Problem Statement: To Predict which model is sutable for the given data

Linear Regression

1.Data Collection:

In [1]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import preprocessing, svm
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import StandardScaler
```

In [2]:
```
train_df=pd.read_csv(r"C:\Users\91903\Downloads\Data_Train.csv")
train_df
```

Out[2]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	..
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10683 rows × 11 columns

In [3]:
```
test_df=pd.read_csv(r"C:\Users\91903\Downloads\Data_Train.csv")
test_df
```

Out[3]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratio
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	..
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10683 rows × 11 columns

2.Data Cleaning and Preprocessing :

In [4]:
```
train_df.head()
```

Out[4]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	To
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m	
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	

In [5]:
```
train_df.tail()
```

Out[5]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratior
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30r
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35r
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40r
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20r

In [6]:
```
test_df.head()
```

Out[6]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	To
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m	
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	

In [7]:
```
test_df.tail()
```

Out[7]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratior
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

In [8]:
```
train_df.shape
```

Out[8]:
```
(10683, 11)
```

In [9]:
```
test_df.shape
```

Out[9]:
```
(10683, 11)
```

In [10]:
```
train_df.describe()
```

Out[10]:

	Price
count	10683.000000
mean	9087.064121
std	4611.359167
min	1759.000000
25%	5277.000000
50%	8372.000000
75%	12373.000000
max	79512.000000

In [11]:
```
test_df.describe()
```

Out[11]:

	Price
count	10683.000000
mean	9087.064121
std	4611.359167
min	1759.000000
25%	5277.000000
50%	8372.000000
75%	12373.000000
max	79512.000000

In [12]:
```
train_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          10683 non-null  object
 1   Date_of_Journey  10683 non-null  object
 2   Source           10683 non-null  object
 3   Destination      10683 non-null  object
 4   Route            10682 non-null  object
 5   Dep_Time         10683 non-null  object
 6   Arrival_Time     10683 non-null  object
 7   Duration         10683 non-null  object
 8   Total_Stops      10682 non-null  object
 9   Additional_Info  10683 non-null  object
 10  Price            10683 non-null  int64 
dtypes: int64(1), object(10)
memory usage: 918.2+ KB
```

In [13]:
```
test_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          10683 non-null  object
 1   Date_of_Journey  10683 non-null  object
 2   Source           10683 non-null  object
 3   Destination      10683 non-null  object
 4   Route            10682 non-null  object
 5   Dep_Time         10683 non-null  object
 6   Arrival_Time     10683 non-null  object
 7   Duration         10683 non-null  object
 8   Total_Stops      10682 non-null  object
 9   Additional_Info  10683 non-null  object
 10  Price            10683 non-null  int64 
dtypes: int64(1), object(10)
memory usage: 918.2+ KB
```

In [14]:
```
train_df.isnull().sum()
```

Out[14]:
```
Airline            0
Date_of_Journey    0
Source             0
Destination        0
Route              1
Dep_Time           0
Arrival_Time       0
Duration           0
Total_Stops        1
Additional_Info    0
Price              0
dtype: int64
```

In [15]:
```
test_df.isnull().sum()
```

Out[15]:
```
Airline            0
Date_of_Journey    0
Source             0
Destination        0
Route              1
Dep_Time           0
Arrival_Time       0
Duration           0
Total_Stops        1
Additional_Info    0
Price              0
dtype: int64
```

In [16]:
```
train_df.dropna(inplace=True)
```

In [17]:
```
train_df.isnull().sum()
```

Out[17]:
```
Airline            0
Date_of_Journey    0
Source             0
Destination        0
Route              0
Dep_Time           0
Arrival_Time       0
Duration           0
Total_Stops        0
Additional_Info    0
Price              0
dtype: int64
```

In [18]:
```
train_df['Airline'].value_counts()
```

Out[18]:
```
Airline
Jet Airways                          3849
IndiGo                               2053
Air India                            1751
Multiple carriers                    1196
SpiceJet                              818
Vistara                               479
Air Asia                              319
GoAir                                 194
Multiple carriers Premium economy      13
Jet Airways Business                    6
Vistara Premium economy                 3
Trujet                                  1
Name: count, dtype: int64
```

In [19]:
```
train_df['Source'].value_counts()
```

Out[19]:
```
Source
Delhi       4536
Kolkata     2871
Banglore    2197
Mumbai       697
Chennai      381
Name: count, dtype: int64
```

In [20]:
```
train_df['Destination'].value_counts()
```

Out[20]:
```
Destination
Cochin       4536
Banglore     2871
Delhi        1265
New Delhi     932
Hyderabad     697
Kolkata       381
Name: count, dtype: int64
```

In [21]:
```
train_df['Total_Stops'].value_counts()
```

Out[21]:
```
Total_Stops
1 stop      5625
non-stop    3491
2 stops     1520
3 stops       45
4 stops        1
Name: count, dtype: int64
```

In [22]:
```
airline={"Airline":{"Jet Airways":0,"IndiGo":1,"Air India":2,"Multiple carrier
"SpiceJet":4,"Vistara":5,"Air Asia":6,"GoAir":7,
"Multiple carriers Premium economy":8,
"Jet Airways Business":9,"Vistara Premium economy":10,"Trujet":11}}
train_df=train_df.replace(airline)
train_df
```

Out[22]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	1	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	2	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	0	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	1	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	1	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m
10679	2	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m
10680	0	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h
10681	5	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m
10682	2	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10682 rows × 11 columns

In [23]:
```
convert={"Source":{"Delhi":0,"Kolkata":1,"Banglore":2,
"Mumbai":3,"Chennai":4}}
train_df=train_df.replace(convert)
train_df
```

Out[23]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	1	24/03/2019	2	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	2	1/05/2019	1	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	0	9/06/2019	0	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	1	12/05/2019	1	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	1	01/03/2019	2	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	Banglore	CCU ? BLR	19:55	22:25	2h 30m
10679	2	27/04/2019	1	Banglore	CCU ? BLR	20:45	23:20	2h 35m
10680	0	27/04/2019	2	Delhi	BLR ? DEL	08:20	11:20	3h
10681	5	01/03/2019	2	New Delhi	BLR ? DEL	11:30	14:10	2h 40m
10682	2	9/05/2019	0	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10682 rows × 11 columns

In [24]:
```
convert={"Destination":{"Cochin":0,"Banglore":1,"Delhi":2,
"New Delhi":3,"Hyderabad":4,"Kolkata":5}}
train_df=train_df.replace(convert)
train_df
```

Out[24]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10682 rows × 11 columns

In [25]:
```
convert={"Total_Stops":{"non-stop":0,"1 stop":1,"2 stops":2,
"3 stops":3,"4 stops":4}}
train_df=train_df.replace(convert)
train_df
```

Out[25]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10682 rows × 11 columns

```
In [26]: train_df
```

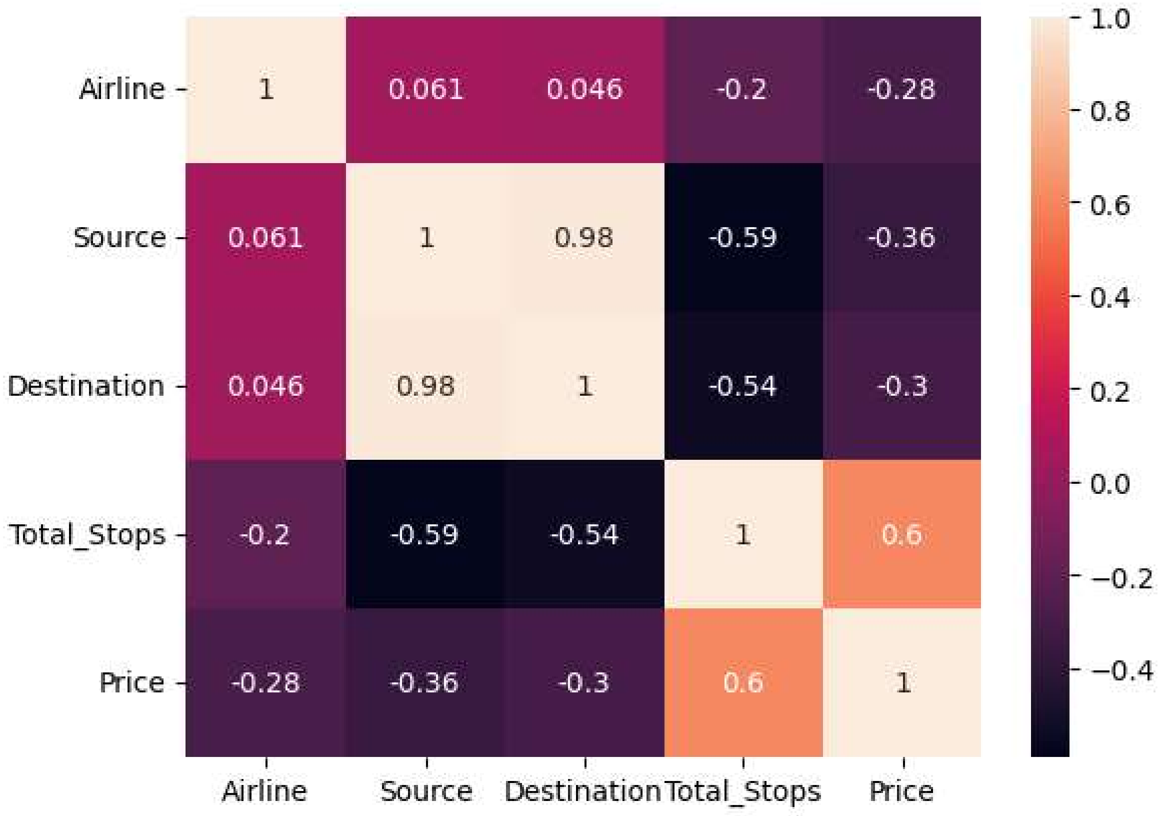
Out[26]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m
...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m

10682 rows × 11 columns

In [27]:
```
dt=train_df[['Airline','Source','Destination','Total_Stops','Price']]
sns.heatmap(dt.corr(),annot=True)
```

Out[27]:
```
<Axes: >
```



In [28]:
```
x=dt[['Airline','Source','Destination','Total_Stops']]
y=dt['Price']
```

In [29]:
```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=
```

In [30]:
```
from sklearn.linear_model import LinearRegression
regr=LinearRegression()
regr.fit(X_train,y_train)
print(regr.intercept_)
coeff_df=pd.DataFrame(regr.coef_,x.columns,columns=['coefficient'])
coeff_df
```

```
7211.098088897486
```

Out[30]:

	coefficient
Airline	-418.483922
Source	-3275.073380
Destination	2505.480291
Total_Stops	3541.798053

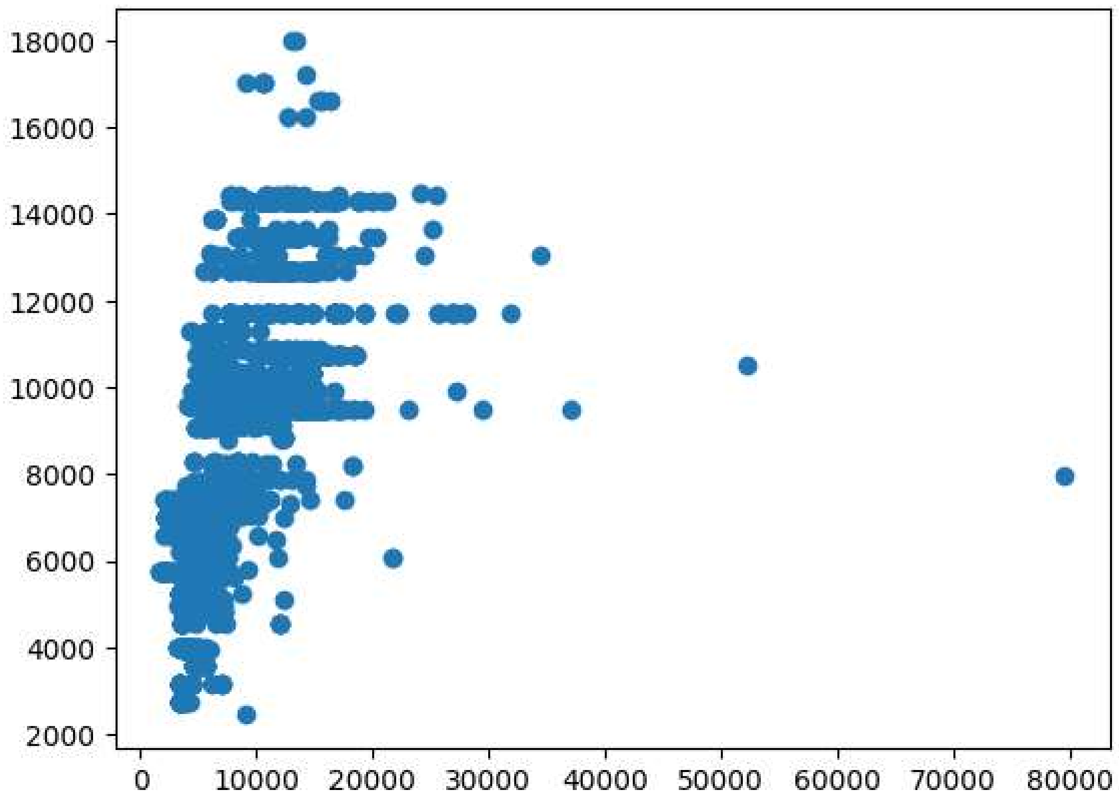
In [31]:
```
score=regr.score(X_test,y_test)
print(score)
```

```
0.41083048909283504
```

In [32]:
```
predictions=regr.predict(X_test)
```

In [33]:
```
plt.scatter(y_test,predictions)
```

Out[33]:
```
<matplotlib.collections.PathCollection at 0x23e49325a20>
```



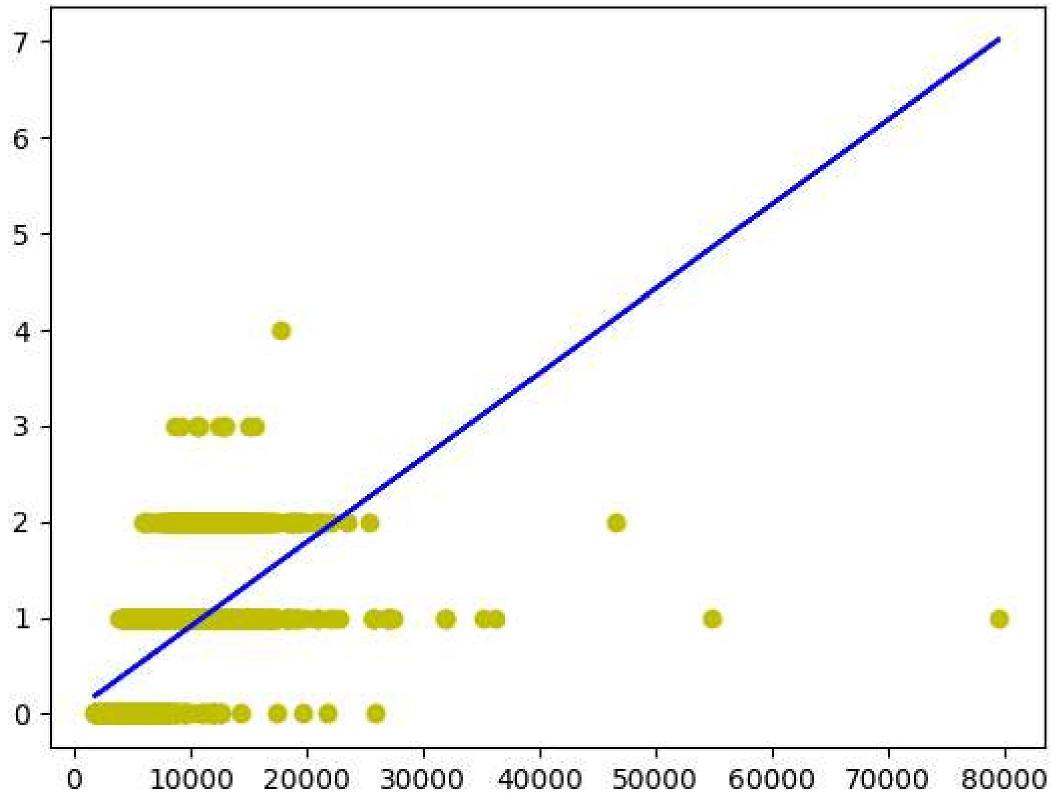
In [34]:
```
x=np.array(dt['Price']).reshape(-1,1)
y=np.array(dt['Total_Stops']).reshape(-1,1)
dt.dropna(inplace=True)
```

```
C:\Users\91903\AppData\Local\Temp\ipykernel_24440\3192770570.py:3: SettingWit
hCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  dt.dropna(inplace=True)
```

In [35]:
```
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
regr.fit(X_train,y_train)
regr.fit(X_train,y_train)
```

Out[35]:
```
▾ LinearRegression

LinearRegression()
```

In [36]:
```
y_pred=regr.predict(X_test)
plt.scatter(X_test,y_test,color='y')
plt.plot(X_test,y_pred,color='b')
plt.show()
```



Logistic Regression

In [37]:
```
x=np.array(dt['Price']).reshape(-1,1)
y=np.array(dt['Total_Stops']).reshape(-1,1)
dt.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression(max_iter=10000)
```

```
C:\Users\91903\AppData\Local\Temp\ipykernel_24440\2636389832.py:3: SettingWit
hCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/s
table/user_guide/indexing.html#returning-a-view-versus-a-copy (https://panda
s.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-ver
sus-a-copy)
  dt.dropna(inplace=True)
```

In [38]:
```
lr.fit(x_train,y_train)
```

```
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\skle
arn\utils\validation.py:1143: DataConversionWarning: A column-vector y was pa
ssed when a 1d array was expected. Please change the shape of y to (n_sample
s, ), for example using ravel().
  y = column_or_1d(y, warn=True)
```

Out[38]:
```
▾        LogisticRegression
LogisticRegression(max_iter=10000)
```

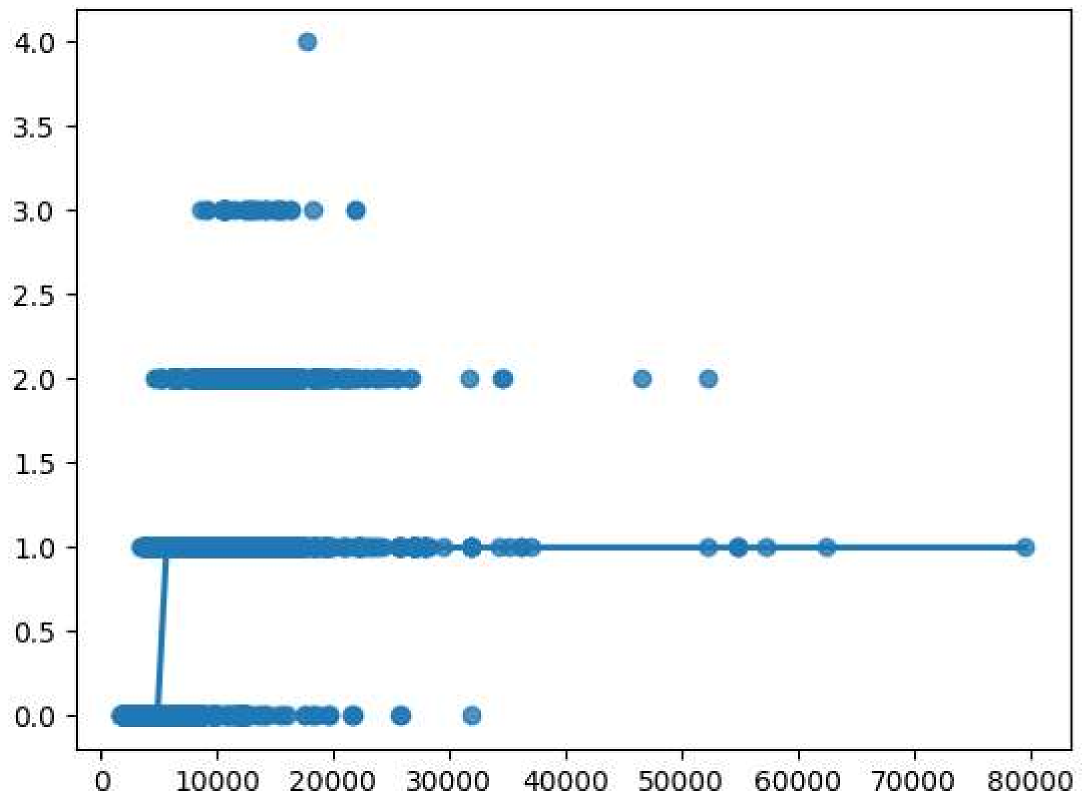
In [39]:
```
score=lr.score(x_test,y_test)
print(score)
```

```
0.7160686427457098
```

In [40]:
```
sns.regplot(x=x,y=y,data=dt,logistic=True,ci=None)
```

```
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\stat
smodels\genmod\families\links.py:198: RuntimeWarning: overflow encountered in
exp
  t = np.exp(-z)
```

Out[40]:
```
<Axes: >
```



Decision Tree

In [41]:
```
from sklearn.tree import DecisionTreeClassifier
clf=DecisionTreeClassifier(random_state=0)
clf.fit(x_train,y_train)
```

Out[41]:
```
▾ DecisionTreeClassifier
DecisionTreeClassifier(random_state=0)
```

In [42]:
```
score=clf.score(x_test,y_test)
print(score)
```

```
0.9369734789391576
```

Random Forest

In [43]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(X_train,y_train)
```

```
C:\Users\91903\AppData\Local\Temp\ipykernel_24440\4104924521.py:3: DataConver
sionWarning: A column-vector y was passed when a 1d array was expected. Pleas
e change the shape of y to (n_samples,), for example using ravel().
  rfc.fit(X_train,y_train)
```

Out[43]:
```
▾ RandomForestClassifier

RandomForestClassifier()
```

In [44]:
```
params={'max_depth':[2,3,5,10,20],
'min_samples_leaf':[5,10,20,50,100,200],
'n_estimators':[10,25,30,50,100,200]}
```

In [45]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=params,cv=2,scoring="accurac
```

In [46]:
```
grid_search.fit(X_train,y_train)
```

```
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\model_selection\_split.py:700: UserWarning: The least populated cla
ss in y has only 1 members, which is less than n_splits=2.
  warnings.warn(
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\model_selection\_validation.py:686: DataConversionWarning: A column
-vector y was passed when a 1d array was expected. Please change the shape
of y to (n_samples,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\model_selection\_validation.py:686: DataConversionWarning: A column
-vector y was passed when a 1d array was expected. Please change the shape
of y to (n_samples,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
C:\Users\91903\AppData\Local\Programs\Python\Python310\lib\site-packages\s
klearn\model_selection\_validation.py:686: DataConversionWarning: A column
-vector y was passed when a 1d array was expected. Please change the shape
of y to (n_samples,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
```

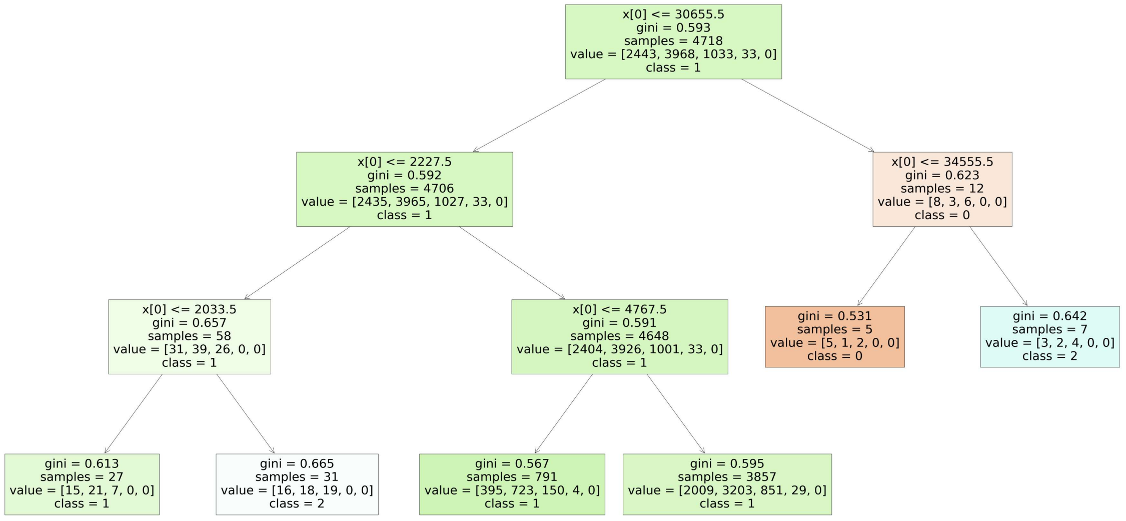
In [47]:
```
grid_search.best_score_
```

Out[47]:
```
0.5238731668896858
```

In [48]:
```
rf_best=grid_search.best_estimator_
rf_best
```

Out[48]:
```
▾                          RandomForestClassifier

RandomForestClassifier(max_depth=3, min_samples_leaf=5, n_estimators=10)
```

In [49]:
```
from sklearn.tree import plot_tree
plt.figure(figsize=(80,40))
plot_tree(rf_best.estimators_[4],class_names=['0','1','2','3','4'],filled=True
```



In [50]:
```
score=rfc.score(x_test,y_test)
print(score)
```

```
0.46177847113884557
```

Conclusion:

For the given dataset,we have performed linear regression,logistic regression,decision tree,random forest classification.Among all the models,we observed that ,in decision tree the accuracy is 0.93,and in the logistic regression we observed,the accuracy is 0.71 where as decision tree got the highest accuracy than the logistic regression.So, the best model that suits for the given dataset is decision tree and lasso regression.

In [ ]: