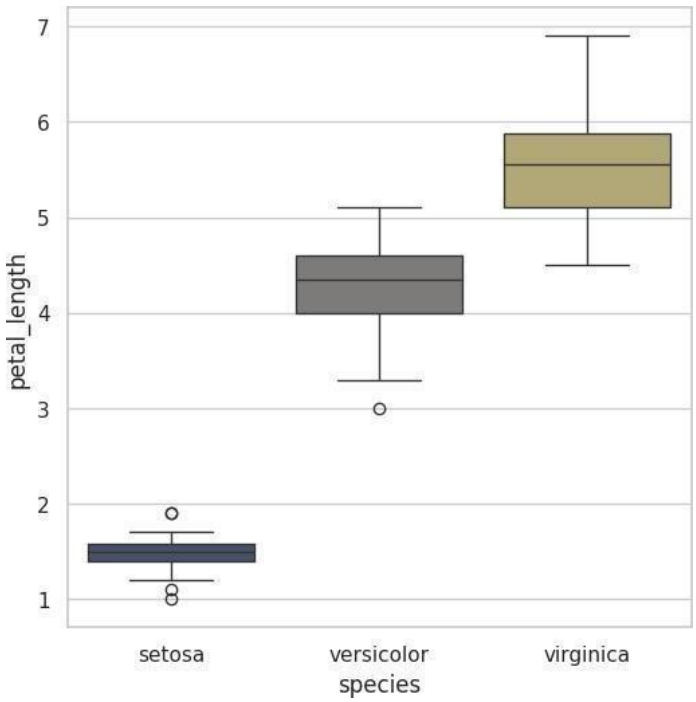




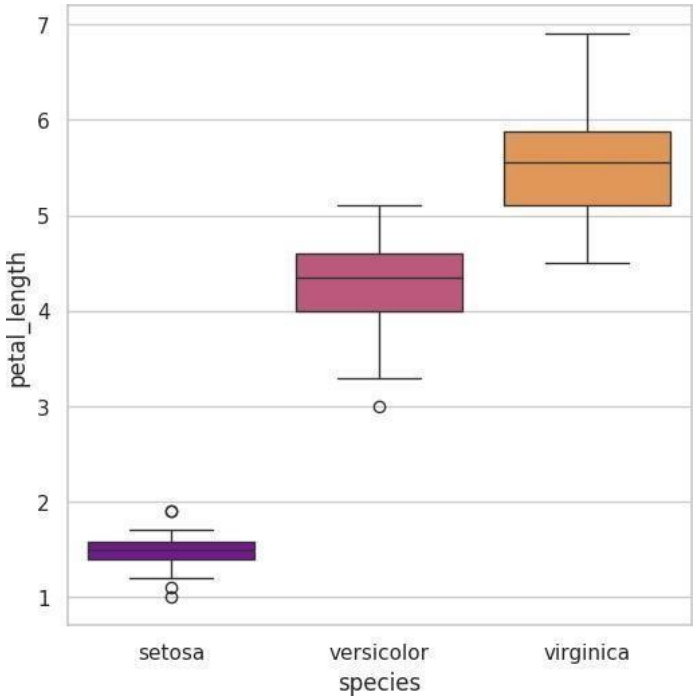

```
sns.set_style('whitegrid')    sns.swarmplot(x="day",  y="total_bill",  data=tips,
palette="plasma") <ipython-input-248931cda8de8a>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `x` variable to `hue` and set `l sns.swarmplot(x="day", y="total_bill",
data=tips, palette="plasma")
<Axes: xlabel='day', ylabel='total_bill'>
```



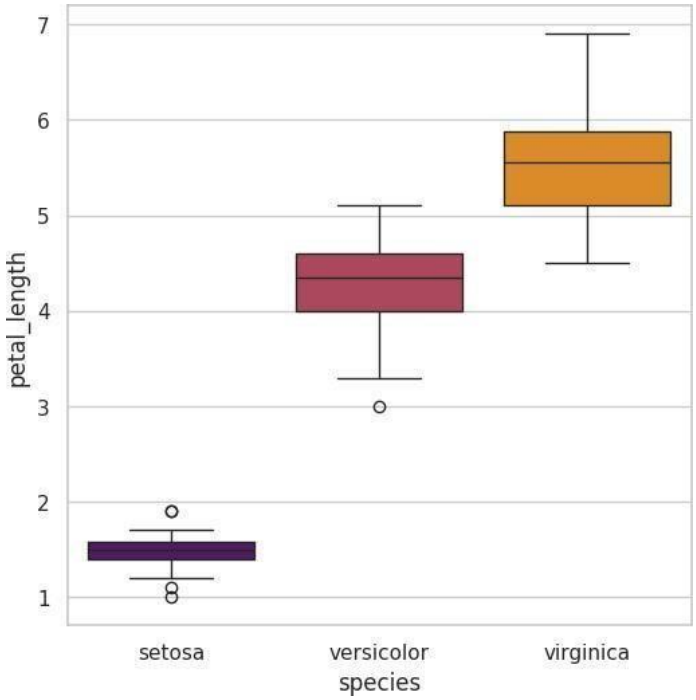

```
iris = sns.load_dataset("iris")   sns.boxplot(x="species", y="petal_length",
data=iris, palette="cividis")   <ipythoninput-26-cc37ff1b7cba>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `x` variable to `hue` and set `l sns.boxplot(x="species", y="petal_length",
data=iris, palette="cividis")
<Axes: xlabel='species', ylabel='petal_length'>
```




```
iris = sns.load_dataset("iris")  sns.boxplot(x="species", y="petal_length", data=iris, palette="plasma") <ipythoninput-27-0b4fe890c1f3>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `l sns.boxplot(x="species", y="petal_length", data=iris, palette="plasma")
<Axes: xlabel='species', ylabel='petal_length'>
```




```
iris = sns.load_dataset("iris")  sns.boxplot(x="species", y="petal_length", data=iris, palette="inferno") <ipythoninput-28-e860428b94f7>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `l sns.boxplot(x="species", y="petal_length", data=iris, palette="inferno")
<Axes: xlabel='species', ylabel='petal_length'>
```

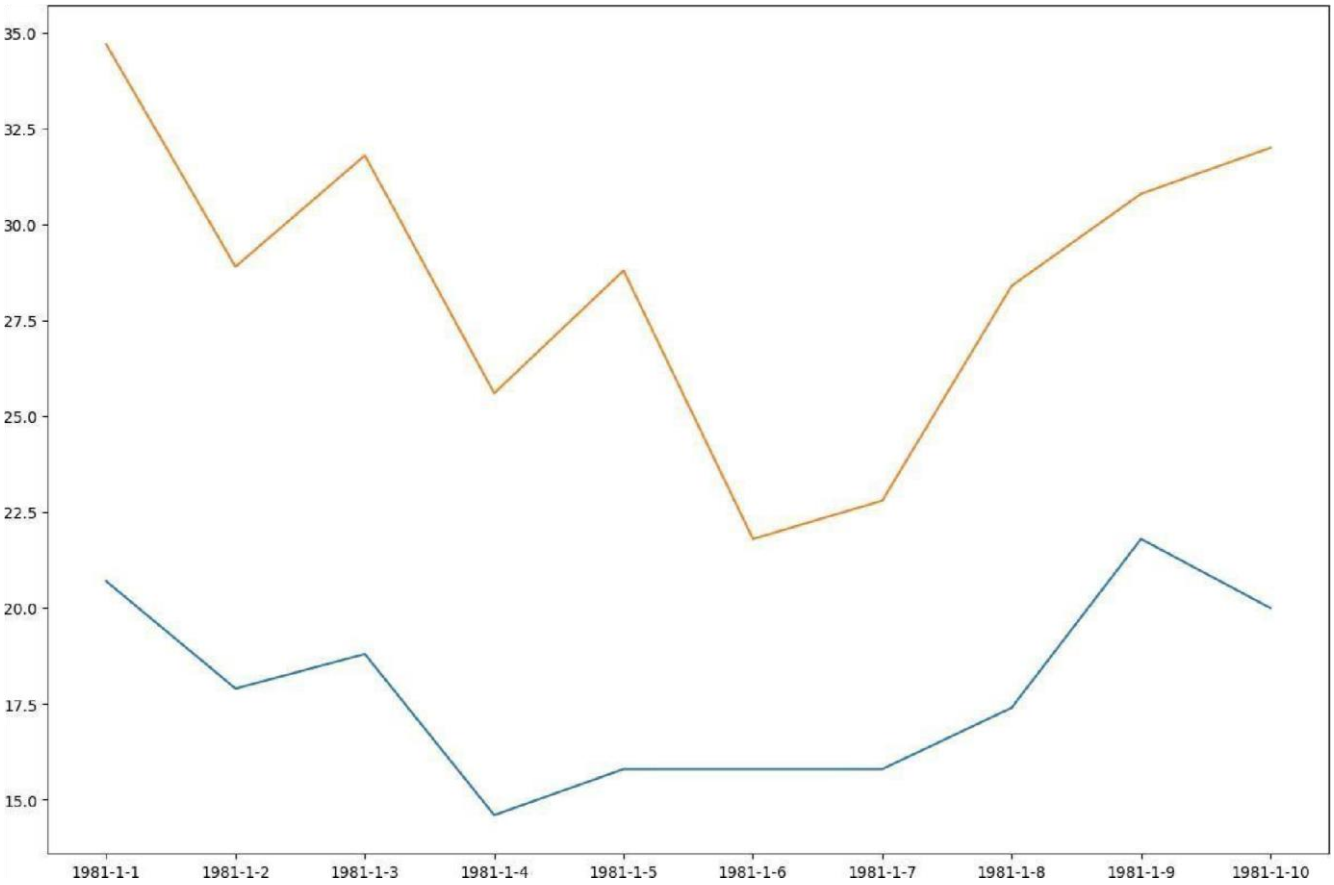



```
    iris   =   sns.load_dataset("iris")      sns.boxplot(x="species",   y="petal_length",
data=iris, palette="magma") <ipython-input29-ebb177fa7cb5>:2: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `x` variable to `hue` and set `l sns.boxplot(x="species", y="petal_length",
data=iris, palette="magma")
<Axes: xlabel='species', ylabel='petal_length'>
```

**LABSHEET-11 MULTIVARIATE VISUALIZATION**

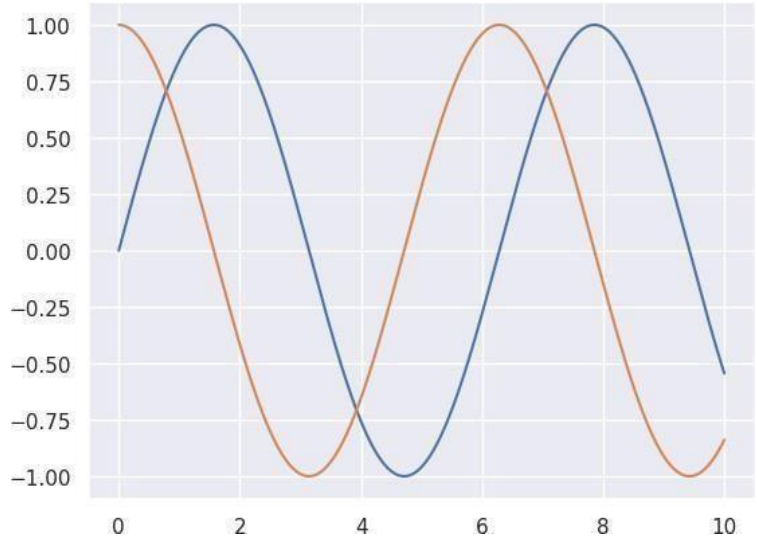
```
Relational plots: relation b/w two variables categorical plots: categorical values are
displayed
distribution plots: examining univariate and bivariate distributions matrix plots: array
of scatterplots
Regression plots: emphasixe patterns in dataset during exploratory data
analysis     import numpy as np import pandas as pd import matplotlib.pyplot as
plt
from matplotlib.pyplot import figure import seaborn as sns   %matplotlib
inline

dates = ['1981-1-1', '1981-1-2','1981-1-3','1981-1-4','1981-1-5','1981-1-6','1981-1-
7','1981-1-8','1981-1-9','1981-1-10'] min_temperature =
[20.7,17.9,18.8,14.6,15.8,15.8,15.8,17.4,21.8,20.0] max_temperature
= [34.7,28.9,31.8,25.6,28.8,21.8,22.8,28.4,30.8,32.0]    fig,axes
=  plt.subplots(nrows=1,  ncols=1, figsize=(15,10))
      axes.plot(dates,min_temperature, label='Min temperature')
```

```
def legend(*args, **kwargs)
/usr/local/lib/python3.10/dist-packages/matplotlib/axes/_axes.py
Place a legend on the Axes.

Call signatures::
```

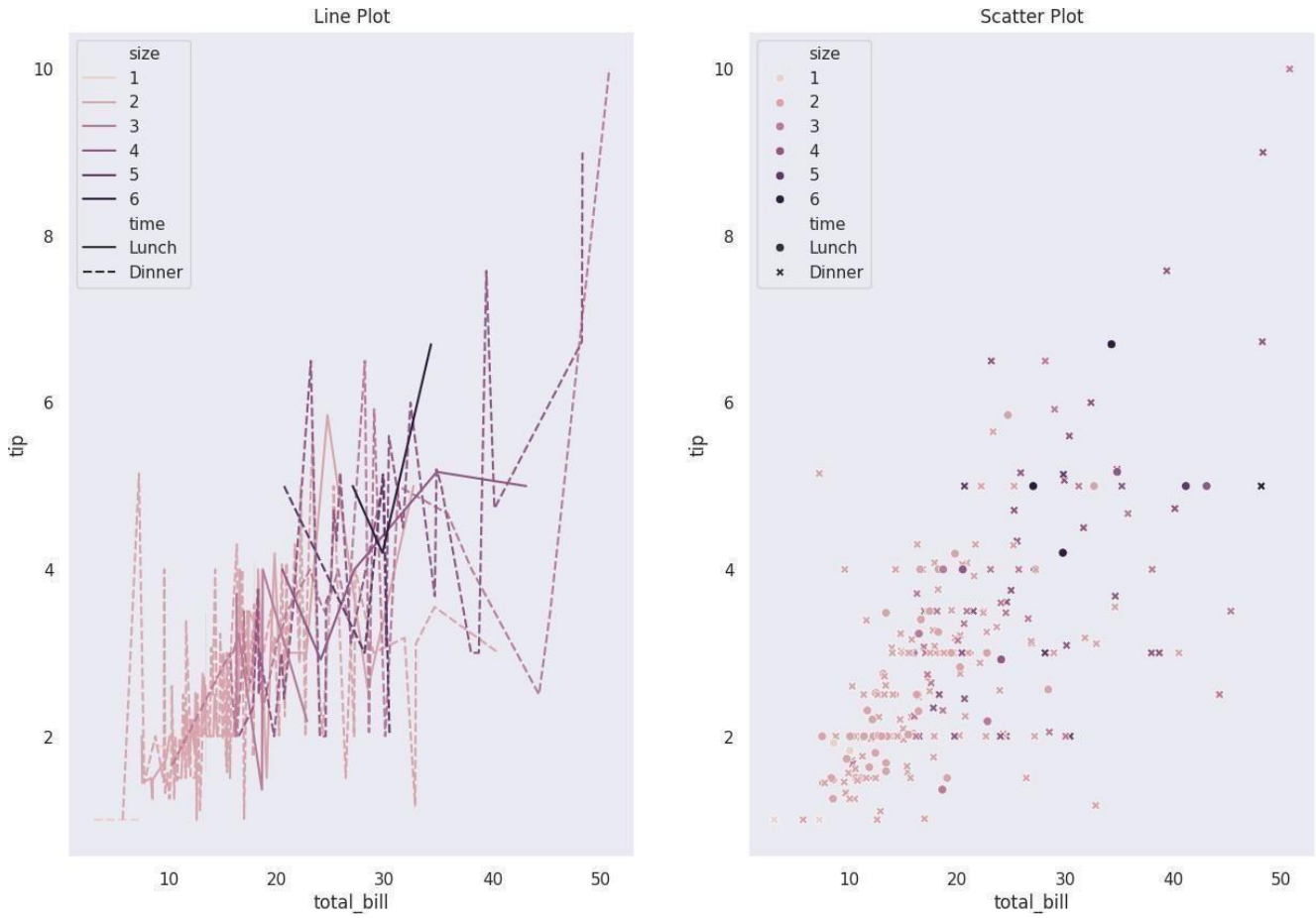



axes.plot(dates,max_temperature, label='Max temperature') axes.legend
matplotlib.axes._axes.Axes.legend sns.set()

```
x = np.linspace(0,10,1000)  plt.plot(x,
np.sin(x), x, np.cos(x))
[<matplotlib.lines.Line2D at 0x7e3acaaaffa0>,
<matplotlib.lines.Line2D at 0x7e3acaae0040>]
```

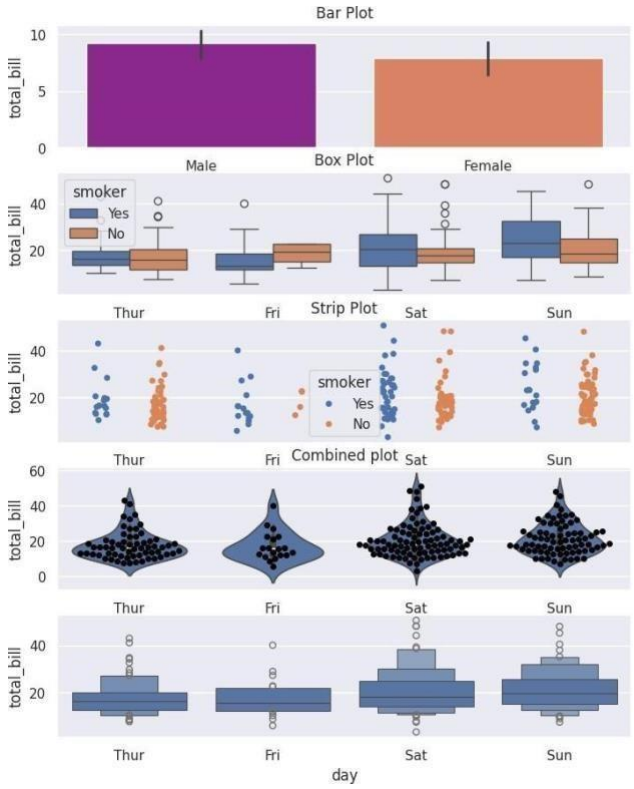


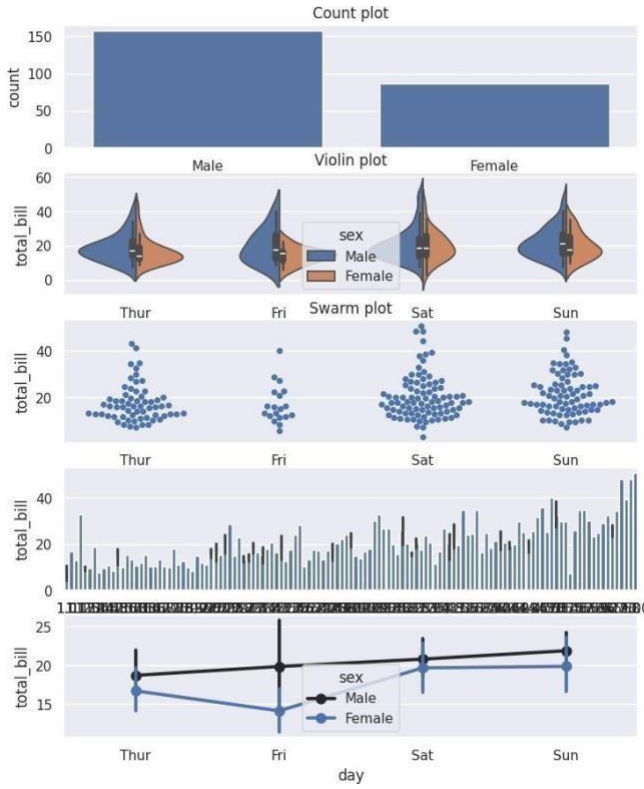

```
sns.set(style="dark")
fig, ax = plt.subplots(ncols=2, nrows=1, figsize=(15,10)) df= sns.load_dataset("tips")

print(df.head())
   sns.lineplot(x="total_bill", y="tip", hue="size", style=
"time", data=df,ax=ax[0]).set_title("Line Plot")
sct_plt = sns.scatterplot(x="total_bill", y="tip", hue="size", style="time", data=df,
ax=ax[1]).set_title("Scatter Plot") sct_plt.figure.savefig('Scatter_plot1.png')
print('Plot Saved')
       total_bill tip sex smoker day time size
16.99 1.01 Female           No Sun Dinner    2
10.34 1.66          Male    No Sun Dinner    3
21.01 3.50          Male    No Sun Dinner    3
23.68 3.31          Male    No Sun Dinner    2
24.59 3.61 Female           No Sun Dinner    4

Plot Saved
```

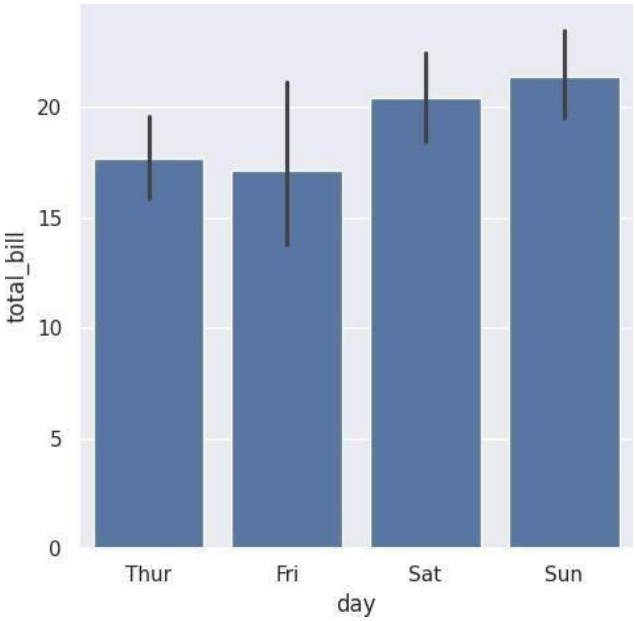



```
sns.set_style('darkgrid')
fig, ax = plt.subplots(nrows=5, ncols=2) fig.set_size_inches(18.5, 10.5)
df=sns.load_dataset('tips')
   sns.barplot(x='sex',  y='total_bill',  data=df,  palette='plasma',  estimator=
np.std,  ax=ax[0,0]).set_title('Bar    Plot')    sns.countplot(x='sex',    data=df,
ax=ax[0,1]).set_title('Count plot')
sns.boxplot(x='day', y='total_bill', data=df, hue='smoker',
ax=ax[1,0]).set_title('Box Plot')
sns.violinplot(x='day', y='total_bill', data=df, hue='sex', split= True,
ax=ax[1,1]).set_title('Violin plot')
 sns.stripplot(x='day',   y='total_bill',   data=df,   jitter=   True,   hue='smoker',
dodge=True, ax=ax[2,0]).set_title('Strip Plot') sns.swarmplot(x='day', y='total_bill',
data=df, ax=ax[2,1]).set_title('Swarm plot')
sns.violinplot(x='day', y='total_bill', data=df, ax=ax[3,0])
sns.swarmplot(x='day',y='total_bill',data=df, color='black',
ax=ax[3,0]).set_title('Combined plot') sns.barplot(x='tip',y='total_bill', data=df,
ax=ax[3,1])
```

```
sns.boxenplot(x="day", y="total_bill", color="b", scale="linear", data=df, ax=ax[4,0])
sns.pointplot(x="day", y="total_bill", color="b", hue="sex", data=df, ax=ax[4,1])
sns.catplot(x='day',y='total_bill',data=df,     kind='bar')       ⇥     <ipython-
input679e72dcff921>:7: FutureWarning:
Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0.
Assign the `x` variable to `hue` and set `l sns.barplot(x='sex', y='total_bill', data=df,
palette='plasma', estimator= np.std, ax=ax[0,0]).set_title('Bar Plot') <ipython-
input679e72dcff921>:24: FutureWarning:

The `scale` parameter has been renamed to `width_method` and will be removed in
v0.15. Pass `width_method='linear' for the same eff sns.boxenplot(x="day",
y="total_bill", color="b", scale="linear", data=df, ax=ax[4,0]) <ipython-input-6-
79e72dcff921>:26: FutureWarning:
Setting a gradient palette using color= is deprecated and will be removed in v0.14.0. Set
`palette='dark:b'` for the same effect. sns.pointplot(x="day", y="total_bill", color="b",
hue="sex", data=df, ax=ax[4,1])
<seaborn.axisgrid.FacetGrid at 0x7e3ac3b802e0>
```



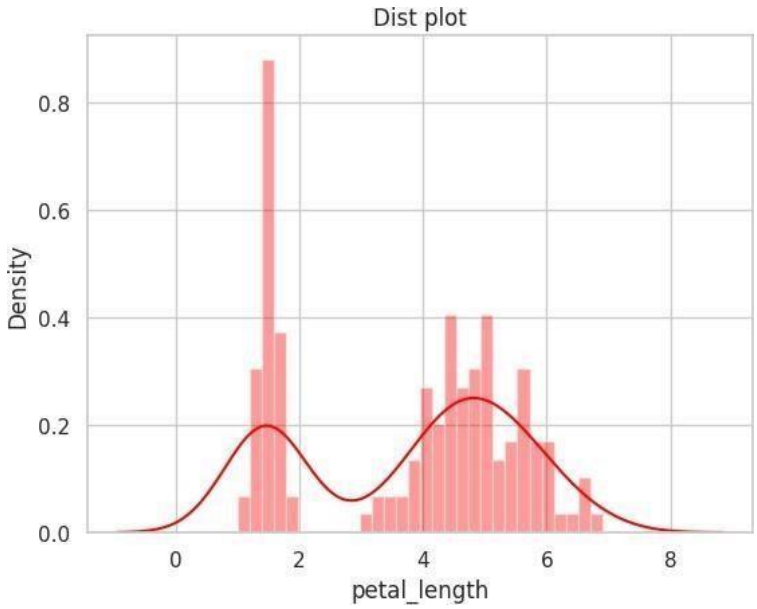



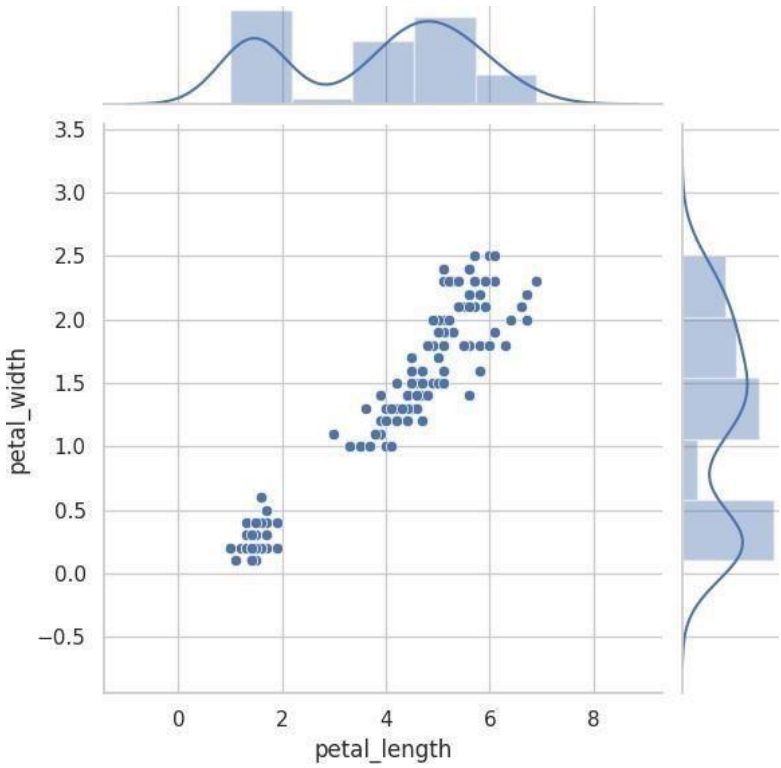

```
sns.set_style('whitegrid')
#loading the dataset directly without any files df=sns.load_dataset('iris')
print(df.head())
```

```
   sepal_length sepal_width petal_length
petal_width species
0     5.1 3.5 1.4 0.2 setosa
1     4.9 3.0 1.4 0.2 setosa
2     4.7 3.2 1.3 0.2 setosa
3     4.6 3.1 1.5 0.2 setosa
4     5.0 3.6 1.4 0.2 setosa      sns.distplot(df['petal_length'], kde=True,
    color='red', bins=30).set_title('Dist plot')  <ipython-input-8-6c2fae3a6ad9>:1:
    UserWarning:
```

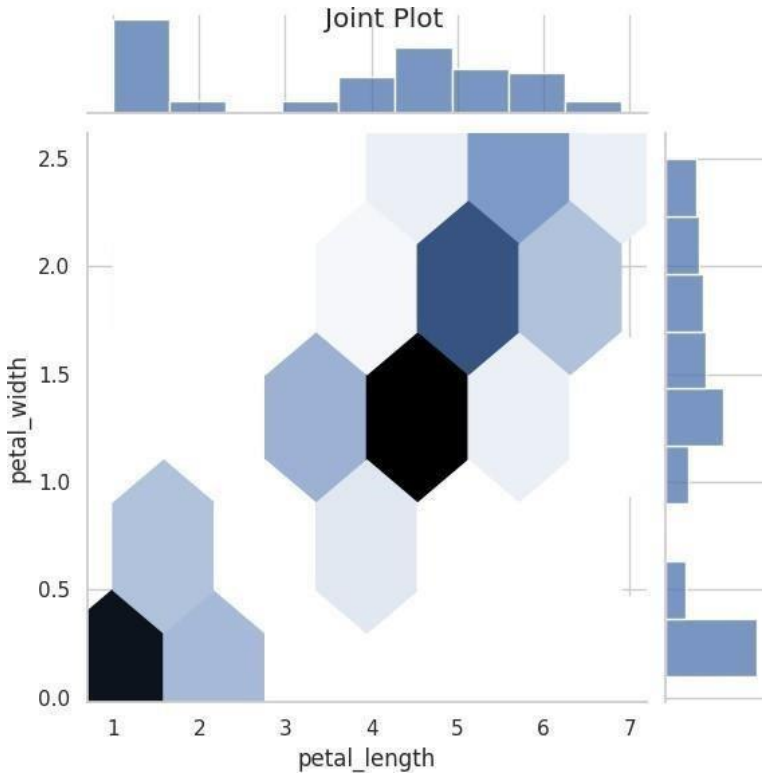
```
`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).     For
a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751
   sns.distplot(df['petal_length'], kde=True, color='red', bins=30).set_title('Dist
plot') Text(0.5, 1.0, 'Dist plot')
```




```
    jointgrid = sns.JointGrid(x='petal_length', y='petal_width',
data=df) jointgrid.plot_joint(sns.scatterplot)
jointgrid.plot_marginals(sns.distplot)
/usr/local/lib/python3.10/distpackages/seaborn/axisgrid.py:1886:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).
For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751   func(self.x,
**orient_kw_x,
**kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py:1892: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms). For a guide to
updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

func(self.y, **orient_kw_y, **kwargs)
<seaborn.axisgrid.JointGrid at 0x7e3b00f8d120>
```

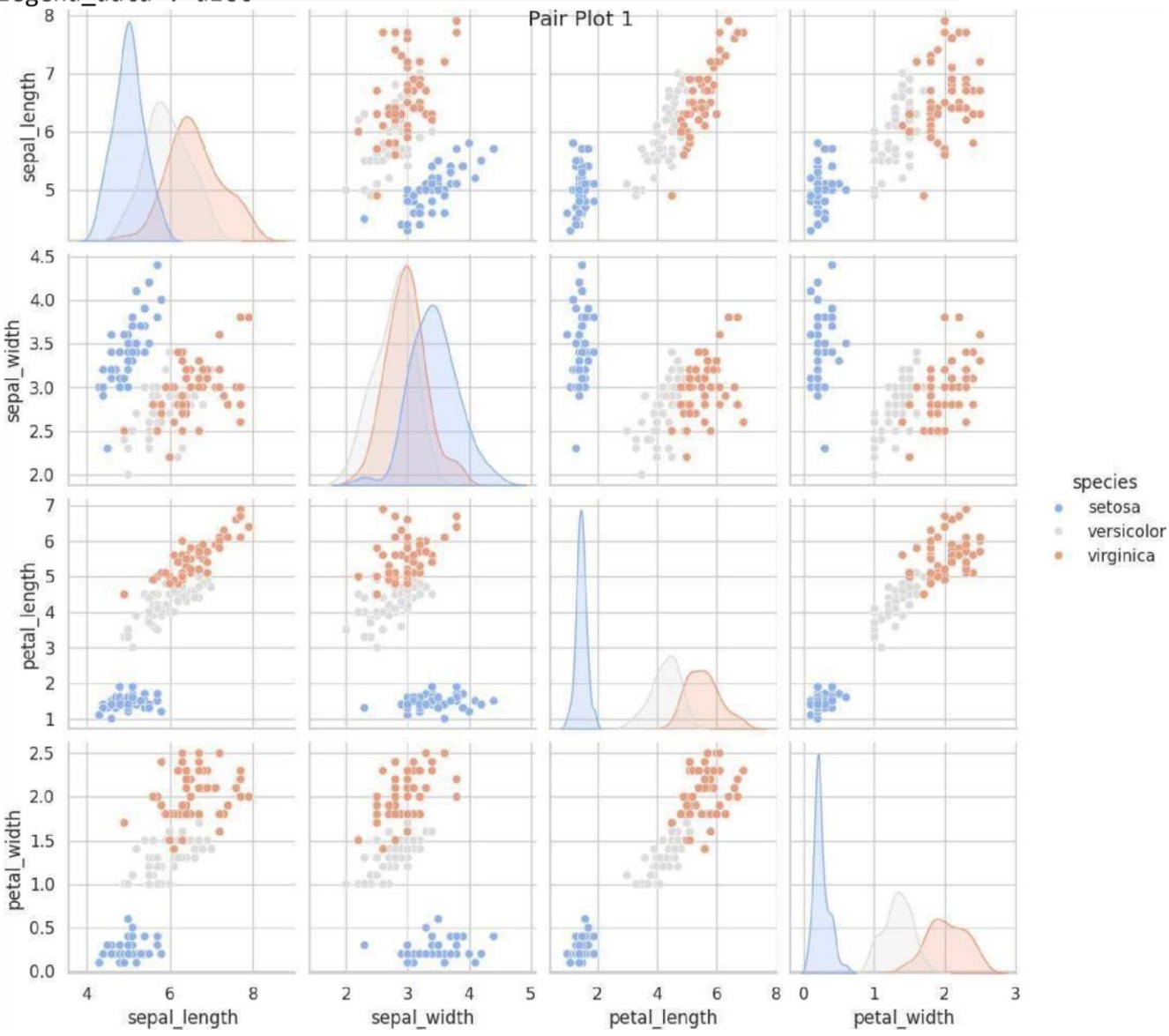



```
    g=sns.jointplot(x='petal_length', y= 'petal_width', data=df,
kind='hex') g.fig.suptitle('Joint Plot')  Text(0.5, 0.98, 'Joint Plot')
```

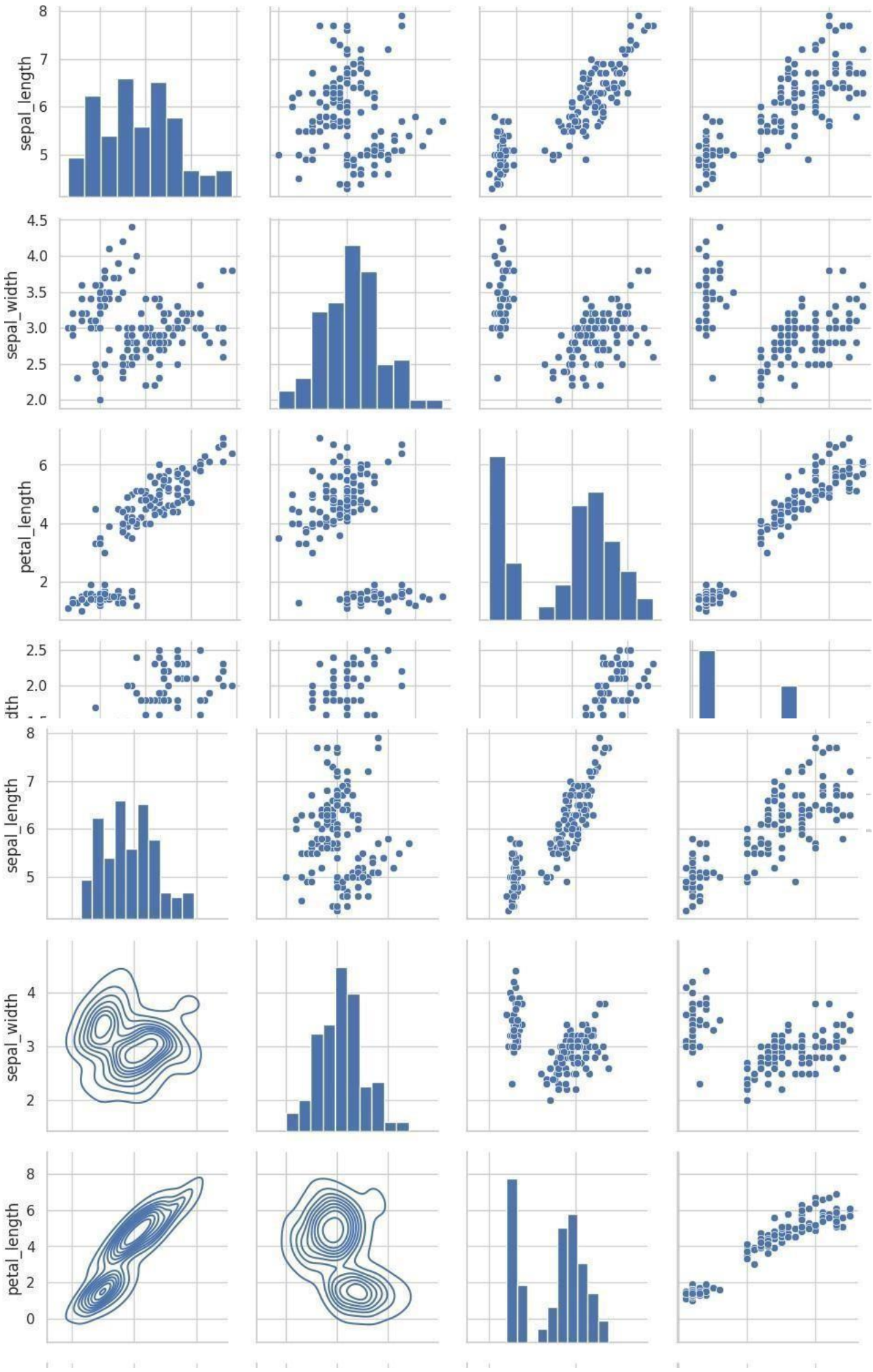



```
g=sns.pairplot(df, hue="species", palette= 'coolwarm') g.fig.suptitle("Pair Plot 1")
g.add_legend
```

```
seaborn.axisgrid.Grid.add_legend
def add_legend(legend_data=None, title=None, label_order=None,
adjust_subtitles=False, **kwargs)
/usr/local/lib/python3.10/dist-packages/seaborn/axisgrid.py
Draw a legend, maybe placing it outside axes and resizing the
figure.

Parameters
legend_data : dict
```




```
pairgrid= sns.PairGrid(data=df)
pairgrid= pairgrid.map_offdiag(sns.scatterplot) pairgrid= pairgrid.map_diag(plt.hist)
   pairgrid = sns.PairGrid(data=df)   pairgrid =
pairgrid.map_upper(sns.scatterplot) pairgrid =
pairgrid.map_diag(plt.hist) pairgrid = pairgrid.map_lower(sns.kdeplot)
```


sepal_length
sepal_width
petal_length
dth
sepal_length
sepal_width
petal_length

20201ISB0014

# LABSHEET-12 TEXT VISUALIZATION

```
import pandas as pd
import matplotlib.pyplot as plt from wordcloud import WordCloud from wordcloud import
STOPWORDS
   df= pd.read_csv('/content/netflix_titles.csv', usecols=['cast'])
df.head()
```

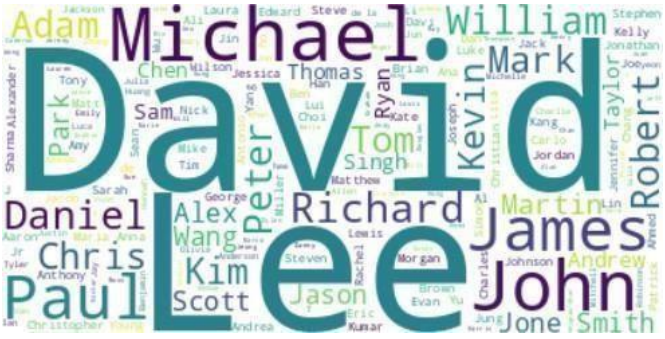
```
                                                cast

NaN
Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...   Sami
Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...
NaN
Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...
```

```
   ndf=df.dropna()
ndf.head()
```

```
cast

Ama Qamata, Khosi Ngema, Gail Mabalane, Thaban...
Sami Bouajila, Tracy Gotoas, Samuel Jouy, Nabi...
Mayur More, Jitendra Kumar, Ranjan Raj, Alam K...
Kate Siegel, Zach Gilford, Hamish Linklater, H...
Vanessa Hudgens, Kimiko Glenn, James Marsden, ...
```

```
text= " ".join(item for item in ndf['cast']) print(text)
Ama Qamata, Khosi Ngema, Gail Mabalane, Thabang Molaba, Dillon Windvogel, Natasha
Thahane, Arno Greeff, Xolile Tshabalala, Getmore
```

```
   stopwords =
set(STOPWORDS)

wordcloud = WordCloud(background_color="White").generate(text) plt.imshow(wordcloud,
interpolation= 'bilinear') plt.axis("off")
plt.margins(x=0, y=0) plt.show()
```




```
wordcloud = WordCloud(background_color="White", max_words=100, max_font_size=300, width=
800,       height=500,       colormap="magma").generate(te       plt.figure(figsize=(20,20))
```

```
plt.imshow(wordcloud, interpolation= 'bilinear') plt.axis("off") plt.margins(x=0, y=0)
plt.show()
```


**LABSHEET-13**
**TIME SERIES DATA**

A time series is the series of data points listed in time order.
A time series is a sequence of successive equal interval points in time.
A time-series analysis consists of methods for analyzing time series data in order to extract meaningful insights and other useful characteristics of data. For performing time series analysis download stock_data.csv

```
  import pandas as pd import numpy as
np import matplotlib.pyplot as plt


# reading the dataset using read_csv
df = pd.read_csv("/content/stock_data.csv", parse_dates=True, index_col="Date")
# displaying the first five rows of dataset df.head()    Open
High Low Close Volume Name
```

Date

**2006-01-03** 39.69 41.22 38.79 40.91 24232729 AABA
**2006-01-04** 41.22 41.90 40.77 40.97 20553479 AABA
**2006-01-05** 40.93 41.73 40.85 41.53 12829610 AABA
**2006-01-06** 42.88 43.57 42.80 43.21 29422828 AABA **2006-01-09** 43.10 43.66 42.82 43.42 16268338 AABA

Next steps:
Generate code with df
View recommendedplots

We have used the 'parse_dates' parameter in the read_csv function to convert the 'Date' column to the DatetimeIndex format. By default, Dates are stored in string format which is not the right format for time series data analysis.

Now, removing the unwanted columns from dataframe i.e. 'Unnamed: 0'.

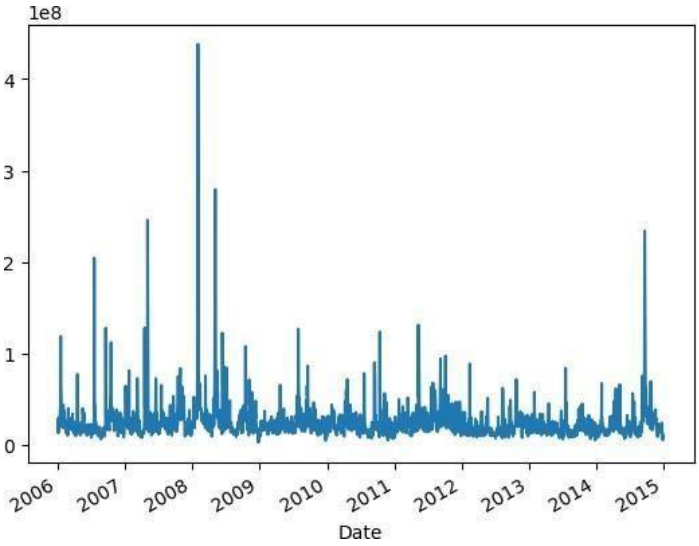
```
# deleting column
df=df.drop(columns='Name') print(df)
```

```
            Open High       Low Close  Volume
Date
2006-01-03 39.69 41.22 38.79 40.91 24232729
2006-01-04 41.22 41.90 40.77 40.97 20553479
2006-01-05 40.93 41.73 40.85 41.53 12829610
2006-01-06 42.88 43.57 42.80 43.21 29422828
2006-01-09 43.10 43.66 42.82 43.42 16268338
...              ...  ...  ...  ...         ...
2014-12-23 51.46 51.46 49.93 50.02 15514036
2014-12-24 50.19 50.92 50.19 50.65 5962870
2014-12-26 50.65 51.06 50.61 50.86 5170048
2014-12-29 50.67 51.01 50.51 50.53 6624489 2014-12-30   50.35
51.27 50.35 51.22 10703455
```

[2263 rows x 5 columns]

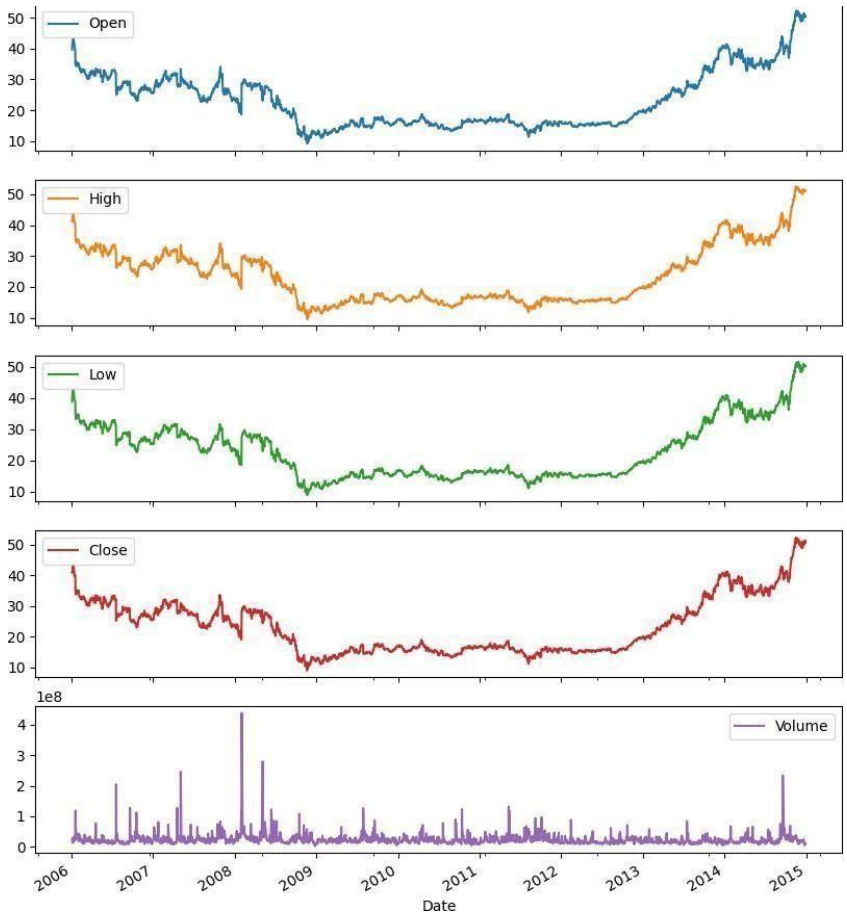
Example 1: Plotting a simple line plot for time series data.

```
df['Volume'].plot()
<Axes:
xlabel='Date'>
```




Example 2: Now let's plot all other columns using subplot.

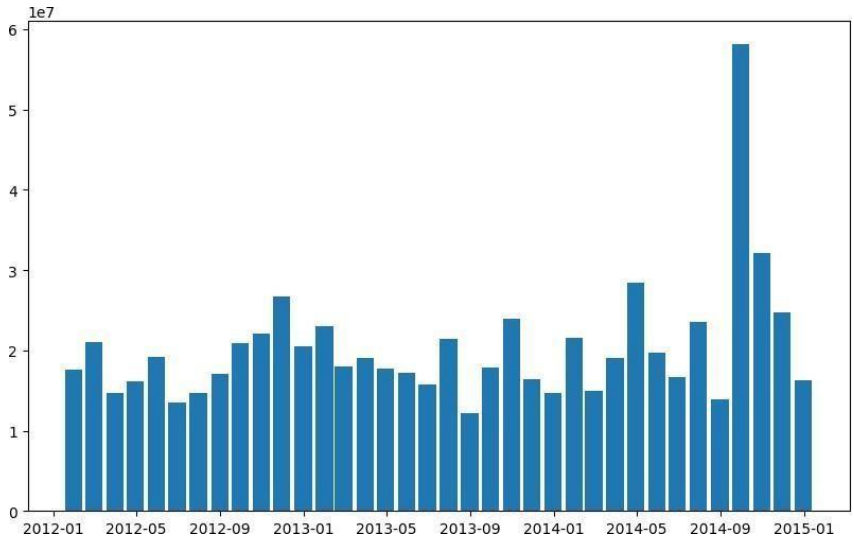
```
   df.plot(subplots=True, figsize=(10, 12))
array([<Axes: xlabel='Date'>,
<Axes: xlabel='Date'>,
<Axes: xlabel='Date'>, <Axes: xlabel='Date'>,
<Axes: xlabel='Date'>], dtype=object)
```




Resampling: Resampling is a methodology of economically using a data sample to improve the accuracy and quantify the uncertainty of a population parameter. Resampling for months or weeks and making bar plots is another very simple and widely used method of finding seasonality. Here we are going to make a bar plot of month data for 2016 and 2017. Example 3:

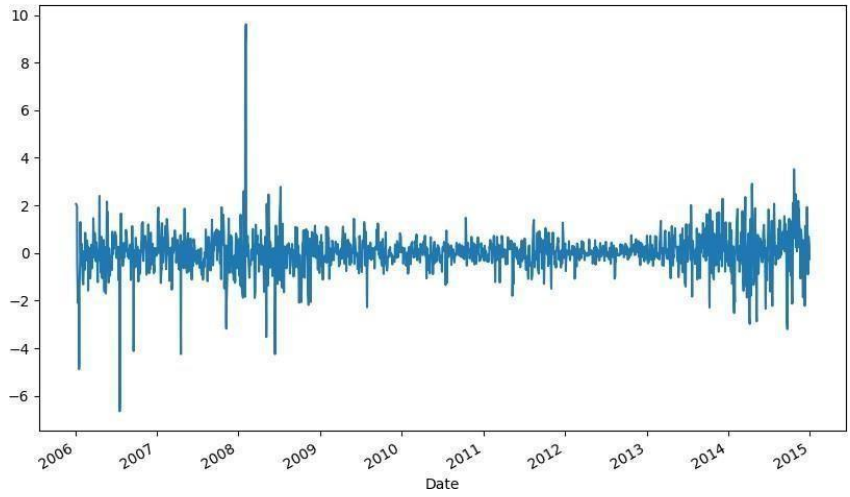
```
# Resampling the time series data based on monthly 'M' frequency df_month
= df.resample("M").mean() print(df_month)

# using subplot
fig, ax = plt.subplots(figsize=(10, 6))

# plotting bar graph   ax.bar(df_month['2012':'2014'].index,
df_month.loc['2012':'2014', "Volume"],width=25, align='center')
```

```
                Open       High        Low      Close         Volume  Change
Date
2006-01-31 38.245500 38.694000 37.641500 38.113000 3.400594e+07 0.991442
2006-02-28 33.141579 33.436842 32.627368 32.975789 2.329848e+07 0.996423
2006-03-31 31.333478 31.696957 30.929130 31.218696 2.095522e+07 1.000390
2006-04-30 32.383684 32.790000 31.914737 32.283158 2.200768e+07 1.001098
2006-05-31 31.744545 32.175455 31.171364 31.517273 2.218047e+07 0.998535
...              ...        ...        ...        ...           ...      ...
2014-08-31 36.836190 37.150000 36.545238 36.876667 1.396539e+07 1.003530
2014-09-30 40.662857 41.270000 39.983810 40.671905 5.811769e+07 1.003005
2014-10-31 41.253043 41.886087 40.784783 41.393913 3.210848e+07 1.005501
2014-11-30 49.879474 50.553158 49.440000 50.151579 2.474402e+07 1.006233
2014-12-31 50.359524 50.975714 49.852857 50.331905 1.623090e+07 0.999653

[108 rows x 6 columns]
<BarContainer object of 36 artists>
```



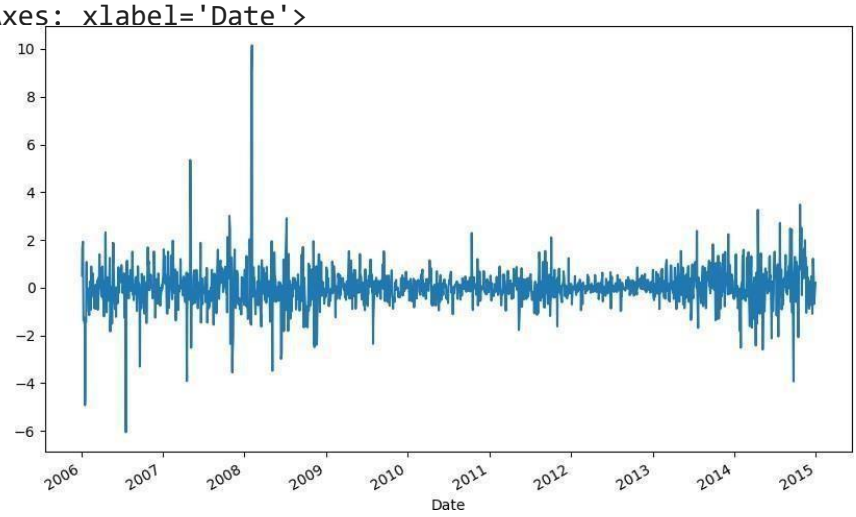

Differencing: Differencing is used to make the difference in values of a specified interval. By default, it's one, we can specify different values for plots. It is the most popular method to remove trends in the data.

```
   df.Low.diff(2).plot(figsize=(10,
6))
```




```
df.High.diff(2).plot(figsize=(10, 6))
```

<Axes: xlabel='Date'>

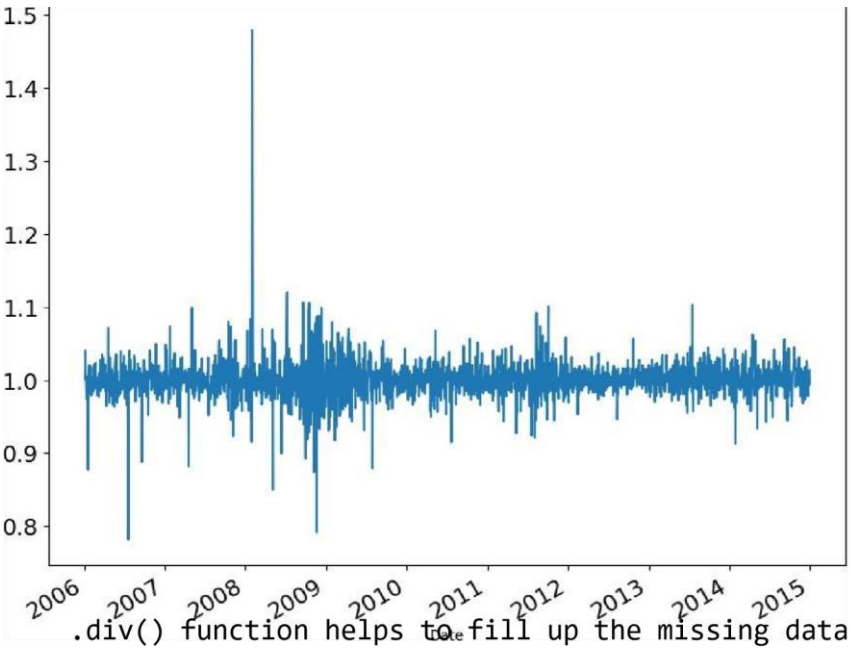



Plotting the Changes in Data

We can also plot the changes that occurred in data over time. There are a few ways to plot changes in data.

Shift: The shift function can be used to shift the data before or after the specified time interval. We can specify the time, and it will shift the data by one day by default. That means we will get the previous day's data. It is helpful to see previous day data and today's data simultaneously side by side.

```
   df['Change'] =
df.Close.div(df.Close.shift())
df['Change'].plot(figsize=(10, 8), fontsize=16)
```




.div() function helps to fill up the missing data values. Actually, div() means division.

If we take df. div(6) it will divide each element in df by 6.

We do this to avoid the null or missing values that are created by the 'shift()' operation.

```
df['Change'].plot(figsize=(10, 6))
```

```
< Axes: xlabel='Date'>
```

[+]