In [1]:

```
import pandas as pd
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
data=pd.read_csv("/home/placement/Downloads/Advertising.csv")
```

In [3]:

```
data.describe()
```

Out[3]:

	Unnamed: 0	TV	radio	newspaper	sales
count	200.000000	200.000000	200.000000	200.000000	200.000000
mean	100.500000	147.042500	23.264000	30.554000	14.022500
std	57.879185	85.854236	14.846809	21.778621	5.217457
min	1.000000	0.700000	0.000000	0.300000	1.600000
25%	50.750000	74.375000	9.975000	12.750000	10.375000
50%	100.500000	149.750000	22.900000	25.750000	12.900000
75%	150.250000	218.825000	36.525000	45.100000	17.400000
max	200.000000	296.400000	49.600000	114.000000	27.000000

In [4]:

```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   Unnamed: 0  200 non-null    int64  
 1   TV          200 non-null    float64
 2   radio       200 non-null    float64
 3   newspaper   200 non-null    float64
 4   sales       200 non-null    float64
dtypes: float64(4), int64(1)
memory usage: 7.9 KB
```

```
In [5]: data1=data.drop(["Unnamed: 0"],axis=1)
```

```
In [6]: data1
```

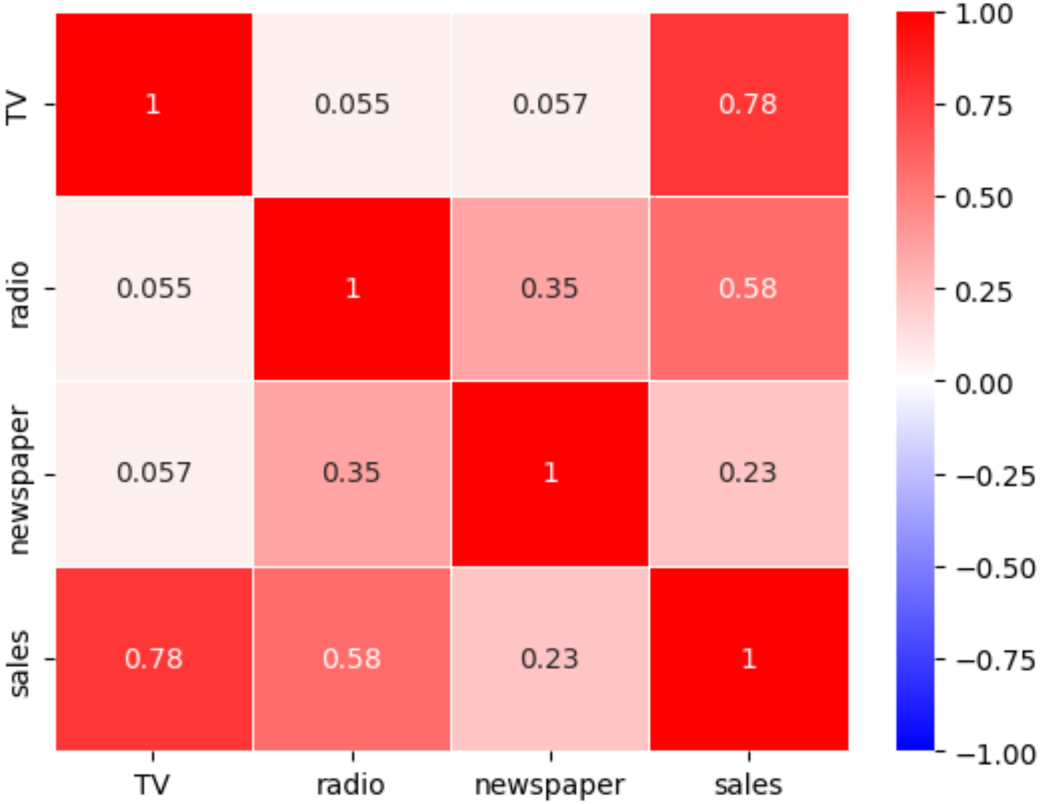
```
Out[6]:
            TV  radio  newspaper  sales
      0  230.1   37.8       69.2   22.1
      1   44.5   39.3       45.1   10.4
      2   17.2   45.9       69.3    9.3
      3  151.5   41.3       58.5   18.5
      4  180.8   10.8       58.4   12.9
    ...    ...    ...        ...    ...
    195   38.2    3.7       13.8    7.6
    196   94.2    4.9        8.1    9.7
    197  177.0    9.3        6.4   12.8
    198  283.6   42.0       66.2   25.5
    199  232.1    8.6        8.7   13.4

    200 rows × 4 columns
```

```
In [7]: cor_mat=data1.corr()
        cor_mat#correlation of data
```

```
Out[7]:
                     TV     radio  newspaper     sales
           TV  1.000000  0.054809   0.056648  0.782224
        radio  0.054809  1.000000   0.354104  0.576223
    newspaper  0.056648  0.354104   1.000000  0.228299
        sales  0.782224  0.576223   0.228299  1.000000
```

```
In [8]: import seaborn as sns#data of correlation in a graoh
        sns.heatmap(cor_mat,vmax=1,vmin=-1,annot=True,linewidth=.5,cmap='bwr')#plotting of graph using seaborn
```

```
Out[8]: <Axes: >
```



```
In [9]: y=data1['sales']
        x=data1.drop(['sales'],axis=1)
```

In [10]:
```
y
```

Out[10]:
```
0      22.1
1      10.4
2       9.3
3      18.5
4      12.9
       ...
195     7.6
196     9.7
197    12.8
198    25.5
199    13.4
Name: sales, Length: 200, dtype: float64
```

In [11]:
```
x
```

Out[11]:

	TV	radio	newspaper
0	230.1	37.8	69.2
1	44.5	39.3	45.1
2	17.2	45.9	69.3
3	151.5	41.3	58.5
4	180.8	10.8	58.4
...	...	...	...
195	38.2	3.7	13.8
196	94.2	4.9	8.1
197	177.0	9.3	6.4
198	283.6	42.0	66.2
199	232.1	8.6	8.7

200 rows × 3 columns

In [12]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.33,random_state=42)#dividing training data an
```

In [13]:

```
x_test.head(5)#display top 5 data in testing data
```

Out[13]:

	TV	radio	newspaper
95	163.3	31.6	52.9
15	195.4	47.7	52.9
30	292.9	28.3	43.2
158	11.7	36.9	45.2
128	220.3	49.0	3.2

In [14]:

```
y_test.head(5)#display top 5 data in testing data price dataframe
```

Out[14]:

```
95     16.9
15     22.4
30     21.4
158     7.3
128    24.7
Name: sales, dtype: float64
```

In [15]:

```
x_train.head(5)#display top 5 data in training data
```

Out[15]:

	TV	radio	newspaper
42	293.6	27.7	1.8
189	18.7	12.1	23.4
90	134.3	4.9	9.3
136	25.6	39.0	9.3
51	100.4	9.6	3.6

In [16]:
```
y_train.head(5)#display top 5 data in training data price dataframe
```

Out[16]:
```
42     20.7
189     6.7
90     11.2
136     9.5
51     10.7
Name: sales, dtype: float64
```

In [17]:
```
from sklearn.linear_model import LinearRegression
reg=LinearRegression()#creating the object of linear Regression
reg.fit(x_train,y_train)#training and fitting linear Regression using training data
```

Out[17]:
```
▾ LinearRegression

LinearRegression()
```

In [18]:
```
ypred=reg.predict(x_test)#calculating predicting value
```

In [19]:
```
ypred
```

Out[19]:
```
array([16.58673085, 21.18622524, 21.66752973, 10.81086512, 22.25210881,
       13.31459455, 21.23875284,  7.38400509, 13.43971113, 15.19445383,
        9.01548612,  6.56945204, 14.4156926 ,  8.93560138,  9.56335776,
       12.10760805,  8.86091137, 16.25163621, 10.31036304, 18.83571624,
       19.81058732, 13.67550716, 12.45182294, 21.58072583,  7.67409148,
        5.67090757, 20.95448184, 11.89301758,  9.13043149,  8.49435255,
       12.32217788,  9.99097553, 21.71995241, 12.64869606, 18.25348116,
       20.17390876, 14.20864218, 21.02816483, 10.91608737,  4.42671034,
        9.59359543, 12.53133363, 10.14637196,  8.1294087 , 13.32973122,
        5.27563699,  9.30534511, 14.15272317,  8.75979349, 11.67053724,
       15.66273733, 11.75350353, 13.21744723, 11.06273296,  6.41769181,
        9.84865789,  9.45756213, 24.32601732,  7.68903682, 12.30794356,
       17.57952015, 15.27952025, 11.45659815, 11.12311877, 16.60003773,
        6.90611478])
```

In [20]:
```
from sklearn.metrics import r2_score
r2_score(y_test,ypred)#finding the efficieny
```

Out[20]:
```
0.8555568430680086
```

In [21]:
```
from sklearn.metrics import mean_squared_error#mean_squared error
a=mean_squared_error(y_test,ypred)
a
```

Out[21]:
```
3.7279283306815105
```

In [22]:
```
from sklearn.linear_model import ElasticNet
from sklearn.model_selection import GridSearchCV
elastic = ElasticNet()

parameters = {'alpha': [1e-15, 1e-10, 1e-8, 1e-4, 1e-3,1e-2, 1, 5, 10, 20]}

elastic_regressor = GridSearchCV(elastic, parameters)

elastic_regressor.fit(x_train, y_train)
```

Out[22]:
```
▸     GridSearchCV
▸ estimator: ElasticNet
        ▸ ElasticNet
```

In [23]:
```
elastic_regressor.best_params_
```

Out[23]:
```
{'alpha': 1}
```

In [24]:
```
elastic=ElasticNet(alpha=0.01)
elastic.fit(x_train,y_train)
y_pred_elastic=elastic.predict(x_test)
```

In [25]:
```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_elastic)
```

Out[25]:
```
0.855576715693211
```

In [26]:
```
x_test
```

Out[26]:

	TV	radio	newspaper
95	163.3	31.6	52.9
15	195.4	47.7	52.9
30	292.9	28.3	43.2
158	11.7	36.9	45.2
128	220.3	49.0	3.2
...	...	...	...
97	184.9	21.0	22.0
31	112.9	17.4	38.6
12	23.8	35.1	65.9
35	290.7	4.1	8.5
119	19.4	16.0	22.3

66 rows × 3 columns

In [27]:
```
test=[[110,32,26]]
y_pred_elastic=elastic.predict(test)
```

In [28]:
```
y_pred_elastic
```

Out[28]:
```
array([14.12116625])
```

In [ ]:
```
```

```
In [ ]:
```