PROBLEM STATEMENT: Which model is suitable for

flight price prediction dataset Importing packages

In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Data Collection

In [2]:

```
train_df=pd.read_csv(r"C:\Users\jyothi reddy\Downloads\Copy of Data_Train.csv")
train_df
```

Out[2]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	non-stop	No info	3897
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2 stops	No info	7662
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2 stops	No info	13882
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1 stop	No info	6218
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1 stop	No info	13302
...	...	...	...	...	...	...	...	...	...	...	...
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m	non-stop	No info	4107
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m	non-stop	No info	4145
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h	non-stop	No info	7229
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m	non-stop	No info	12648
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2 stops	No info	11753

10683 rows × 11 columns

In [3]:

```
test_df=pd.read_csv(r"C:\Users\jyothi reddy\Downloads\Copy of Test_set.csv")
test_df
```

Out[3]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info
0	Jet Airways	6/06/2019	Delhi	Cochin	DEL ? BOM ? COK	17:30	04:25 07 Jun	10h 55m	1 stop	No info
1	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? MAA ? BLR	06:20	10:20	4h	1 stop	No info
2	Jet Airways	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	19:15	19:00 22 May	23h 45m	1 stop	In-flight meal not included
3	Multiple carriers	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	08:00	21:00	13h	1 stop	No info
4	Air Asia	24/06/2019	Banglore	Delhi	BLR ? DEL	23:55	02:45 25 Jun	2h 50m	non-stop	No info
...	...	...	...	...	...	...	...	...	...	...
2666	Air India	6/06/2019	Kolkata	Banglore	CCU ? DEL ? BLR	20:30	20:25 07 Jun	23h 55m	1 stop	No info
2667	IndiGo	27/03/2019	Kolkata	Banglore	CCU ? BLR	14:20	16:55	2h 35m	non-stop	No info
2668	Jet Airways	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	21:50	04:25 07 Mar	6h 35m	1 stop	No info
2669	Air India	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	04:00	19:15	15h 15m	1 stop	No info
2670	Multiple carriers	15/06/2019	Delhi	Cochin	DEL ? BOM ? COK	04:55	19:15	14h 20m	1 stop	No info

2671 rows × 10 columns

In [4]:

```
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 [5]:

```
test_df.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 [6]:

```
train_df.describe()
```

Out[6]:

	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 [7]:

```
test_df.describe()
```

Out[7]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info
count	2671	2671	2671	2671	2671	2671	2671	2671	2671	2671
unique	11	44	5	6	100	199	704	320	5	6
top	Jet Airways	9/05/2019	Delhi	Cochin	DEL ? BOM ? COK	10:00	19:00	2h 50m	1 stop	No info
freq	897	144	1145	1145	624	62	113	122	1431	2148

In [8]:

```
train_df.head()
```

Out[8]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	non-stop	No info	3897
1	Air India	1/05/2019	Kolkata	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2 stops	No info	7662
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2 stops	No info	13882
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1 stop	No info	6218
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1 stop	No info	13302

In [9]:

```
test_df.head()
```

Out[9]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info
0	Jet Airways	6/06/2019	Delhi	Cochin	DEL ? BOM ? COK	17:30	04:25 07 Jun	10h 55m	1 stop	No info
1	IndiGo	12/05/2019	Kolkata	Banglore	CCU ? MAA ? BLR	06:20	10:20	4h	1 stop	No info
2	Jet Airways	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	19:15	19:00 22 May	23h 45m	1 stop	In-flight meal not included
3	Multiple carriers	21/05/2019	Delhi	Cochin	DEL ? BOM ? COK	08:00	21:00	13h	1 stop	No info
4	Air Asia	24/06/2019	Banglore	Delhi	BLR ? DEL	23:55	02:45 25 Jun	2h 50m	non-stop	No info

In [10]:

```
train_df.tail()
```

Out[10]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU ? BLR	19:55	22:25	2h 30m	non-stop	No info	4107
10679	Air India	27/04/2019	Kolkata	Banglore	CCU ? BLR	20:45	23:20	2h 35m	non-stop	No info	4145
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR ? DEL	08:20	11:20	3h	non-stop	No info	7229
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR ? DEL	11:30	14:10	2h 40m	non-stop	No info	12648
10682	Air India	9/05/2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2 stops	No info	11753

In [11]:

```
test_df.tail()
```

Out[11]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info
2666	Air India	6/06/2019	Kolkata	Banglore	CCU ? DEL ? BLR	20:30	20:25 07 Jun	23h 55m	1 stop	No info
2667	IndiGo	27/03/2019	Kolkata	Banglore	CCU ? BLR	14:20	16:55	2h 35m	non-stop	No info
2668	Jet Airways	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	21:50	04:25 07 Mar	6h 35m	1 stop	No info
2669	Air India	6/03/2019	Delhi	Cochin	DEL ? BOM ? COK	04:00	19:15	15h 15m	1 stop	No info
2670	Multiple carriers	15/06/2019	Delhi	Cochin	DEL ? BOM ? COK	04:55	19:15	14h 20m	1 stop	No info

In [12]:

```
train_df.shape
```

Out[12]:

```
(10683, 11)
```

In [13]:

```
test_df.shape
```

Out[13]:

```
(2671, 10)
```

In [14]:

```
train_df.columns
```

Out[14]:

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

In [15]:

```
test_df.columns
```

Out[15]:

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

In [16]:

```
train_df.isnull().sum()
```

Out[16]:

```
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 [17]:

```
test_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
dtype: int64
```

In [18]:

```
train_df.dropna(inplace=True)
```

In [19]:

```
train_df.isnull().sum()
```

Out[19]:

```
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 [20]:

```
train_df["Airline"].value_counts()
```

Out[20]:

```
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 [21]:

```
train_df["Source"].value_counts()
```

Out[21]:

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

In [22]:

```
test_df['Destination'].value_counts()
```

Out[22]:

```
Destination
Cochin       1145
Banglore      710
Delhi         317
New Delhi     238
Hyderabad     186
Kolkata        75
Name: count, dtype: int64
```

In [23]:

```
test_df["Airline"].value_counts()
```

Out[23]:

```
Airline
Jet Airways                          897
IndiGo                               511
Air India                            440
Multiple carriers                    347
SpiceJet                             208
Vistara                              129
Air Asia                              86
GoAir                                 46
Multiple carriers Premium economy      3
Vistara Premium economy                2
Jet Airways Business                   2
Name: count, dtype: int64
```

In [36]:

```
tara":5,"Air Asia":6,"GoAir":7,'Vistara Premium economy':8,"Jet Airways Business":9,"Multiple carriers Premium economy":10,'Trujet':11}}
```

Out[36]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	0	No info	3897
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2	No info	7662
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2	No info	13882
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1	No info	6218
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1	No info	13302
...	...	...	...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m	0	No info	4107
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m	0	No info	4145
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h	0	No info	7229
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m	0	No info	12648
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2	No info	11753

10682 rows × 11 columns

In [27]:

```
source={"Source":{"Delhi":0,"Kolkata":1,"Banglore":2,"Mumbai":3,"Chennai":4}}
train_df=train_df.replace(source)
train_df
```

Out[27]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	1	24/03/2019	2	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	non-stop	No info	3897
1	2	1/05/2019	1	Banglore	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2 stops	No info	7662
2	0	9/06/2019	0	Cochin	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2 stops	No info	13882
3	1	12/05/2019	1	Banglore	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1 stop	No info	6218
4	1	01/03/2019	2	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1 stop	No info	13302
...	...	...	...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	Banglore	CCU ? BLR	19:55	22:25	2h 30m	non-stop	No info	4107
10679	2	27/04/2019	1	Banglore	CCU ? BLR	20:45	23:20	2h 35m	non-stop	No info	4145
10680	0	27/04/2019	2	Delhi	BLR ? DEL	08:20	11:20	3h	non-stop	No info	7229
10681	5	01/03/2019	2	New Delhi	BLR ? DEL	11:30	14:10	2h 40m	non-stop	No info	12648
10682	2	9/05/2019	0	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2 stops	No info	11753

10682 rows × 11 columns

In [29]:

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

Out[29]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	non-stop	No info	3897
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2 stops	No info	7662
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2 stops	No info	13882
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1 stop	No info	6218
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1 stop	No info	13302
...	...	...	...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m	non-stop	No info	4107
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m	non-stop	No info	4145
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h	non-stop	No info	7229
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m	non-stop	No info	12648
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2 stops	No info	11753

10682 rows × 11 columns

In [30]:

```
Stop={"Total_Stops":{"non-stop":0,"1 stop":1,"2 stops":2,"3 stops":3,"4 stops":4}}
train_df=train_df.replace(Stop)
train_df
```

Out[30]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	0	No info	3897
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2	No info	7662
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	2	No info	13882
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1	No info	6218
4	1	01/03/2019	2	3	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1	No info	13302
...	...	...	...	...	...	...	...	...	...	...	...
10678	6	9/04/2019	1	1	CCU ? BLR	19:55	22:25	2h 30m	0	No info	4107
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m	0	No info	4145
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h	0	No info	7229
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m	0	No info	12648
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2	No info	11753

10682 rows × 11 columns

Exploratory Data Analysis

In [37]:

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

Out[37]:

```
<Axes: >
```

In [38]:

```
x=train_df[['Airline','Source','Destination','Total_Stops']]
y=train_df['Price']
```

Linear Regression

In [39]:

```
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 [40]:

```
from sklearn.linear_model import LinearRegression
ln=LinearRegression()
ln.fit(x_train,y_train)
print(ln.intercept_)
```

```
7203.852211805011
```

In [41]:

```
coeff_df=pd.DataFrame(ln.coef_,x.columns,columns=['coefficient'])
coeff_df
```

Out[41]:

	coefficient
Airline	-414.489116
Source	-3277.818838
Destination	2507.211381
Total_Stops	3544.147340

In [42]:

```
score=ln.score(x_test,y_test)
score
```

Out[42]:

```
0.4105643712880689
```

In [43]:

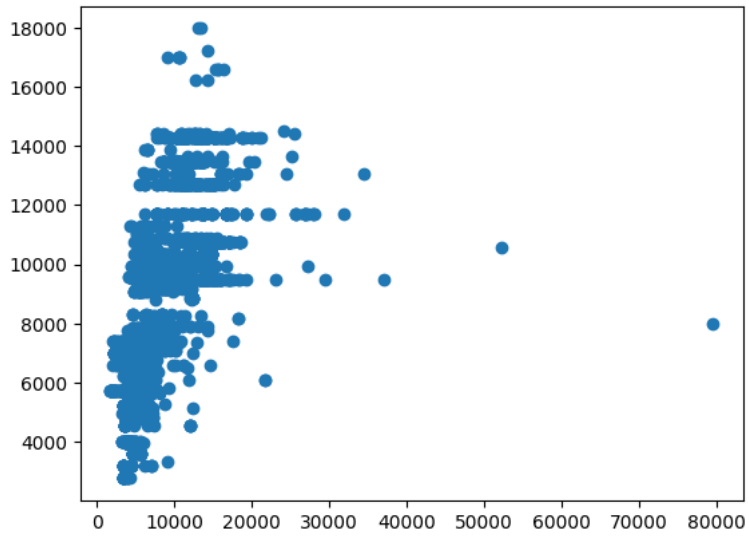
```
predictions=ln.predict(x_test)
```

In [44]:

```
plt.scatter(y_test,predictions)
```

Out[44]:

```
<matplotlib.collections.PathCollection at 0x1f8a74e1210>
```



In [45]:

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

In [46]:

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
ln.fit(x_train,y_train)
ln.fit(x_train,y_train)
```

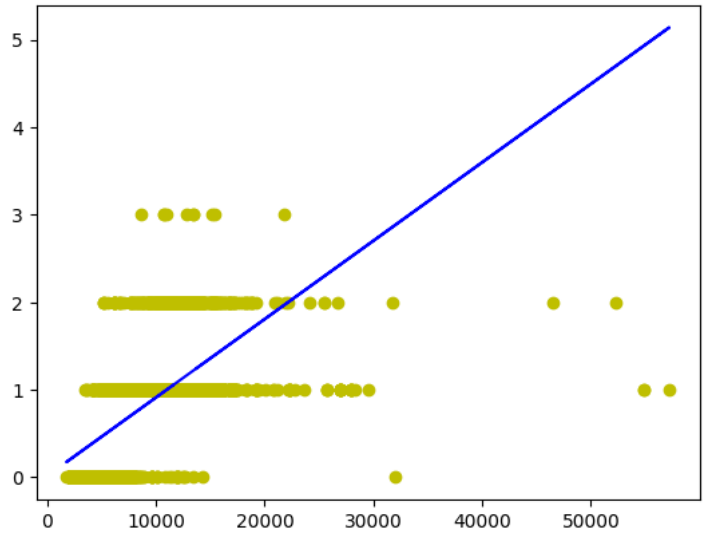
Out[46]:

LinearRegression

LinearRegression()

In [47]:

```
y_pred=ln.predict(x_test)
plt.scatter(x_test,y_test,color='y')
plt.plot(x_test,y_pred,color='b')
plt.show()
```



By using Linear Regression we didn't get the accuracy for this model. So we will use logistic regression

Logistic Regression

In [48]:

```
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import StandardScaler
```

In [49]:

```
x=np.array(df['Price']).reshape(-1,1)
y=np.array(df['Total_Stops']).reshape(-1,1)
df.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)
import warnings
warnings.simplefilter(action='ignore')
```

```
C:\Users\jyothi reddy\AppData\Local\Temp\ipykernel_12264\1264944960.py:3: 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-vie
w-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df.dropna(inplace=True)
```

In [50]:

```
lr.fit(x_train,y_train)
```

Out[50]:

```
LogisticRegression(max_iter=10000)
```

In [51]:

```
score=lr.score(x_test,y_test)
score
```

Out[51]:

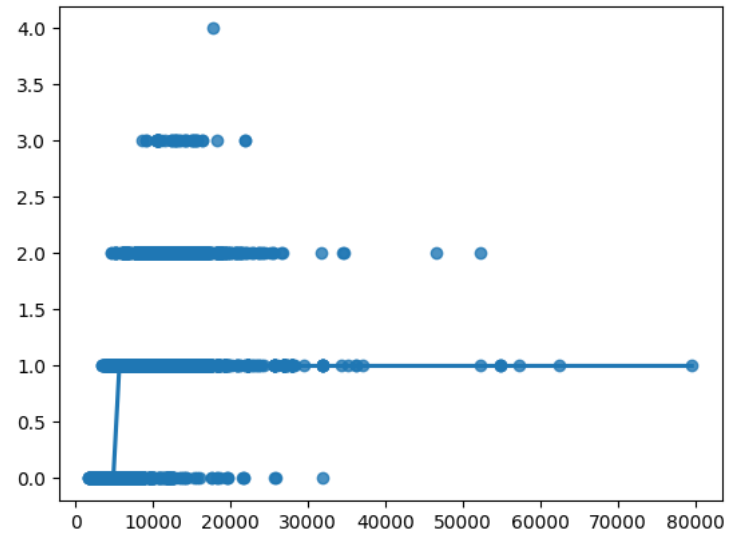
```
0.7160686427457098
```

In [52]:

```
sns.regplot(x=x,y=y,data=df,logistic=True,ci=None)
```

Out[52]:

```
<Axes: >
```



Decision Tree

In [53]:

```
from sklearn.tree import DecisionTreeClassifier
dtc=DecisionTreeClassifier(random_state=0)
dtc.fit(x_train,y_train)
```

Out[53]:

```
DecisionTreeClassifier
DecisionTreeClassifier(random_state=0)
```

In [54]:

```
score=dtc.score(x_test,y_test)
score
```

Out[54]:

```
0.9369734789391576
```

Random Forest

In [55]:

```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
```

Out[55]:

```
RandomForestClassifier
RandomForestClassifier()
```

In [56]:

```
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 [57]:

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

In [58]:

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

Out[58]:

GridSearchCV
estimator: RandomForestClassifier
RandomForestClassifier

In [59]:

```
grid_search.best_score_
```

Out[59]:

```
0.8741467212330059
```

In [60]:

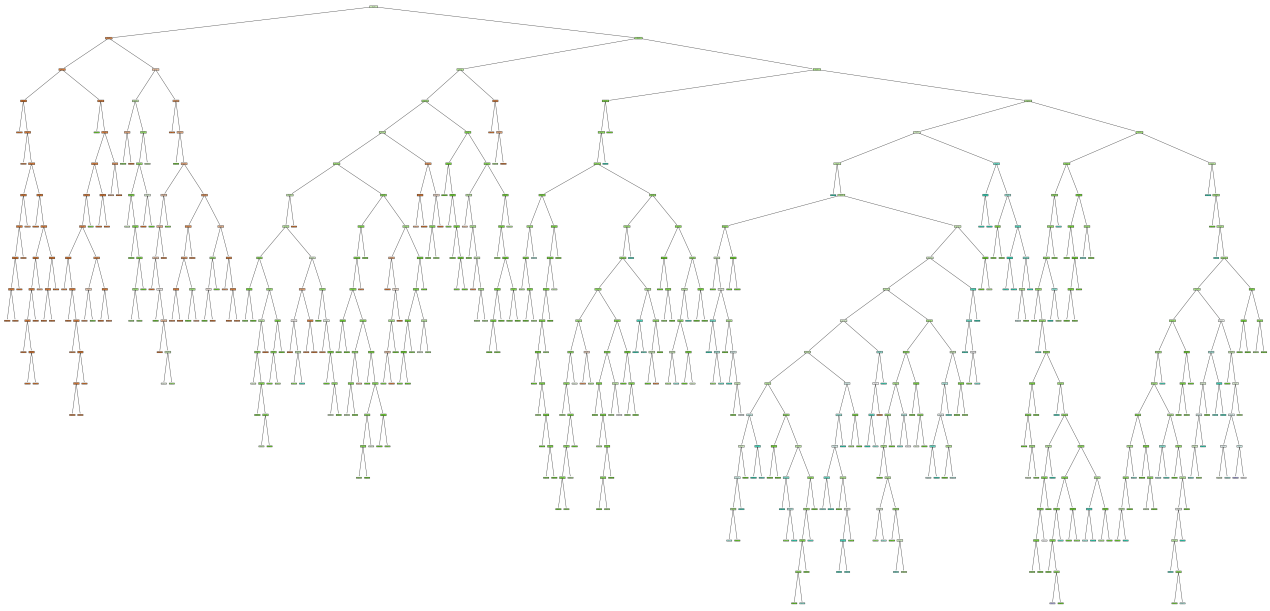
```
rf_best=grid_search.best_estimator_
rf_best
```

Out[60]:

RandomForestClassifier
RandomForestClassifier(max_depth=20, min_samples_leaf=5, n_estimators=200)

In [61]:

```
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 [62]:

```
score=rfc.score(x_test,y_test)
print(score)
```

```
0.9369734789391576
```

Conclusion:

Based on accuracy scores of all models that were implemented we can conclude that "Decision Tree" is the best model for the given dataset

In [ ]: