Import Libraries

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import warnings
import seaborn as sns
warnings.filterwarnings("ignore")
```

Exploratory Data Analysis

In [3]:
```
data=pd.read_csv('/home/placement/Desktop/Advertising.csv')
data
```

Out[3]:

	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 × 5 columns

In [4]:
```
data.describe()
```

Out[4]:

	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 [5]:
```
data.head(5)
```

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

In [6]:
```
data.tail(5)
```

Out[6]:

	Unnamed: 0	TV	radio	newspaper	sales
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

In [7]:
```
data.info
```

Out[7]:
```
<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 [8]:
```
data.columns
```

Out[8]:
```
Index(['Unnamed: 0', 'TV', 'radio', 'newspaper', 'sales'], dtype='object')
```

In [9]:
```
data1=data.drop(columns='Unnamed: 0')
data1
```

Out[9]:

	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 [10]:
```
data1.isna().sum()
```

Out[10]:
```
TV           0
radio        0
newspaper    0
sales        0
dtype: int64
```

In [11]:
```
cor=data1.corr()
cor
```

Out[11]:

	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 [12]:
```
y=data1['sales']
x=data1.drop(columns='sales')
```

In [13]:
```
x
```

Out[13]:

	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 [14]:
```
y
```

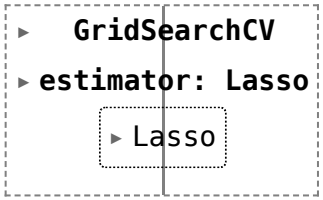
Out[14]:
```
0      22.1
1      10.4
2       9.3
3      18.5
4      12.9
       ...
195     7.6
196     9.7
197    12.8
198    25.5
199    13.4
Name: sales, Length: 200, dtype: float64
```

In [15]:
```
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)
```

Lasso

In [16]:
```
from sklearn.model_selection import GridSearchCV
from sklearn.linear_model import Lasso
lasso=Lasso()
parameters={'alpha':[1e-15,1e-10,1e-4,1e-3,1e-2,15,10,20,30]}
lasso_regressor=GridSearchCV(lasso,parameters)
lasso_regressor.fit(x_train,y_train)
```

Out[16]:



In [17]:
```
lasso_regressor.best_params_
```

Out[17]:
```
{'alpha': 0.01}
```

In [18]:
```
lasso=Lasso(alpha=0.01)
lasso.fit(x_train,y_train)
y_pred_lasso=lasso.predict(x_test)
```

In [19]:
```
from sklearn.metrics import r2_score #to know the efficiency of the predicted price
r2_score(y_test,y_pred_lasso)
```

Out[19]:
```
0.8555927456329158
```

In [20]:
```
from sklearn.metrics import mean_squared_error
Lasso_Error=mean_squared_error(y_pred_lasso,y_test)
Lasso_Error
```

Out[20]:
```
3.727001722653106
```

In [21]:
```
results=pd.DataFrame(columns=['Price','Predicted']) #create datafame for price and predicted
results['Price']=y_test
results['Predicted']=y_pred_lasso
results=results.reset_index() #remove the index as ID values
results['id']=results.index
```

In [22]:
```
results
```

Out[22]:

	index	Price	Predicted	id
0	95	16.9	16.586103	0
1	15	22.4	21.184946	1
2	30	21.4	21.667103	2
3	158	7.3	10.810215	3
4	128	24.7	22.251471	4
...	...	...	...	...
61	97	15.5	15.279738	61
62	31	11.9	11.456759	62
63	12	9.2	11.122240	63
64	35	12.8	16.601060	64
65	119	6.6	6.906611	65

66 rows × 4 columns

In [23]:
```
results["Difference"]=results.apply(lambda x:x.Price-x.Predicted,axis=1)#add the column for difference b/w
```

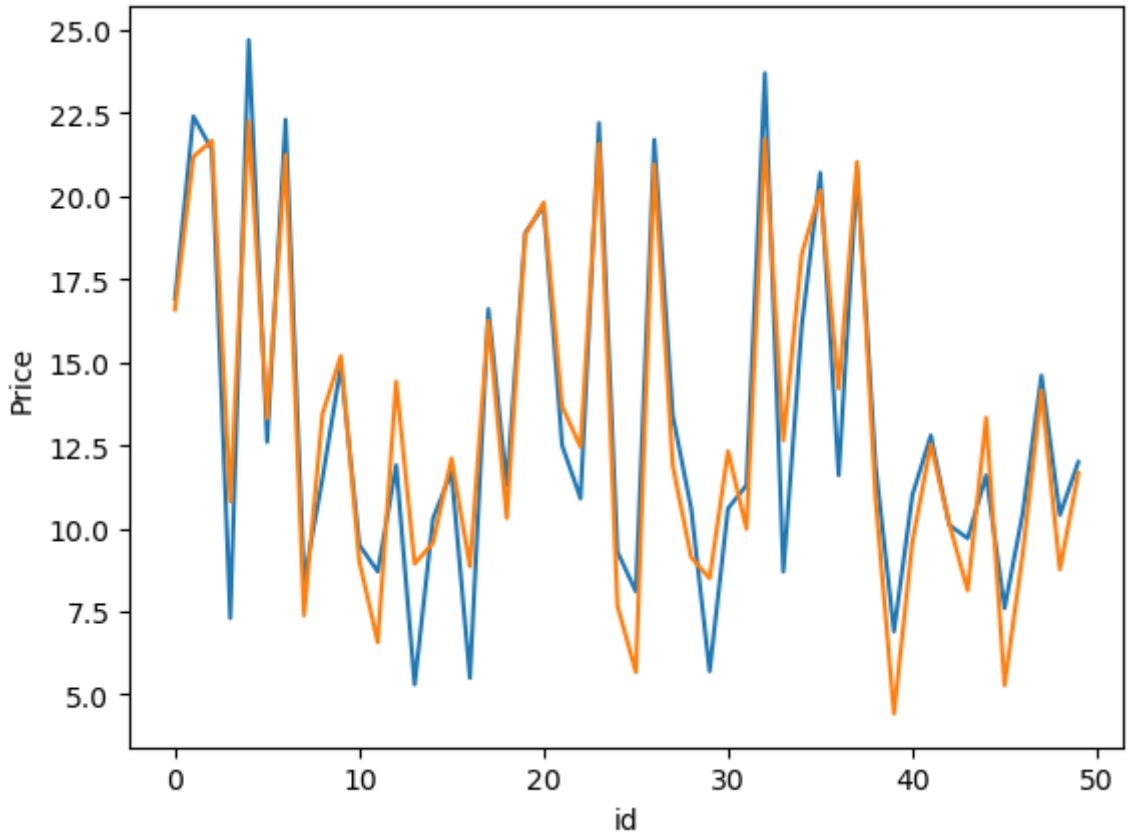
In [24]:
```
results
```

Out[24]:

	index	Price	Predicted	id	Difference
0	95	16.9	16.586103	0	0.313897
1	15	22.4	21.184946	1	1.215054
2	30	21.4	21.667103	2	-0.267103
3	158	7.3	10.810215	3	-3.510215
4	128	24.7	22.251471	4	2.448529
...	...	...	...	...	...
61	97	15.5	15.279738	61	0.220262
62	31	11.9	11.456759	62	0.443241
63	12	9.2	11.122240	63	-1.922240
64	35	12.8	16.601060	64	-3.801060
65	119	6.6	6.906611	65	-0.306611

66 rows × 5 columns

In [25]:
```
sns.lineplot(x='id',y='Price',data=results.head(50)) #actual color=blue
sns.lineplot(x='id',y='Predicted',data=results.head(50)) #predicted color=orange
plt.show()
```



In [ ]:
```

```