data-analysis-on-airline-dataset

August 10, 2024

1 AIRLINE DATASET

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2 Importing Required Modules

1. importing numpy for mathematical operation on arrays and dataframe.
2. importing pandas for reading data and data manipualtion.
3. importing matplotlib and seaborn to show the insights and visualization from the dataset.
4. importing warnings for Warning messages that are typically issued in dataframe where it is useful to alert the user of some condition in a program, where that condition (normally) doesn t warrant raising an exception and terminating the program.

[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

[2]:
```
sns.set(style = 'darkgrid')
```

3 Reading Dataset and Checking the NaN Values , Data Types , and Statistical Analysis

1. Since data is in form of excel file we have to use pandas read_excel to load the data
2. After loading it is important to check the complete information of data as it can indication many of the hidden infomation such as null values in a column or a row
3. Check whether any null values are there or not. if it is present then following can be done,
4. Filling NaN values with mean, median and mode using fillna() method Describe data –> which can give statistical analysis

[3]:
```
df = pd.read_excel("Data_Train.xlsx")
```

[4]:
```
df
```

[4]:
```
            Airline Date_of_Journey    Source Destination  \
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
…              …              …        …          …
10794          NaN             NaN       NaN         NaN
10795          NaN             NaN       NaN         NaN
10796          NaN             NaN       NaN         NaN
10797          NaN             NaN       NaN         NaN
10798          NaN             NaN       NaN         NaN

                        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
…                        …       …            …       …          …
10794                    NaN      NaN           NaN      NaN         NaN
10795                    NaN      NaN           NaN      NaN         NaN
10796                    NaN      NaN           NaN      NaN         NaN
10797                    NaN      NaN           NaN      NaN         NaN
10798                    NaN      NaN           NaN      NaN         NaN

      Additional_Info    Price
0             No info   3897.0
1             No info   7662.0
2             No info  13882.0
3             No info   6218.0
4             No info  13302.0
…                ….       …
10794            NaN      NaN
10795            NaN      NaN
10796            NaN      NaN
10797            NaN      NaN
10798            NaN      NaN

[10799 rows x 11 columns]
```

[5]:
```
df.shape
```

[5]:
```
(10799, 11)
```

[6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10799 entries, 0 to 10798
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  float64
dtypes: float64(1), object(10)
memory usage: 928.2+ KB
```

[7]:
```
df.describe()
```

[7]:

	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

[8]:
```
df.describe(include=object)
```

[8]:

	Airline	Date_of_Journey	Source	Destination	Route	\
count	10683	10683	10683	10683	10682	
unique	12	44	5	6	128	
top	Jet Airways	18/05/2019	Delhi	Cochin	DEL → BOM → COK	
freq	3849	504	4537	4537	2376	

	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info
count	10683	10683	10683	10682	10683
unique	222	1343	368	5	10
top	18:55	19:00	2h 50m	1 stop	No info
freq	233	423	550	5625	8345

[9]:
```
df.describe(include=float)
```

[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
```

[10]:
```
df.isnull().sum()
```

[10]:
```
Airline            116
Date_of_Journey    116
Source             116
Destination        116
Route              117
Dep_Time           116
Arrival_Time       116
Duration           116
Total_Stops        117
Additional_Info    116
Price              116
dtype: int64
```

[11]:
```
df.isnull().sum()/df.shape[0]*100
```

[11]:
```
Airline            1.074174
Date_of_Journey    1.074174
Source             1.074174
Destination        1.074174
Route              1.083434
Dep_Time           1.074174
Arrival_Time       1.074174
Duration           1.074174
Total_Stops        1.083434
Additional_Info    1.074174
Price              1.074174
dtype: float64
```

[12]:
```
df['Airline'].mode()
```

[12]:
```
0    Jet Airways
dtype: object
```

[13]:
```
df['Airline']=df['Airline'].fillna(df['Airline'].mode()[0])
```

[14]:
```
df.isnull().sum()
```

[14]:
```
Airline              0
Date_of_Journey    116
Source             116
Destination        116
Route              117
Dep_Time           116
Arrival_Time       116
Duration           116
Total_Stops        117
Additional_Info    116
Price              116
dtype: int64
```

[15]:
```
df['Date_of_Journey'].mode()
```

[15]:
```
0    18/05/2019
dtype: object
```

[16]:
```
df['Date_of_Journey']=df['Date_of_Journey'].fillna(df['Date_of_Journey'].
↪mode()[0])
```

[17]:
```
df['Source'].mode()
```

[17]:
```
0    Delhi
dtype: object
```

[18]:
```
df['Source']=df['Source'].fillna(df['Source'].mode()[0])
```

[19]:
```
df['Destination'].mode()
```

[19]:
```
0    Cochin
dtype: object
```

[20]:
```
df['Destination']=df['Destination'].fillna(df['Destination'].mode()[0])
```

[21]:
```
df['Route'].mode()
```

[21]:
```
0    DEL → BOM → COK
dtype: object
```

[22]:
```
df['Route']=df['Route'].fillna(df['Route'].mode()[0])
```

[23]:
```
df.isnull().sum()
```

[23]:
```
Airline              0
Date_of_Journey      0
Source               0
Destination          0
Route                0
Dep_Time           116
Arrival_Time       116
Duration           116
Total_Stops        117
Additional_Info    116
Price              116
dtype: int64
```

[24]:
```
df['Dep_Time'].mode()
```

[24]:
```
0    18:55
dtype: object
```

[25]:
```
df['Dep_Time']=df['Dep_Time'].fillna(df['Dep_Time'].mode()[0])
```

[26]:
```
df['Arrival_Time'].mode()
```

[26]:
```
0    19:00
dtype: object
```

[27]:
```
df['Arrival_Time']=df['Arrival_Time'].fillna(df['Arrival_Time'].mode()[0])
```

[28]:
```
df['Duration'].mode()
```

[28]:
```
0    2h 50m
dtype: object
```

[29]:
```
df['Duration']=df['Duration'].fillna(df['Duration'].mode()[0])
```

[30]:
```
df['Total_Stops'].mode()
```

[30]:
```
0    1 stop
dtype: object
```

[31]:
```
df['Total_Stops']=df['Total_Stops'].fillna(df['Total_Stops'].mode()[0])
```

[32]:
```
df['Additional_Info'].mode()
```

[32]:
```
0    No info
dtype: object
```

[33]:
```
df['Additional_Info']=df['Additional_Info'].fillna(df['Additional_Info'].
↪mode()[0])
```

[34]:
```
df['Price'].mean()
```

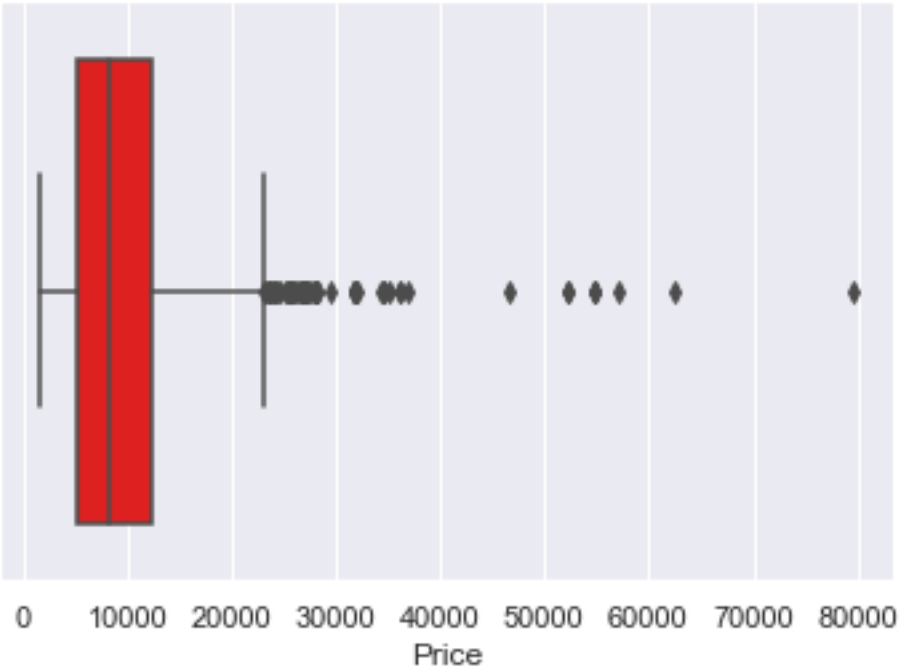
[34]:
```
9087.064120565385
```

[35]:
```
df['Price'].median()
```

[35]:
```
8372.0
```

[36]:
```
sns.boxplot(df.Price,color='red')
```

[36]:
```
<AxesSubplot:xlabel='Price'>
```



[37]:
```
df['Price']=df['Price'].fillna(df['Price'].mean())
```

[38]:
```
df.isnull().sum()
```

[38]:
```
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
```

4 From df.info() we can see that Date_of_Journey is a object data type

1. Therefore, we have to convert this datatype into timestamp so that we can use that column properly to find the insights.
2. For this we require pandas to_datetime to convert object data type to datetime dtype.

[39]:
```
df['Date_of_Journey']=pd.to_datetime(df['Date_of_Journey'])
df['Dep_Time']=pd.to_datetime(df['Dep_Time'])
df['Arrival_Time']=pd.to_datetime(df['Arrival_Time'])
```

[40]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10799 entries, 0 to 10798
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype
---  ------           --------------  -----
 0   Airline          10799 non-null  object
 1   Date_of_Journey  10799 non-null  datetime64[ns]
 2   Source           10799 non-null  object
 3   Destination      10799 non-null  object
 4   Route            10799 non-null  object
 5   Dep_Time         10799 non-null  datetime64[ns]
 6   Arrival_Time     10799 non-null  datetime64[ns]
 7   Duration         10799 non-null  object
 8   Total_Stops      10799 non-null  object
 9   Additional_Info  10799 non-null  object
 10  Price            10799 non-null  float64
dtypes: datetime64[ns](3), float64(1), object(7)
memory usage: 928.2+ KB
```

5 We can see that Total_Stops is a Categorical column we can replace that column data into categories

[41]:
```
df
```

[41]:
```
           Airline Date_of_Journey    Source Destination  \
0           IndiGo      2019-03-24  Banglore   New Delhi
1        Air India      2019-01-05   Kolkata    Banglore
2      Jet Airways      2019-09-06     Delhi      Cochin
3           IndiGo      2019-12-05   Kolkata    Banglore
4           IndiGo      2019-01-03  Banglore   New Delhi
…             …            …       …          …
10794  Jet Airways      2019-05-18     Delhi      Cochin
10795  Jet Airways      2019-05-18     Delhi      Cochin
10796  Jet Airways      2019-05-18     Delhi      Cochin
10797  Jet Airways      2019-05-18     Delhi      Cochin
10798  Jet Airways      2019-05-18     Delhi      Cochin

                      Route             Dep_Time        Arrival_Time Duration  \
0                 BLR → DEL 2022-12-09 22:20:00 2022-03-22 01:10:00   2h 50m
1      CCU → IXR → BBI → BLR 2022-12-09 05:50:00 2022-12-09 13:15:00   7h 25m
2      DEL → LKO → BOM → COK 2022-12-09 09:25:00 2022-06-10 04:25:00      19h
3            CCU → NAG → BLR 2022-12-09 18:05:00 2022-12-09 23:30:00   5h 25m
4            BLR → NAG → DEL 2022-12-09 16:50:00 2022-12-09 21:35:00   4h 45m
…                      …                 …                 …      …
10794        DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10795        DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10796        DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10797        DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10798        DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m

      Total_Stops Additional_Info         Price
0        non-stop         No info   3897.000000
1         2 stops         No info   7662.000000
2         2 stops         No info  13882.000000
3          1 stop         No info   6218.000000
4          1 stop         No info  13302.000000
…             …            …           …
10794      1 stop         No info   9087.064121
10795      1 stop         No info   9087.064121
10796      1 stop         No info   9087.064121
10797      1 stop         No info   9087.064121
10798      1 stop         No info   9087.064121

[10799 rows x 11 columns]
```

[42]:
```
df.replace({"non-stop": 0 , "1 stop": 1, "2 stops": 2, "3 stops": 3, "4 stops":
↪4}, inplace = True)
```

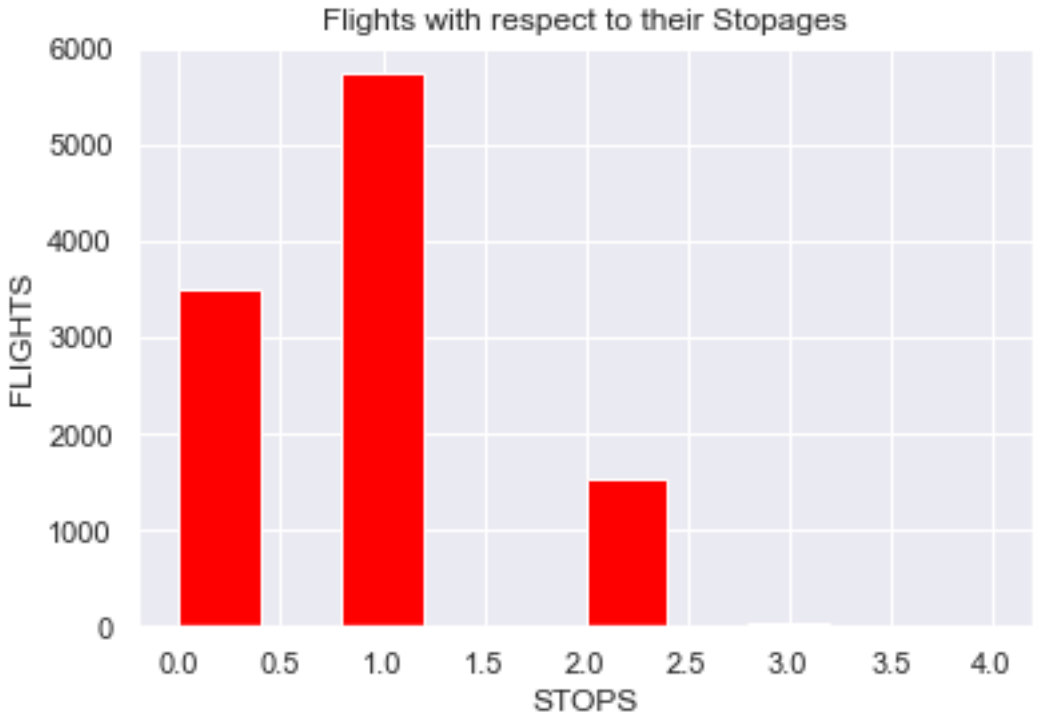
[43]:
```
df
```

[43]:

```
            Airline Date_of_Journey    Source Destination  \
0            IndiGo      2019-03-24  Banglore   New Delhi
1         Air India      2019-01-05   Kolkata    Banglore
2       Jet Airways      2019-09-06     Delhi      Cochin
3            IndiGo      2019-12-05   Kolkata    Banglore
4            IndiGo      2019-01-03  Banglore   New Delhi
…               …               …         …           …
10794   Jet Airways      2019-05-18     Delhi      Cochin
10795   Jet Airways      2019-05-18     Delhi      Cochin
10796   Jet Airways      2019-05-18     Delhi      Cochin
10797   Jet Airways      2019-05-18     Delhi      Cochin
10798   Jet Airways      2019-05-18     Delhi      Cochin

                      Route            Dep_Time        Arrival_Time Duration  \
0                 BLR → DEL 2022-12-09 22:20:00 2022-03-22 01:10:00   2h 50m
1       CCU → IXR → BBI → BLR 2022-12-09 05:50:00 2022-12-09 13:15:00   7h 25m
2       DEL → LKO → BOM → COK 2022-12-09 09:25:00 2022-06-10 04:25:00      19h
3             CCU → NAG → BLR 2022-12-09 18:05:00 2022-12-09 23:30:00   5h 25m
4             BLR → NAG → DEL 2022-12-09 16:50:00 2022-12-09 21:35:00   4h 45m
…                         …                 …                 …       …
10794         DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10795         DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10796         DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10797         DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m
10798         DEL → BOM → COK 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m

       Total_Stops Additional_Info         Price
0                0         No info   3897.000000
1                2         No info   7662.000000
2                2         No info  13882.000000
3                1         No info   6218.000000
4                1         No info  13302.000000
…              …               …           …
10794            1         No info   9087.064121
10795            1         No info   9087.064121
10796            1         No info   9087.064121
10797            1         No info   9087.064121
10798            1         No info   9087.064121

[10799 rows x 11 columns]
```

6 1st Insights: How many Flights with respect to their Stopages ?

[44]:
```
# From This Histogram  we can see that no.of flights and their Stopages
# In this Data maximum flights have 1 stopages
# And there are few flights which have 3rd and 4th stopages

plt.title("Flights with respect to their Stopages")
plt.hist(df['Total_Stops'], color='red')
plt.xlabel("STOPS")
plt.ylabel("FLIGHTS")
plt.show()
```



[45]:
```
df['Total_Stops'].value_counts()
```

[45]:
```
1    5742
0    3491
2    1520
3      45
4       1
Name: Total_Stops, dtype: int64
```

3481 fligths have 0 Stopages

5742 fligths have 1 Stopages

1520 fligths have 2 Stopages

45 fligths have 3 Stopages

1 fligths have 4 Stopages

7 2nd Insights: What flight is Expensive and Cheaper

[46]:
```
df
```

[46]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	IndiGo	2019-03-24	Banglore	New Delhi	BLR → DEL	2022-12-09 22:20:00	2022-03-22 01:10:00	2h 50m	0	No info	3897.000000
1	Air India	2019-01-05	Kolkata	Banglore	CCU → IXR → BBI → BLR	2022-12-09 05:50:00	2022-12-09 13:15:00	7h 25m	2	No info	7662.000000
2	Jet Airways	2019-09-06	Delhi	Cochin	DEL → LKO → BOM → COK	2022-12-09 09:25:00	2022-06-10 04:25:00	19h	2	No info	13882.000000
3	IndiGo	2019-12-05	Kolkata	Banglore	CCU → NAG → BLR	2022-12-09 18:05:00	2022-12-09 23:30:00	5h 25m	1	No info	6218.000000
4	IndiGo	2019-01-03	Banglore	New Delhi	BLR → NAG → DEL	2022-12-09 16:50:00	2022-12-09 21:35:00	4h 45m	1	No info	13302.000000
…	…	…	…	…	…	…	…	…	…	…	…
10794	Jet Airways	2019-05-18	Delhi	Cochin	DEL → BOM → COK	2022-12-09 18:55:00	2022-12-09 19:00:00	2h 50m	1	No info	9087.064121
10795	Jet Airways	2019-05-18	Delhi	Cochin	DEL → BOM → COK	2022-12-09 18:55:00	2022-12-09 19:00:00	2h 50m	1	No info	9087.064121
10796	Jet Airways	2019-05-18	Delhi	Cochin	DEL → BOM → COK	2022-12-09 18:55:00	2022-12-09 19:00:00	2h 50m	1	No info	9087.064121
10797	Jet Airways	2019-05-18	Delhi	Cochin	DEL → BOM → COK	2022-12-09 18:55:00	2022-12-09 19:00:00	2h 50m			
10798	Jet Airways	2019-05-18	Delhi	Cochin	DEL → BOM → COK	2022-12-09 18:55:00	2022-12-09 19:00:00	2h 50m			

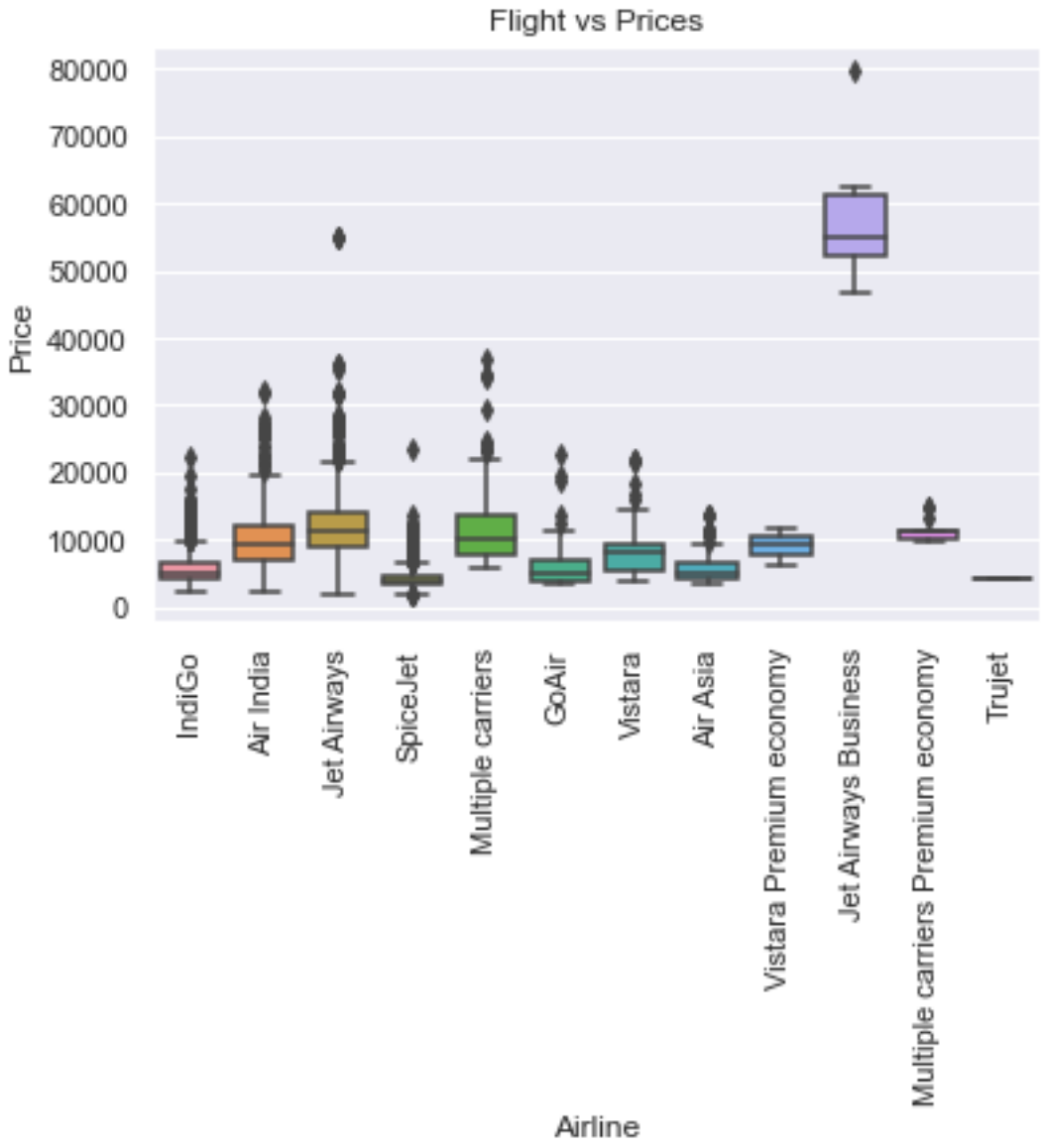
```
10797            1         No info   9087.064121
10798            1         No info   9087.064121

[10799 rows x 11 columns]
```

[47]:
```
df.groupby(['Airline'])['Price'].max().sort_values(ascending=False)
```

[47]:
```
Airline
Jet Airways Business                   79512.0
Jet Airways                            54826.0
Multiple carriers                      36983.0
Air India                              31945.0
SpiceJet                               23267.0
GoAir                                  22794.0
IndiGo                                 22153.0
Vistara                                21730.0
Multiple carriers Premium economy      14629.0
Air Asia                               13774.0
Vistara Premium economy                11793.0
Trujet                                  4140.0
Name: Price, dtype: float64
```

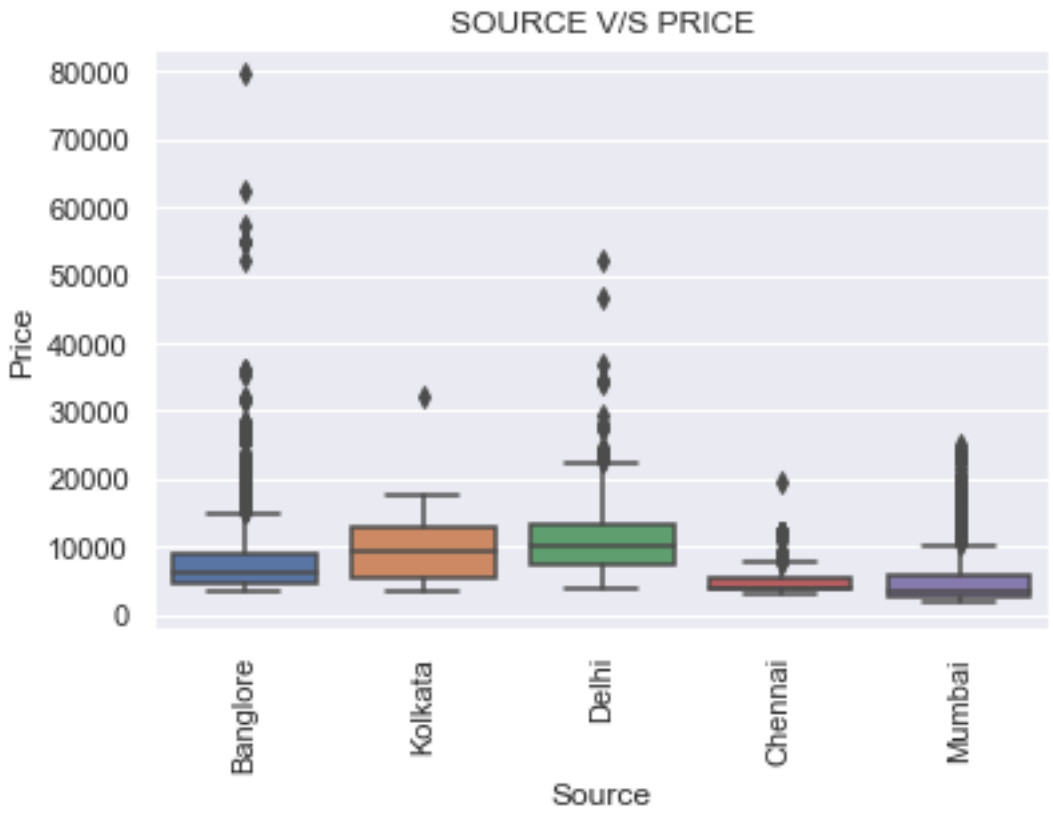
Jet Airways Business is most expensive flight and Trujet is cheaper one

[82]:
```
sns.boxplot(df['Airline'],df['Price'])
plt.xticks(rotation=90,size=11)
plt.title('Flight vs Prices')
plt.show()
```



8 3rd Insights: Variation of Flight Price from Source

[83]:
```
sns.boxplot(df['Source'],df['Price'])
plt.xticks(rotation=90,size=11)
plt.title('SOURCE V/S PRICE')
plt.show()
```



From this boxplot we can see the maximum Outliers are in Bangalore and Minimum in KolKata

[109]:
```
df.head(20)
```

[109]:

	Airline	Source	Route	Destination	Duration	\
0	IndiGo	Banglore	BLR → DEL	Delhi	2h 50m	
1	Air India	Kolkata	CCU → IXR → BBI → BLR	Banglore	7h 25m	
2	Jet Airways	Delhi	DEL → LKO → BOM → COK	Cochin	19h	
3	IndiGo	Kolkata	CCU → NAG → BLR	Banglore	5h 25m	
4	IndiGo	Banglore	BLR → NAG → DEL	Delhi	4h 45m	
5	SpiceJet	Kolkata	CCU → BLR	Banglore	2h 25m	
6	Jet Airways	Banglore	BLR → BOM → DEL	Delhi	15h 30m	
7	Jet Airways	Banglore	BLR → BOM → DEL	Delhi	21h 5m	
8	Jet Airways	Banglore	BLR → BOM → DEL	Delhi	25h 30m	
9	Multiple carriers	Delhi	DEL → BOM → COK	Cochin	7h 50m	
10	Air India	Delhi	DEL → BLR → COK	Cochin	13h 15m	
11	IndiGo	Kolkata	CCU → BLR	Banglore	2h 35m	
12	Air India	Chennai	MAA → CCU	Kolkata	2h 15m	
13	Jet Airways	Kolkata	CCU → BOM → BLR	Banglore	12h 10m	
14	IndiGo	Kolkata	CCU → BLR	Banglore	2h 35m	
15	Air India	Delhi	DEL → AMD → BOM → COK	Cochin	26h 35m	

```
16           SpiceJet     Delhi        DEL → PNQ → COK      Cochin   4h 30m
17        Jet Airways     Delhi        DEL → BOM → COK      Cochin  22h 35m
18          Air India     Delhi  DEL → CCU → BOM → COK      Cochin      23h
19        Jet Airways     Delhi        DEL → BOM → COK      Cochin  20h 35m

    Total_Stops              Additional_Info    Price  Month_of_Journey  \
0             0                      No info   3897.0                 3
1             2                      No info   7662.0                 1
2             2                      No info  13882.0                 9
3             1                      No info   6218.0                12
4             1                      No info  13302.0                 1
5             0                      No info   3873.0                 6
6             1  In-flight meal not included  11087.0                12
7             1                      No info  22270.0                 1
8             1  In-flight meal not included  11087.0                12
9             1                      No info   8625.0                 5
10            1                      No info   8907.0                 1
11            0                      No info   4174.0                 4
12            0                      No info   4667.0                 6
13            1  In-flight meal not included   9663.0                 9
14            0                      No info   4804.0                 4
15            2                      No info  14011.0                 3
16            1                      No info   5830.0                 4
17            1  In-flight meal not included  10262.0                12
18            2                      No info  13381.0                12
19            1  In-flight meal not included  12898.0                 5

    Day_of_Journey  Dep_hour  Dep_min
0               24        22       20
1                5         5       50
2                6         9       25
3                5        18        5
4                3        16       50
5               24         9        0
6                3        18       55
7                3         8        0
8                3         8       55
9               27        11       25
10               6         9       45
11              18        20       20
12              24        11       40
13               5        21       10
14              24        17       15
15               3        16       40
16              15         8       45
17               6        14        0
18               6        20       15
```

```
19              27        16        0
```

[51]:
```
df[df['Total_Stops']==4]
```

[51]:
```
        Airline Date_of_Journey    Source Destination  \
9182  Air India      2019-01-03  Banglore   New Delhi

                                  Route             Dep_Time  \
9182  BLR → CCU → BBI → HYD → VGA → DEL 2022-12-09 05:50:00

            Arrival_Time Duration  Total_Stops  Additional_Info    Price
9182 2022-03-02 11:20:00  29h 30m            4  Change airports  17686.0
```

[52]:
```
df[df['Total_Stops']==3]
```

[52]:
```
                 Airline Date_of_Journey    Source Destination  \
402           Air India      2019-06-15     Delhi      Cochin
919           Air India      2019-12-05   Kolkata    Banglore
1218          Air India      2019-06-27     Delhi      Cochin
1665          Air India      2019-01-03  Banglore   New Delhi
2172          Air India      2019-05-18     Delhi      Cochin
2623          Air India      2019-12-03    Mumbai   Hyderabad
2633   Multiple carriers      2019-06-03     Delhi      Cochin
2718          Air India      2019-09-03     Delhi      Cochin
2814          Air India      2019-12-03  Banglore   New Delhi
2822          Air India      2019-05-24   Kolkata    Banglore
3157   Multiple carriers      2019-05-15     Delhi      Cochin
3220          Air India      2019-06-05   Kolkata    Banglore
3317   Multiple carriers      2019-03-03     Delhi      Cochin
3496          Air India      2019-12-03  Banglore   New Delhi
3568          Air India      2019-05-21   Kolkata    Banglore
3584   Multiple carriers      2019-05-15     Delhi      Cochin
3815          Air India      2019-03-21     Delhi      Cochin
3945          Air India      2019-12-03    Mumbai   Hyderabad
4118          Air India      2019-06-15     Delhi      Cochin
4463          Air India      2019-01-06     Delhi      Cochin
4655          Air India      2019-06-27     Delhi      Cochin
4760   Multiple carriers      2019-12-06     Delhi      Cochin
5050          Air India      2019-01-04   Kolkata    Banglore
5446          Air India      2019-06-03  Banglore   New Delhi
5838   Multiple carriers      2019-12-06     Delhi      Cochin
5947          Air India      2019-03-03  Banglore   New Delhi
5996          Air India      2019-03-24   Kolkata    Banglore
6444          Air India      2019-06-24     Delhi      Cochin
6599   Multiple carriers      2019-09-06     Delhi      Cochin
6884          Air India      2019-06-27     Delhi      Cochin
7001          Air India      2019-03-24   Kolkata    Banglore
```

7031	Air India	2019-12-05	Kolkata	Banglore
7249	Air India	2019-01-06	Delhi	Cochin
7586	Air India	2019-06-05	Kolkata	Banglore
7752	Multiple carriers	2019-09-06	Delhi	Cochin
7876	Air India	2019-06-06	Delhi	Cochin
8153	Air India	2019-09-05	Delhi	Cochin
8204	Air India	2019-09-06	Kolkata	Banglore
8601	Air India	2019-05-27	Delhi	Cochin
8729	Air India	2019-06-24	Delhi	Cochin
9029	Air India	2019-03-03	Banglore	New Delhi
9454	Air India	2019-01-04	Kolkata	Banglore
9484	Air India	2019-03-21	Delhi	Cochin
9569	Air India	2019-01-03	Banglore	New Delhi
10693	Air India	2019-03-06	Delhi	Cochin

	Route	Dep_Time	Arrival_Time	\
402	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-16 07:40:00
919	CCU → BBI → IXR → DEL → BLR	2022-12-09	12:00:00	2022-05-13 23:15:00
1218	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-28 07:40:00
1665	BLR → CCU → BBI → HYD → DEL	2022-12-09	05:50:00	2022-03-02 12:15:00
2172	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-05-19 19:15:00
2623	BOM → JDH → JAI → DEL → HYD	2022-12-09	09:40:00	2022-03-13 15:15:00
2633	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-12-09 21:00:00
2718	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-03-10 19:15:00
2814	BLR → BOM → IDR → GWL → DEL	2022-12-09	17:25:00	2022-03-13 18:05:00
2822	CCU → DEL → COK → TRV → BLR	2022-12-09	10:00:00	2022-05-25 10:30:00
3157	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-12-09 21:00:00
3220	CCU → DEL → COK → TRV → BLR	2022-12-09	10:00:00	2022-05-07 10:30:00
3317	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-12-09 21:00:00
3496	BLR → BOM → IDR → GWL → DEL	2022-12-09	06:45:00	2022-03-13 18:05:00
3568	CCU → GAU → IMF → DEL → BLR	2022-12-09	09:50:00	2022-12-09 23:15:00
3584	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-05-16 01:30:00
3815	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-03-22 19:15:00
3945	BOM → BLR → CCU → BBI → HYD	2022-12-09	16:50:00	2022-03-13 12:25:00
4118	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-16 19:15:00
4463	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-02 19:15:00
4655	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-28 19:15:00
4760	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-12-09 21:00:00
5050	CCU → GAU → IMF → DEL → BLR	2022-12-09	16:45:00	2022-04-02 23:15:00
5446	BLR → HBX → BOM → BHO → DEL	2022-12-09	12:00:00	2022-12-09 23:25:00
5838	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-06-13 01:30:00
5947	BLR → HBX → BOM → AMD → DEL	2022-12-09	12:00:00	2022-12-09 23:55:00
5996	CCU → GAU → IMF → DEL → BLR	2022-12-09	05:55:00	2022-12-09 23:15:00
6444	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-25 07:40:00
6599	DEL → GWL → IDR → BOM → COK	2022-12-09	11:35:00	2022-06-10 01:30:00
6884	DEL → RPR → NAG → BOM → COK	2022-12-09	05:15:00	2022-06-28 19:15:00
7001	CCU → BBI → IXR → DEL → BLR	2022-12-09	12:00:00	2022-03-25 23:15:00

7031	CCU → GAU → IMF → DEL → BLR	2022-12-09 09:50:00	2022-12-09 23:15:00	26h 25m	3	No info	10493.0
7249	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	35h 15m	3	No info	10991.0
7586	CCU → DEL → COK → TRV → BLR	2022-12-09 07:00:00	2022-05-07 10:30:00	26h 25m	3	No info	11543.0
7752	DEL → GWL → IDR → BOM → COK	2022-12-09 11:35:00	2022-12-09 21:00:00	30h 25m	3	No info	12346.0
7876	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-07 19:15:00	38h	3	No info	10703.0
8153	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-05-10 19:15:00	29h 35m	3	No info	18293.0
8204	CCU → GAU → IMF → DEL → BLR	2022-12-09 09:50:00	2022-12-09 23:15:00	9h 25m	3	No info	21829.0
8601	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-05-28 19:15:00	38h	3	No info	15586.0
8729	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-25 19:15:00	24h 40m	3	No info	13387.0
9029	BLR → HBX → BOM → NAG → DEL	2022-12-09 12:00:00	2022-03-07 10:35:00	24h 30m	3	No info	13007.0
9454	CCU → DEL → COK → TRV → BLR	2022-12-09 10:00:00	2022-04-02 10:30:00	9h 25m	3	No info	16294.0
9484	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-03-22 19:15:00	24h 30m	3	No info	12797.0
9569	BLR → CCU → BBI → HYD → DEL	2022-12-09 05:50:00	2022-03-02 08:50:00	9h 25m	3	No info	21829.0
10693	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-04 19:15:00	35h 20m	3	No info	13387.0
402	BLR → CCU → BBI → HYD → DEL	2022-12-09 05:50:00	2022-03-02 08:50:00	13h 25m	3	No info	14960.0
919	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	16294.0
1218	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	9128.0
1665	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	19h 35m	3	No info	14260.0
2172	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
2623	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
2633	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
2718	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	9h 25m	3	No info	15629.0
2814	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	30h 30m	3	No info	8607.0
2822	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	11h 25m	3	No info	14195.0
3157	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	15419.0
3220	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	11h 55m	3	No info	10573.0
3317	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	17h 20m	3	No info	15145.0
3496	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	26h 25m	3	No info	10493.0
3568	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	15419.0
3584	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
3815	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	35h 15m	3	No info	14221.0
3945	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	26h 25m	3	No info	10493.0
4118	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	15419.0
4463	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
4655	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
4760	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	9h 25m	3	No info	15629.0
5050	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	30h 30m	3	No info	8607.0
5446	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	11h 25m	3	No info	14195.0
5838	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	15419.0
5947	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	11h 55m	3	No info	10573.0
5996	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	17h 20m	3	No info	15145.0
6444	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	26h 25m	3	No info	10493.0
6599	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	13h 55m	3	No info	15419.0
6884	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	38h	3	No info	10703.0
7001	DEL → RPR → NAG → BOM → COK	2022-12-09 05:15:00	2022-06-02 07:40:00	35h 15m	3	No info	14221.0

```
7031   13h 25m            3         No info  14015.0
7249   26h 25m            3         No info  12383.0
7586   27h 30m            3         No info  13007.0
7752    9h 25m            3         No info  15629.0
7876       38h            3         No info  10703.0
8153       38h            3         No info  10703.0
8204   13h 25m            3         No info  14960.0
8601       38h            3         No info  10493.0
8729       38h            3         No info  10493.0
9029   22h 35m            3         No info  12358.0
9454   24h 30m            3         No info  12954.0
9484       38h            3         No info   9128.0
9569       27h            3         No info  13081.0
10693      38h            3         No info  10493.0
```

[53]:
```
df.loc[df['Total_Stops']==2]
```

[53]:
```
           Airline Date_of_Journey   Source Destination  \
1        Air India      2019-01-05  Kolkata    Banglore
2      Jet Airways      2019-09-06    Delhi      Cochin
15       Air India      2019-03-03    Delhi      Cochin
18       Air India      2019-12-06    Delhi      Cochin
25     Jet Airways      2019-09-06    Delhi      Cochin
…              …              …      …          …
10736  Jet Airways      2019-09-05    Delhi      Cochin
10738    Air India      2019-12-05  Kolkata    Banglore
10740  Jet Airways      2019-06-27    Delhi      Cochin
10741  Jet Airways      2019-05-27    Delhi      Cochin
10757    Air India      2019-09-05    Delhi      Cochin

                        Route            Dep_Time        Arrival_Time Duration  \
1      CCU → IXR → BBI → BLR 2022-12-09 05:50:00 2022-12-09 13:15:00   7h 25m
2      DEL → LKO → BOM → COK 2022-12-09 09:25:00 2022-06-10 04:25:00      19h
15     DEL → AMD → BOM → COK 2022-12-09 16:40:00 2022-03-04 19:15:00  26h 35m
18     DEL → CCU → BOM → COK 2022-12-09 20:15:00 2022-06-13 19:15:00      23h
25     DEL → IDR → BOM → COK 2022-12-09 21:25:00 2022-06-10 12:35:00  15h 10m
…                      …                  …                  …       …
10736  DEL → JDH → BOM → COK 2022-12-09 11:40:00 2022-12-09 19:00:00   7h 20m
10738  CCU → IXR → DEL → BLR 2022-12-09 05:50:00 2022-12-09 23:15:00  17h 25m
10740  DEL → AMD → BOM → COK 2022-12-09 23:05:00 2022-06-28 19:00:00  19h 55m
10741  DEL → AMD → BOM → COK 2022-12-09 13:25:00 2022-05-28 04:25:00      15h
10757  DEL → GOI → BOM → COK 2022-12-09 10:55:00 2022-12-09 19:15:00   8h 20m

       Total_Stops              Additional_Info    Price
1                2                     No info   7662.0
2                2                     No info  13882.0
15               2                     No info  14011.0
```

```
18              2                      No info  13381.0
25              2                      No info  13292.0
…             …                        …      …
10736           2                      No info  21219.0
10738           2                      No info  11411.0
10740           2  In-flight meal not included  11150.0
10741           2                      No info  16704.0
10757           2                      No info  11753.0

[1520 rows x 11 columns]
```

[54]:
```
df.loc[df['Total_Stops']==1]
```

[54]:
```
           Airline Date_of_Journey    Source Destination            Route  \
3           IndiGo      2019-12-05   Kolkata    Banglore  CCU → NAG → BLR
4           IndiGo      2019-01-03  Banglore   New Delhi  BLR → NAG → DEL
6      Jet Airways      2019-12-03  Banglore   New Delhi  BLR → BOM → DEL
7      Jet Airways      2019-01-03  Banglore   New Delhi  BLR → BOM → DEL
8      Jet Airways      2019-12-03  Banglore   New Delhi  BLR → BOM → DEL
…            …             …       …         …              …
10794  Jet Airways      2019-05-18     Delhi      Cochin  DEL → BOM → COK
10795  Jet Airways      2019-05-18     Delhi      Cochin  DEL → BOM → COK
10796  Jet Airways      2019-05-18     Delhi      Cochin  DEL → BOM → COK
10797  Jet Airways      2019-05-18     Delhi      Cochin  DEL → BOM → COK
10798  Jet Airways      2019-05-18     Delhi      Cochin  DEL → BOM → COK

                 Dep_Time        Arrival_Time Duration  Total_Stops  \
3     2022-12-09 18:05:00 2022-12-09 23:30:00   5h 25m            1
4     2022-12-09 16:50:00 2022-12-09 21:35:00   4h 45m            1
6     2022-12-09 18:55:00 2022-03-13 10:25:00  15h 30m            1
7     2022-12-09 08:00:00 2022-03-02 05:05:00   21h 5m            1
8     2022-12-09 08:55:00 2022-03-13 10:25:00  25h 30m            1
…                    …                 …       …          …
10794 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m            1
10795 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m            1
10796 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m            1
10797 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m            1
10798 2022-12-09 18:55:00 2022-12-09 19:00:00   2h 50m            1

                   Additional_Info         Price
3                          No info   6218.000000
4                          No info  13302.000000
6      In-flight meal not included  11087.000000
7                          No info  22270.000000
8      In-flight meal not included  11087.000000
…                            …           …
10794                      No info   9087.064121
```

```
10795                      No info   9087.064121
10796                      No info   9087.064121
10797                      No info   9087.064121
10798                      No info   9087.064121

[5742 rows x 11 columns]
```

[55]:
```
df[df['Total_Stops']==0]
```

[55]:
```
           Airline Date_of_Journey    Source Destination      Route  \
0           IndiGo      2019-03-24  Banglore   New Delhi  BLR → DEL
5        SpiceJet       2019-06-24   Kolkata    Banglore  CCU → BLR
11          IndiGo      2019-04-18   Kolkata    Banglore  CCU → BLR
12       Air India      2019-06-24   Chennai     Kolkata  MAA → CCU
14          IndiGo      2019-04-24   Kolkata    Banglore  CCU → BLR
…              …             …         …          …         …
10752    SpiceJet       2019-05-21  Banglore       Delhi  BLR → DEL
10753     Air Asia      2019-09-04   Kolkata    Banglore  CCU → BLR
10754    Air India      2019-04-27   Kolkata    Banglore  CCU → BLR
10755  Jet Airways      2019-04-27  Banglore       Delhi  BLR → DEL
10756      Vistara      2019-01-03  Banglore   New Delhi  BLR → DEL

                 Dep_Time        Arrival_Time Duration  Total_Stops  \
0     2022-12-09 22:20:00 2022-03-22 01:10:00   2h 50m            0
5     2022-12-09 09:00:00 2022-12-09 11:25:00   2h 25m            0
11    2022-12-09 20:20:00 2022-12-09 22:55:00   2h 35m            0
12    2022-12-09 11:40:00 2022-12-09 13:55:00   2h 15m            0
14    2022-12-09 17:15:00 2022-12-09 19:50:00   2h 35m            0
…                     …                   …      …          …
10752 2022-12-09 05:55:00 2022-12-09 08:35:00   2h 40m            0
10753 2022-12-09 19:55:00 2022-12-09 22:25:00   2h 30m            0
10754 2022-12-09 20:45:00 2022-12-09 23:20:00   2h 35m            0
10755 2022-12-09 08:20:00 2022-12-09 11:20:00       3h            0
10756 2022-12-09 11:30:00 2022-12-09 14:10:00   2h 40m            0

                    Additional_Info    Price
0                           No info   3897.0
5                           No info   3873.0
11                          No info   4174.0
12                          No info   4667.0
14                          No info   4804.0
…                               …        …
10752  No check-in baggage included   3257.0
10753                       No info   4107.0
10754                       No info   4145.0
10755                       No info   7229.0
10756                       No info  12648.0
```

```
[3491 rows x 11 columns]
```

9 Extracting Journey Day and Month

For this we require pandas to_datetime to convert object data type to datetime dtype.

.dt.day method will extract only day of that date

.dt.month method will extract only month of that date

[56]:
```
df['Month_of_Journey']=pd.to_datetime(df['Date_of_Journey']).dt.month
```

[57]:
```
df['Day_of_Journey']=pd.to_datetime(df['Date_of_Journey']).dt.day
```

[58]:
```
# Since we have converted Date_of_Journey column into integers, Now we can drop␣
↪as it is of no use.
df.drop(columns=['Date_of_Journey'], inplace=True)
```

[85]:
```
# Departure time is when a plane leaves the gate.

# Extracting Hours
df["Dep_hour"] = pd.to_datetime(df["Dep_Time"]).dt.hour

# Extracting Minutes
df["Dep_min"] = pd.to_datetime(df["Dep_Time"]).dt.minute

# Now we can drop Dep_Time as it is of no use
df.drop(["Dep_Time"], axis = 1, inplace = True)
```

[86]:
```
# Arrival time is when the plane pulls up to the gate.

# Extracting Hours
df["Arrival_hour"] = pd.to_datetime(df.Arrival_Time).dt.hour

# Extracting Minutes
df["Arrival_min"] = pd.to_datetime(df.Arrival_Time).dt.minute

# Now we can drop Arrival_Time as it is of no use
df.drop(["Arrival_Time"], axis = 1, inplace = True)
```

[87]:
```
df
```

[87]:

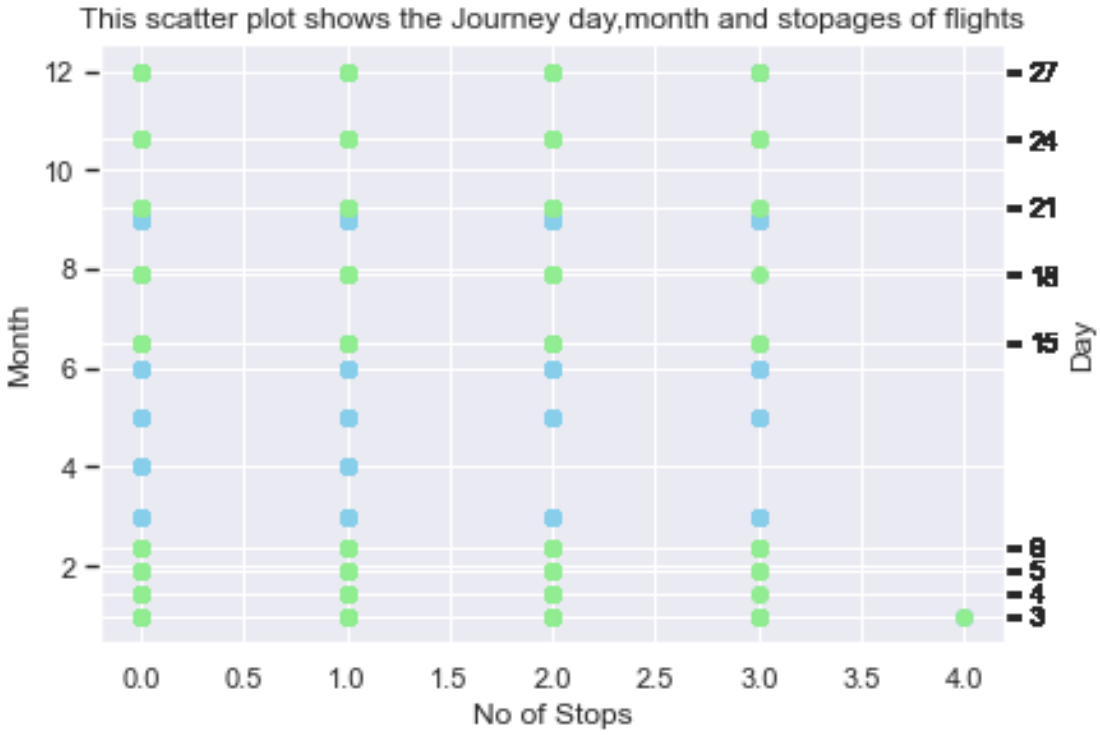
	Airline	Source	Route	Destination	Duration	\
0	IndiGo	Banglore	BLR → DEL	Delhi	2h 50m	
1	Air India	Kolkata	CCU → IXR → BBI → BLR	Banglore	7h 25m	
2	Jet Airways	Delhi	DEL → LKO → BOM → COK	Cochin	19h	

```
3           IndiGo   Kolkata        CCU → NAG → BLR    Banglore   5h 25m
4           IndiGo  Banglore        BLR → NAG → DEL       Delhi   4h 45m
…              …       …                    …         …      …
10794  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10795  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10796  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10797  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10798  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m

       Total_Stops Additional_Info         Price  Month_of_Journey  \
0                0         No info   3897.000000                 3
1                2         No info   7662.000000                 1
2                2         No info  13882.000000                 9
3                1         No info   6218.000000                12
4                1         No info  13302.000000                 1
…              …               …           …                 …
10794            1         No info   9087.064121                 5
10795            1         No info   9087.064121                 5
10796            1         No info   9087.064121                 5
10797            1         No info   9087.064121                 5
10798            1         No info   9087.064121                 5

       Day_of_Journey  Dep_hour  Dep_min  Arrival_hour  Arrival_min
0                  24        22       20             1           10
1                   5         5       50            13           15
2                   6         9       25             4           25
3                   5        18        5            23           30
4                   3        16       50            21           35
…                 …       …      …           …          …
10794              18        18       55            19            0
10795              18        18       55            19            0
10796              18        18       55            19            0
10797              18        18       55            19            0
10798              18        18       55            19            0

[10799 rows x 14 columns]
```

10 4th Insights: On What Day and Month Have Flight Maximum Stopages

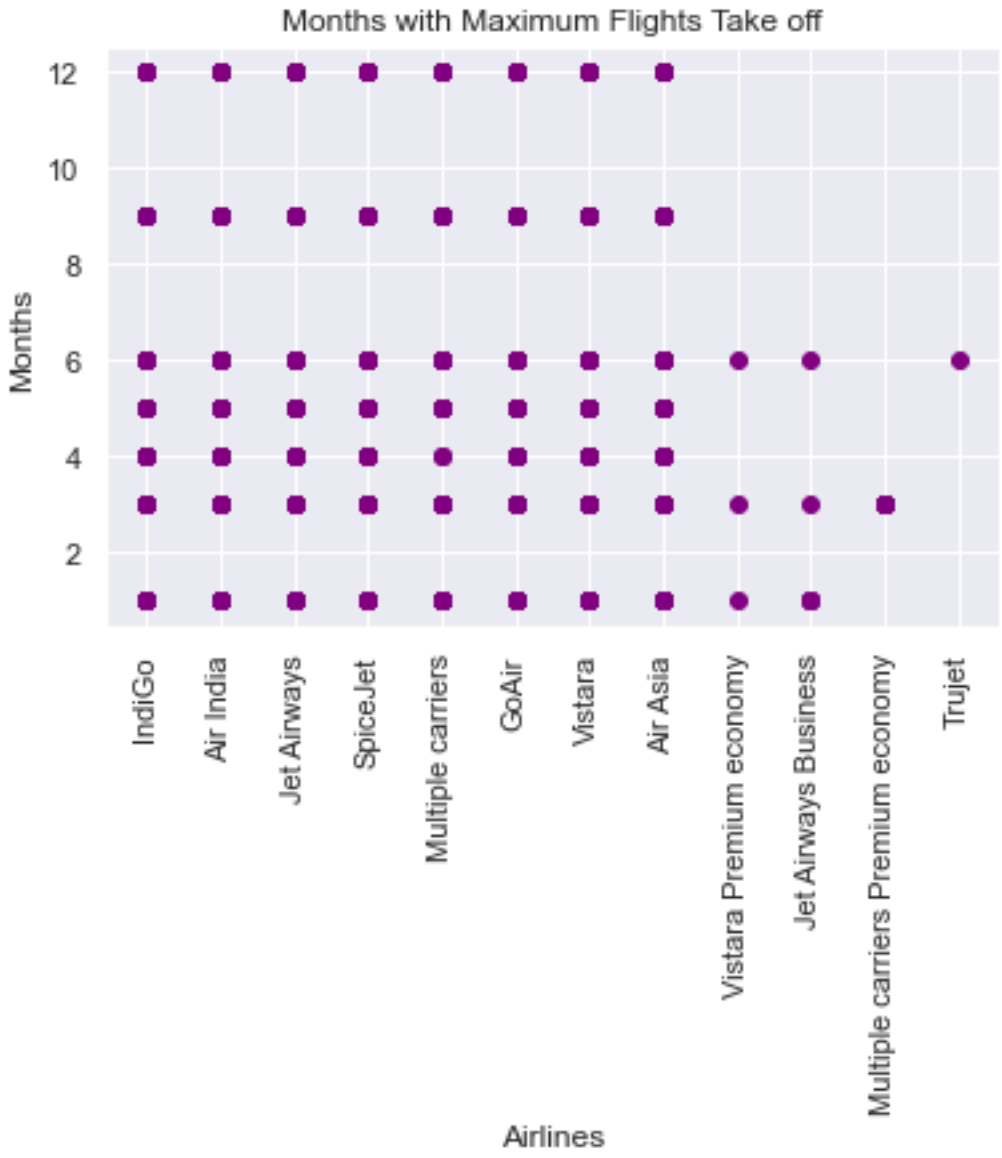
[88]:
```
fiSg, ax = plt.subplots(constrained_layout=True)
month=list(df['Month_of_Journey'])
stopages=list(df["Total_Stops"])
day=list(df['Day_of_Journey'])
ax2=ax.twinx()
ax.scatter(stopages,month,color="skyblue")
```

```
ax2.scatter(stopages,day,color="lightgreen")
ax.set_xlabel('No of Stops')
ax.set_ylabel('Month')
ax2.set_ylabel('Day')
plt.xticks(rotation=80,size=3)
plt.title("This scatter plot shows the Journey day,month and stopages of␣
 ↪flights")
plt.yticks(day)
plt.show()
```



11 5th Insights: On what Month have Maximum Flights Take off ?

[89]:
```
plt.title("Months with Maximum Flights Take off")
plt.scatter(df['Airline'],df['Month_of_Journey'], color='purple')
plt.xlabel("Airlines")
plt.ylabel("Months")
plt.xticks(rotation=90)
plt.show()
```



12 6th Insights: What Month has The Maximum Earning

[90]:
```
df
```

[90]:

	Airline	Source	Route	Destination	Duration	\
0	IndiGo	Banglore	BLR → DEL	Delhi	2h 50m	
1	Air India	Kolkata	CCU → IXR → BBI → BLR	Banglore	7h 25m	
2	Jet Airways	Delhi	DEL → LKO → BOM → COK	Cochin	19h	
3	IndiGo	Kolkata	CCU → NAG → BLR	Banglore	5h 25m	
4	IndiGo	Banglore	BLR → NAG → DEL	Delhi	4h 45m	

```
…            …       …                    …          …      …
10794  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10795  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10796  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10797  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m
10798  Jet Airways     Delhi        DEL → BOM → COK      Cochin   2h 50m

       Total_Stops Additional_Info         Price  Month_of_Journey  \
0                0         No info   3897.000000                 3
1                2         No info   7662.000000                 1
2                2         No info  13882.000000                 9
3                1         No info   6218.000000                12
4                1         No info  13302.000000                 1
…              …               …           …                 …
10794            1         No info   9087.064121                 5
10795            1         No info   9087.064121                 5
10796            1         No info   9087.064121                 5
10797            1         No info   9087.064121                 5
10798            1         No info   9087.064121                 5

       Day_of_Journey  Dep_hour  Dep_min  Arrival_hour  Arrival_min
0                  24        22       20             1           10
1                   5         5       50            13           15
2                   6         9       25             4           25
3                   5        18        5            23           30
4                   3        16       50            21           35
…                 …       …      …           …          …
10794              18        18       55            19            0
10795              18        18       55            19            0
10796              18        18       55            19            0
10797              18        18       55            19            0
10798              18        18       55            19            0

[10799 rows x 14 columns]
```

[91]:
```
df.groupby(['Month_of_Journey'])['Price'].sum()
```

[91]:
```
Month_of_Journey
1     1.127959e+07
3     1.864722e+07
4     2.217885e+06
5     2.046897e+07
6     2.336915e+07
9     1.342937e+07
12    8.719011e+06
Name: Price, dtype: float64
```

Month_of_Journey

1 11279591

3 18647220

4 2217885

5 19414875

6 23369151

9 13429373

12 8719011

Name: Price, dtype: int64

[92]:
```
plt.figure(figsize=(7,5))
plt.title('Representing the Maximum Earning With Respect to Month')
keys=[months for months,df in df.groupby(["Month_of_Journey"])]

plt.bar(keys,df.groupby(["Month_of_Journey"]).sum()["Price"], color='orange')
plt.xlabel('Months')
plt.ylabel('Prices in Crores')
plt.xticks(keys,rotation=90,size=8)
plt.show()
```

[93]:
```
df["Source"].unique()
```

[93]:
```
array(['Banglore', 'Kolkata', 'Delhi', 'Chennai', 'Mumbai'], dtype=object)
```

[94]:
```
df['Airline'].unique()
```

[94]:
```
array(['IndiGo', 'Air India', 'Jet Airways', 'SpiceJet',
       'Multiple carriers', 'GoAir', 'Vistara', 'Air Asia',
       'Vistara Premium economy', 'Jet Airways Business',
       'Multiple carriers Premium economy', 'Trujet'], dtype=object)
```

[95]:
```
df['Destination'].unique()
```

[95]:
```
array(['Delhi', 'Banglore', 'Cochin', 'Kolkata', 'Hyderabad'],
      dtype=object)
```

[96]:
```
#Removing New in New Delhi from Destination column
destination=[]
for i in df['Destination']:
    if i=='New Delhi':
        destination.append(i.replace('New Delhi','Delhi'))
    else:
        destination.append(i)
```

[97]:
```
#Dropping the Destination column to add the New column
df.drop(columns=['Destination'],inplace=True)
```

[111]:
```
df.head(3)
```

[111]:

	Airline	Source	Route	Destination	Duration	Total_Stops	Additional_Info	Price	Month_of_Journey	Day_of_Journey	Dep_hour	Dep_min
0	IndiGo	Banglore	BLR → DEL	Delhi	2h 50m	0	No info	3897.0	3	24	22	20
1	Air India	Kolkata	CCU → IXR → BBI → BLR	Banglore	7h 25m	2	No info	7662.0	1	5	5	50
2	Jet Airways	Delhi	DEL → LKO → BOM → COK	Cochin	19h	2	No info	13882.0	9	6	9	25

[99]:
```
#Adding the new Column Destination which have filltered city names
df['Destination']=pd.Series(destination)
```

[100]:
```
# Making list of all columns
cols=df.columns.tolist()
cols
```

[100]:
```
['Airline',
 'Source',
 'Route',
 'Duration',
 'Total_Stops',
 'Additional_Info',
 'Price',
 'Month_of_Journey',
 'Day_of_Journey',
 'Dep_hour',
 'Dep_min',
 'Arrival_hour',
 'Arrival_min',
 'Destination']
```

[101]:
```
#Slicing to arrange the position of Destination column
cols=cols[0:3]+cols[-1:]+cols[3:11]
cols
```

[101]:
```
['Airline',
 'Source',
 'Route',
 'Destination',
 'Duration',
 'Total_Stops',
 'Additional_Info',
 'Price',
 'Month_of_Journey',
 'Day_of_Journey',
 'Dep_hour',
 'Dep_min']
```

[102]:
```
#Assigning all the column to the dataframe
df=df[cols]
```

[103]:
```
df.head(4)
```

[103]:

	Airline	Source	Route	Destination	Duration
0	IndiGo	Banglore	BLR → DEL	Delhi	2h 50m
1	Air India	Kolkata	CCU → IXR → BBI → BLR	Banglore	7h 25m

```
2  Jet Airways     Delhi  DEL → LKO → BOM → COK      Cochin      19h
3       IndiGo   Kolkata       CCU → NAG → BLR    Banglore   5h 25m

   Total_Stops Additional_Info    Price  Month_of_Journey  Day_of_Journey  \
0            0         No info   3897.0                 3              24
1            2         No info   7662.0                 1               5
2            2         No info  13882.0                 9               6
3            1         No info   6218.0                12               5

   Dep_hour  Dep_min
0        22       20
1         5       50
2         9       25
3        18        5
```

[104]:
```
df['Airline'].unique()
```

[104]:
```
array(['IndiGo', 'Air India', 'Jet Airways', 'SpiceJet',
       'Multiple carriers', 'GoAir', 'Vistara', 'Air Asia',
       'Vistara Premium economy', 'Jet Airways Business',
       'Multiple carriers Premium economy', 'Trujet'], dtype=object)
```

[105]:
```
df['Source'].unique()
```

[105]:
```
array(['Banglore', 'Kolkata', 'Delhi', 'Chennai', 'Mumbai'], dtype=object)
```

[106]:
```
df['Destination'].unique()
```

[106]:
```
array(['Delhi', 'Banglore', 'Cochin', 'Kolkata', 'Hyderabad'],
      dtype=object)
```

13 7th Insights: Checking the Availablity of Flight with respect to Source and Destination

[107]:
```
df1=df.groupby(['Source','Destination',])['Airline'].value_counts()
```

[108]:
```
df1
```

[108]:
```
Source    Destination  Airline
Banglore  Delhi        Jet Airways                          788
                       IndiGo                               523
                       Air India                            332
                       Vistara                              185
                       SpiceJet                             181
                       GoAir                                 93
                       Air Asia                              89
```

```
                      Jet Airways Business                     4
                      Vistara Premium economy                  2
Chennai   Kolkata     IndiGo                                 184
                      SpiceJet                               128
                      Vistara                                 43
                      Air India                               25
                      Vistara Premium economy                  1
Delhi     Cochin      Jet Airways                            1702
                      Multiple carriers                      1196
                      Air India                               747
                      IndiGo                                  705
                      SpiceJet                                 87
                      Air Asia                                 80
                      GoAir                                    76
                      Vistara                                  45
                      Multiple carriers Premium economy        13
                      Jet Airways Business                      2
Kolkata   Banglore    Jet Airways                            1256
                      Air India                               512
                      IndiGo                                  445
                      SpiceJet                                300
                      Vistara                                 183
                      Air Asia                                150
                      GoAir                                    25
Mumbai    Hyderabad   Jet Airways                             219
                      IndiGo                                  196
                      Air India                               136
                      SpiceJet                                122
                      Vistara                                  23
                      Trujet                                    1
Name: Airline, dtype: int64
```