NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:30.07.2024

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

```
data=pd.read_csv('/content/Iris_Dataset.csv')
data
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm	variety
0	1	5.1	3.5	1.4	0.2	Iris-setosa
1	2	4.9	3.0	1.4	0.2	Iris-setosa
2	3	4.7	3.2	1.3	0.2	Iris-setosa
3	4	4.6	3.1	1.5	0.2	Iris-setosa
4	5	5.0	3.6	1.4	0.2	Iris-setosa
...	...	...	...	...	...	...
145	146	6.7	3.0	5.2	2.3	Iris-virginica
146	147	6.3	2.5	5.0	1.9	Iris-virginica
147	148	6.5	3.0	5.2	2.0	Iris-virginica
148	149	6.2	3.4	5.4	2.3	Iris-virginica
149	150	5.9	3.0	5.1	1.8	Iris-virginica

150 rows × 6 columns

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 6 columns):
 # Column Non-Null Count Dtype
---- ---------- ---------------------- ---------
 0 Id 150 non-null int64
 1 SepalLengthCm 150 non-null float64
 2 SepalWidthCm 150 non-null float64
 3 PetalLengthCm 150 non-null float64
 4 PetalWidthCm 150 non-null float64
 5 variety 150 non-null object
dtypes: float64(4), int64(1), object(1)
memory usage: 7.2+ KB
```

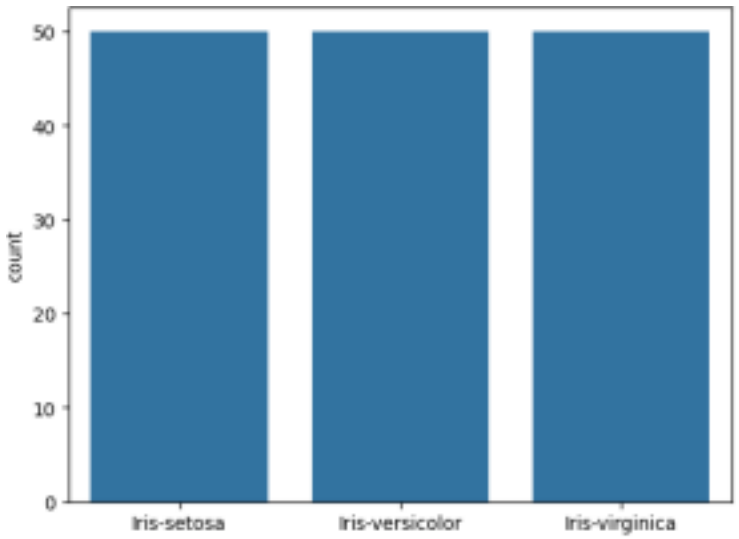
```
data.describe()
```

	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm	PetalWidthCm
count	150.000000	150.000000	150.000000	150.000000	150.000000
mean	75.500000	5.843333	3.054000	3.758667	1.198667
std	43.445368	0.828066	0.433594	1.764420	0.763161
min	1.000000	4.300000	2.000000	1.000000	0.100000
25%	38.250000	5.100000	2.800000	1.600000	0.300000
50%	75.500000	5.800000	3.000000	4.350000	1.300000
75%	112.750000	6.400000	3.300000	5.100000	1.800000
max	150 000000	7 900000	4 400000	6 900000	2 500000

```
data.value_counts('variety')
```

variety	count
Iris-setosa	50
Iris-versicolor	50
Iris-virginica	50

```
sns.countplot(x='variety',data=data,)
plt.show()
```

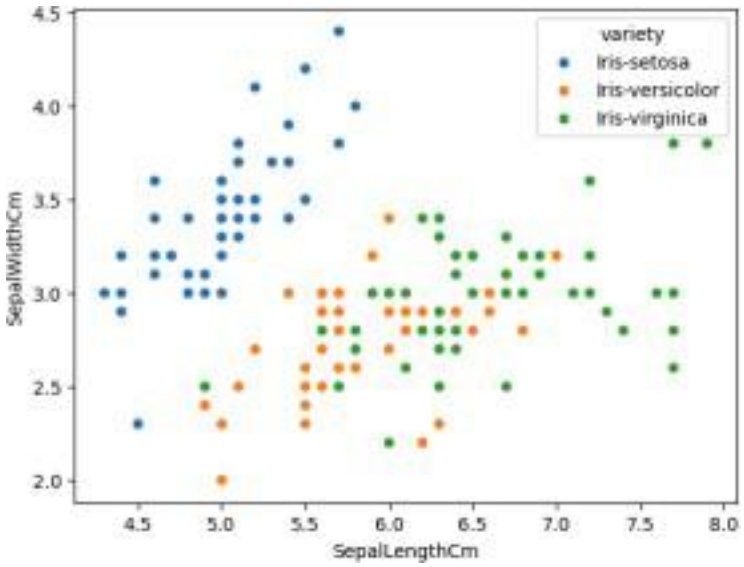



```
dummies=pd.get_dummies(data.variety)
FinalDataset=pd.concat([pd.get_dummies(data.variety),data.iloc[:,[0,1,2,3]]],axis=1)
FinalDataset.head()
```

	Iris-setosa	Iris-versicolor	Iris-virginica	Id	SepalLengthCm	SepalWidthCm	PetalLengthCm
0	True	False	False	1	5.1	3.5	1.4
1	True	False	False	2	4.9	3.0	1.4
2	True	False	False	3	4.7	3.2	1.3
3	True	False	False	4	4.6	3.1	1.5
4	True	False	False	5	5	0	3

```
sns.scatterplot(x='SepalLengthCm',y='SepalWidthCm',hue='variety',data=data,)
```

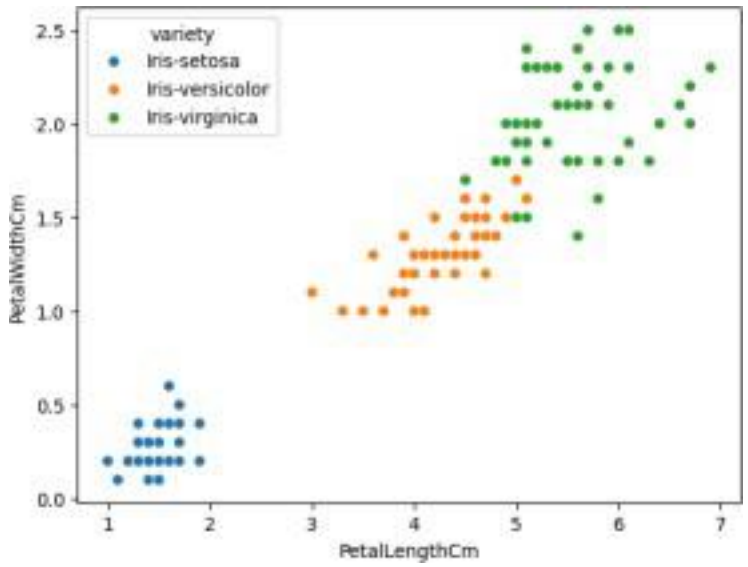
```
<Axes: xlabel='SepalLengthCm', ylabel='SepalWidthCm'>
```



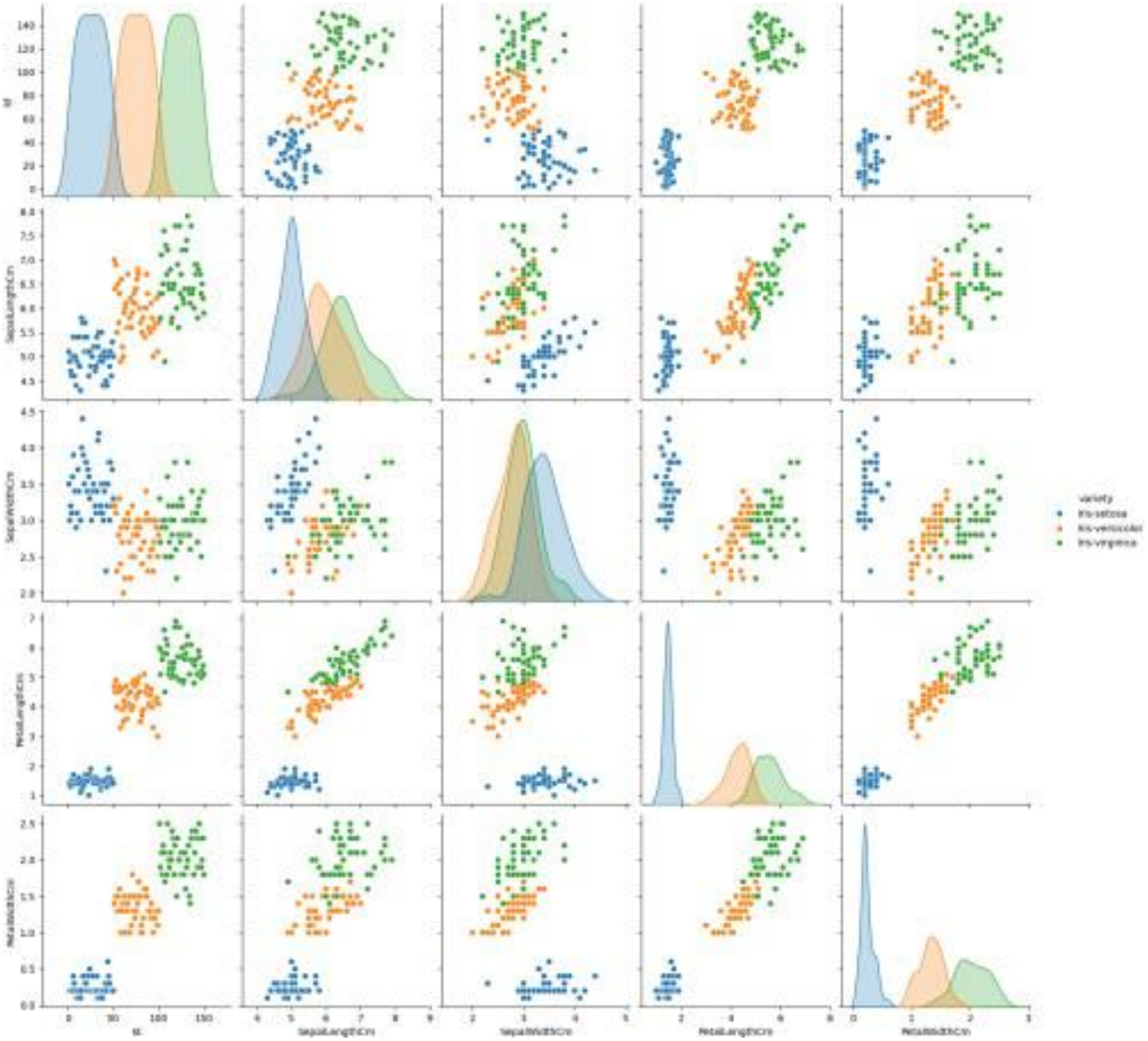

```
sns.scatterplot(x='PetalLengthCm',y='PetalWidthCm',hue='variety',data=data,)
```



```
<Axes: xlabel='PetalLengthCm', ylabel='PetalWidthCm'>
```

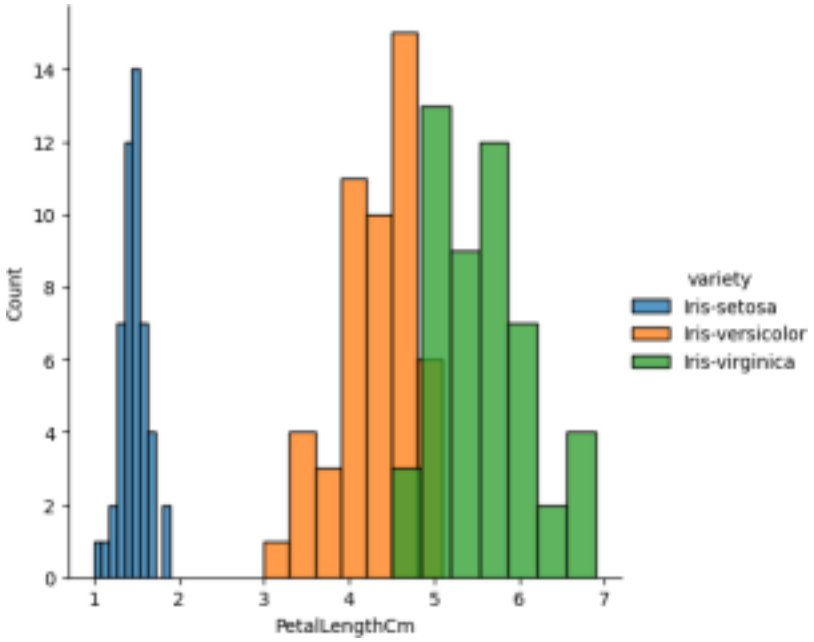



```
sns.pairplot(data,hue='variety',height=3);
```

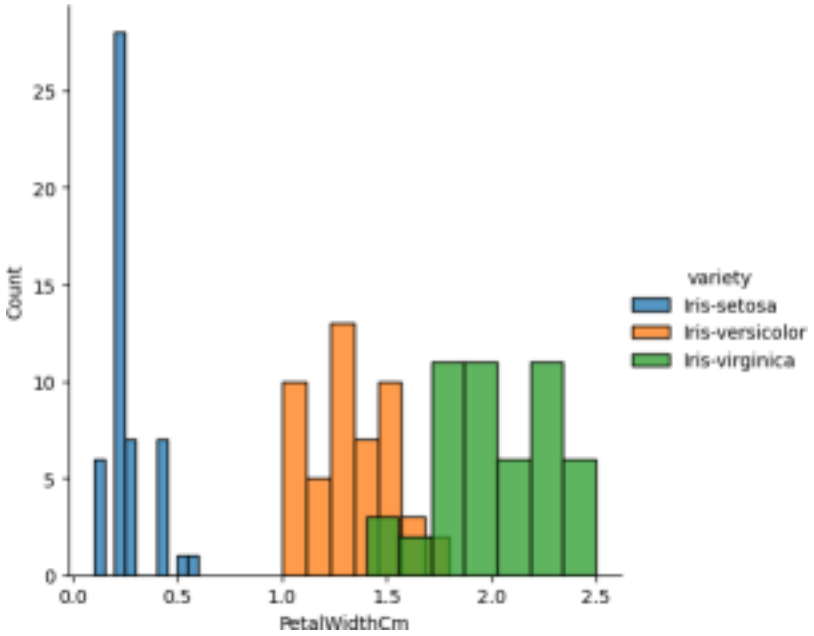


 `plt.show()`

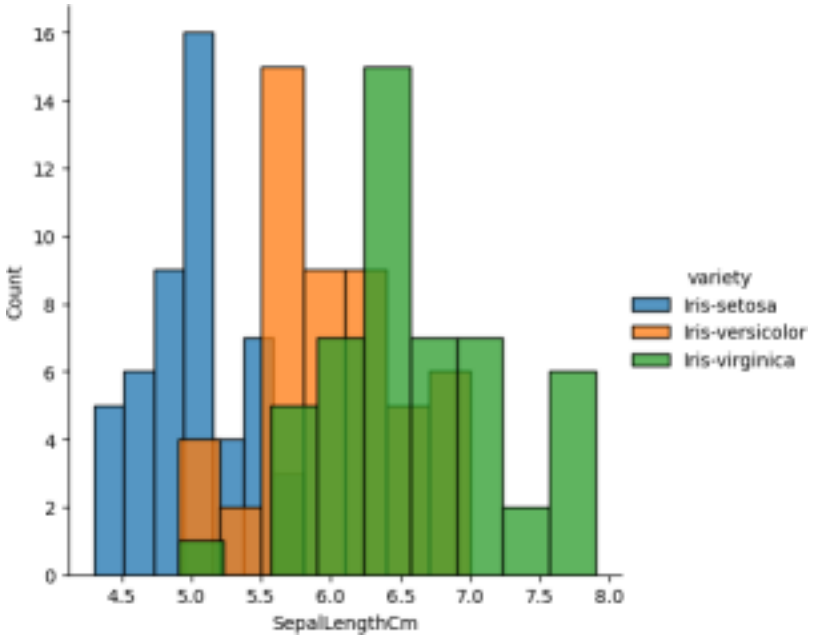
```
sns.FacetGrid(data,hue='variety',height=5).map(sns.histplot,'PetalLengthCm').add_legend();
plt.show();
```



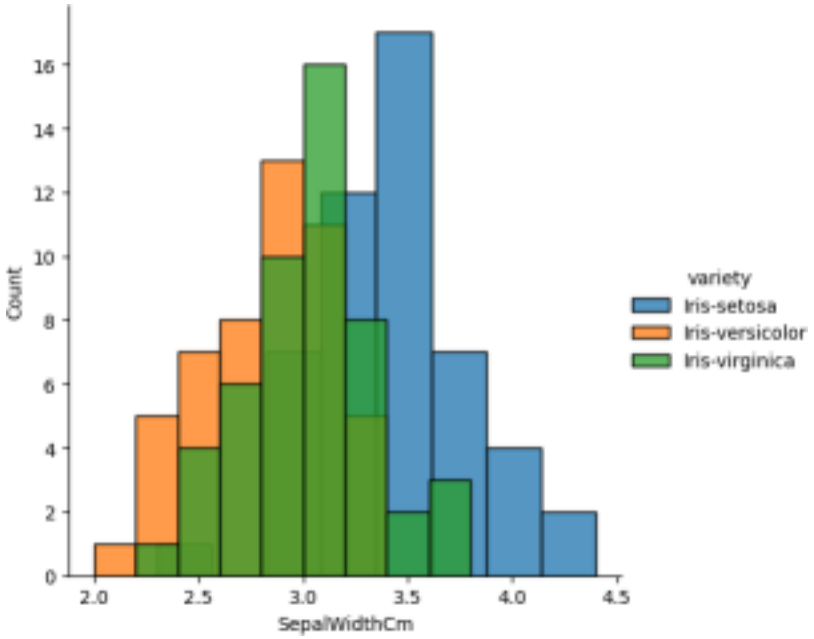

```
sns.FacetGrid(data,hue='variety',height=5).map(sns.histplot,'PetalWidthCm').add_legend();
plt.show();
```




```
sns.FacetGrid(data,hue='variety',height=5).map(sns.histplot,'SepalLengthCm').add_legend();
plt.show();
```




```
sns.FacetGrid(data,hue='variety',height=5).map(sns.histplot,'SepalWidthCm').add_legend();
plt.show();
```



NAME: ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:06.08.2024

```
import numpy as np
array=np.random.randint(1,100,9)
array
```

```
array([83, 25, 19, 47, 62, 15, 96, 39, 51])
```

```
np.sqrt(array)
```

```
array([9.11043358, 5. , 4.35889894, 6.8556546 , 7.87400787,
       3.87298335, 9.79795897, 6.244998 , 7.14142843])
```

```
array.ndim
```

```
1
```

```
new_array=array.reshape(3,3)
```

```
new_array
```

```
array([[83, 25, 19],
       [47, 62, 15],
       [96, 39, 51]])
```

```
new_array.ndim
```

```
2
```

```
new_array.ravel()
```

```
array([83, 25, 19, 47, 62, 15, 96, 39, 51])
```

```
newm=new_array.reshape(3,3)
```

```
newm
```

```
array([[83, 25, 19],
       [47, 62, 15],
       [96, 39, 51]])
```

```
newm[2,1:3]
```

```
array([39, 51])
```

```
newm[1:2,1:3]
```

```
array([[62, 15]])
```

```
new_array[0:3,0:0]
```

```
array([], shape=(3, 0), dtype=int64)
```

```
new_array[0:2,0:1]
array([[83],
       [47]])
```

```
new_array[0:3,0:1]
```

```
array([[83],
       [47],
       [96]])
```

```
new_array[1:3]
```

```
array([[47, 62, 15],
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:13.08.2024

```
import numpy as np
import pandas as pd
list=[[1,'Smith',50000],[2,'Jones',60000]]
```

```
df=pd.DataFrame(list)
df
```

	0	1	2
0	1	Smith	50000
1	2	Jones	60000

```
df.columns=['Empd','Name','Salary']
df
```

	Empd	Name	Salary
0	1	Smith	50000
1	2	Jones	60000

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2 entries, 0 to 1
Data columns (total 3 columns):
 # Column Non-Null Count Dtype
---  ------ -------------- -----
 0 Empd 2 non-null int64
 1 Name 2 non-null object
 2 Salary 2 non-null int64
dtypes: int64(2), object(1)
memory usage: 176.0+ bytes
```

```
df=pd.read_csv("/content/50_Startups.csv")
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 50 entries, 0 to 49
Data columns (total 5 columns):
 # Column Non-Null Count Dtype
---  ------ -------------- -----
 0 R&D Spend 50 non-null float64
 1 Administration 50 non-null float64
 2 Marketing Spend 50 non-null float64
 3 State 50 non-null object
 4 Profit 50 non-null float64
dtypes: float64(4), object(1)
memory usage: 2.1+ KB
```

```
df.head()
```

	R&D Spend	Administration	Marketing Spend	State	Profit
0	165349.20	136897.80	471784.10	New York	192261.83
1	162597.70	151377.59	443898.53	California	191792.06
2	153441.51	101145.55	407934.54	Florida	191050.39
3	144372.41	118671.85	383199.62	New York	182901.99
4	142107 34	91391 77	366168 42	Florida	166187 94

```
df.tail()
```

	R&D Spend	Administration	Marketing Spend	State	Profit
45	1000.23	124153.04	1903.93	New York	64926.08
46	1315.46	115816.21	297114.46	Florida	49490.75
47	0.00	135426.92	0.00	California	42559.73
48	542.05	51743.15	0.00	New York	35673.41
49	0 00	116983 80	45173 06	California	14681 40

```
import numpy as np
import pandas as pd
df=pd.read_csv("/content/employee.csv")
```

```
df.head()
```

	emp id	name	salary
0	1	SREE VARSSINI K S	5000
1	2	SREEMATHI B	6000
2	3	SREYA G	7000
3	4	SREYASKARI MULLAPUDI	5000
4	5	SRI AKASH U G	8000

```
df.tail()
```

	emp id	name	salary
2	3	SREYA G	7000
3	4	SREYASKARI MULLAPUDI	5000
4	5	SRI AKASH U G	8000
5	6	SRI HARSHAVARDHANAN R	3000
6	7	SRI HARSHAVARDHANAN R	6000

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7 entries, 0 to 6
Data columns (total 3 columns):
 # Column Non-Null Count Dtype
--- ------ -------------- -----
 0 emp id 7 non-null int64
 1 name 7 non-null object
 2 salary 7 non-null int64
dtypes: int64(2), object(1)
memory usage: 296.0+ bytes
```

```
df.salary
```

	salary
0	5000
1	6000
2	7000
3	5000
4	8000
5	3000
6	6000

```
type(df.salary)
```

```
pandas.core.series.Series
          __                    def __init                                          (data=None, index=None, dtype: Dtype |
                                                                                    None=None, name=None, copy: bool | None=None,

fastpath: bool=False) -> None

One-dimensional ndarray with axis labels (including time series).

Labels need not be unique but must be a hashable type. The object
supports both integer- and label-based indexing and provides a host of
methods for performing operations involving the index. Statistical
  th d f d h b idd t t ti ll l d
```

```
df.salary.mean()
```

```
5714.285714285715
```



```
df.salary.median()
```

```
6000.0
```

```
df.salary.mode()
```

	salary
0	5000
1	6000

```
df.salary.var()
```

```
2571428.5714285714
```

```
df.salary.std()
```

```
1603.5674514745463
```

```
df.describe()
```

	emp id	salary
count	7.000000	7.000000
mean	4.000000	5714.285714
std	2.160247	1603.567451
min	1.000000	3000.000000
25%	2.500000	5000.000000
50%	4.000000	6000.000000
75%	5.500000	6500.000000
max	7 000000	8000 000000

```
df.describe(include='all')
```

	emp id	name	salary
count	7.000000	7	7.000000
unique	NaN	6	NaN
top	NaN	SRI HARSHAVARDHANAN R	NaN
freq	NaN	2	NaN
mean	4.000000	NaN	5714.285714
std	2.160247	NaN	1603.567451
min	1.000000	NaN	3000.000000
25%	2.500000	NaN	5000.000000
50%	4.000000	NaN	6000.000000
75%	5.500000	NaN	6500.000000
max	7 000000	NaN	8000 000000

```
empCol=df.columns
empCol
```

```
Index(['emp id', 'name ', 'salary'], dtype='object')
```

```
emparray=df.values
```

```
emparray
```

```
array([[1, 'SREE VARSSINI K S', 5000],
       [2, 'SREEMATHI B', 6000],
       [3, 'SREYA G', 7000],
       [4, 'SREYASKARI MULLAPUDI', 5000],
       [5, 'SRI AKASH U G', 8000],
       [6, 'SRI HARSHAVARDHANAN R', 3000],
       [7, 'SRI HARSHAVARDHANAN R', 6000]], dtype=object)
```



```
employee_DF=pd.DataFrame(emparray,columns=empCol)
```

```
employee_DF
```

	emp id	name	salary
0	1	SREE VARSSINI K S	5000

1	2	SREEMATHI B	6000
2	3	SREYA G	7000
3	4	SREYASKARI MULLAPUDI	5000
4	5	SRI AKASH U G	8000
5	6	SRI HARSHAVARDHANAN R	3000
6	7	SRI HARSHAVARDHANAN R	6000

```
Start coding or generate with AI.
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:20.08.2024

```
#sample calculation for low range(lr) , upper range (ur),percentile
import numpy as np
array=np.random.randint(1,100,16) # randomly generate 16 numbers between 1 to 100
array
```

```
array([27, 50, 44, 6, 58, 61, 23, 86, 67, 20, 75, 7, 79, 61, 90, 54])
```

```
array.mean()
```

```
50.5
```

```
np.percentile(array,25)
```

```
26.0
```

```
np.percentile(array,50)
```

```
56.0
```

```
np.percentile(array,75)
```

```
69.0
```

```
np.percentile(array,100)
```

```
90.0
```

```
#outliers detection
def outDetection(array):
  sorted(array)
  Q1,Q3=np.percentile(array,[25,75])
  IQR=Q3-Q1
  lr=Q1-(1.5*IQR)
  ur=Q3+(1.5*IQR)
  return lr,ur
```

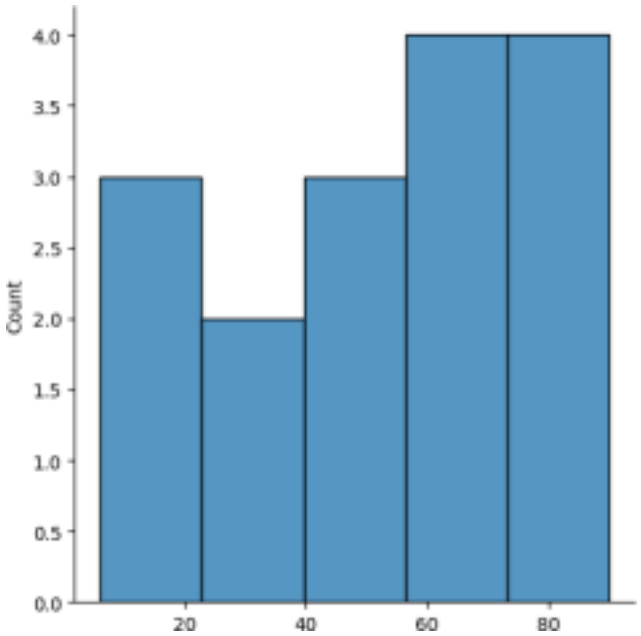
```
lr,ur=outDetection(array)
```

```
lr,ur
```

```
(-38.5, 133.5)
```

```
import seaborn as sns
%matplotlib inline
sns.displot(array)
```

```
<seaborn.axisgrid.FacetGrid at 0x78f3291c2710>
```




```
sns.distplot(array)
```

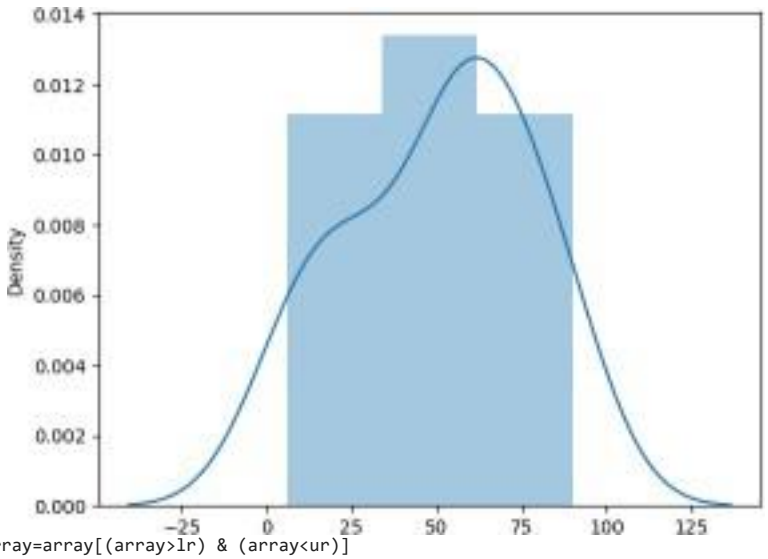
```
<ipython-input-19-d72101983c40>:1: UserWarning:

`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(array)
<Axes: ylabel='Density'>
```

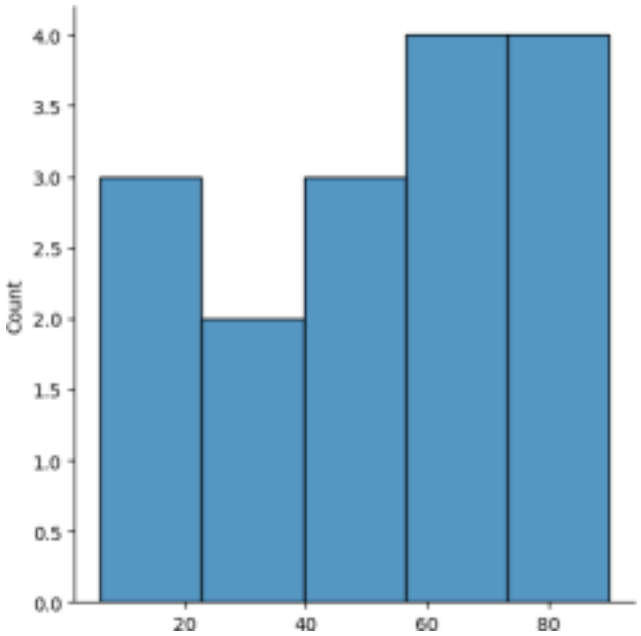



```
new_array=array[(array>lr) & (array<ur)]
new_array
```

```
array([27, 50, 44, 6, 58, 61, 23, 86, 67, 20, 75, 7, 79, 61, 90, 54])
```

```
sns.displot(new_array)
```

```
<seaborn.axisgrid.FacetGrid at 0x78f2e09bb580>
```




```
lr1,ur1=outDetection(new_array)
lr1,ur1
```

```
(-38.5, 133.5)
```

```
final_array=new_array[(new_array>lr1) & (new_array<ur1)]
final_array
```

```
array([27, 50, 44, 6, 58, 61, 23, 86, 67, 20, 75, 7, 79, 61, 90, 54])
```

```
sns.distplot(final_array)
```

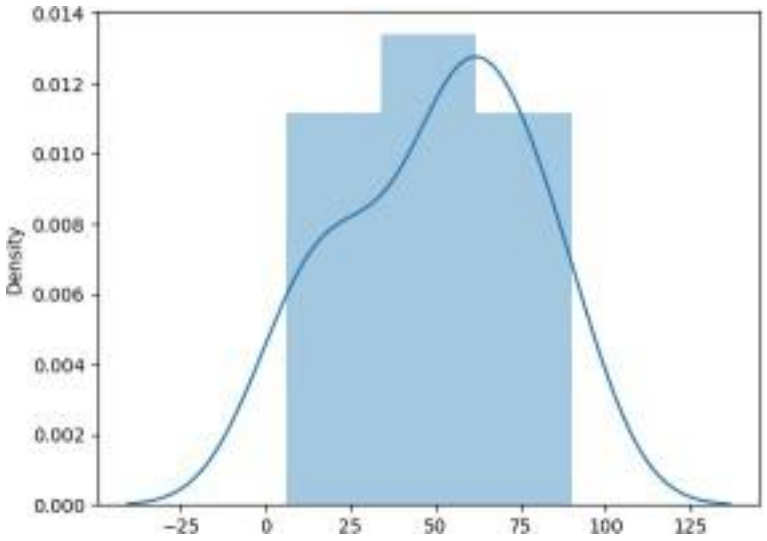
```
<ipython-input-18-7ba96ada5b76>:1: UserWarning:

`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(final_array)
<Axes: ylabel='Density'>
```



NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:27.08.2024

Handling Missing and Inappropriate Data in a Dataset

Aim: Demonstrate an experiment to handle missing data and inappropriate data in a Data set using Python Pandas Library for Data Preprocessing.

Dataset Given:

Hotel.csv

CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group
1	20-25	4	Ibis	veg	1300	2	40000	20-25
2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
3	25-30	6	RedFox	Veg	1322	2	30000	25-30
4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
5	35+	3	Ibis	Vegetarian	989	2	45000	35+
6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

About Dataset:

No.of Columns =9 (called as series – CustomerID, Age_Group, Rating(1-5),Hotel, FoodPreference, Bill, NoOfPax, EstimatedSalary)

CutomerID: Numerical Continuous data

Age: Categorical Data

Rating (1-5): Numerical Discrete Data

Hotel: Categorical Data

Food: Categorical Data

Bill: Numerical Continuous data

NoOfPax: Numerical Discrete

EstimatedSalary: Numerical Continuous data

Python Code:

Upload Hotel.csv and convert it into dataFrame

import numpy as np

import pandas as pd

df=pd.read_csv("Hotel_Dataset.csv")

df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
9	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
10	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

#From the dataframe identify the duplicate row(i.e row 9)

The duplicated() method returns a Series with True and False values that describe which rows in the DataFrame are duplicated and not.

df.duplicated()

```
0     False
1     False
2     False
3     False
4     False
5     False
6     False
7     False
8     False
9      True
10    False
dtype: bool
```

The info() method prints information about the DataFrame. The information contains the number of columns, column labels, column data types, memory usage, range index, and the number of cells in each column (non-null values).

df.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11 entries, 0 to 10
Data columns (total 9 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   CustomerID        11 non-null     int64
 1   Age_Group         11 non-null     object
 2   Rating(1-5)       11 non-null     int64
 3   Hotel             11 non-null     object
 4   FoodPreference    11 non-null     object
 5   Bill              11 non-null     int64
 6   NoOfPax           11 non-null     int64
 7   EstimatedSalary   11 non-null     int64
 8   Age_Group.1       11 non-null     object
dtypes: int64(5), object(4)
memory usage: 924.0+ bytes
```

The drop_duplicates() method removes duplicate rows.

df.drop_duplicates(inpl

ace=True) df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	Estimated Salary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
10	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

#While removing duplicate record row index also removed

The len() function to return the length of an object. With a dataframe, the function returns the number of rows.

len(df)

10

#Reset the index

index=np.array(list(range(0,len(df))))

df.set_index(index,inplace=True)

index

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

df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary	Age_Group.1
0	1	20-25	4	Ibis	veg	1300	2	40000	20-25
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000	30-35
2	3	25-30	6	RedFox	Veg	1322	2	30000	25-30
3	4	20-25	-1	LemonTree	Veg	1234	2	120000	20-25
4	5	35+	3	Ibis	Vegetarian	989	2	45000	35+
5	6	35+	3	Ibys	Non-Veg	1909	2	122220	35+
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122	35+
7	8	20-25	7	LemonTree	Veg	2999	-10	345673	20-25
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999	25-30
9	10	30-35	5	RedFox	non-Veg	-6755	4	87777	30-35

Axis refers to the dimensions of a DataFrame (index and columns) or Series (index only) Use axis=0 to apply functions row-wise along the index. Use axis=1 to apply functions column-wise across columns.

df.drop(['Age_Group.1'],axis=1,inp

lace=True) df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1	20-25	4	Ibis	veg	1300	2	40000
1	2	30-35	5	LemonTree	Non-Veg	2000	3	59000
2	3	25-30	6	RedFox	Veg	1322	2	30000
3	4	20-25	-1	LemonTree	Veg	1234	2	120000
4	5	35+	3	Ibis	Vegetarian	989	2	45000
5	6	35+	3	Ibys	Non-Veg	1909	2	122220
6	7	35+	4	RedFox	Vegetarian	1000	-1	21122
7	8	20-25	7	LemonTree	Veg	2999	-10	345673
8	9	25-30	2	Ibis	Non-Veg	3456	3	-99999
9	10	30-35	5	RedFox	non-Veg	-6755	4	87777

The function . loc is typically used for label indexing and can access multiple columns.

df.CustomerID.loc[df.CustomerID<0]=np.nan

df.Bill.loc[df.Bill<0]=np.nan

df.EstimatedSalary.loc[df.EstimatedSalary<0]=np.nan

df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1.0	20-25	4.0	Ibis	veg	1300.0	2	40000.0
1	2.0	30-35	5.0	LemonTree	Non-Veg	2000.0	3	59000.0
2	3.0	25-30	NaN	RedFox	Veg	1322.0	2	30000.0
3	4.0	20-25	NaN	LemonTree	Veg	1234.0	2	120000.0
4	5.0	35+	3.0	Ibis	Vegetarian	989.0	2	45000.0
5	6.0	35+	3.0	Ibys	Non-Veg	1909.0	2	122220.0
6	7.0	35+	4.0	RedFox	Vegetarian	1000.0	-1	21122.0
7	8.0	20-25	NaN	LemonTree	Veg	2999.0	-10	345673.0
8	9.0	25-30	2.0	Ibis	Non-Veg	3456.0	3	NaN
9	10.0	30-35	5.0	RedFox	non-Veg	NaN	4	87777.0

df['NoOfPax'].loc[(df['NoOfPax']<1) | (df['NoOfPax']>20)]=np.nan df

```
See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
df['NoOfPax'].loc[(df['NoOfPax']<1) | (df['NoOfPax']>20)]=np.nan
```

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1.0	20-25	4.0	Ibis	veg	1300.0	2.0	40000.0
1	2.0	30-35	5.0	LemonTree	Non-Veg	2000.0	3.0	59000.0
2	3.0	25-30	NaN	RedFox	Veg	1322.0	2.0	30000.0
3	4.0	20-25	NaN	LemonTree	Veg	1234.0	2.0	120000.0
4	5.0	35+	3.0	Ibis	Vegetarian	989.0	2.0	45000.0
5	6.0	35+	3.0	Ibys	Non-Veg	1909.0	2.0	122220.0
6	7.0	35+	4.0	RedFox	Vegetarian	1000.0	NaN	21122.0
7	8.0	20-25	NaN	LemonTree	Veg	2999.0	NaN	345673.0
8	9.0	25-30	2.0	Ibis	Non-Veg	3456.0	3.0	NaN
9	10.0	30-35	5.0	RedFox	non-Veg	NaN	4.0	87777.0

df.Age_Group.unique()

```
array(['20-25', '30-35', '25-30', '35+'], dtype=object)
```

df.Hotel.unique()

```
array(['Ibis', 'LemonTree', 'RedFox', 'Ibys'], dtype=object)
```

Using the inplace=True keyword in a pandas method changes the default behaviour such that the operation on the dataframe doesn't return anything, it instead 'modifies the underlying data

df.Hotel.replace(['Ibys'],'Ibis',inplac

e=True) df.FoodPreference.unique

```
<bound method Series.unique of 0 veg
1 Non-Veg
2 Veg
3 Veg
4 Vegetarian
5 Non-Veg
6 Vegetarian
7 Veg
8 Non-Veg
9 non-Veg
Name: FoodPreference, dtype: object>
```

df.FoodPreference.replace(['Vegetarian','veg'],'Veg',in

place=True) df.FoodPreference.replace(['non-Veg'],'Non-

Veg',inplace=True)

Fillna is a Pandas function to fill the NA/NaN values with the specified method.

If column or feature is numerical continuous data then replace the missing(NaN) value by taking mean value.

If column or feature is numerical discrete data then replace the missing(NaN) value by taking median value.
If column or feature is non-numerical i.e Categorical data then replace the missing(NaN) value by taking mode value.

df.EstimatedSalary.fillna(round(df.EstimatedSalary.mean()),inplace=True)

df.NoOfPax.fillna(round(df.NoOfPax.median()),inplace=True)

df['Rating(1-5)'].fillna(round(df['Rating(1-5)'].median()), inplace=True)

df.Bill.fillna(round(df.Bill.mean()),inplace=True)

df

	CustomerID	Age_Group	Rating(1-5)	Hotel	FoodPreference	Bill	NoOfPax	EstimatedSalary
0	1.0	20-25	4.0	Ibis	Veg	1300.0	2.0	40000.0
1	2.0	30-35	5.0	LemonTree	Non-Veg	2000.0	3.0	59000.0
2	3.0	25-30	4.0	RedFox	Veg	1322.0	2.0	30000.0
3	4.0	20-25	4.0	LemonTree	Veg	1234.0	2.0	120000.0
4	5.0	35+	3.0	Ibis	Veg	989.0	2.0	45000.0
5	6.0	35+	3.0	Ibis	Non-Veg	1909.0	2.0	122220.0
6	7.0	35+	4.0	RedFox	Veg	1000.0	2.0	21122.0
7	8.0	20-25	4.0	LemonTree	Veg	2999.0	2.0	345673.0
8	9.0	25-30	2.0	Ibis	Non-Veg	3456.0	3.0	96755.0
9	10.0	30-35	5.0	RedFox	Non-Veg	1801.0	4.0	87777.0

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:03.09.2024

```
import numpy as np
import pandas as pd
df=pd.read_csv('/content/pre-process_datasample.csv')
df
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	NaN	Yes
5	France	35.0	58000.0	Yes
6	Spain	NaN	52000.0	No
7	France	48.0	79000.0	Yes
8	NaN	50.0	83000.0	No
9	France	37.0	67000.0	Yes

Next steps: `df.head()` Generate code with `df` View recommended plots New interactive sheet

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40 0	NaN	Yes

Next steps: Generate code with `df` View recommended plots New interactive sheet

```
df.Country.fillna(df.Country.mode()[0],inplace=True)
features=df.iloc[:,:-1].values
```

```
<ipython-input-5-20665a0bbaa1>:1: FutureWarning: A value is trying to be set on a copy of a DataFrame o The
behavior will change in pandas 3.0. This inplace method will never work because the intermediate ob

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inpla


df.Country.fillna(df.Country.mode()[0],inplace=True)
```

```
Start coding or generate with AI.
```



```
from sklearn.impute import SimpleImputer


age=SimpleImputer(strategy="mean",missing_values=np.nan)


Salary=SimpleImputer(strategy="mean",missing_values=np.nan)


age.fit(features[:,[1]])
```

```
▾ SimpleImputer i ?
SimpleImputer()
```

```
Salary.fit(features[:,[2]])
```

```
▾ SimpleImputer i ?
SimpleImputer()
```

```
SimpleImputer()
```

```
▾ SimpleImputer i ?
SimpleImputer()
```

```
features[:,[1]]=age.transform(features[:,[1]])


features[:,[2]]=Salary.transform(features[:,[2]])


features
```

```
array([['France', 44.0, 72000.0],
 ['Spain', 27.0, 48000.0],
 ['Germany', 30.0, 54000.0],
 ['Spain', 38.0, 61000.0],
 ['Germany', 40.0, 63777.77777777778],
 ['France', 35.0, 58000.0],
```

```
       ['Spain', 38.77777777777778, 52000.0],
       ['France', 48.0, 79000.0],
       ['France', 50.0, 83000.0],
       ['France', 37.0, 67000.0]], dtype=object)
```

```
from sklearn.preprocessing import OneHotEncoder
```

```
oh = OneHotEncoder(sparse_output=False)
```

```
Country=oh.fit_transform(features[:,[0]])
```

```
Country
```

```
array([[1., 0., 0.],
       [0., 0., 1.],
       [0., 1., 0.],
       [0., 0., 1.],
       [0., 1., 0.],
       [1., 0., 0.],
       [0., 0., 1.],
       [1., 0., 0.],
```



```
       [1., 0., 0.],
       [1., 0., 0.]])
```

```
final_set=np.concatenate((Country,features[:,[1,2]]),axis=1)
```

```
final_set
```

```
array([[1.0, 0.0, 0.0, 44.0, 72000.0],
       [0.0, 0.0, 1.0, 27.0, 48000.0],
       [0.0, 1.0, 0.0, 30.0, 54000.0],
       [0.0, 0.0, 1.0, 38.0, 61000.0],
       [0.0, 1.0, 0.0, 40.0, 63777.77777777778],
       [1.0, 0.0, 0.0, 35.0, 58000.0],
       [0.0, 0.0, 1.0, 38.77777777777778, 52000.0],
       [1.0, 0.0, 0.0, 48.0, 79000.0],
       [1.0, 0.0, 0.0, 50.0, 83000.0],
       [1.0, 0.0, 0.0, 37.0, 67000.0]], dtype=object)
```

```
from sklearn.preprocessing import StandardScaler
sc=StandardScaler()
sc.fit(final_set)
feat_standard_scaler=sc.transform(final_set)
```

```
feat_standard_scaler
```

```
array([[ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
         7.58874362e-01, 7.49473254e-01],
       [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
       -1.71150388e+00, -1.43817841e+00],
       [-1.00000000e+00, 2.00000000e+00, -6.54653671e-01,
       -1.27555478e+00, -8.91265492e-01],
       [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
       -1.13023841e-01, -2.53200424e-01],
       [-1.00000000e+00, 2.00000000e+00, -6.54653671e-01,
       1.77608893e-01, 6.63219199e-16],
       [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
       -5.48972942e-01, -5.26656882e-01],
       [-1.00000000e+00, -5.00000000e-01, 1.52752523e+00,
       0.00000000e+00, -1.07356980e+00],
       [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01, 1.34013983e+00,
       1.38753832e+00],
       [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01, 1.63077256e+00,
       1.75214693e+00],
       [ 1.00000000e+00, -5.00000000e-01, -6.54653671e-01,
       -2.58340208e-01, 2.93712492e-01]])
```

```
from sklearn.preprocessing import MinMaxScaler
mms=MinMaxScaler(feature_range=(0,1))
mms.fit(final_set)
feat_minmax_scaler=mms.transform(final_set)
```

```
array([[1. , 0. , 0. , 0.73913043, 0.68571429],
 [0. , 0. , 1. , 0. , 0. ],
 [0. , 1. , 0. , 0.13043478, 0.17142857],
 [0. , 0. , 1. , 0.47826087, 0.37142857],
 [0. , 1. , 0. , 0.56521739, 0.45079365],
 [1. , 0. , 0. , 0.34782609, 0.28571429],
 [0. , 0. , 1. , 0.51207729, 0.11428571],
 [1. , 0. , 0. , 0.91304348, 0.88571429],
 [1. , 0. , 0. , 1. , 1. ],
 [1. , 0. , 0. , 0.43478261, 0.54285714]])
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:10.09.2024

```
import numpy as np
import pandas as pd
df=pd.read_csv("/content/pre-process_datasample.csv")
df
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	NaN	Yes
5	France	35.0	58000.0	Yes
6	Spain	NaN	52000.0	No
7	France	48.0	79000.0	Yes
8	NaN	50.0	83000.0	No
9	France	37.0	67000.0	Yes

Double-click (or enter) to edit

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 # Column Non-Null Count Dtype
--- ------ -------------- -----
 0 Country 9 non-null object
 1 Age 9 non-null float64
 2 Salary 9 non-null float64
 3 Purchased 10 non-null object
dtypes: float64(2), object(2)
memory usage: 448.0+ bytes
```

```
df.Country.mode()
```

	Country
0	France

```
df.Country.mode()[0]
```

```
type(df.Country.mode())
```

```
pandas.core.series.Series
__                    def __init                                    (data=None, index=None, dtype: Dtype |
                                                                    None=None, name=None, copy: bool | None=None,
fastpath: bool=False) -> None
 ~~index is not None, the resulting Series is reindexed with the index values.~~
dtype : str, numpy.dtype, or ExtensionDtype, optional
 Data type for the output Series. If not specified, this will be
 inferred from `data`.
 See the :ref:`user guide <basics.dtypes>` for more usages.
name : Hashable, default None
    The name to give to the Series
```

```
df.Country.fillna(df.Country.mode()[0],inplace=True)
```

```
df.Age.fillna(df.Age.median(),inplace=True)
```

```
df.Salary.fillna(round(df.Salary.mean()),inplace=True)
```

```
df
```

	Country	Age	Salary	Purchased
0	France	44.0	72000.0	No
1	Spain	27.0	48000.0	Yes
2	Germany	30.0	54000.0	No
3	Spain	38.0	61000.0	No
4	Germany	40.0	63778.0	Yes
5	France	35.0	58000.0	Yes
6	Spain	38.0	52000.0	No
7	France	48.0	79000.0	Yes
8	France	50.0	83000.0	No
9	France	37 0	67000 0	Yes

```
pd.get_dummies(df.Country)
```

	France	Germany	Spain
0	True	False	False
1	False	False	True
2	False	True	False
3	False	False	True
4	False	True	False
5	True	False	False
6	False	False	True
7	True	False	False
8	True	False	False
9	True	False	False

```
updated_dataset=pd.concat([pd.get_dummies(df.Country),df.iloc[:,[1,2,3]]],axis=1)
```

```
updated_dataset
```

	France	Germany	Spain	Age	Salary	Purchased
0	True	False	False	44.0	72000.0	No
1	False	False	True	27.0	48000.0	Yes
2	False	True	False	30.0	54000.0	No
3	False	False	True	38.0	61000.0	No
4	False	True	False	40.0	63778.0	Yes
5	True	False	False	35.0	58000.0	Yes
6	False	False	True	38.0	52000.0	No
7	True	False	False	48.0	79000.0	Yes
8	True	False	False	50.0	83000.0	No
9	True	False	False	37 0	67000 0	Yes

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10 entries, 0 to 9
Data columns (total 4 columns):
 # Column Non-Null Count Dtype
---  ------ -------------- -----
 0 Country 10 non-null object
 1 Age 10 non-null float64
 2 Salary 10 non-null float64
 3 Purchased 10 non-null object
dtypes: float64(2), object(2)
memory usage: 448.0+ bytes
```

```
updated_dataset.Purchased.replace(['No','Yes'],[0,1],inplace=True)
```



```
updated_dataset
```

	France	Germany	Spain	Age	Salary	Purchased
0	True	False	False	44.0	72000.0	0
1	False	False	True	27.0	48000.0	1

2 False True False 30.0 54000.0 0

3 False False True 38.0 61000.0 0

4 False True False 40.0 63778.0 1

5 True False False 35.0 58000.0 1

6 False False True 38.0 52000.0 0

7 True False False 48.0 79000.0 1

8 True False False 50.0 83000.0 0

9 True False False 37 0 67000 0 1

```
Start coding or generate with AI.
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:08.10.2024

```
import seaborn as sns
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
```

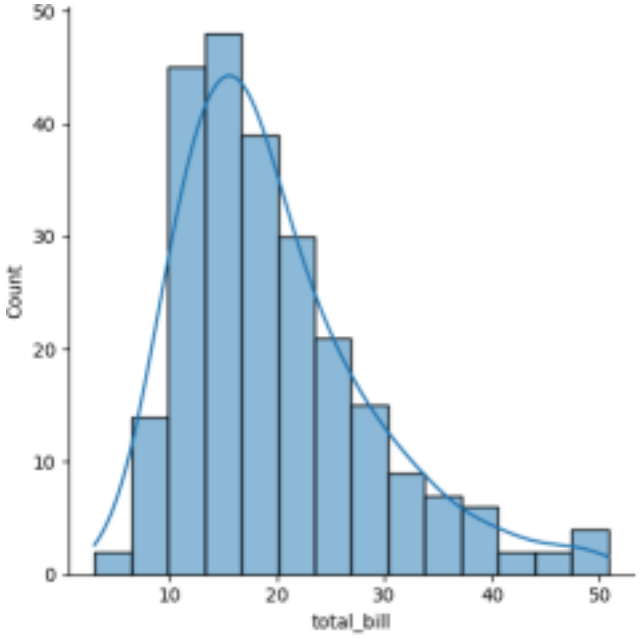
```
tips=sns.load_dataset('tips')
```

```
tips.head()
```

	total_bill	tip	sex	smoker	day	time	size
0	16.99	1.01	Female	No	Sun	Dinner	2
1	10.34	1.66	Male	No	Sun	Dinner	3
2	21.01	3.50	Male	No	Sun	Dinner	3
3	23.68	3.31	Male	No	Sun	Dinner	2
4	24.59	3.61	Female	No	Sun	Dinner	4

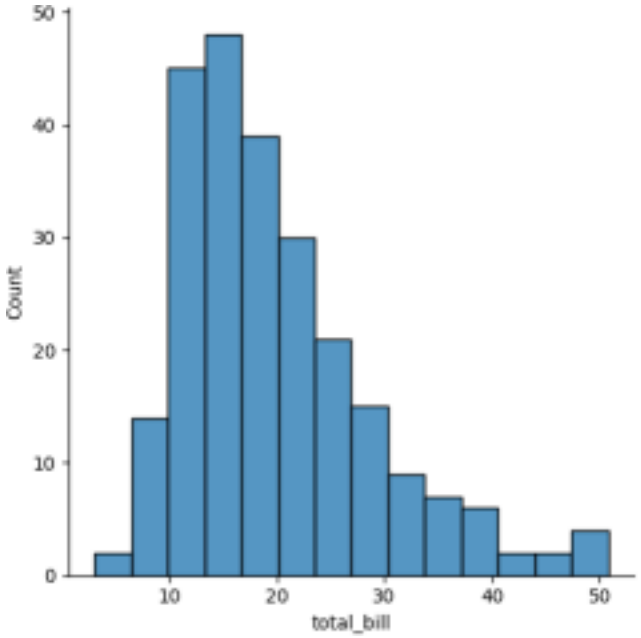

```
sns.displot(tips.total_bill,kde=True)
```

```
<seaborn.axisgrid.FacetGrid at 0x79bb4c7ea680>
```



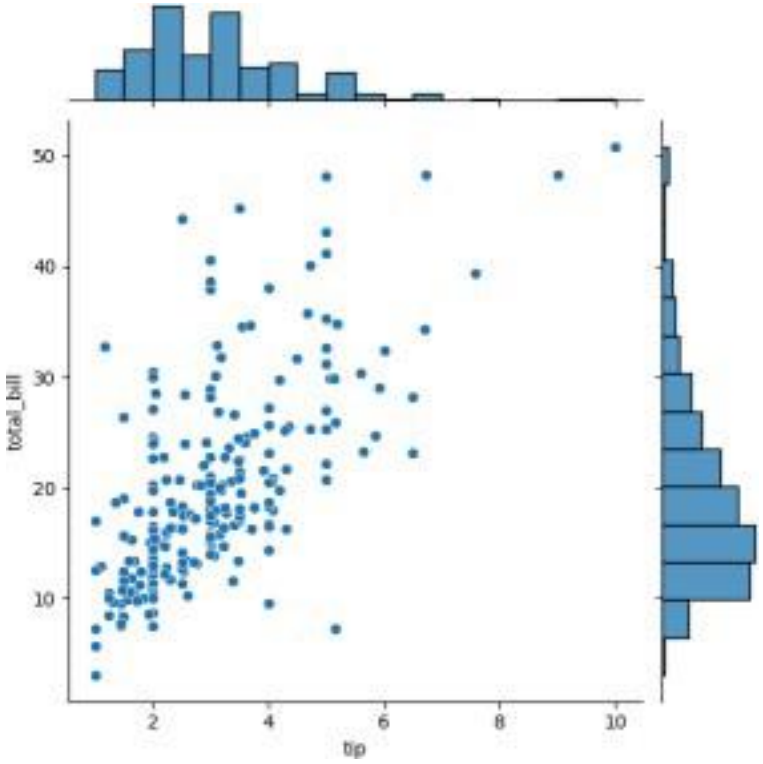

```
sns.displot(tips.total_bill,kde=False)
```

```
<seaborn.axisgrid.FacetGrid at 0x79bb0b0af580>
```




```
sns.jointplot(x=tips.tip,y=tips.total_bill)
```

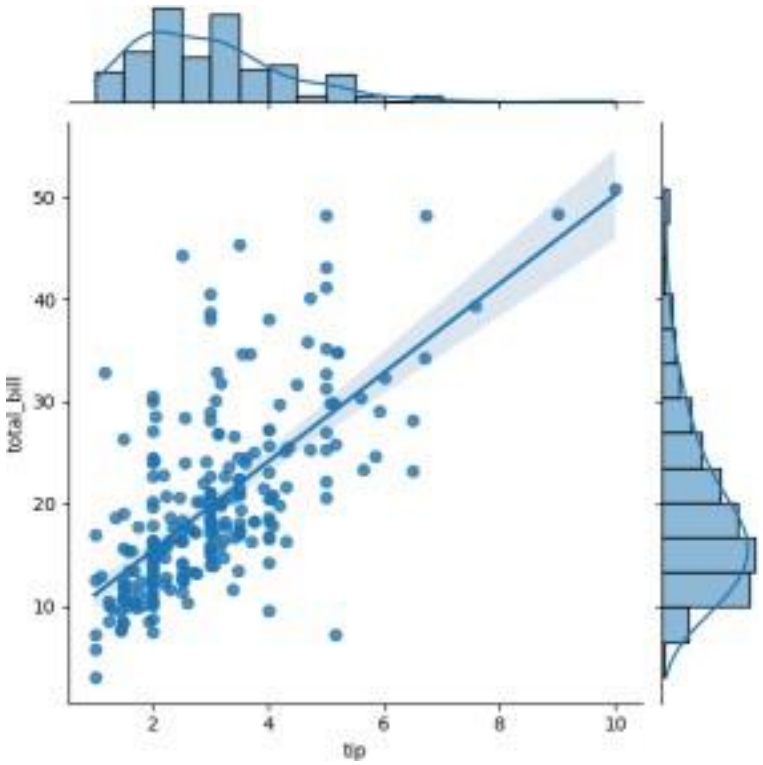
```
<seaborn.axisgrid.JointGrid at 0x79bb08fc96c0>
```




```
sns.jointplot(x=tips.tip,y=tips.total_bill,kind="reg")
```

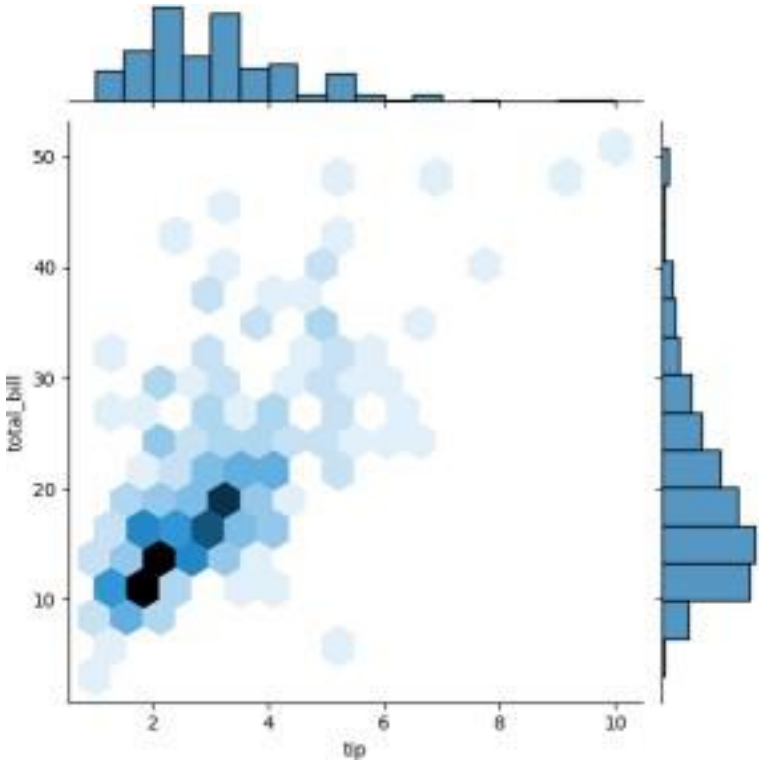


```
<seaborn.axisgrid.JointGrid at 0x79bb08fc9cf0>
```




```
sns.jointplot(x=tips.tip,y=tips.total_bill,kind="hex")
```

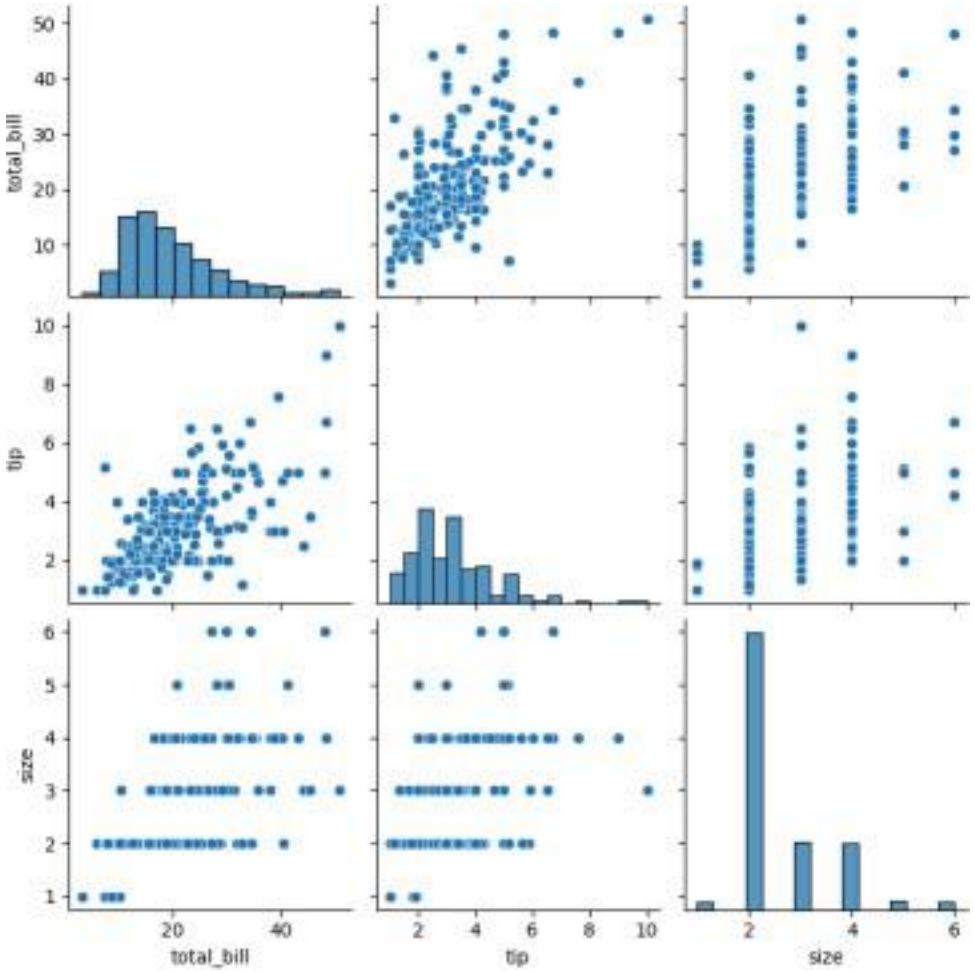
```
<seaborn.axisgrid.JointGrid at 0x79bb088f4730>
```




```
sns.pairplot(tips)
```



```
<seaborn.axisgrid.PairGrid at 0x79bb06fc3d30>
```




```
tips.time.value_counts()
```

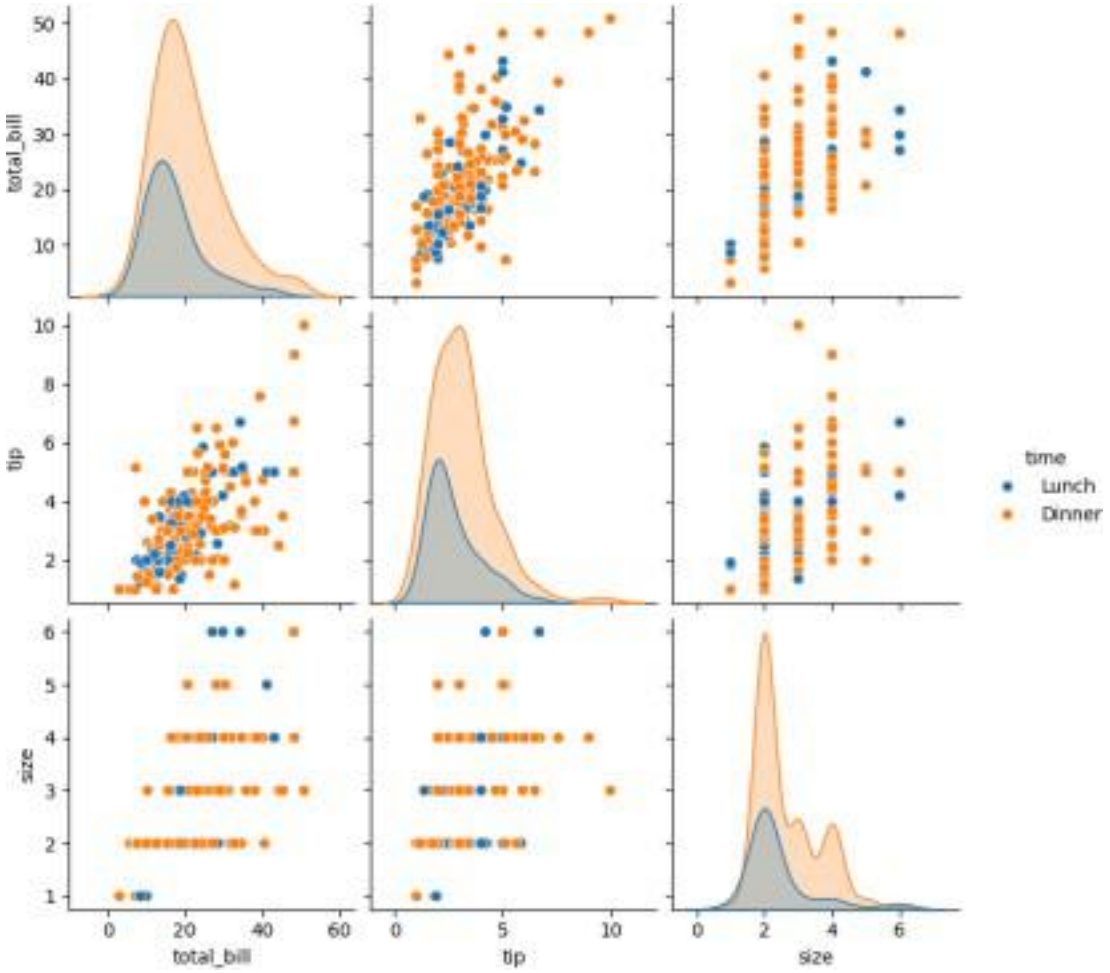
time	count
Dinner	176
Lunch	68

dtype: int64

```
sns.pairplot(tips,hue='time')
```

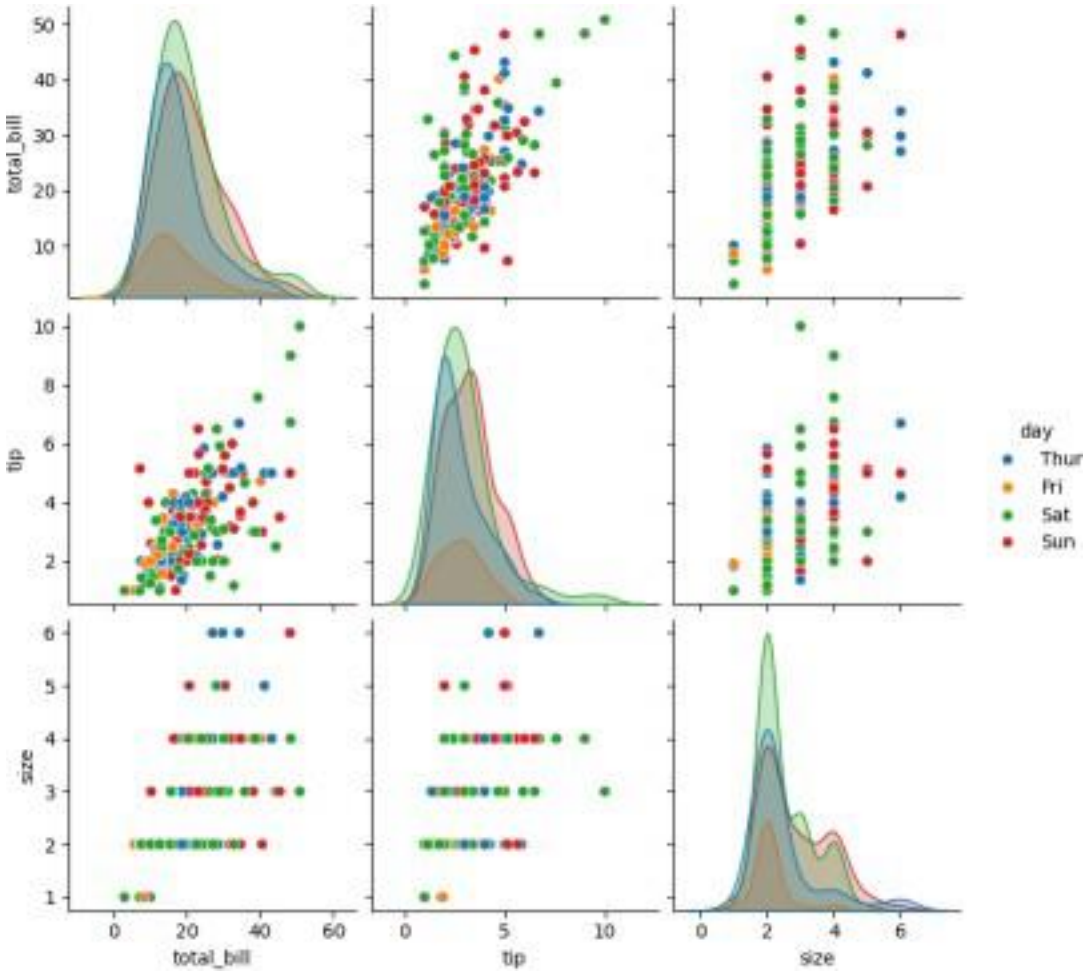


```
<seaborn.axisgrid.PairGrid at 0x79bb088f4670>
```



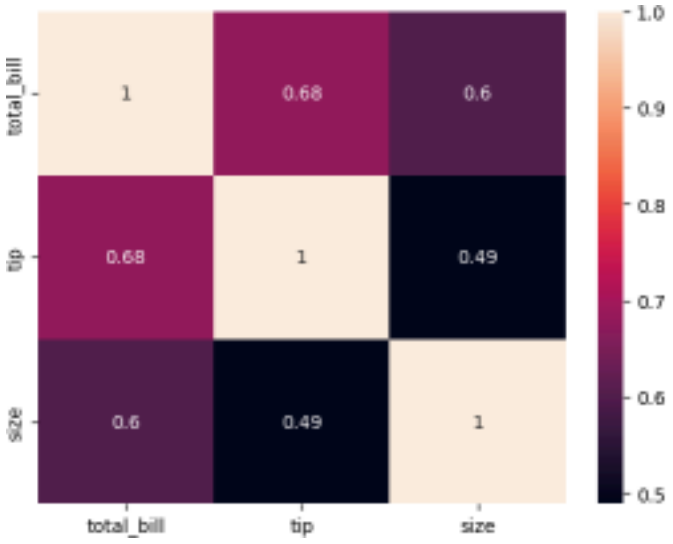

```
sns.pairplot(tips,hue='day')
```

```
<seaborn.axisgrid.PairGrid at 0x79bb08f1f6a0>
```



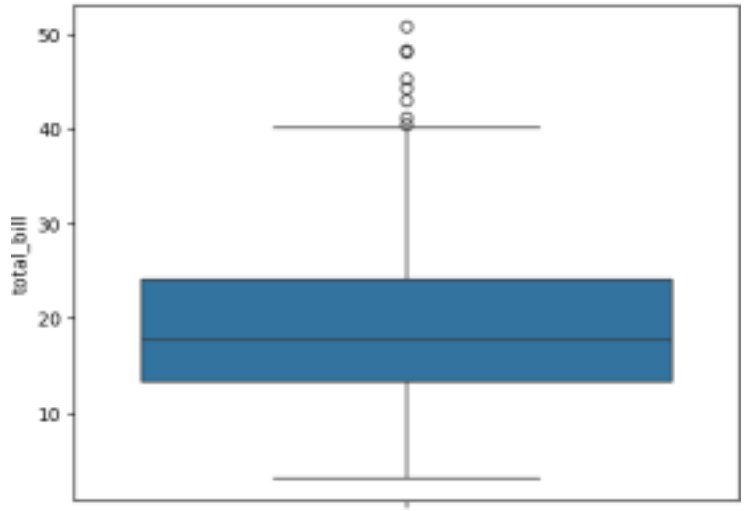

```
sns.heatmap(tips.corr(numeric_only=True),annot=True)
```

```
<Axes: >
```



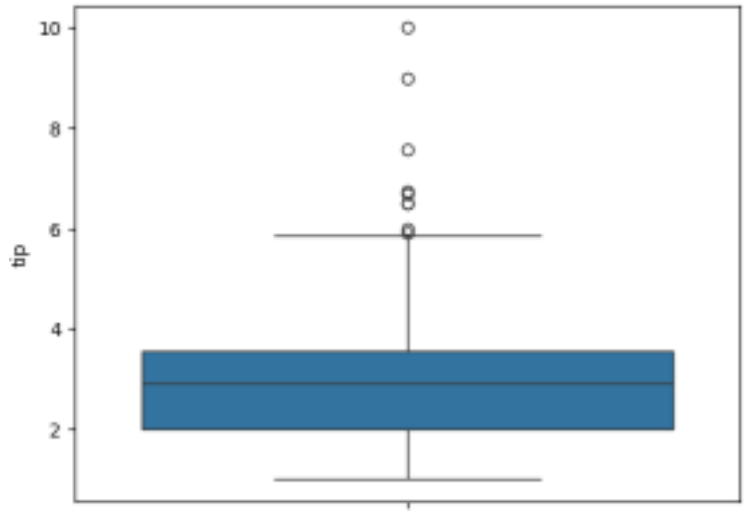

```
sns.boxplot(tips.total_bill)
```

```
<Axes: ylabel='total_bill'>
```



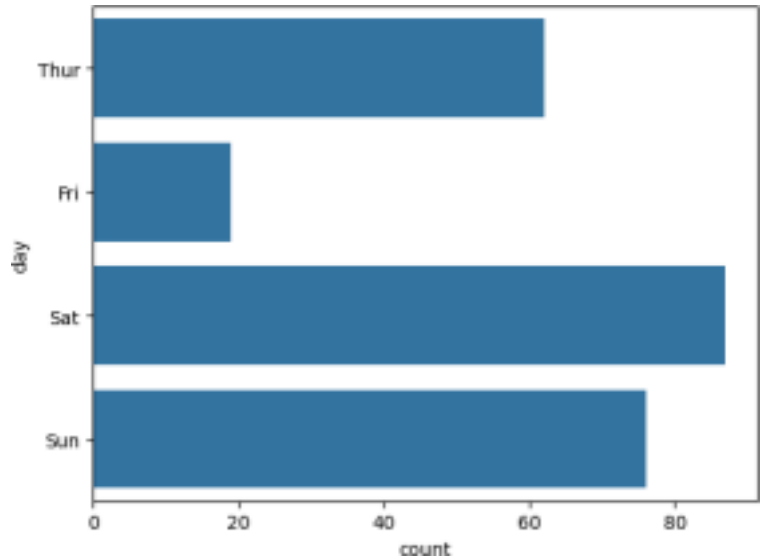

```
sns.boxplot(tips.tip)
```

```
<Axes: ylabel='tip'>
```




```
sns.countplot(tips.day)
```

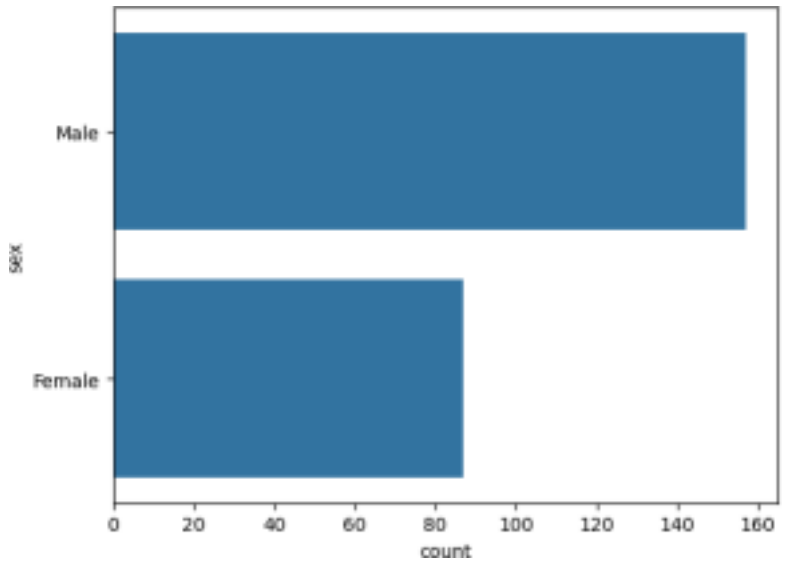
```
<Axes: xlabel='count', ylabel='day'>
```




```
sns.countplot(tips.sex)
```

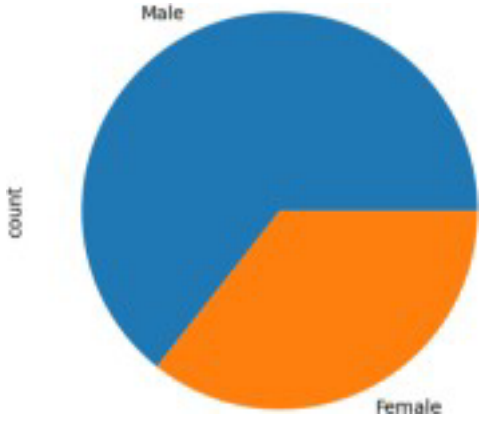


```
<Axes: xlabel='count', ylabel='sex'>
```



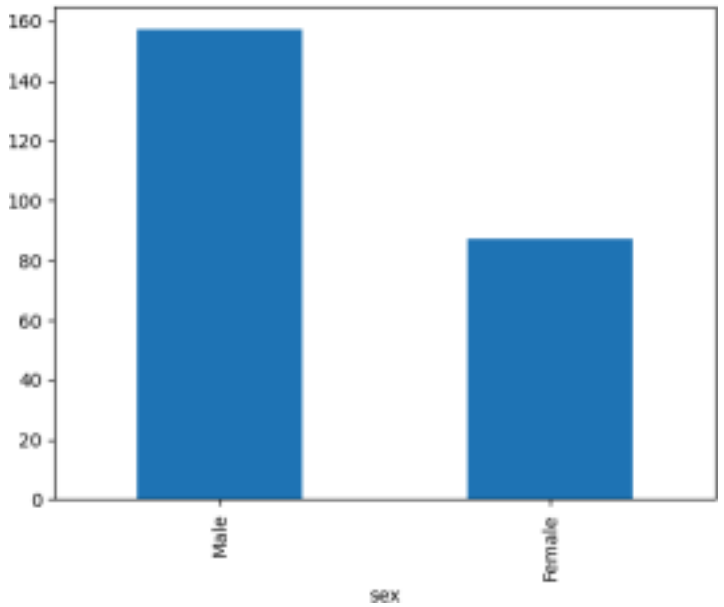

```
tips.sex.value_counts().plot(kind='pie')
```

```
<Axes: ylabel='count'>
```




```
tips.sex.value_counts().plot(kind='bar')
```

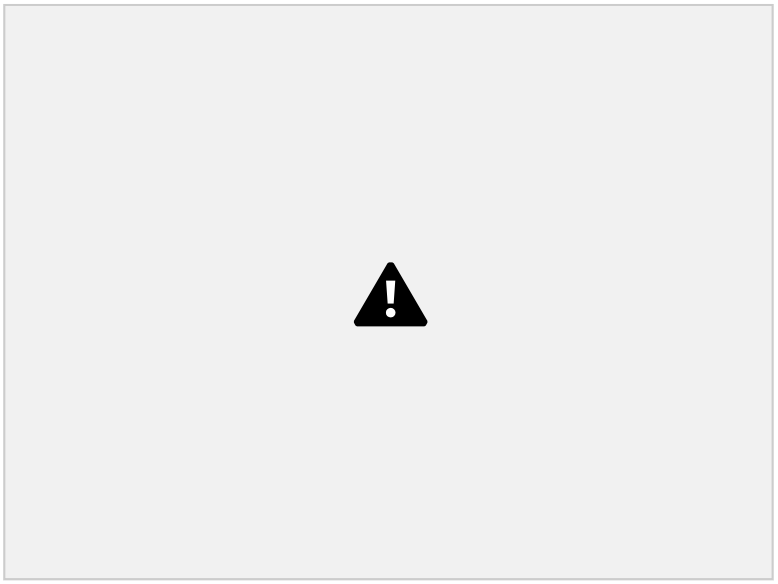
```
<Axes: xlabel='sex'>
```




```
sns.countplot(tips[tips.time=='Dinner']['day'])
```



```
<Axes: xlabel='count', ylabel='day'>
```



NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:08.10.2024

In [ ]: In [19]:

In [3]: In [4]:

In [5]:
```
import numpy as np
import pandas as pd
```

```
'pandas.core.frame.DataFrame'>RangeIndex:30entries,0to29Datac
```

olumns(total2columns):#ColumnNon-NullCountDtype

_____ 0 ----------

YearsExperience 30 non-null float64 1 Salary 30 non-null int64dtyp es:float64(1),int64(1)memoryusage:612.0bytesd f.dropna(i

```
n
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```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
#  Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0  YearsExperience  30 non-null     float64
 1  Salary           30 non-null     float64
dtypes: float64(2)
memory usage: 608.0 bytes
```

```
non-null int64 dtypes:
df=pd.read_csv('Salary_data float64(1), int64(1)
.csv')
df


df.info()

<class
```

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)

Out[5]:

	YearsExperience	Salary
count	30.000000	30.000000
mean	5.313333	76003.000000
std	2.837888	27414.429785
min	1.100000	37731.000000
25%	3.200000	56720.750000
50%	4.700000	65237.000000
75%	7.700000	100544.750000
max	10.500000	122391.000000

In [6]:

In [7]:

In [20]:

```
features=df.iloc[:,[0]].values
label=df.iloc[:,[1]].values
```

```
from sklearn.model_selection import
train_test_split
x_train,x_test,y_train,y_test=train_test_split(
features,label,test_size=0.2,random_st
```

```
from sklearn.linear_model import
LinearRegression
model=LinearRegression()
model.fit(x_train,y_train)
```

Out[20]: ▾ LinearRegression

LinearRegression()

In [21]:
```
model.score(x_train,y_train)
```

Out[21]: 0.9603182547438908

In [23]:
```
model.score(x_test,y_test)
```

Out[23]: 0.9184170849214232

In [24]:
```
model.coef_
```

Out[24]: array([[9281.30847068]])

In [25]:
```
model.intercept_
```

Out[25]: array([27166.73682891])

In [26]:

In [ ]:
```
import pickle
```

In [27]: In [28]:

In [ ]: In [29]:

```
yr_of_exp=float(input("Enter
Years of Experience: "))
yr_of_exp_NP=np.array([[yr_of_e
xp]])
Salary=model.predict(yr_of_exp_
NP)

Enter Years of Experience: 44
```

```
print("Estimated Salary for {}
years of
experience is {}: "
.format(yr_of_exp,Salary)
Estimated Salary for 44.0 years
of experience
```

```
pickle.dump(model,open('SalaryPred.model','wb') is [[435544.30953887]]:
)


model=pickle.load(open('SalaryPred.model','rb')
)
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:22.10.2024

In [1]:
```
import numpy as np
import pandas as pd

df=pd.read_csv('Iris.csv'
)
```

In [2]:
```
df.info()
```

```
<class
'pandas.c
ore.frame
.DataFr
ame'>
RangeInde
x: 150
entries, 0 to 149 Data
c
o
l
u
m
n
s
(
t
o
t
a
l
5
c
o
l
u
m
n
s
)
:
#
Column
Non-
Null
Count
Dtype  ___ _______
--------------  _____ 0
sepal.length 150 non-null
float64 1 sepal.width 150
non-null float64 2
petal.length 150 non-null
float64 3 petal.width 150
non-null float64 4
vari
ety
150
non-
null
obje
ct      dtypes:
float
64(4)
,
```

In [3]:

objec
t(1)
memor
y
usage
:
6.0+
KB

df.variety.value_counts()

Out[3]: Setosa 50
Versicolor 50
Virginica 50
Name: variety, dtype: int64
df.head(
)
In [4]:

Out[4]: **sepal.length sepal.width petal.length petal.width variety** **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

In [5]: In [6]: In [8]:

```
features=df.iloc[:,:-1].values
label=df.iloc[:,4].values

from sklearn.model_selection import
train_test_split
```

```
from sklearn.neighbors import
KNeighborsClassifier

xtrain,xtest,ytrain,ytest=train_test
_split
(features,label,test_size=.2,rando
model_KNN=KNeighborsClassifier(n_neighbor
s
=5)
model_KNN.fit(xtrain,ytrain)
```

Out[8]: KNeighborsClassifier()

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page

In [9]:
```
print(model_KNN.score(xtrain,y
train))
print(model_KNN.score(xtest,yt
est))
```

```
0.9583333333333334
1.0
```

In [10]:
```
from sklearn.metrics import
confusion_matrix
confusion_matrix(label,model_K
NN.predict(features))
```

Out[10]:
```
array([[50, 0, 0],
       [ 0, 47, 3],
       [ 0, 2, 48]], dtype=int64)
```

In [11]:
```
from sklearn.metrics import
classification_report
print(classificat
ion_report(label,
mo
del_KNN.predict(f
eatures)))
```

```
 precision recall f1-score support

 Setosa 1.00 1.00 1.00 50
 Versicolor
0.96 0.94 0.95 50  Virginica 0.94
0.96 0.95 50

 accuracy 0.97 150  macro avg 0.97
0.97 0.97 150 weighted avg 0.97
0.97
0.97 15
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:29.10.2024

In [1]:
```
import numpy as np
import pandas as pd
df=pd.read_csv('Social_Network_Ads.csv')
df
```

Out[1]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0
...	...	...	...	...	...
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

400 rows × 5 columns

```
df.head(
)
```

In [2]:

Out[2]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

```
In [4]:                                                  2,3]].values
                                                         label=df.iloc[:,4].v

features=df.iloc[:,[ alues features


Out[4]: array([[ 19, 19000],  [
          35, 20000],
           [ 26, 43000],
           [ 27, 57000],
           [ 19, 76000],
           [ 27, 58000],
           [ 27, 84000],
           [ 32, 150000],
           [ 25, 33000],
           [ 35, 65000],
           [ 26, 80000],
           [ 26, 52000],
           [ 20, 86000],
           [ 32, 18000],
           [ 18, 82000],
           [ 29, 80000],
           [ 47, 25000],
           [ 45, 26000],
           [ 46, 28000],

                                                                  [ 48 29000]
                              label
In
[5]:


 Out[5]: array([0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1, 1,
         1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0, 0,            0, 0, 0, 0, 0,  0,
         0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0,            0, 1, 0, 0,  0, 0,
         0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,            1, 0, 0,  0, 0, 0,
         0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 1,            0, 0,  0, 0, 0, 0,
         0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,               0, 0, 0, 0,  0, 0,
                                                            0, 0, 0, 0, 0, 1,   0, 0,
         1, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0,             0, 0, 0, 0, 0, 1,   0, 0,
         0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,             0, 0, 1, 0, 1, 0,   0, 0,
         1, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0,                                 0, 0,
         1, 1, 0, 1, 1, 0, 1, 0, 0, 0, 1, 1, 0,     0, 1, 1, 1, 0, 0, 1, 1, 0,   1,
                                                 1, 1, 0, 1, 0, 1, 0, 1, 0, 0,
         1, 1, 0, 1, 0, 0, 1, 1, 0, 1,   1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1,
         1, 0, 1, 1, 1, 1, 0, 1, 1, 0,      0, 1, 0, 1, 1, 1, 1, 0, 0, 01 1, 1,
         0, 1, 1, 1, 1, 1, 0, 0, 0, 1,      0, 0, 1, 0, 1, 0, 1, 1, 0, 1, 0, 1,
                                       1, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1,
         1, 0, 1, 1, 0, 0, 0,          1, 1, 1, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1,
         1, 0, 1, 1, 0, 0, 1,          1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1,
         1, 0, 1, 1, 1, 0, 1,          0,
                                       1,
                                       0,
                                       1,
                                       0,
                                       1,
                                       0,
                                       1,
                                       0,
                                       0,
                                        1, 1, 1, 1, 0, 1,  1, 1, 0, 1], dtype=int64)
                                                            import train_test_split
                                                            from
                                                            sklearn.linear_model
                                                            import
```

```
from sklearn.model_selection
```

```
In [7]: In [8]:
```

```
plit(features,label,
test_size=0.
model=LogisticRegres
sion()
 model.fit(x_train,y_train)
 train_score=model.score(x_tr
 ain,y_train)
 test_score=model.score(x_tes
 t,y_test)
 if test_score>train_score:
 print("Test {} Train{} Random
 State
{}".format(test_score,train_score,
i)
```

```
Test 0.6875 Train0.63125 Random
State 3
Test 0.7375 Train0.61875 Random
State 4
Test 0.6625 Train0.6375 Random
State 5
Test 0.65 Train0.640625 Random
State 6
Test 0.675 Train0.634375 Random
State 7
Test 0.675 Train0.634375 Random
State 8
Test 0.65 Train0.640625 Random
State 10
Test 0.6625 Train0.6375 Random
State 11
Test 0.7125 Train0.625 Random
State 13
Test 0.675 Train0.634375 Random
State 16
Test 0.7 Train0.628125 Random
State 17
Test 0.7 Train0.628125 Random
State 21
Test 0.65 Train0.640625 Random
State 24
Test 0.6625 Train0.6375 Random
State 25
Test 0.75 Train0.615625 Random
State 26
Test 0.675 Train0.634375 Random
State 27
Test 0.7 Train0.628125 Random
State 28
Test 0.6875 Train0.63125 Random
State 29
Test 0.6875 Train0.63125 Random
State 31
T t 0 6625 T i 0 6375 R d St t 37
```

```
for i in range(1,401):
```

```
x_train,x_test,y_train,y_test=
train_test_s
plit(features,label,test_size=
0.2,
finalModel=LogisticRegression()
```

```
x_train,x_test,y_train,y_test=train_test_s finalModel.fit(x_train,y_train)
```

```
Out[8]: LogisticRegression()
```

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trust the notebook.

On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [9]: In [10]:

```
from sklearn.metrics import
classification_report
print(classification_report(la
bel,fi
nalModel.predict(features)))
```

```
 precision recall f1-score support

 0 0.85 0.93 0.89 257  1 0.84 0.71
0.77 143

 accuracy 0.85 400  macro avg 0.85
0.82 0.83 400 weighted avg 0.85 0.85
0.85 400
```

```
print(finalModel.score(x_train,y_tra in))
print(finalModel.score(x_test,y_test
))
```

```
0.834375
0.9125
```

NAME:ASWINKUMAR J
ROLL NO:230701044
SUBJECT NAME:CS23332-FUNDAMENTALS OF DATA SCIENCE
DATE:05.11.2024

In [1]:
```
import seaborn as sns
%matplotlib inline
```

In [2]: In [3]:
```
df=pd.read_csv(
'Mall_Customer
s.csv')
```

```
df.info()
```

```
<class
'pandas.core.frame.DataFrame'
>
RangeIndex: 200 entries, 0 to
199
Data
columns
(total
5
columns
):
# Column Non-Null Count Dtype
--- ------ --------------
-----  0 CustomerID 200
non-null int64  1 Gender 200
non-null
object 2
Age 200
non-null
int64  3
Annual
Income (k$)
200 non-
null int64      4 Spending Score
(1-100) 200
non-null
int64 dtypes:
int64(4),
object(1)
memory usage:
7.9+ KB
```

In [4]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as
plt
```

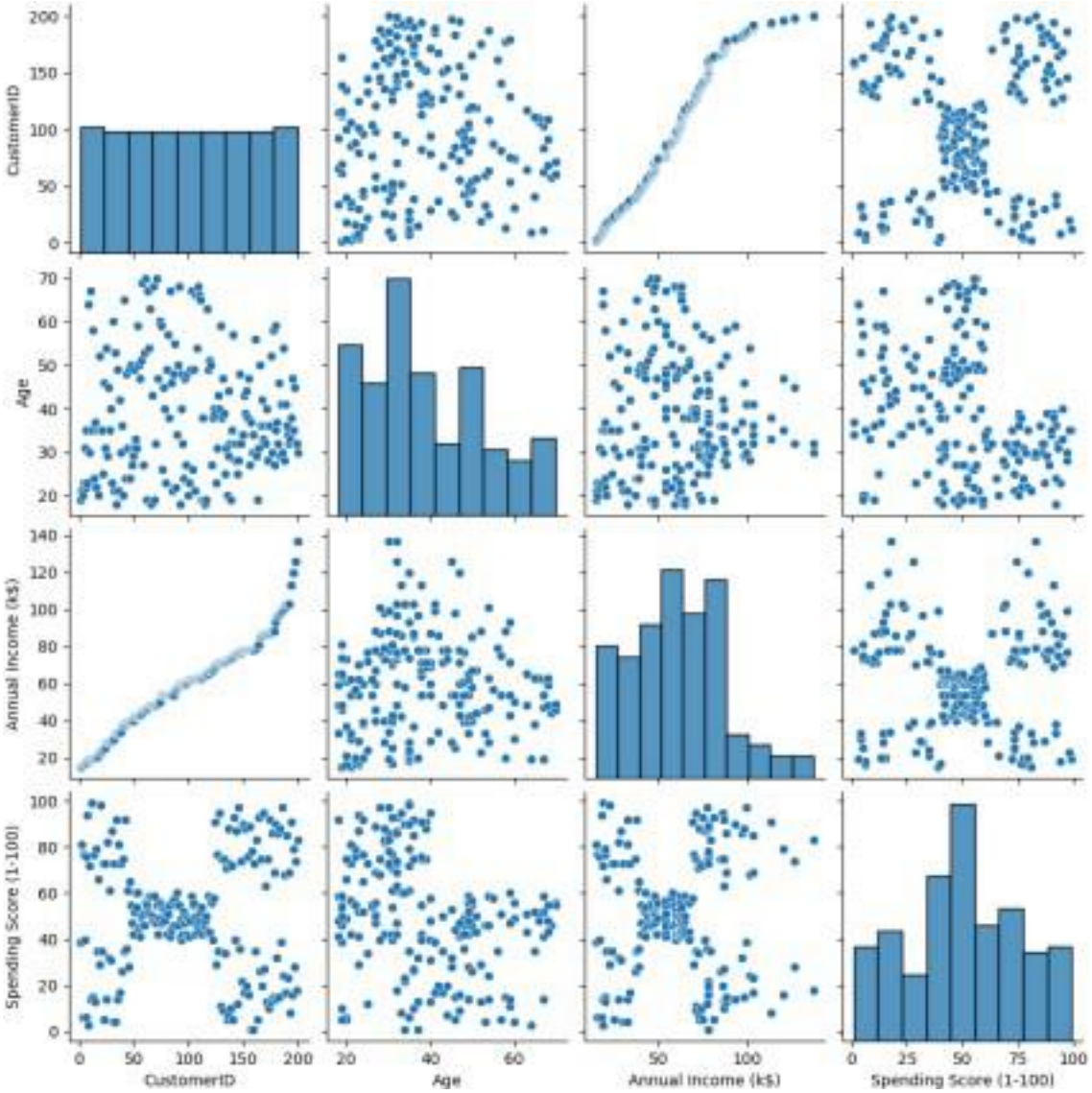
```
df.head()
```

Out[4]:

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

In [5]:
```
sns.pairplot(df)
```

Out[5]: <seaborn.axisgrid.PairGrid at 0x170e8e47850>




```
features=df.iloc[:,[3,4]].values
```

In [6]:

In [7]:

```
from sklearn.cluster import
```

```
KMeans
model=KMeans(n
_clusters=5)
```

```
model.fit(features) KMeans(n_clusters=5)
```

```
warnings.warn(
```

Out[7]:
```
KMeans(n_clusters=5)
```

```
is known to have a memory leak on Windows
with MKL, when there are less chunks than
available threads. You c an avoid it by
setting the environment variable
OMP_NUM_THREADS=1.
warnings.warn(
```

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [8]:
```
Final=df.iloc[:,[3,4]]
Final['label']=model.predict(features)
Final.head()
```

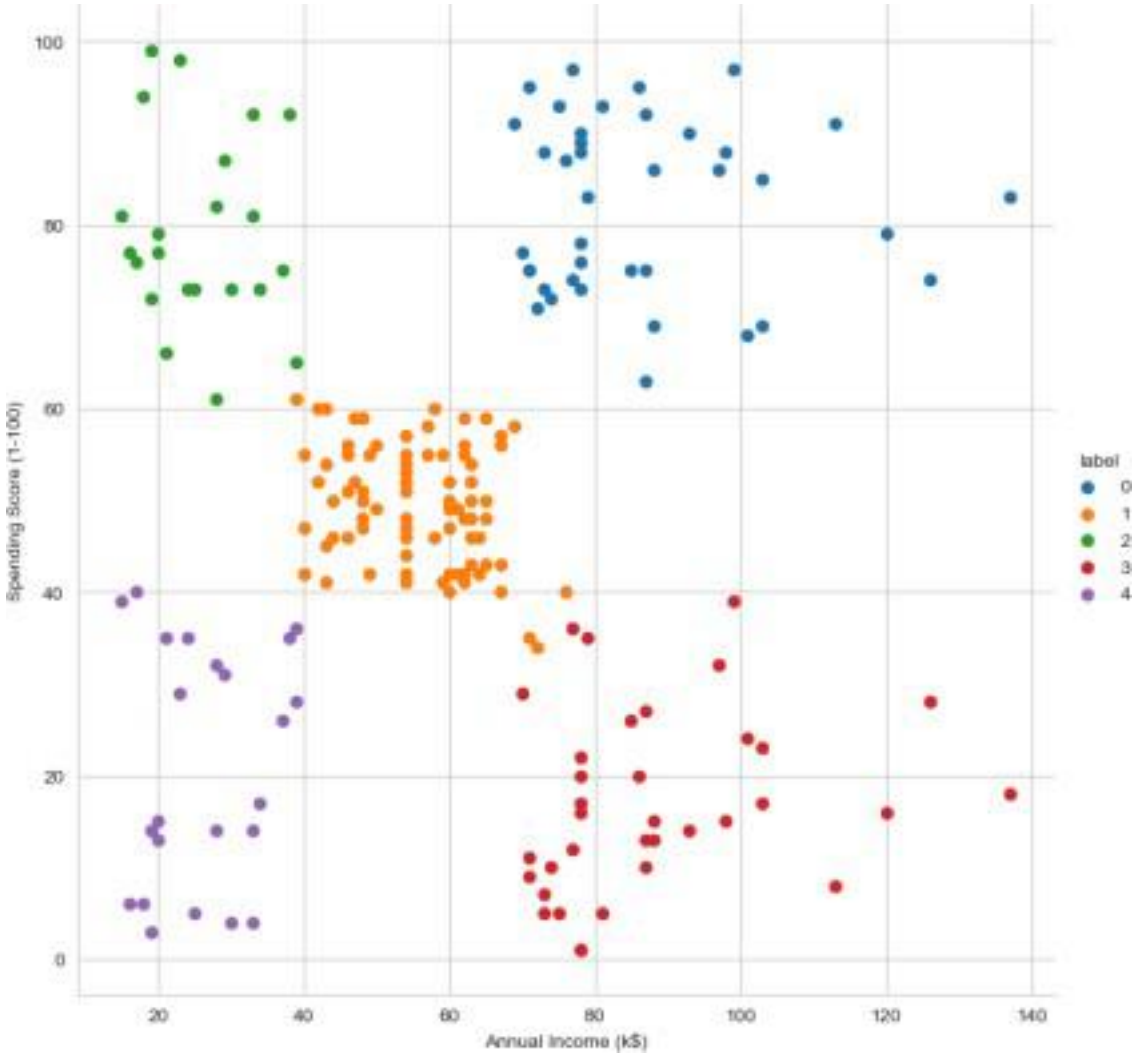
```
.loc[row_indexer,col_indexer] =
value instead

See the caveats in the
documentation:
https://pandas.pydata.org/pandas-
doc
s/stable/user_guide/indexing.html#returni
a view-versus-a-copy)
Final['label']=model.predict(features)
```

```
pandas.pydata.org/pandas-docs/stable/user
_guide/indexing.html#returning-
```

Out[8]:

	Annual Income (k$)	Spending Score (1-100)	
label 0	15	39	4
1	15	81	2
2	16	6	4
3	16	77	2
4	17	40	4

In [9]:
```
sns.set_style("whitegrid")
sns.FacetGrid(Final,hue="label",height=8) \
.map(plt.scatter,"Annual Income (k$)", "Spending Score (1-100)") \
.add_legend();
plt.show()
```



In [10]:
```
features_el=df.iloc[:,[2,3,4]].values
from sklearn.cluster import KMeans
wcss=[]
for i in range(1,10):
 model=KMeans(n_clusters=i)
 model.fit(features_el)
 wcss.append(model.inertia_)
plt.plot(range(1,10),wcss)
```

Out[10]: [<matplotlib.lines.Line2D at 0x170e99f3550>]