```
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]: `data.head(10)`

Out[5]:

	Unnamed: 0	TV	radio	newspaper	sales
0	1	230.1	37.8	69.2	22.1
1	2	44.5	39.3	45.1	10.4
2	3	17.2	45.9	69.3	9.3
3	4	151.5	41.3	58.5	18.5
4	5	180.8	10.8	58.4	12.9
5	6	8.7	48.9	75.0	7.2
6	7	57.5	32.8	23.5	11.8
7	8	120.2	19.6	11.6	13.2
8	9	8.6	2.1	1.0	4.8
9	10	199.8	2.6	21.2	10.6

In [6]: `data.shape`

Out[6]: (200, 5)

In [7]: `data.isna().sum()`

Out[7]:
```
Unnamed: 0    0
TV            0
radio         0
newspaper     0
sales         0
dtype: int64
```

In [12]:
```
data1=data.drop(['Unnamed: 0'],axis=1)
data1
```

Out[12]:

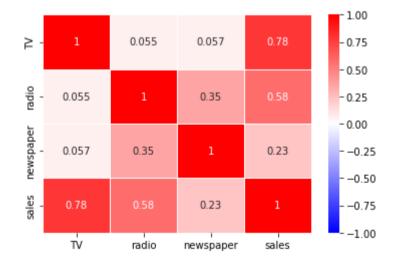|	TV	radio	newspaper	sales
0	230.1	37.8	69.2	22.1
1	44.5	39.3	45.1	10.4
2	17.2	45.9	69.3	9.3
3	151.5	41.3	58.5	18.5
4	180.8	10.8	58.4	12.9
...	...	...	...	...
195	38.2	3.7	13.8	7.6
196	94.2	4.9	8.1	9.7
197	177.0	9.3	6.4	12.8
198	283.6	42.0	66.2	25.5
199	232.1	8.6	8.7	13.4

200 rows × 4 columns

In [13]:
```python
cor=data1.corr()
cor
```

Out[13]:

	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 [15]:
```python
import seaborn as sns
sns.heatmap(cor,vmax=1,vmin=-1,annot=True,linewidth=.5,cmap='bwr')
```

Out[15]: <AxesSubplot:>

In [17]:
```python
y=data1['sales']
x=data1.drop('sales',axis=1)
```

In [18]: `y`

Out[18]:
```
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 [19]:
```python
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)
```

In [20]: `x_test.head(5)`

Out[20]:

	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 [21]: `y_test.head(5)`

Out[21]:
```
95      16.9
15      22.4
30      21.4
158      7.3
128     24.7
Name: sales, dtype: float64
```

In [22]: `x_train.head(5)`

Out[22]:

	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 [23]: `y_train.head(5)`

Out[23]:
```
42      20.7
189      6.7
90      11.2
136      9.5
51      10.7
Name: sales, dtype: float64
```

In [24]:
```python
from sklearn.linear_model import LinearRegression
reg=LinearRegression() #creating object of LinearRegression
reg.fit(x_train,y_train) #training and fitting LR object using training data
```

Out[24]: `LinearRegression()`

In [25]: `y_pred=reg.predict(x_test)`

In [26]: `y_pred`

Out[26]:
```
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 [27]:
```python
from sklearn.metrics import r2_score
r2_score(y_test,y_pred)
```

Out[27]: 0.8555568430680086

In [28]:
```python
from sklearn.metrics import mean_squared_error
mean_squared_error(y_pred,y_test)
```

Out[28]: 3.7279283306815105

In [29]:
```python
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import ElasticNet
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[29]:
```
GridSearchCV(estimator=ElasticNet(),
             param_grid={'alpha': [1e-15, 1e-10, 1e-08, 0.0001, 0.001, 0.01, 1,
                                   5, 10, 20]})
```

In [30]:
```python
elastic_regressor.best_params_
```

Out[30]: {'alpha': 1}

In [31]:
```python
elastic=ElasticNet(alpha=1)
elastic.fit(x_train,y_train)
y_pred_elastic=elastic.predict(x_test)
```

In [32]:
```python
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_elastic)
```

Out[32]: 0.8574667157937813

In [33]:
```python
from sklearn.metrics import mean_squared_error
Elastic_Error=mean_squared_error(y_pred_elastic,y_test)
Elastic_Error
```

Out[33]: 3.678636493022796

In [34]: x_test

Out[34]:

	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 [38]:
```python
test=[[110,33,21]]
y_pred_elastic=elastic.predict(test)
y_pred_elastic
```

Out[38]: array([14.27162918])

In [39]:
```python
test=[[110,33,21],[220,66,13]]
y_pred_elastic=elastic.predict(test)
y_pred_elastic
```

Out[39]: array([14.27162918, 25.54573805])

In [ ]: