```
In [26]: import pandas as pd
```

```
In [27]: import warnings
         warnings.filterwarnings("ignore")
```

```
In [28]: data=pd.read_csv("/home/placement/Downloads/Advertising.csv")
```

```
In [29]: data.describe()
```

```
Out[29]:
```

	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 [30]:
```
data.info
```

Out[30]:
```
<bound method DataFrame.info of      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
..          ...    ...    ...        ...    ...
195         196   38.2    3.7       13.8    7.6
196         197   94.2    4.9        8.1    9.7
197         198  177.0    9.3        6.4   12.8
198         199  283.6   42.0       66.2   25.5
199         200  232.1    8.6        8.7   13.4

[200 rows x 5 columns]>
```

In [31]:
```
data=data.drop(['Unnamed: 0'],axis=1)
```

In [32]:

```
data
```

Out[32]:

	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 [33]:

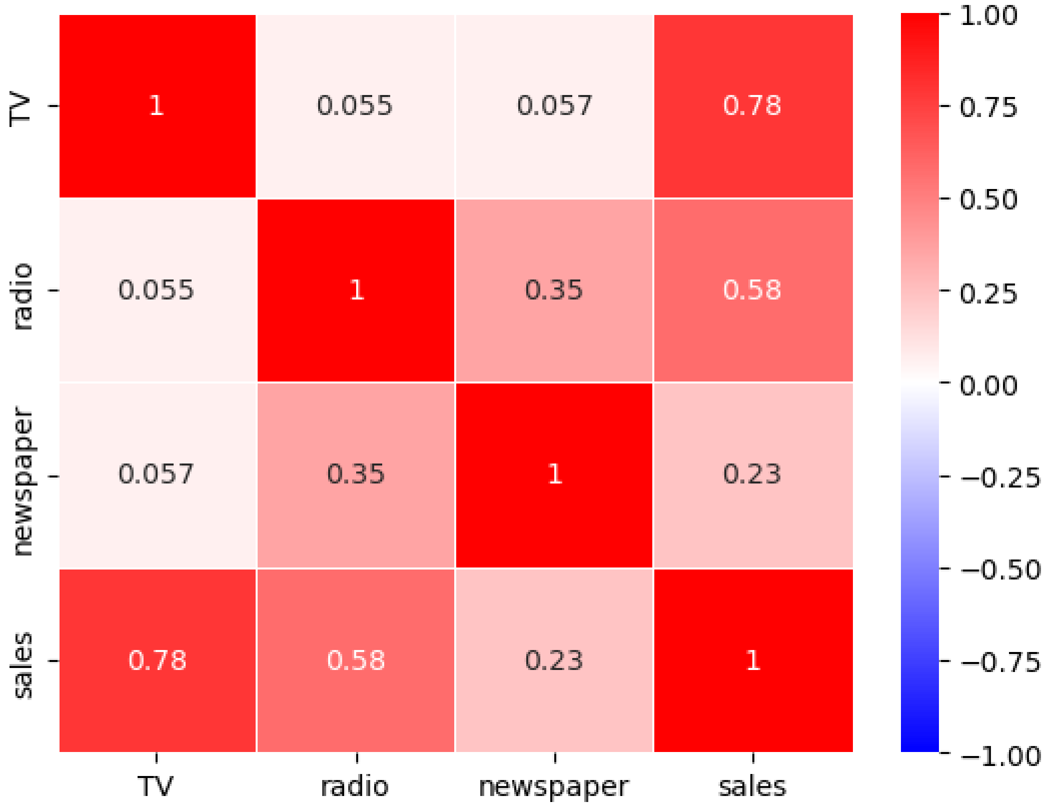
```
cor=data.corr()
cor
```

Out[33]:

	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 [34]:
```
import seaborn as sns
sns.heatmap(cor,vmax=1,vmin=-1,annot=True,linewidths=.5,cmap='bwr')
```

Out[34]:
```
<Axes: >
```



In [35]:
```
y=data['sales']
x=data.drop('sales',axis=1)
```

In [36]:
```
y
```

Out[36]:
```
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 [37]:
```
x
```

Out[37]:

	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 [38]: list(data)
```

```
Out[38]: ['TV', 'radio', 'newspaper', 'sales']
```

```
In [39]: data1=data.drop(['sales'],axis=1)
```

```
In [40]: data1
```

```
Out[40]:
            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
```

linear regression

```
In [41]: 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 [42]:
```
from sklearn.linear_model import LinearRegression
reg=LinearRegression()
reg.fit(x_train,y_train)# command for traning / fitting the mode
```

Out[42]:
```
▾ LinearRegression

LinearRegression()
```

In [43]:
```
ypred=reg.predict(x_test)
```

In [44]:
```
ypred
```

Out[44]:
```
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 [45]:
```
from sklearn.metrics import r2_score
r2_score(y_test,ypred)
```

Out[45]:
```
0.8555568430680086
```

In [46]:

```
from sklearn.metrics import mean_squared_error
linear_Error=mean_squared_error(ypred_linear,y_test)
linear_Error
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
Cell In[46], line 2
      1 from sklearn.metrics import mean_squared_error
----> 2 linear_Error=mean_squared_error(ypred_linear,y_test)
      3 linear_Error

NameError: name 'ypred_linear' is not defined
```

elastic net

In [ ]:

```
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)
```

In [ ]:

```
elastic_regressor.best_params_
```

In [ ]:

```
elastic=ElasticNet(alpha=0.01)
elastic.fit(x_train,y_train)
y_pred_elastic=elastic.predict(x_test)
```

In [ ]:

```
from sklearn.metrics import r2_score
r2_score(y_test,y_pred_elastic)
```

In [ ]:

```
from sklearn.metrics import mean_squared_error
elastic_Error=mean_squared_error(y_pred_elastic,y_test)
elastic_Error
```

In [ ]:

```
x_test
```

In [ ]:

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

In [ ]:

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

In [ ]: