In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
traindf=pd.read_csv(r"C:\Users\Niranjan\Downloads\Data_Train1.csv")
traindf
```

Out[2]:

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

10683 rows × 11 columns

In [4]:
```
testdf=pd.read_csv(r"C:\Users\Niranjan\Downloads\Test_set1.csv")
testdf
```

Out[4]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Sto
0	Jet Airways	6/06/2019	Delhi	Cochin	DEL ? BOM ? COK	17:30	04:25 07 Jun	10h 55m	1 st
1	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? MAA ? BLR	06:20	10:20	4h	1 st
2	Jet Airways	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	19:15	19:00 22 May	23h 45m	1 st
3	Multiple carriers	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	08:00	21:00	13h	1 st
4	Air Asia	24/06/2019	Banglore	Delhi	BLR ? DEL	23:55	02:45 25 Jun	2h 50m	non-st
...	...	...	...	...	...	...	...	...	
2666	Air India	6/06/2019	Kolkata	Banglore	CCU ? DEL ? BLR	20:30	20:25 07 Jun	23h 55m	1 st
2667	IndiGo	27/03/2019	Kolkata	Banglore	CCU ? BLR	14:20	16:55	2h 35m	non-st
2668	Jet Airways	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	21:50	04:25 07 Mar	6h 35m	1 st
2669	Air India	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	04:00	19:15	15h 15m	1 st
2670	Multiple carriers	15/06/2019	Delhi	Cochin	DEL ? BOM ? COK	04:55	19:15	14h 20m	1 st

2671 rows × 10 columns

In [5]:
```
1 traindf.head()
```

Out[5]:

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

In [6]:
```
1 testdf.head()
```

Out[6]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops
0	Jet Airways	6/06/2019	Delhi	Cochin	DEL ? BOM ? COK	17:30	04:25 07 Jun	10h 55m	1 stop
1	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? MAA ? BLR	06:20	10:20	4h	1 stop
2	Jet Airways	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	19:15	19:00 22 May	23h 45m	1 stop
3	Multiple carriers	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	08:00	21:00	13h	1 stop
4	Air Asia	24/06/2019	Banglore	Delhi	BLR ? DEL	23:55	02:45 25 Jun	2h 50m	non-stop

In [7]:
```
1 traindf.tail()
```

Out[7]:

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

In [8]:
```
1 testdf.tail()
```

Out[8]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stop
2666	Air India	6/06/2019	Kolkata	Banglore	CCU ? DEL ? BLR	20:30	20:25 07 Jun	23h 55m	1 sto
2667	IndiGo	27/03/2019	Kolkata	Banglore	CCU ? BLR	14:20	16:55	2h 35m	non-sto
2668	Jet Airways	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	21:50	04:25 07 Mar	6h 35m	1 sto
2669	Air India	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	04:00	19:15	15h 15m	1 sto
2670	Multiple carriers	15/06/2019	Delhi	Cochin	DEL ? BOM ? COK	04:55	19:15	14h 20m	1 sto

In [9]:
```
1 traindf.describe()
```

Out[9]:

	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 [10]:
```
1 testdf.describe()
```

Out[10]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_St
count	2671	2671	2671	2671	2671	2671	2671	2671	2
unique	11	44	5	6	100	199	704	320	
top	Jet Airways	9/05/2019	Delhi	Cochin	DEL ? BOM ? COK	10:00	19:00	2h 50m	1 s
freq	897	144	1145	1145	624	62	113	122	1

In [11]:
```
1 traindf.shape
```

Out[11]: (10683, 11)

In [12]:
```
1 testdf.shape
```

Out[12]: (2671, 10)

In [13]:
```
1 traindf.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]:
```
1 testdf.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 2671 entries, 0 to 2670
Data columns (total 10 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          2671 non-null   object
 1   Date_of_Journey  2671 non-null   object
 2   Source           2671 non-null   object
 3   Destination      2671 non-null   object
 4   Route            2671 non-null   object
 5   Dep_Time         2671 non-null   object
 6   Arrival_Time     2671 non-null   object
 7   Duration         2671 non-null   object
 8   Total_Stops      2671 non-null   object
 9   Additional_Info  2671 non-null   object
dtypes: object(10)
memory usage: 208.8+ KB
```

In [15]:
```
1 traindf.duplicated().sum()
```

Out[15]: 220

In [16]:
```
1 testdf.duplicated().sum()
```

Out[16]: 26

In [17]:
```
1 traindf.columns
```

Out[17]:
```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
       'Additional_Info', 'Price'],
      dtype='object')
```

In [18]:
```
1 traindf.columns
```

Out[18]:
```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
       'Additional_Info', 'Price'],
      dtype='object')
```

In [19]:
```
1 traindf.isnull().sum()
```

Out[19]:
```
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 [20]:
```
1 testdf.isnull().sum()
```

Out[20]:
```
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
dtype: int64
```

In [21]:
```
1 traindf.dropna(inplace=True)
```

In [22]:
```
1 traindf.isnull().sum()
```

Out[22]:
```
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 [23]:
```
1 traindf.shape
```

Out[23]:
```
(10682, 11)
```

In [24]:
```
1 traindf['Airline'].value_counts()
```

Out[24]:
```
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 [25]:
```
1 traindf['Source'].value_counts()
```

Out[25]:
```
Source
Delhi       4536
Kolkata     2871
Banglore    2197
Mumbai       697
Chennai      381
Name: count, dtype: int64
```

In [26]:
```
1 traindf['Destination'].value_counts()
```

Out[26]:
```
Destination
Cochin       4536
Banglore     2871
Delhi        1265
New Delhi     932
Hyderabad     697
Kolkata       381
Name: count, dtype: int64
```

In [27]:
```
1 traindf['Total_Stops'].value_counts()
```

Out[27]:
```
Total_Stops
1 stop      5625
non-stop    3491
2 stops     1520
3 stops       45
4 stops        1
Name: count, dtype: int64
```

In [28]:
```
airline={"Airline":{"Jet Airways":0,"IndiGo":1,"Air India":2,"Multiple carriers":
"SpiceJet":4,"Vistara":5,"Air Asia":6,"GoAir":7,
"Multiple carriers Premium economy":8,
"Jet Airways Business":9,"Vistara Premium economy":10,"Trujet":11}}
traindf=traindf.replace(airline)
traindf
```

Out[28]:

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

10682 rows × 11 columns

In [29]:
```
city={"Source":{"Delhi":0,"Kolkata":1,"Banglore":2,
"Mumbai":3,"Chennai":4}}
traindf=traindf.replace(city)
traindf
```

Out[29]:

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

10682 rows × 11 columns

In [30]:
```
destination={"Destination":{"Cochin":0,"Banglore":1,"Delhi":2,
"New Delhi":3,"Hyderabad":4,"Kolkata":5}}
traindf=traindf.replace(destination)
traindf
```

Out[30]:

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

10682 rows × 11 columns

In [31]:
```
stops={"Total_Stops":{"non-stop":0,"1 stop":1,"2 stops":2,
"3 stops":3,"4 stops":4}}
traindf=traindf.replace(stops)
traindf
```

Out[31]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stop
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 [32]:
```
1 traindf
```

Out[32]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stop
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 [33]:
```
#EDA
fdf=traindf[['Airline','Source','Destination','Total_Stops','Price']]
sns.heatmap(fdf.corr(),annot=True)
```

Out[33]: <Axes: >

In [34]:
```
x=fdf[['Airline','Source','Destination','Total_Stops']]
y=fdf['Price']
```

Linear Regression

In [35]:
```
#Linear Regression
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=100
```

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

	coefficient
Airline	-418.483922
Source	-3275.073380
Destination	2505.480291
Total_Stops	3541.798053

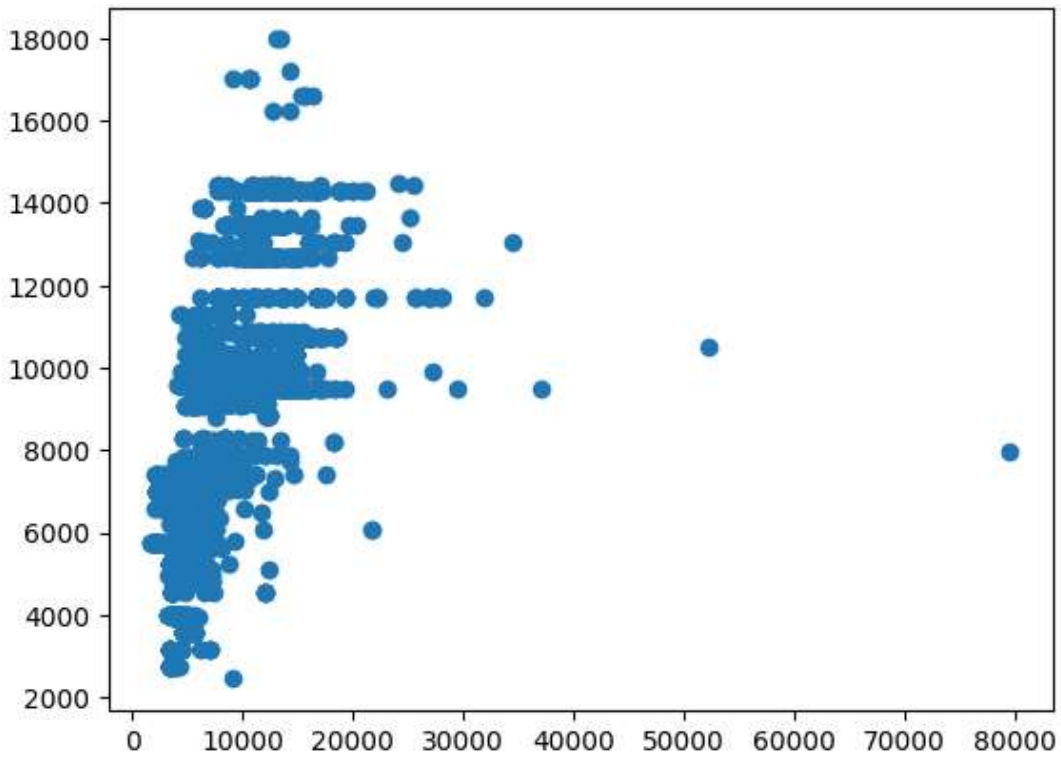
In [37]:
```
#Linear Rgeression
score=regr.score(X_test,y_test)
print(score)
```

```
0.41083048909283504
```

In [38]:
```
predictions=regr.predict(X_test)
```

In [39]:
```
plt.scatter(y_test,predictions)
```

Out[39]:
```
<matplotlib.collections.PathCollection at 0x24611ed8610>
```



In [40]:
```
x=np.array(fdf['Price']).reshape(-1,1)
y=np.array(fdf['Total_Stops']).reshape(-1,1)
fdf.dropna(inplace=True)
```

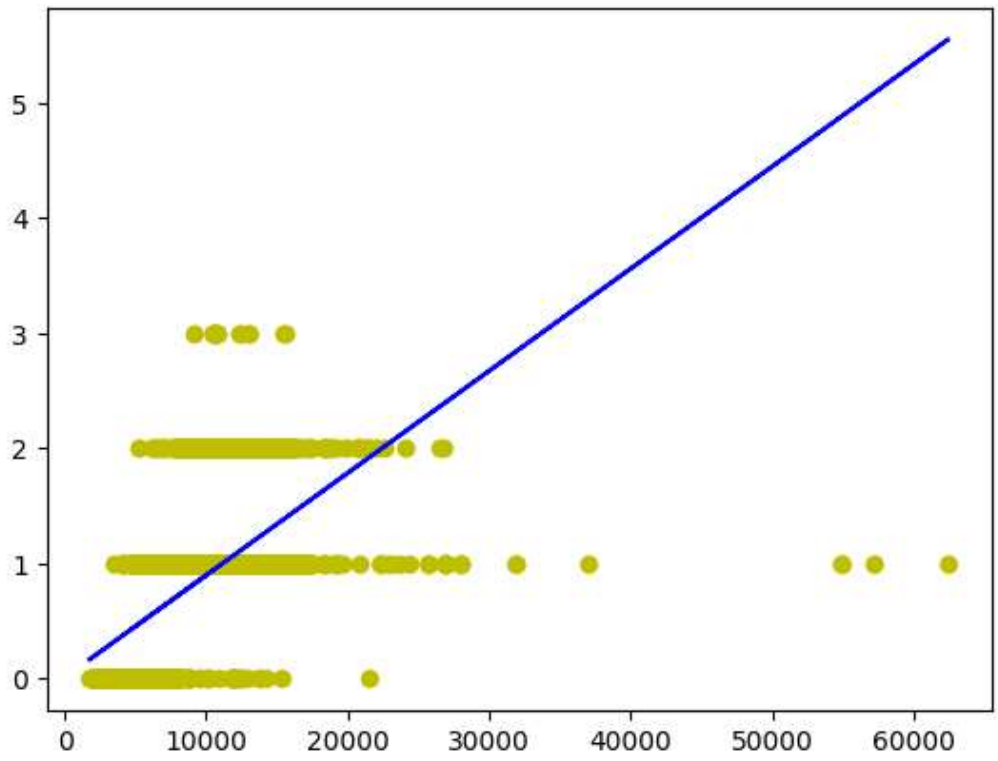
```
C:\Users\Niranjan\AppData\Local\Temp\ipykernel_11876\521034954.py:3: SettingWithCopy
Warning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/u
ser_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pa
ndas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  fdf.dropna(inplace=True)
```

In [41]:
```
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[41]:
```
LinearRegression
LinearRegression()
```

In [42]:
```
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 [43]:
```
#Logistic Regression
x=np.array(fdf['Price']).reshape(-1,1)
y=np.array(fdf['Total_Stops']).reshape(-1,1)
fdf.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=1)
from sklearn.linear_model import LogisticRegression
lr=LogisticRegression(max_iter=10000)
```

```
C:\Users\Niranjan\AppData\Local\Temp\ipykernel_11876\3604832714.py:4: SettingWithCopyWarning:
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/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  fdf.dropna(inplace=True)
```

In [44]:
```
lr.fit(x_train,y_train)
```

```
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklearn\utils\validation.py:1143: 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().
  y = column_or_1d(y, warn=True)
```

Out[44]:
```
LogisticRegression
LogisticRegression(max_iter=10000)
```

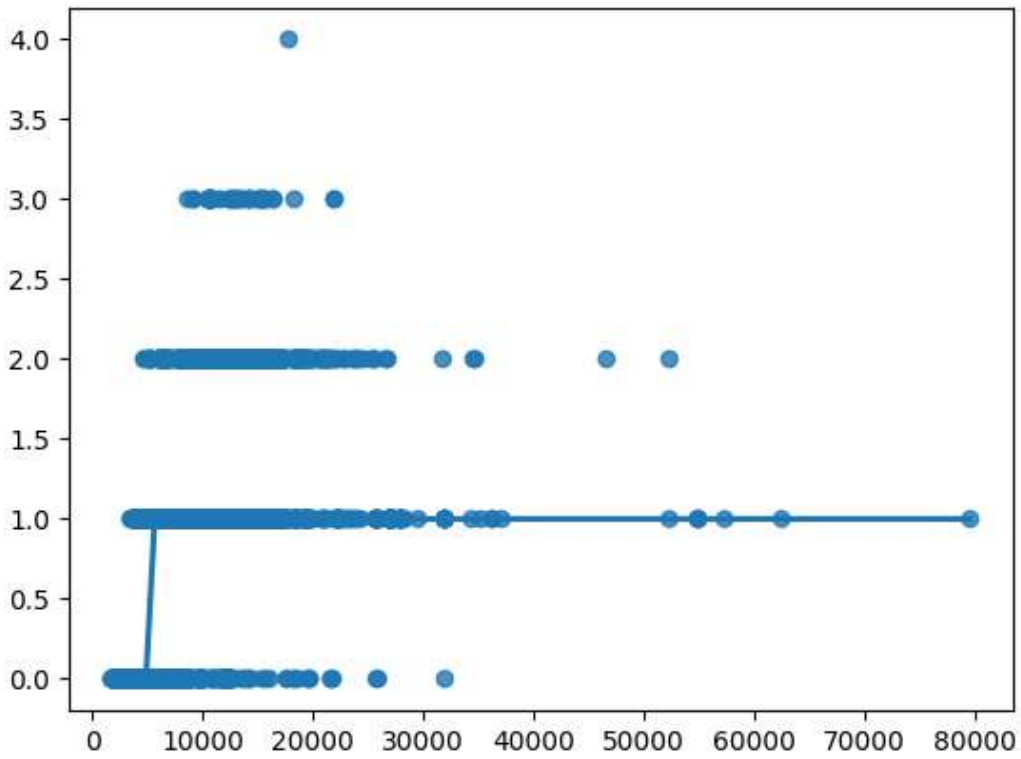
In [45]:
```
score=lr.score(x_test,y_test)
print(score)
```

```
0.7160686427457098
```

In [46]:
```
1 sns.regplot(x=x,y=y,data=fdf,logistic=True,ci=None)
```

```
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\statsmod
els\genmod\families\links.py:198: RuntimeWarning: overflow encountered in exp
  t = np.exp(-z)
```

Out[46]: <Axes: >



Decision Tree

In [47]:
```
1 #Decision tree
2 from sklearn.tree import DecisionTreeClassifier
3 clf=DecisionTreeClassifier(random_state=0)
4 clf.fit(x_train,y_train)
```

Out[47]:
```
DecisionTreeClassifier
DecisionTreeClassifier(random_state=0)
```

In [48]:
```
1 score=clf.score(x_test,y_test)
2 print(score)
```

```
0.9369734789391576
```

Random Classifier

In [49]:

```
#Random forest classifier
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(X_train,y_train)
```

```
C:\Users\Niranjan\AppData\Local\Temp\ipykernel_11876\1232785509.py:4: DataConversion
Warning: A column-vector y was passed when a 1d array was expected. Please change th
e shape of y to (n_samples,), for example using ravel().
  rfc.fit(X_train,y_train)
```

Out[49]:

```
▾ RandomForestClassifier
RandomForestClassifier()
```

In [50]:

```
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 [51]:

```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=params,cv=2,scoring="accuracy")
```

In [52]:

```
grid_search.fit(X_train,y_train)
```

```
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklea
rn\model_selection\_split.py:700: UserWarning: The least populated class in y has
only 1 members, which is less than n_splits=2.
  warnings.warn(
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklea
rn\model_selection\_validation.py:686: DataConversionWarning: A column-vector y w
as passed when a 1d array was expected. Please change the shape of y to (n_sample
s,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklea
rn\model_selection\_validation.py:686: DataConversionWarning: A column-vector y w
as passed when a 1d array was expected. Please change the shape of y to (n_sample
s,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
C:\Users\Niranjan\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklea
rn\model_selection\_validation.py:686: DataConversionWarning: A column-vector y w
as passed when a 1d array was expected. Please change the shape of y to (n_sample
s,), for example using ravel().
  estimator.fit(X_train, y_train, **fit_params)
```

In [53]:

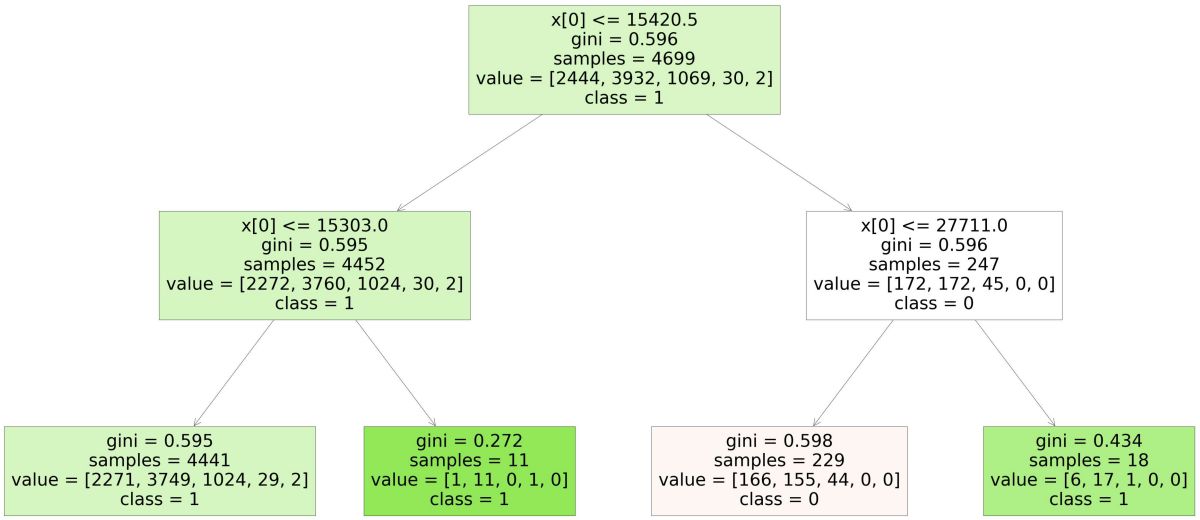
```
grid_search.best_score_
```

Out[53]: 0.523605715699528

In [54]:
```
rf_best=grid_search.best_estimator_
rf_best
```

Out[54]:
```
RandomForestClassifier(max_depth=2, min_samples_leaf=5, n_estimators=10)
```

In [55]:
```
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 [56]:
```
score=rfc.score(x_test,y_test)
print(score)
```

```
0.45460218408736347
```

Conclusion

For the above Dataset we use different Types of Models,For that each and every model we get different Types of Accuracies.Based on that accuracies we can conclude which model is best fit for my our Dataset. Here we get different Types of accuracies For That Different Types of Accuracies Decision Tree is get more accuracy among all the models.So,that we can Conclude that for our Model Decision Tree is Best fit.

In [ ]:
```

```