MINI PROJECT - 2

Problem Statement:Which model is suitable best for Flight price Prediction Dataset

In [2]:
```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.linear_model import LogisticRegression
```

Data collection

In [3]:
```
train_df=pd.read_csv(r"C:\Users\LENOVO\Desktop\Data_Train11.csv")
train_df
```

Out[3]:

	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	
...	...	...	...	...	...	...	...	...	
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 [4]:
```
test_df=pd.read_csv(r"C:\Users\LENOVO\Desktop\Test_set22.csv")
test_df
```

Out[4]:

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

2671 rows × 10 columns

Data cleaning and preproceesing

In [5]:
```
train_df.shape
```

Out[5]:
```
(10683, 11)
```

In [6]:
```
test_df.shape
```
Out[6]:
```
(2671, 10)
```

In [7]:
```
train_df.describe
```
Out[7]:
```
<bound method NDFrame.describe of            Airline Date_of_Journey    Source D
estination
0           IndiGo      24/03/2019  Banglore    New Delhi  \
1        Air India       1/05/2019   Kolkata     Banglore
2      Jet Airways       9/06/2019     Delhi       Cochin
3           IndiGo      12/05/2019   Kolkata     Banglore
4           IndiGo      01/03/2019  Banglore    New Delhi
...            ...             ...       ...          ...
10678     Air Asia       9/04/2019   Kolkata     Banglore
10679    Air India      27/04/2019   Kolkata     Banglore
10680  Jet Airways      27/04/2019  Banglore        Delhi
10681      Vistara      01/03/2019  Banglore    New Delhi
10682    Air India       9/05/2019     Delhi       Cochin

                       Route Dep_Time  Arrival_Time Duration Total_Stops  
0                  BLR ? DEL    22:20  01:10 22 Mar   2h 50m    non-stop   \
1      CCU ? IXR ? BBI ? BLR    05:50         13:15   7h 25m     2 stops
2      DEL ? LKO ? BOM ? COK    09:25  04:25 10 Jun      19h     2 stops
3            CCU ? NAG ? BLR    18:05         23:30   5h 25m      1 stop
4            BLR ? NAG ? DEL    16:50         21:35   4h 45m      1 stop
...                      ...      ...           ...      ...         ...
10678              CCU ? BLR    19:55         22:25   2h 30m    non-stop
10679              CCU ? BLR    20:45         23:20   2h 35m    non-stop
10680              BLR ? DEL    08:20         11:20       3h    non-stop
10681              BLR ? DEL    11:30         14:10   2h 40m    non-stop
10682  DEL ? GOI ? BOM ? COK    10:55         19:15   8h 20m     2 stops

      Additional_Info  Price
0             No info   3897
1             No info   7662
2             No info  13882
3             No info   6218
4             No info  13302
...               ...    ...
10678         No info   4107
10679         No info   4145
10680         No info   7229
10681         No info  12648
10682         No info  11753

[10683 rows x 11 columns]>
```

In [8]:
```
test_df.describe
```

Out[8]:
```
<bound method NDFrame.describe of                  Airline Date_of_Journey    Sou
rce Destination
0            Jet Airways       6/06/2019     Delhi      Cochin  \
1                 IndiGo      12/05/2019   Kolkata    Banglore
2            Jet Airways      21/05/2019     Delhi      Cochin
3      Multiple carriers      21/05/2019     Delhi      Cochin
4               Air Asia      24/06/2019  Banglore       Delhi
...                  ...             ...       ...         ...
2666           Air India       6/06/2019   Kolkata    Banglore
2667              IndiGo      27/03/2019   Kolkata    Banglore
2668         Jet Airways       6/03/2019     Delhi      Cochin
2669           Air India       6/03/2019     Delhi      Cochin
2670   Multiple carriers      15/06/2019     Delhi      Cochin

                Route Dep_Time  Arrival_Time Duration Total_Stops
0     DEL ? BOM ? COK    17:30  04:25 07 Jun  10h 55m      1 stop  \
1     CCU ? MAA ? BLR    06:20         10:20       4h      1 stop
2     DEL ? BOM ? COK    19:15  19:00 22 May  23h 45m      1 stop
3     DEL ? BOM ? COK    08:00         21:00      13h      1 stop
4           BLR ? DEL    23:55  02:45 25 Jun   2h 50m    non-stop
...               ...      ...           ...      ...         ...
2666  CCU ? DEL ? BLR    20:30  20:25 07 Jun  23h 55m      1 stop
2667        CCU ? BLR    14:20         16:55   2h 35m    non-stop
2668  DEL ? BOM ? COK    21:50  04:25 07 Mar   6h 35m      1 stop
2669  DEL ? BOM ? COK    04:00         19:15  15h 15m      1 stop
2670  DEL ? BOM ? COK    04:55         19:15  14h 20m      1 stop

                  Additional_Info
0                         No info
1                         No info
2     In-flight meal not included
3                         No info
4                         No info
...                           ...
2666                      No info
2667                      No info
2668                      No info
2669                      No info
2670                      No info

[2671 rows x 10 columns]>
```

In [9]:
```
train_df.head
```

Out[9]:
```
<bound method NDFrame.head of            Airline Date_of_Journey    Source Desti
nation
0          IndiGo      24/03/2019  Banglore   New Delhi  \
1       Air India       1/05/2019   Kolkata    Banglore
2     Jet Airways       9/06/2019     Delhi      Cochin
3          IndiGo      12/05/2019   Kolkata    Banglore
4          IndiGo      01/03/2019  Banglore   New Delhi
...           ...             ...       ...         ...
10678    Air Asia       9/04/2019   Kolkata    Banglore
10679   Air India      27/04/2019   Kolkata    Banglore
10680 Jet Airways      27/04/2019  Banglore       Delhi
10681     Vistara      01/03/2019  Banglore   New Delhi
10682   Air India       9/05/2019     Delhi      Cochin

                       Route Dep_Time  Arrival_Time Duration Total_Stops
0                  BLR ? DEL    22:20  01:10 22 Mar   2h 50m    non-stop  \
1      CCU ? IXR ? BBI ? BLR    05:50         13:15   7h 25m     2 stops
2      DEL ? LKO ? BOM ? COK    09:25  04:25 10 Jun      19h     2 stops
3            CCU ? NAG ? BLR    18:05         23:30   5h 25m      1 stop
4            BLR ? NAG ? DEL    16:50         21:35   4h 45m      1 stop
...                      ...      ...           ...      ...         ...
10678              CCU ? BLR    19:55         22:25   2h 30m    non-stop
10679              CCU ? BLR    20:45         23:20   2h 35m    non-stop
10680              BLR ? DEL    08:20         11:20       3h    non-stop
10681              BLR ? DEL    11:30         14:10   2h 40m    non-stop
10682  DEL ? GOI ? BOM ? COK    10:55         19:15   8h 20m     2 stops

      Additional_Info  Price
0             No info   3897
1             No info   7662
2             No info  13882
3             No info   6218
4             No info  13302
...               ...    ...
10678         No info   4107
10679         No info   4145
10680         No info   7229
10681         No info  12648
10682         No info  11753

[10683 rows x 11 columns]>
```

In [10]:
```
test_df.head
```

Out[10]:
```
<bound method NDFrame.head of                Airline Date_of_Journey    Source
Destination
0           Jet Airways       6/06/2019     Delhi      Cochin  \
1                IndiGo      12/05/2019   Kolkata    Banglore
2           Jet Airways      21/05/2019     Delhi      Cochin
3     Multiple carriers      21/05/2019     Delhi      Cochin
4              Air Asia      24/06/2019  Banglore       Delhi
...                 ...             ...       ...         ...
2666          Air India       6/06/2019   Kolkata    Banglore
2667             IndiGo      27/03/2019   Kolkata    Banglore
2668        Jet Airways       6/03/2019     Delhi      Cochin
2669          Air India       6/03/2019     Delhi      Cochin
2670  Multiple carriers      15/06/2019     Delhi      Cochin

                Route Dep_Time  Arrival_Time Duration Total_Stops
0     DEL ? BOM ? COK    17:30  04:25 07 Jun  10h 55m      1 stop  \
1     CCU ? MAA ? BLR    06:20         10:20       4h      1 stop
2     DEL ? BOM ? COK    19:15  19:00 22 May  23h 45m      1 stop
3     DEL ? BOM ? COK    08:00         21:00      13h      1 stop
4           BLR ? DEL    23:55  02:45 25 Jun   2h 50m    non-stop
...               ...      ...           ...      ...         ...
2666  CCU ? DEL ? BLR    20:30  20:25 07 Jun  23h 55m      1 stop
2667        CCU ? BLR    14:20         16:55   2h 35m    non-stop
2668  DEL ? BOM ? COK    21:50  04:25 07 Mar   6h 35m      1 stop
2669  DEL ? BOM ? COK    04:00         19:15  15h 15m      1 stop
2670  DEL ? BOM ? COK    04:55         19:15  14h 20m      1 stop

                  Additional_Info
0                         No info
1                         No info
2     In-flight meal not included
3                         No info
4                         No info
...                           ...
2666                      No info
2667                      No info
2668                      No info
2669                      No info
2670                      No info

[2671 rows x 10 columns]>
```

In [11]:
```
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 [12]:
```
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
```

TO FIND MISSING VALUES

In [13]:
```
train_df.isna().sum()
```

Out[13]:
```
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 [14]:
```
test_df.isna().sum()
```

Out[14]:
```
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 [15]:
```
train_df.duplicated().sum()
```

Out[15]:
```
220
```

In [16]:
```
test_df.duplicated().sum()
```

Out[16]:
```
26
```

In [17]:
```
train_df.dropna(inplace=True)
```

In [18]:
```
train_df.isna().sum()
```

Out[18]:
```
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 [19]:
```
train_df.shape
```

Out[19]:
```
(10682, 11)
```

Feature selection

In [20]:
```
train_df.columns
```

Out[20]:
```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
       'Additional_Info', 'Price'],
      dtype='object')
```

In [21]:
```
test_df.columns
```

Out[21]:
```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
       'Additional_Info'],
      dtype='object')
```

In [22]:
```
train_df['Airline'].value_counts()
```

Out[22]:
```
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 [23]:
```
train_df['Source'].value_counts()
```

Out[23]:
```
Source
Delhi       4536
Kolkata     2871
Banglore    2197
Mumbai       697
Chennai      381
Name: count, dtype: int64
```

In [24]:
```
train_df['Destination'].value_counts()
```

Out[24]:
```
Destination
Cochin       4536
Banglore     2871
Delhi        1265
New Delhi     932
Hyderabad     697
Kolkata       381
Name: count, dtype: int64
```

In [25]:
```
train_df['Total_Stops'].value_counts()
```

Out[25]:
```
Total_Stops
1 stop      5625
non-stop    3491
2 stops     1520
3 stops       45
4 stops        1
Name: count, dtype: int64
```

In [26]:
```
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}}
train_df=train_df.replace(airline)
train_df
```

Out[26]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Tot
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 [27]:
```
city={"Source":{"Delhi":0,"Kolkata":1,"Banglore":2,
"Mumbai":3,"Chennai":4}}
train_df=train_df.replace(city)
train_df
```

Out[27]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Tota
0	1	24/03/2019	2	New Delhi	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	r
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	r
10679	2	27/04/2019	1	Banglore	CCU ? BLR	20:45	23:20	2h 35m	r
10680	0	27/04/2019	2	Delhi	BLR ? DEL	08:20	11:20	3h	r
10681	5	01/03/2019	2	New Delhi	BLR ? DEL	11:30	14:10	2h 40m	r
10682	2	9/05/2019	0	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	

10682 rows × 11 columns

In [28]:
```
destination={"Destination":{"Cochin":0,"Banglore":1,"Delhi":2,
"New Delhi":3,"Hyderabad":4,"Kolkata":5}}
train_df=train_df.replace(destination)
train_df
```

Out[28]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Tota
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	r
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	r
10679	2	27/04/2019	1	1	CCU ? BLR	20:45	23:20	2h 35m	r
10680	0	27/04/2019	2	2	BLR ? DEL	08:20	11:20	3h	r
10681	5	01/03/2019	2	3	BLR ? DEL	11:30	14:10	2h 40m	r
10682	2	9/05/2019	0	0	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	

10682 rows × 11 columns

In [29]:
```
stops={"Total_Stops":{"non-stop":0,"1 stop":1,"2 stops":2,
"3 stops":3,"4 stops":4}}
train_df=train_df.replace(stops)
train_df
```

Out[29]:

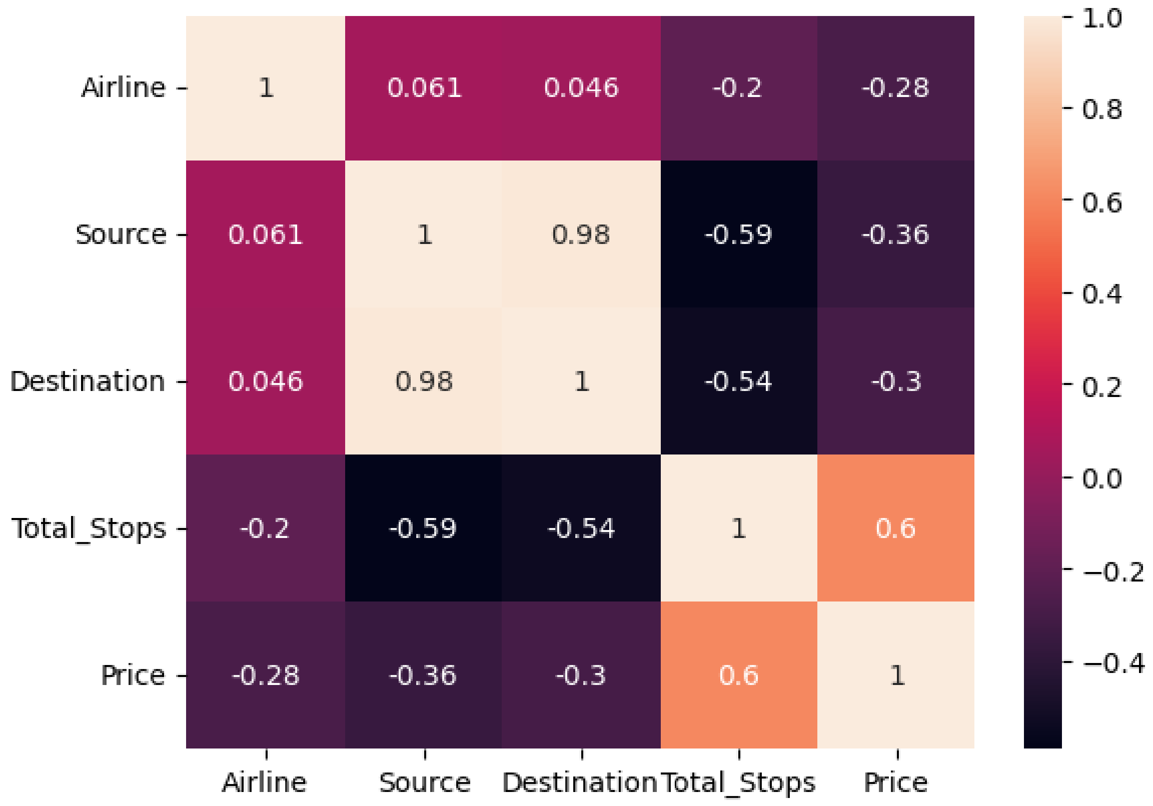
	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Tota
0	1	24/03/2019	2	3	BLR ? DEL	22:20	01:10 22 Mar	2h 50m	
1	2	1/05/2019	1	1	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	
2	0	9/06/2019	0	0	DEL ? LKO ? BOM ? COK	09:25	04:25 10 Jun	19h	
3	1	12/05/2019	1	1	CCU ? NAG ? BLR	18:05	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

visualization

In [30]:
```
fdf=train_df[['Airline','Source','Destination','Total_Stops','Price']]
sns.heatmap(fdf.corr(),annot=True)
```

Out[30]:
```
<Axes: >
```



Linearregression for training data

In [31]:
```
x=np.array(train_df['Source']).reshape(-1,1)
y=np.array(train_df['Destination']).reshape(-1,1)
```

In [32]:
```
X_train,X_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=100
```

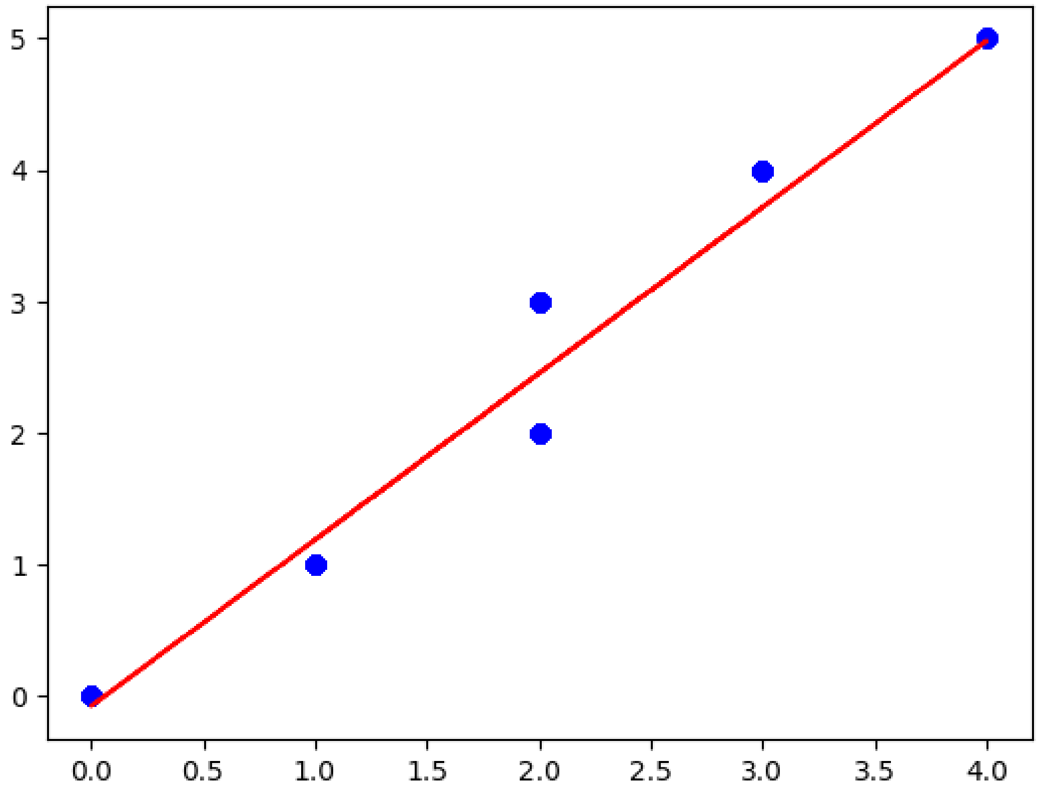
In [33]:
```
from sklearn.linear_model import LinearRegression
regr=LinearRegression()
regr.fit(X_train,y_train)
print(regr.intercept_)
print(regr.coef_)
```

```
[-0.08091813]
[[1.26597749]]
```

```
In [90]: 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)
```

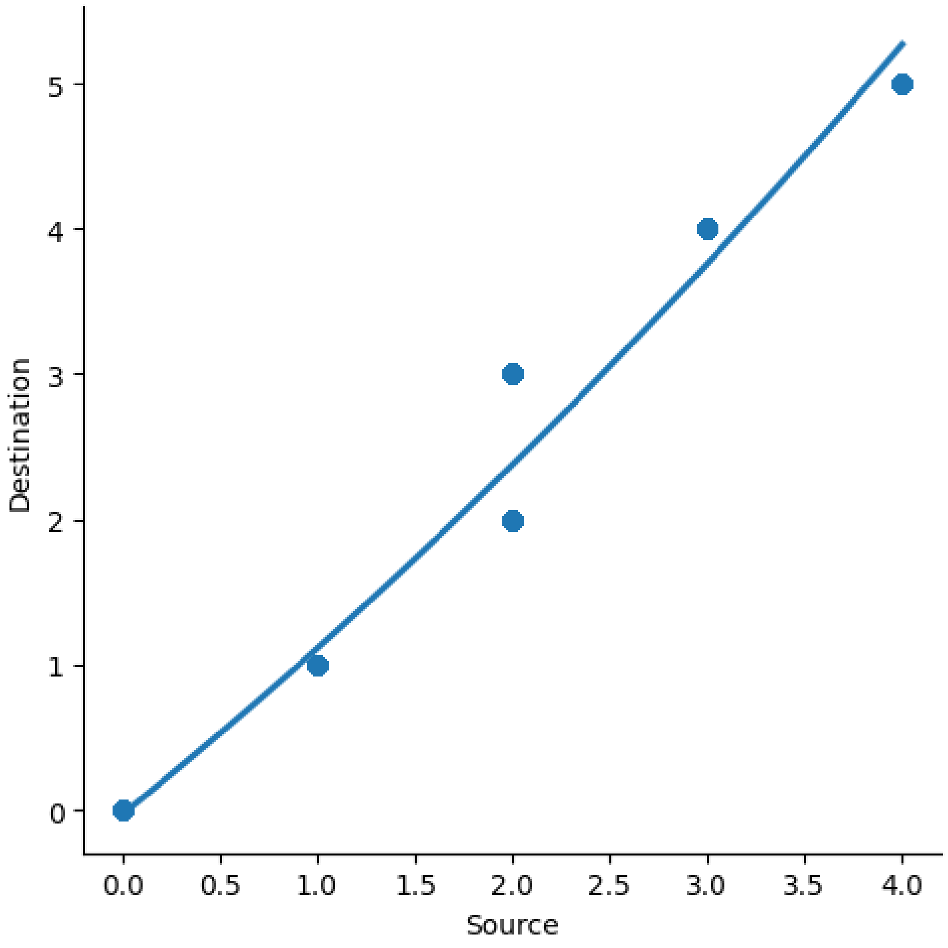
```
Out[90]: ▾ LinearRegression

         LinearRegression()
```

```
In [93]: y_pred=regr.predict(X_test)
         plt.scatter(X_test,y_test,color='b')
         plt.plot(X_test,y_pred,color='r')
         plt.show()
```



In [34]:
```
sns.lmplot(x="Source",y="Destination",data=train_df,order=2,ci=None)
```

Out[34]:
```
<seaborn.axisgrid.FacetGrid at 0x1a0bd009e10>
```



In [35]:
```
score=regr.score(X_test,y_test)
print(score)
```

```
0.9676993120302174
```

ridge

In [79]:
```
from sklearn.linear_model import Ridge, RidgeCV, Lasso
```

In [80]:
```
ridge=Ridge(alpha=2)
ridge.fit(x_train,y_train)
train_score_ridge=ridge.score(x_train,y_train)
test_score_ridge=ridge.score(x_test,y_test)
print("\nLinearRegression\n")
print(train_score_ridge)
print(test_score_ridge)
```

```

LinearRegression

0.9666541265004386
0.9655420671601435
```

Lasso

In [83]:
```
lasso=Lasso(alpha=100)
lasso=lasso.fit(x_train,y_train)
train_score_lasso=lasso.score(x_train,y_train)
test_score_lasso=lasso.score(x_test,y_test)
print(train_score_lasso)
print(test_score_lasso)
```

```
0.0
-8.925310498675287e-06
```

elastic

In [84]:
```
from sklearn.linear_model import ElasticNet
```

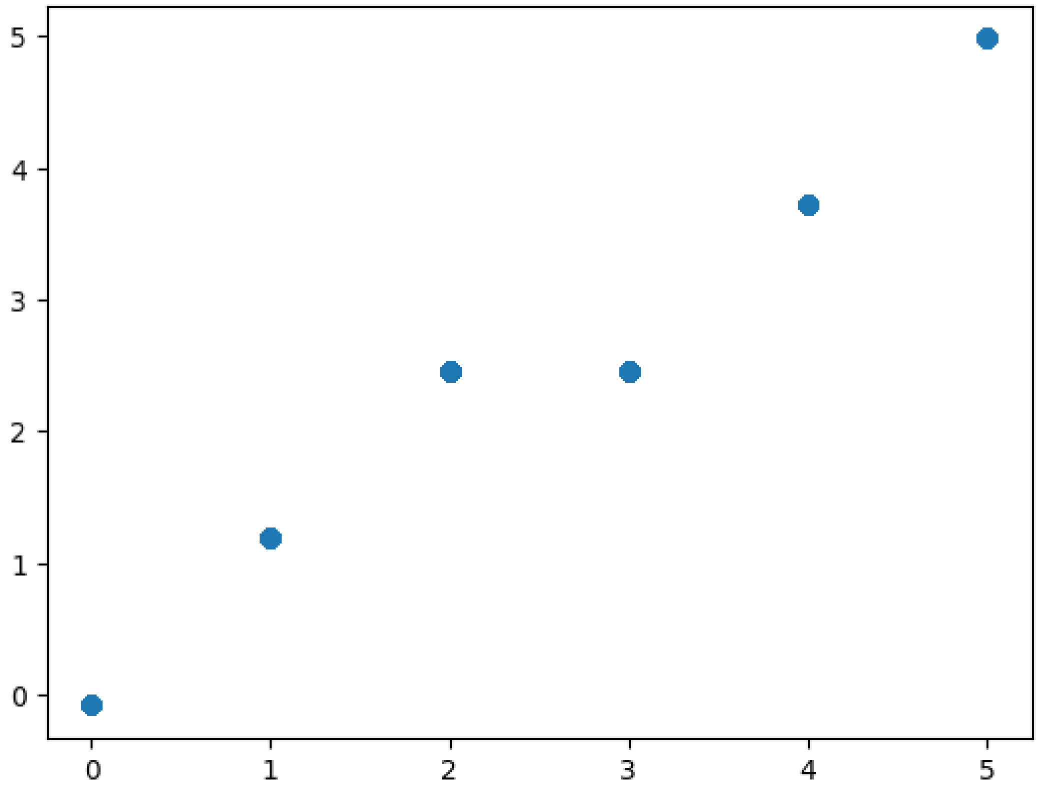
In [87]:
```
a=ElasticNet()
a.fit(x,y)
print(a.coef_)
print(a.intercept_)
```

```
[0.6035366]
[0.5919792]
```

In [89]:
```
predictions=regr.predict(X_test)
```

In [50]:
```
plt.scatter(y_test,predictions)
```

Out[50]:
```
<matplotlib.collections.PathCollection at 0x1a0bcfee890>
```



Logistic regression ¶

In [53]:
```
x=np.array(train_df['Source']).reshape(-1,1)
y=np.array(train_df['Destination']).reshape(-1,1)
train_df.dropna(inplace=True)
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=1)
lr=LogisticRegression(max_iter=10000)
```

In [54]:
```
lr.fit(x_train,y_train)
```

```
C:\Users\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\sklear
n\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[54]:
```
▾ LogisticRegression
LogisticRegression(max_iter=10000)
```

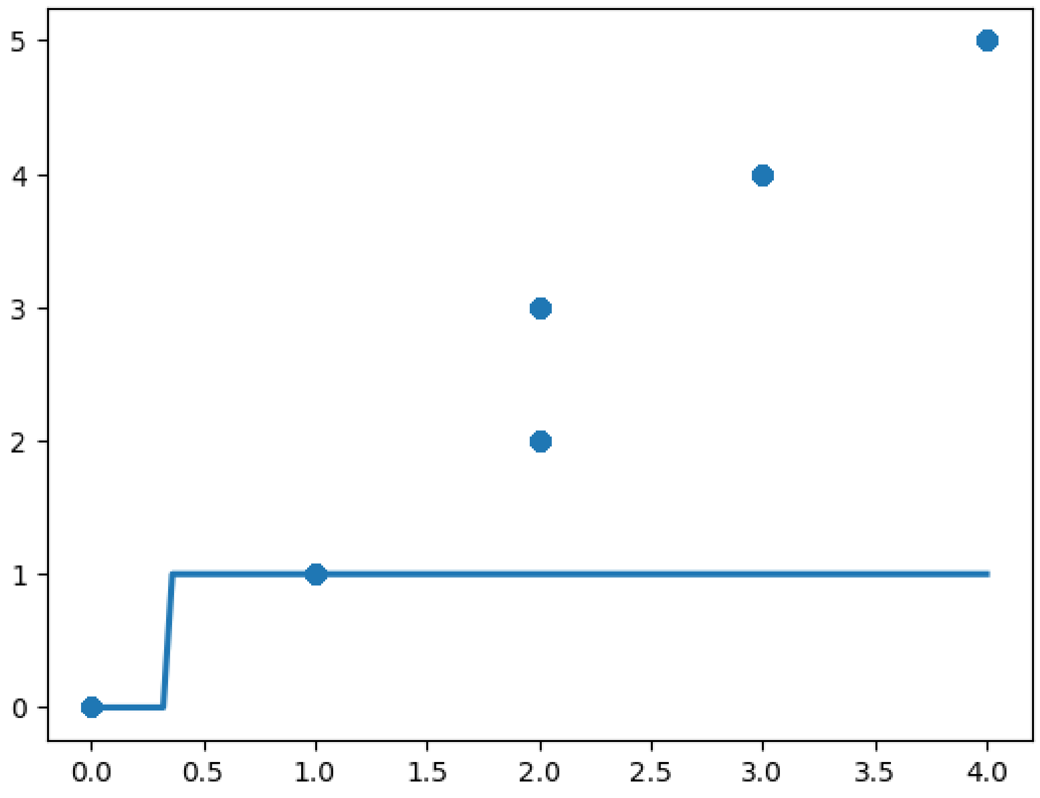
In [55]:
```
score=lr.score(x_test,y_test)
print(score)
```

```
0.9110764430577223
```

In [59]:
```
sns.regplot(x=x,y=y,data=train_df,logistic=True,ci=None)
```

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

Out[59]:
```
<Axes: >
```



Decision tree

In [60]:
```
from sklearn.tree import DecisionTreeClassifier
train_df=DecisionTreeClassifier(random_state=0)
train_df.fit(x_train,y_train)
```

Out[60]:
```
▾ DecisionTreeClassifier
DecisionTreeClassifier(random_state=0)
```

In [61]:
```
score=train_df.score(x_test,y_test)
print(score)
```

```
0.9110764430577223
```

Random classifier

In [71]:
```
from sklearn.ensemble import RandomForestClassifier
train_df=RandomForestClassifier()
train_df.fit(X_train,y_train)
```

```
C:\Users\LENOVO\AppData\Local\Temp\ipykernel_6684\3479789618.py:3: DataConversio
nWarning: A column-vector y was passed when a 1d array was expected. Please chan
ge the shape of y to (n_samples,), for example using ravel().
  train_df.fit(X_train,y_train)
```

Out[71]:
```
▾ RandomForestClassifier

RandomForestClassifier()
```

In [72]:
```
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 [73]:
```
from sklearn.model_selection import GridSearchCV
grid_search=GridSearchCV(estimator=rfc,param_grid=params,cv=2,scoring="accuracy")
```

In [74]:
```
grid_search.fit(X_train,y_train)
```

```
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\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skle
arn\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\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skle
arn\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\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skle
arn\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\LENOVO\AppData\Local\Programs\Python\Python311\Lib\site-packages\skle
arn\model_selection\_validation.py:686: DataConversionWarning: A column-vector
```

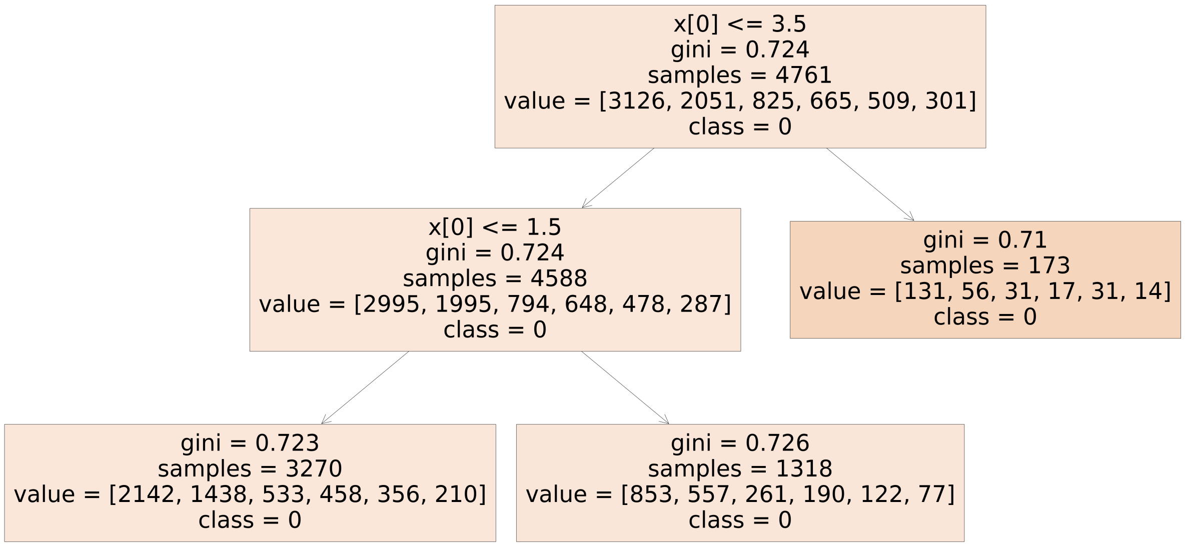
In [75]:
```
grid_search.best_score_
```

Out[75]:
```
0.42182694348222594
```

In [76]:
```
rf_best=grid_search.best_estimator_
rf_best
```

Out[76]:
```
▾                    RandomForestClassifier
RandomForestClassifier(max_depth=2, min_samples_leaf=5, n_estimators=10)
```

In [77]:
```
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 [78]:
```
score=rfc.score(x_test,y_test)
print(score)
```

```
0.431201248049922
```

conclusion

For the above Dataset we use different Types of models ,for each and every model we get differentTypes of Accuracies.Based on that accuracies we can conclude which model is best fit for my ourDataset.

Here we got different types accuracies,For linear regression we obtained 96% accuracy,For Logistic regression we obtained 91%

accuracy,For Random forest we obtained 42% accuracy,For decision tree we obtained 91% acuracy.From all the observations we can conclude that LinearRegression model is Best fit .

```
In [ ]:
```