In [776…
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import plotly.express as px
```

In [777…
```
data=pd.read_csv('/content/FlightPrice_train.csv')
```

In [778…
```
data.head()
```

Out[778]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
0	IndiGo	24-03-2019	Bengaluru	New Delhi	BLR ? DEL	22:20	22-03-2020 01:10	2h 50m	non-stop	No info	3897
1	Air India	01-05-2019	Kolkata	Bengaluru	CCU ? IXR ? BBI ? BLR	05:50	13:15	7h 25m	2 stops	No info	7662
2	Jet Airways	09-06-2019	Delhi	Cochin	DEL ? LKO ? BOM ? COK	09:25	10-06-2020 04:25	19h	2 stops	No info	13882
3	IndiGo	12-05-2019	Kolkata	Bengaluru	CCU ? NAG ? BLR	18:05	23:30	5h 25m	1 stop	No info	6218
4	IndiGo	01-03-2019	Bengaluru	New Delhi	BLR ? NAG ? DEL	16:50	21:35	4h 45m	1 stop	No info	13302

In [779…
```
data.tail()
```

Out[779]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duration	Total_Stops	Additional_Info	Price
10678	Air Asia	09-04-2019	Kolkata	Bengaluru	CCU ? BLR	19:55	22:25	2h 30m	non-stop	No info	4107
10679	Air India	27-04-2019	Kolkata	Bengaluru	CCU ? BLR	20:45	23:20	2h 35m	non-stop	No info	4145
10680	Jet Airways	27-04-2019	Bengaluru	Delhi	BLR ? DEL	08:20	11:20	3h	non-stop	No info	7229
10681	Vistara	01-03-2019	Bengaluru	New Delhi	BLR ? DEL	11:30	14:10	2h 40m	non-stop	No info	12648
10682	Air India	09-05-2019	Delhi	Cochin	DEL ? GOI ? BOM ? COK	10:55	19:15	8h 20m	2 stops	No info	11753

In [780…
```
data.shape
```

Out[780]:
```
(10683, 11)
```

In [781…
```
data.describe()
```

Out[781]:

	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 [782…
```
data.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            10683 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      10683 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 [783…

```
data.isnull().sum()
```

Out[783]:

```
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
```

EXPLORING DATA

In [784…

```
numeric_data=[feature for feature in data.columns if data[feature].dtype != 'O']
categorical_data=[feature for feature in data.columns if data[feature].dtype == 'O']
```

In [785…

```
print(f'We have {len(numeric_data)} numerical features :{numeric_data}')
print(f'We have {len(categorical_data)} categorical features :{categorical_data}')
```

```
We have 1 numerical features :['Price']
We have 10 categorical features :['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route', 'Dep_Time', 'Arrival_Time', 'D
uration', 'Total_Stops', 'Additional_Info']
```

In [786…

```
for col in categorical_data:
    print(data[col].value_counts(normalize=True)*100)
    print('============')
```

```
Jet Airways                          36.029205
IndiGo                               19.217448
Air India                            16.399888
Multiple carriers                    11.195357
SpiceJet                              7.657025
Vistara                               4.483759
Air Asia                              2.986053
GoAir                                 1.815969
Multiple carriers Premium economy     0.121689
Jet Airways Business                  0.056164
Vistara Premium economy               0.028082
Trujet                                0.009361
Name: Airline, dtype: float64
============
18-05-2019    4.717776
06-06-2019    4.708415
21-05-2019    4.652251
09-06-2019    4.633530
12-06-2019    4.614809
09-05-2019    4.530563
21-03-2019    3.959562
15-05-2019    3.791070
06-03-2019    3.772349
27-05-2019    3.575775
27-06-2019    3.323037
24-06-2019    3.285594
01-06-2019    3.201348
03-06-2019    3.117102
15-06-2019    3.070299
24-03-2019    3.023495
03-03-2019    2.948610
09-03-2019    2.826921
27-03-2019    2.798839
24-05-2019    2.677151
06-05-2019    2.639708
01-05-2019    2.592905
12-05-2019    2.424413
01-04-2019    2.405691
01-03-2019    1.862773
15-03-2019    1.516428
18-03-2019    1.460264
12-03-2019    1.329215
09-04-2019    1.170083
03-04-2019    1.029673
```

```
21-06-2019    1.020313
18-06-2019    0.982870
06-04-2019    0.936067
27-04-2019    0.879903
24-04-2019    0.861181
03-05-2019    0.842460
15-04-2019    0.833099
21-04-2019    0.767575
18-04-2019    0.627165
12-04-2019    0.589722
Name: Date_of_Journey, dtype: float64
============
Delhi        42.469344
Kolkata      26.874473
Bengaluru    20.565384
Mumbai        6.524385
Chennai       3.566414
Name: Source, dtype: float64
============
Cochin       42.469344
Bengaluru    26.874473
Delhi        11.841243
New Delhi     8.724141
Hyderabad     6.524385
Kolkata       3.566414
Name: Destination, dtype: float64
============
DEL ? BOM ? COK          22.240944
BLR ? DEL                14.527754
CCU ? BOM ? BLR           9.164092
CCU ? BLR                 6.777123
BOM ? HYD                 5.812974
                           ...
CCU ? VTZ ? BLR           0.009361
CCU ? IXZ ? MAA ? BLR     0.009361
BOM ? COK ? MAA ? HYD     0.009361
BOM ? CCU ? HYD           0.009361
BOM ? BBI ? HYD           0.009361
Name: Route, Length: 128, dtype: float64
============
18:55    2.181035
17:00    2.124871
07:05    1.918937
10:00    1.900215
```

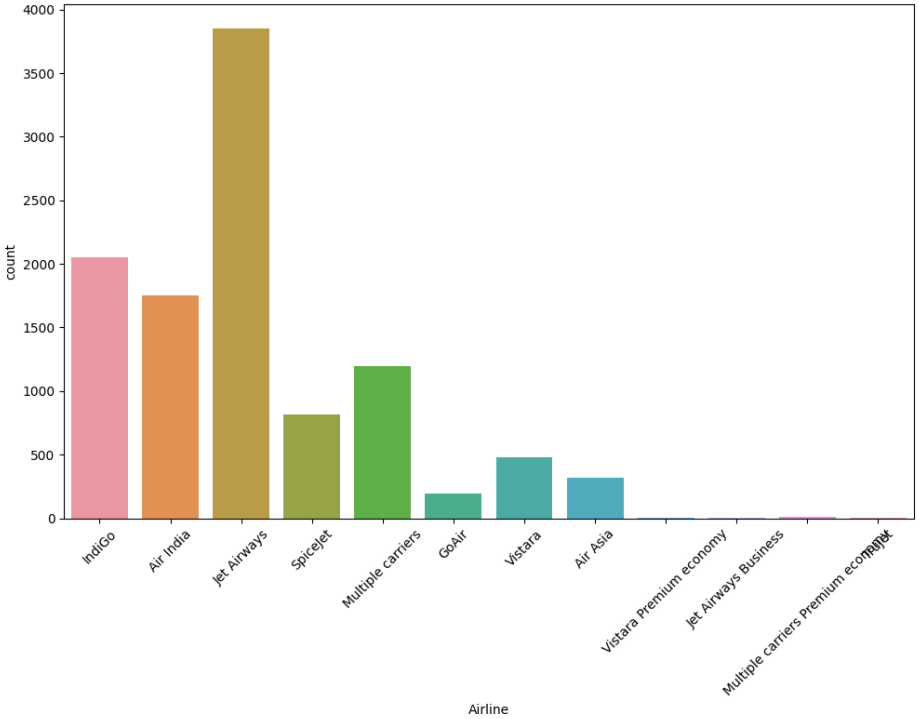
```
07:10    1.890855
           ...
16:25    0.009361
01:35    0.009361
21:35    0.009361
04:15    0.009361
03:00    0.009361
Name: Dep_Time, Length: 222, dtype: float64
============
19:00               3.959562
21:00               3.369840
19:15               3.117102
16:10               1.441543
12:35               1.142001
                      ...
02-06-2020 00:25    0.009361
13-03-2020 08:55    0.009361
19-05-2020 11:05    0.009361
22-05-2020 12:30    0.009361
13-03-2020 21:20    0.009361
Name: Arrival_Time, Length: 1343, dtype: float64
============
2h 50m     5.148367
1h 30m     3.613217
2h 45m     3.154545
2h 55m     3.154545
2h 35m     3.079659
             ...
31h 30m    0.009361
30h 25m    0.009361
42h 5m     0.009361
4h 10m     0.009361
47h 40m    0.009361
Name: Duration, Length: 368, dtype: float64
============
1 stop      52.663110
non-stop    32.678087
2 stops     14.228213
3 stops      0.421230
4 stops      0.009361
Name: Total_Stops, dtype: float64
============
No info                         78.114762
In-flight meal not included     18.552841
```

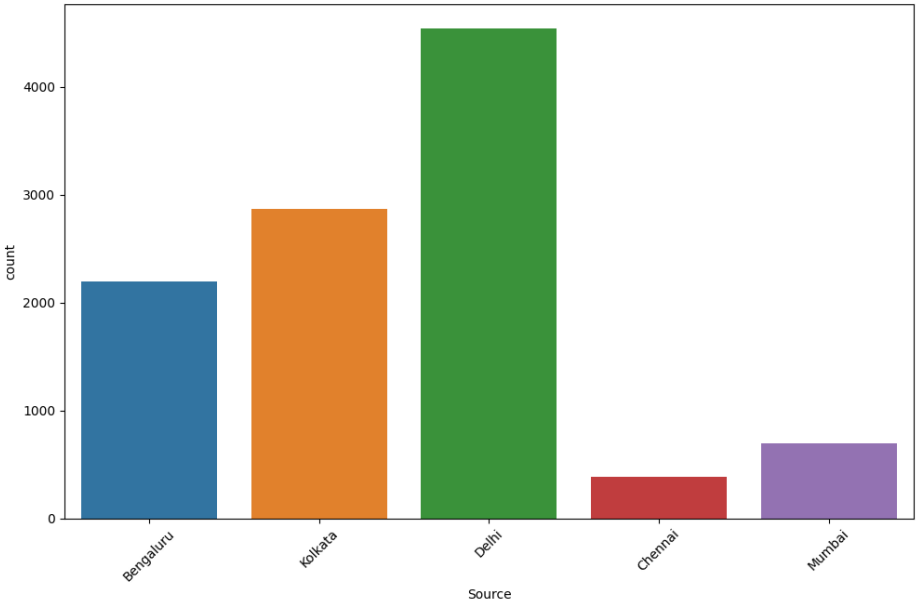
```
No check-in baggage included     2.995413
1 Long layover                   0.177853
Change airports                  0.065525
Business class                   0.037443
No Info                          0.028082
1 Short layover                  0.009361
Red-eye flight                   0.009361
2 Long layover                   0.009361
Name: Additional_Info, dtype: float64
============
```

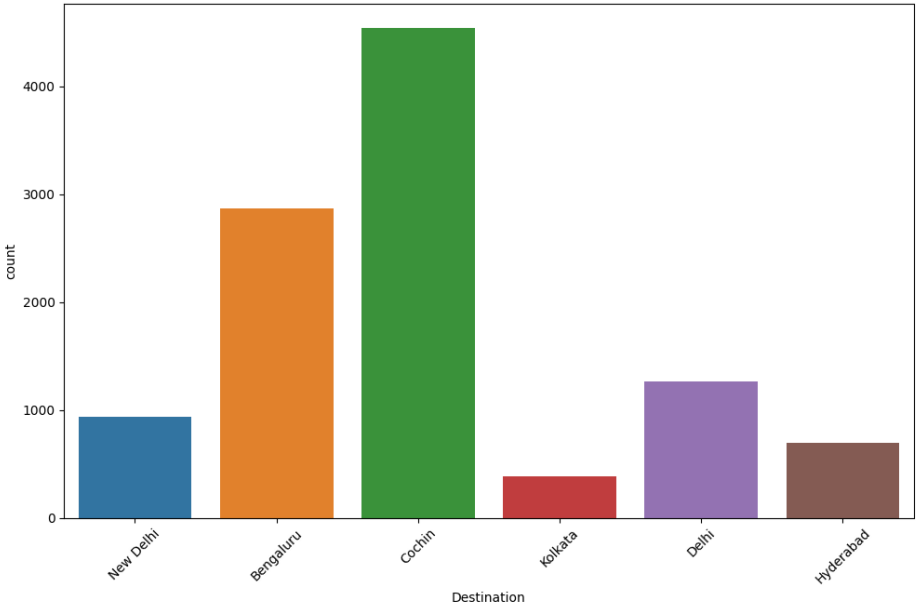
In [787…

```
plt.figure(figsize=(20,15))
plt.suptitle('Graph of count of each categorial data', fontsize=20, fontweight='bold', alpha=0.8, y=1.)
cat1 = [ 'Airline','Source', 'Destination']
for i in range(0, len(cat1)):
    plt.subplot(2,2,i+1)
    sns.countplot(x=data[cat1[i]])
    plt.xlabel(cat1[i])
    plt.xticks(rotation=45)
    plt.tight_layout()
```

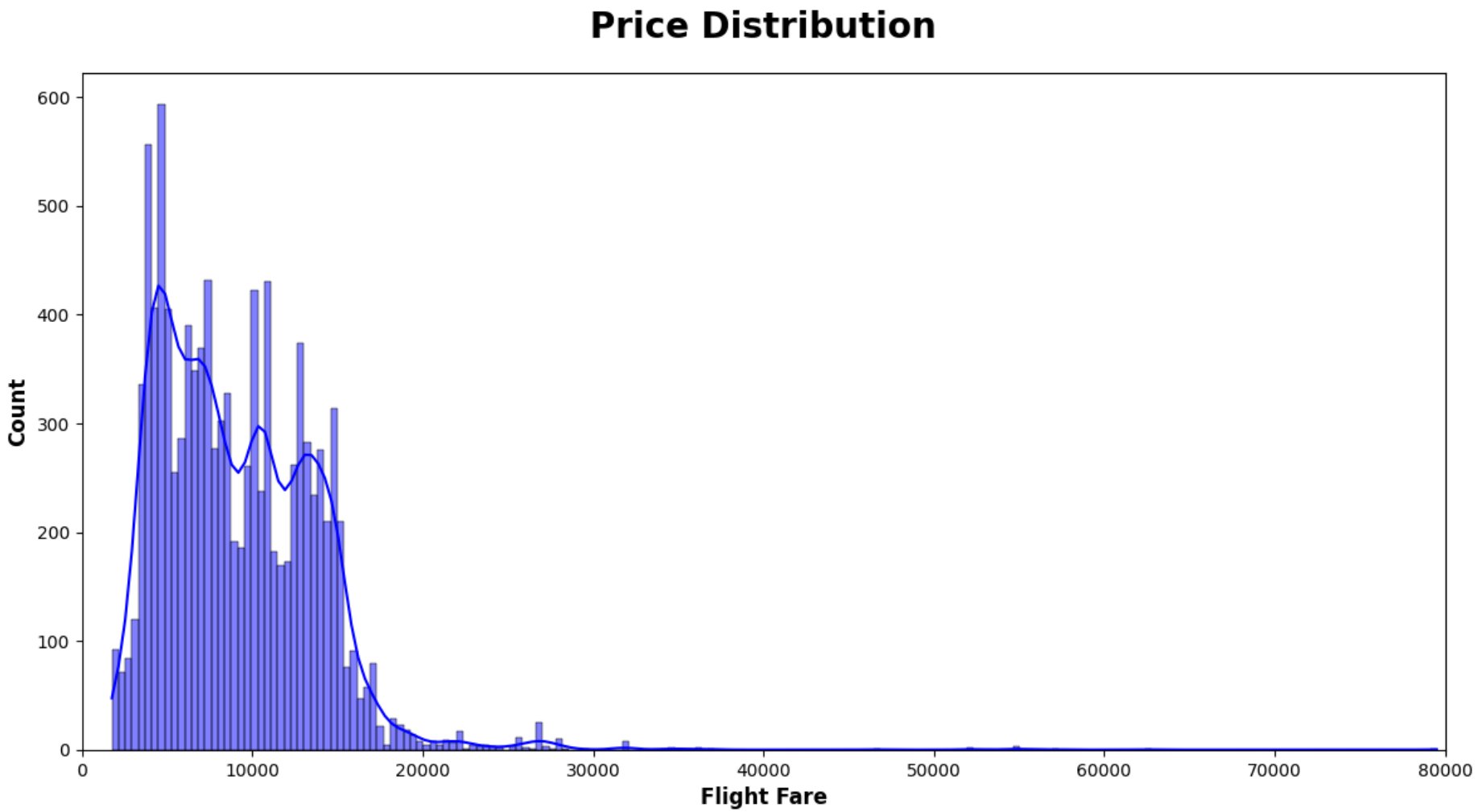
Graph of count of each categorial data







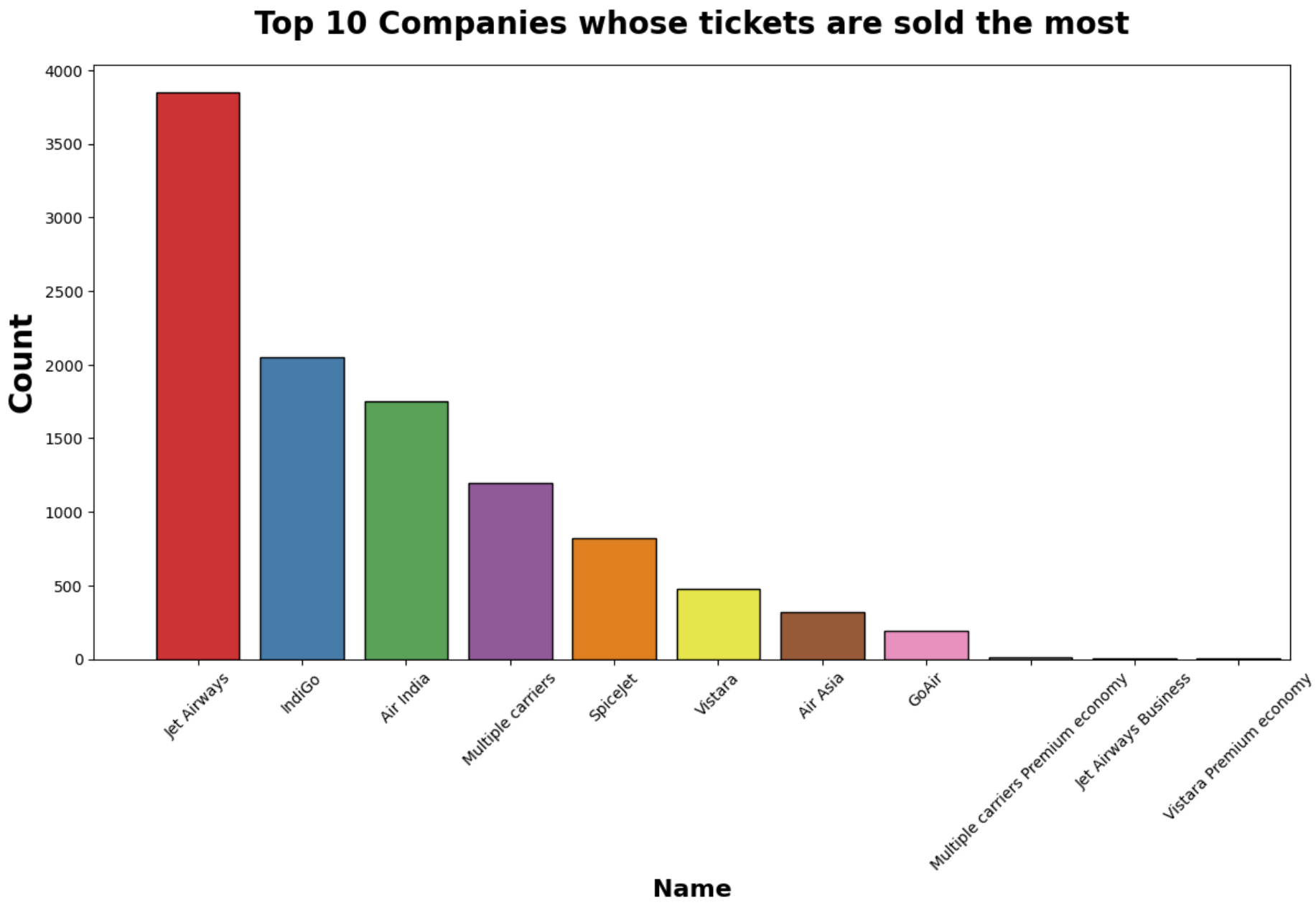
In [788…
```
plt.subplots(figsize=(14,7))
sns.histplot(data.Price, bins=200, kde=True, color = 'b')
plt.title("Price Distribution", weight="bold",fontsize=20, pad=20)
plt.ylabel("Count", weight="bold", fontsize=12)
plt.xlabel("Flight Fare", weight="bold", fontsize=12)
plt.xlim(0,80000)
plt.show()
```



In [789…
```
#Top 10 Aviation Companies whose flight tickets are sold the most
data.Airline.value_counts()[0:10]
```

Out[789]:
```
Jet Airways                          3849
IndiGo                               2053
Air India                            1752
Multiple carriers                    1196
SpiceJet                              818
Vistara                               479
Air Asia                              319
GoAir                                 194
Multiple carriers Premium economy      13
Jet Airways Business                    6
Name: Airline, dtype: int64
```

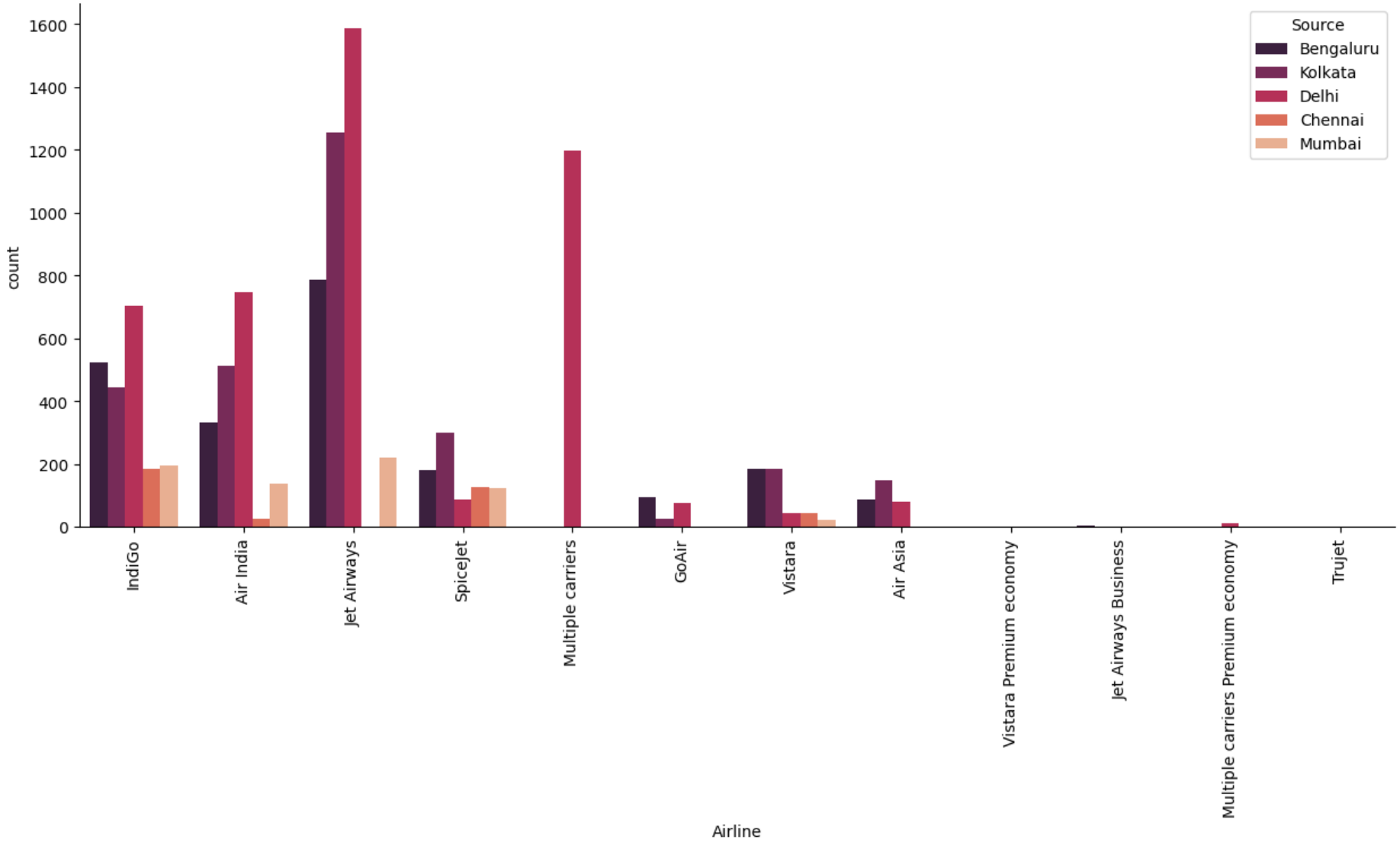
In [790…
```
plt.subplots(figsize=(14,7))
sns.countplot(x="Airline", data=data,ec = "black",palette="Set1",order = data['Airline'].value_counts().index)
plt.title("Top 10 Companies whose tickets are sold the most", weight="bold",fontsize=20, pad=20)
plt.ylabel("Count", weight="bold", fontsize=20)
plt.xlabel("Name", weight="bold", fontsize=16)
plt.xticks(rotation= 45)
plt.xlim(-1,10.5)
plt.show()
```



In [791…

```
plt.figure(figsize=(15,6))
sns.countplot(data, x ='Airline' ,hue= 'Source', palette ='rocket')
plt.xticks(rotation = 90)
```

```
sns.despine()
plt.show()
```



In [792…

```
#Mean price of Jet Airways whose flight tickets are sold the most
jet_airways = data[data['Airline'] == 'Jet Airways']['Price'].mean()
print(f'The mean price of Jet Airways Flight Tickets  is {jet_airways:.2f} Rupees')
```

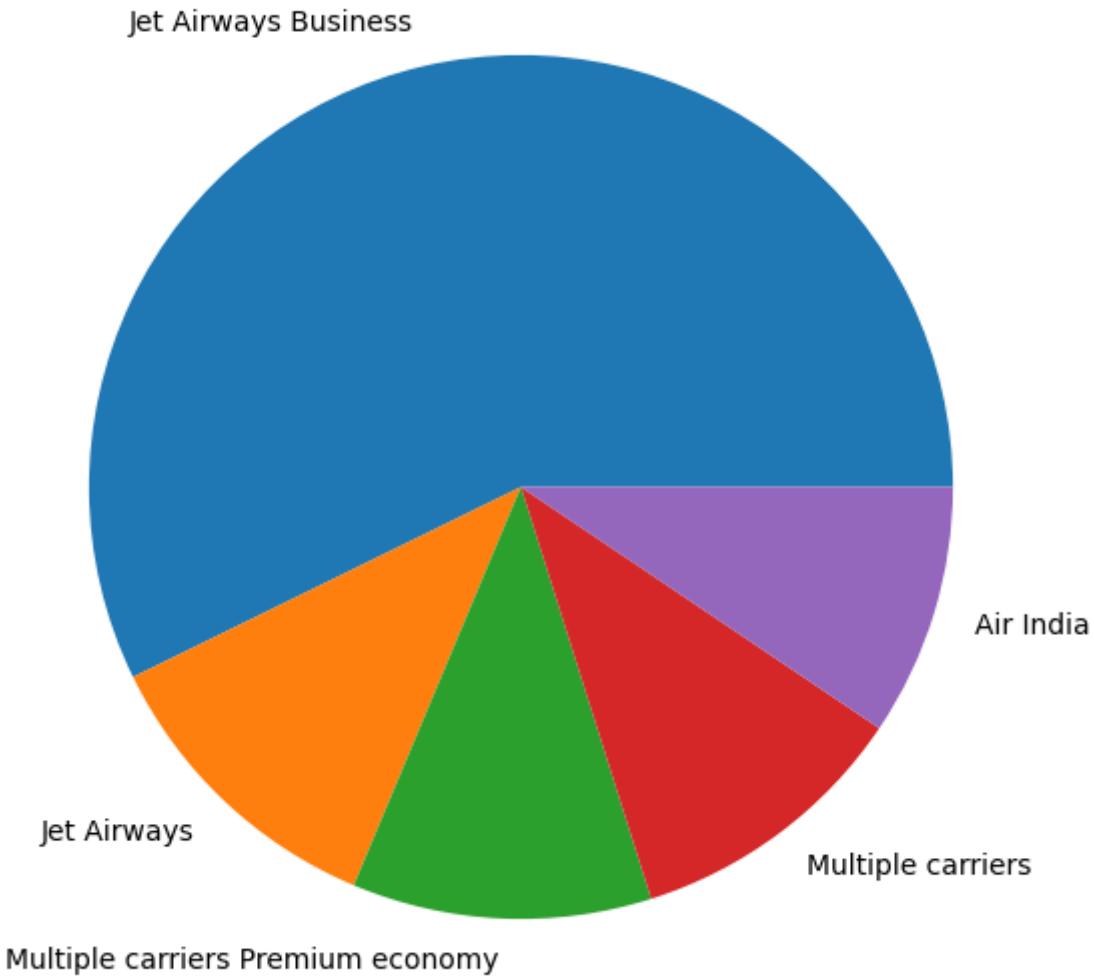
```
The mean price of Jet Airways Flight Tickets  is 11643.92 Rupees
```

In [793…
```
#Costliest Aviation Companies and Costliest Flight Tickets
airline = data.groupby('Airline').Price.max()
company= airline.to_frame().sort_values('Price',ascending=False)[0:10]
company
```

Out[793]:

Airline	Price
Jet Airways Business	79512
Jet Airways	54826
Multiple carriers	36983
Air India	31945
SpiceJet	23267
GoAir	22794
IndiGo	22153
Vistara	21730
Multiple carriers Premium economy	14629
Air Asia	13774

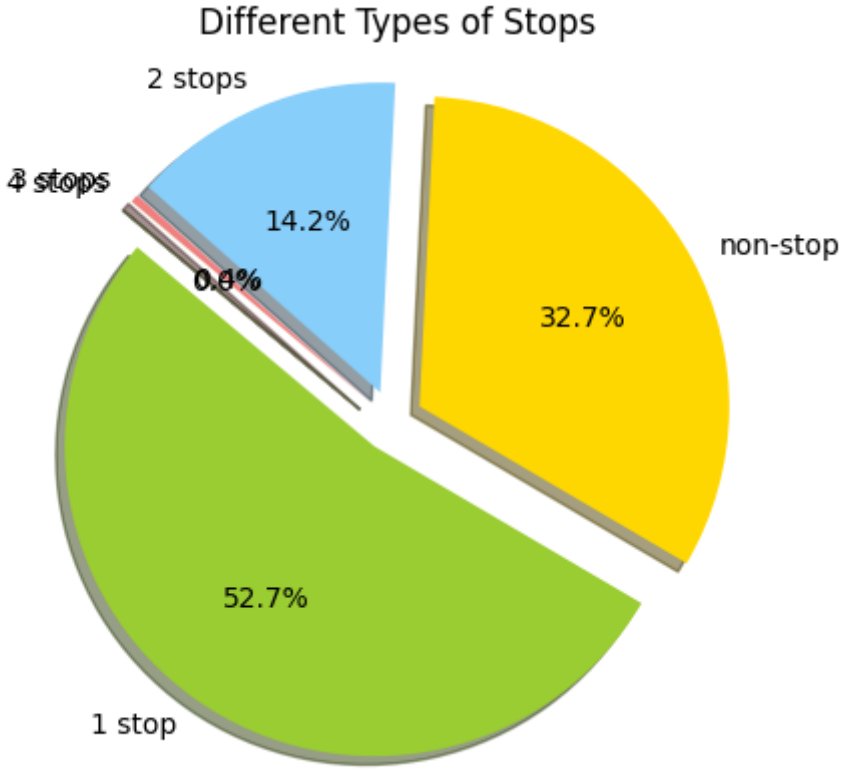
In [794…
```
airline_company = data.groupby('Airline')
company = airline_company.mean().sort_values('Price', ascending=False)[0:5]
fig = plt.figure(figsize=(10, 7))
plt.pie(company['Price'], labels=company.index)
plt.show()
```



In [795…

```
stop_counts = data['Total_Stops'].value_counts()
labels = stop_counts.index.tolist()
sizes = stop_counts.tolist()
colors = ['yellowgreen', 'gold', 'lightskyblue', 'lightcoral']
explode = (0.1, 0.1,0.1,0.1,0.1)
plt.pie(sizes,explode=explode, labels=labels, colors=colors,autopct='%1.1f%%', shadow=True, startangle=140)
plt.axis('equal')
```

```
plt.title("Different Types of Stops")
plt.show()
```

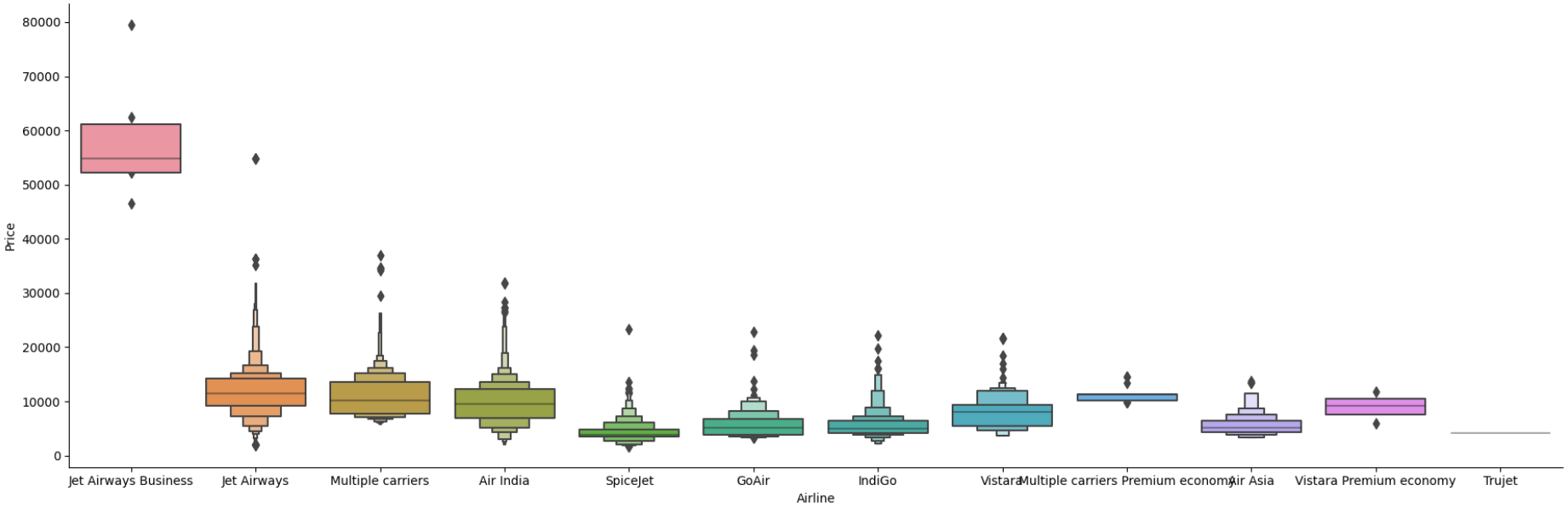


In [796…

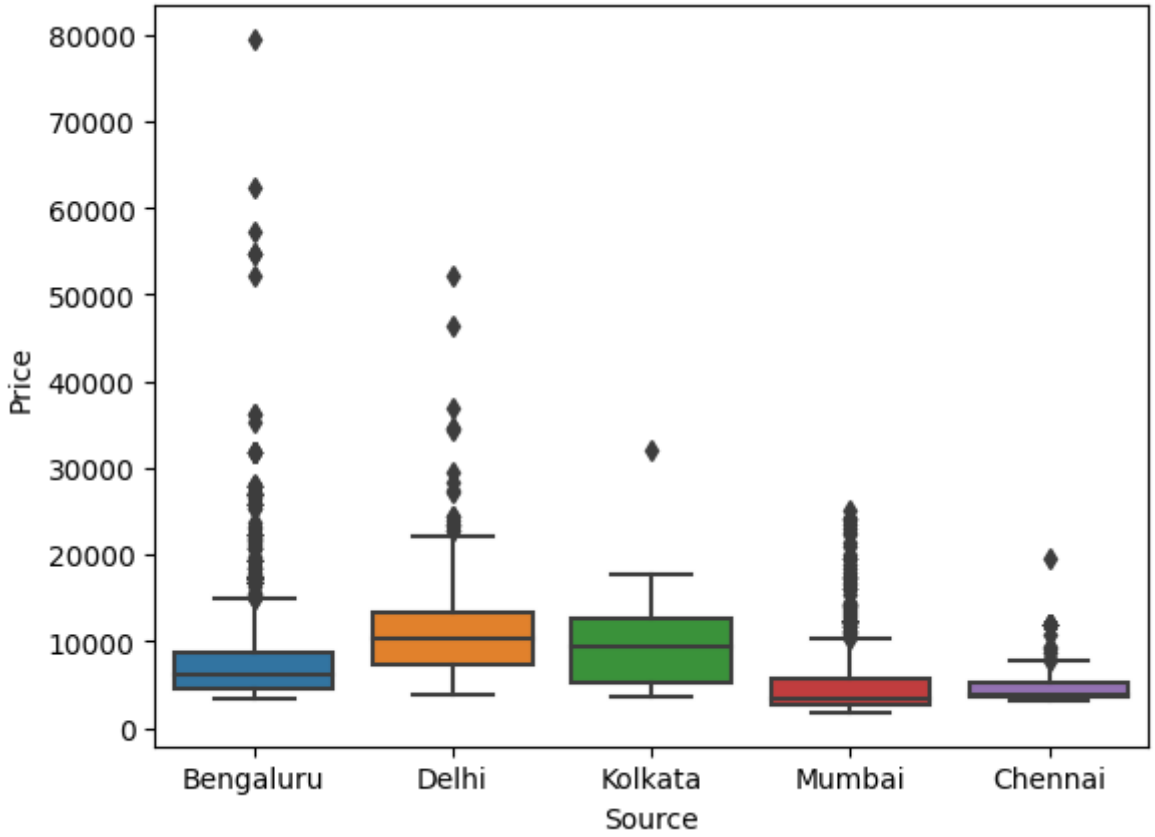
```
plt.subplots(figsize=(14,7))
sns.barplot(x=airline.index, y=airline.values,ec = "black",palette="Set2")
plt.title("Airline Company vs Flight Ticket Price", weight="bold",fontsize=20, pad=20)
plt.ylabel("Flight Ticket Price", weight="bold", fontsize=15)
plt.xlabel("Airline Name", weight="bold", fontsize=16)
plt.xticks(rotation=90)
plt.show()
```


Airline Company vs Flight Ticket Price
Flight Ticket Price
0
10000
20000
30000
40000
50000
60000
70000
80000
Air Asia
Air India
GoAir
IndiGo
Jet Airways
Jet Airways Business
Multiple carriers
Multiple carriers Premium economy
SpiceJet
Trujet
Vistara
Vistara Premium economy
Airline Name

In [797…
```
sns.catplot(y = "Price", x = "Airline", data = data.sort_values("Price", ascending = False), kind="boxen", height = 6, aspect = 
plt.show()
```

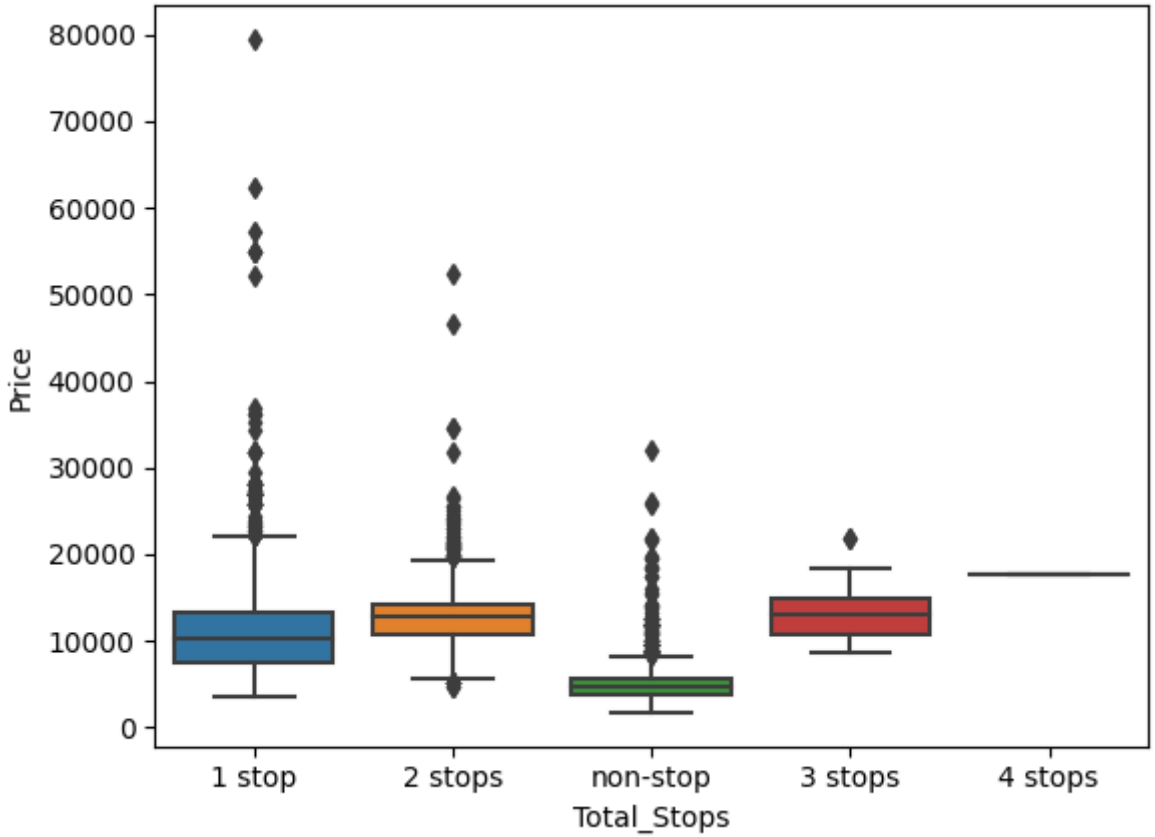


In [798…
```
sns.boxplot(y = "Price", x = "Source", data = data.sort_values("Price", ascending = False))
plt.show()
```



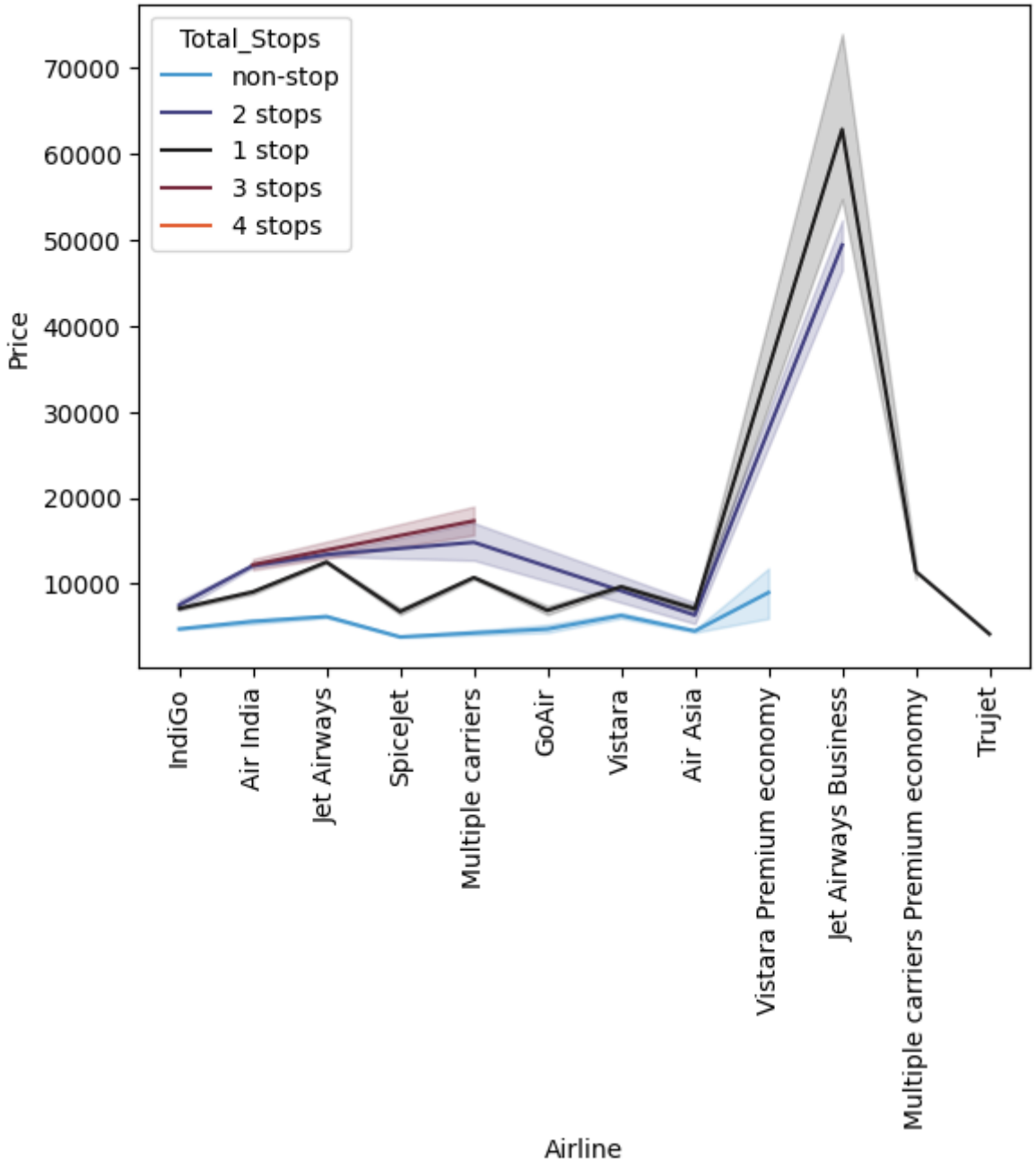
In [799…

```
sns.boxplot(y = "Price", x = "Total_Stops", data = data.sort_values("Price", ascending = False))
plt.show()
```



In [800…

```
sns.lineplot(data, x =  'Airline', y = 'Price',hue = 'Total_Stops', palette='icefire' )
plt.xticks(rotation = 90)
plt.show()
```


Total_Stops
non-stop
2 stops
1 stop
3 stops
4 stops
Price
70000
60000
50000
40000
30000
20000
10000
IndiGo
Air India
Jet Airways
SpiceJet
Multiple carriers
GoAir
Vistara
Air Asia
Vistara Premium economy
Jet Airways Business
Multiple carriers Premium economy
Trujet
Airline

1-Stop Fights with Jet Airways Business are the costliest followed by the 2-Stop flights with the same Non stop flights are the cheapest across the board

In [801…
```
#OneHotEncoding -----> Nominal data
Source = data[["Source"]]
Source = pd.get_dummies(data['Source'],drop_first=True)
Source.head()
```

Out[801]:

	Chennai	Delhi	Kolkata	Mumbai
0	0	0	0	0
1	0	0	1	0
2	0	1	0	0
3	0	0	1	0
4	0	0	0	0

In [802…
```
# As Destination is Nominal Categorical data we will perform OneHotEncoding
Destination = data[["Destination"]]
Destination = pd.get_dummies(Destination, drop_first = True)
Destination.head()
```

Out[802]:

	Destination_Cochin	Destination_Delhi	Destination_Hyderabad	Destination_Kolkata	Destination_New Delhi
0	0	0	0	0	1
1	0	0	0	0	0
2	1	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	1

In [803…
```
# droping column, because Additinal_info has since 80 % has no information
# Route---> is related to no of stops
data.drop(["Route", "Additional_Info"], axis = 1, inplace = True)
```

In [804…
```
data['Total_Stops'].value_counts()
# As this is case of Ordinal Categorical type we perform LabelEncoder
#we replace the values in key values
data.replace({'non-stop':0,'1 stop':1,'2 stops':2,'3 stops':3,'4 stops':4},inplace=True)
data.head()
```

Out[804]:

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price
0	IndiGo	24-03-2019	Bengaluru	New Delhi	22:20	22-03-2020 01:10	2h 50m	0	3897
1	Air India	01-05-2019	Kolkata	Bengaluru	05:50	13:15	7h 25m	2	7662
2	Jet Airways	09-06-2019	Delhi	Cochin	09:25	10-06-2020 04:25	19h	2	13882
3	IndiGo	12-05-2019	Kolkata	Bengaluru	18:05	23:30	5h 25m	1	6218
4	IndiGo	01-03-2019	Bengaluru	New Delhi	16:50	21:35	4h 45m	1	13302

In [805…
```
# Heatmap
plt.figure(figsize=(15,10))
sns.heatmap(data.corr(),annot = True, cmap = "RdYlGn")
```

Out[805]:
```
<Axes: >
```


Total_Stops
Price
1
0.6
0.6
1
Total_Stops
Price
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65

In [806…

```
data["Date_of_Journey"] = pd.to_datetime(data["Date_of_Journey"])
data["day"] = data["Date_of_Journey"].dt.day_name()
```

```
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '24-03-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '24-06-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '27-05-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '18-04-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '24-04-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '15-04-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '21-03-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '15-05-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '18-06-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '15-06-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '18-05-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '27-06-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '21-05-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '15-03-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '24-05-2019' in DD/MM/YYYY form
```

```
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '21-04-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '21-06-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '27-03-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '18-03-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
/usr/local/lib/python3.9/dist-packages/pandas/core/tools/datetimes.py:1047: UserWarning: Parsing '27-04-2019' in DD/MM/YYYY form
at. Provide format or specify infer_datetime_format=True for consistent parsing.
  cache_array = _maybe_cache(arg, format, cache, convert_listlike)
```

In [807…

```
data.head()
```

Out[807]:

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
0	IndiGo	2019-03-24	Bengaluru	New Delhi	22:20	22-03-2020 01:10	2h 50m	0	3897	Sunday
1	Air India	2019-01-05	Kolkata	Bengaluru	05:50	13:15	7h 25m	2	7662	Saturday
2	Jet Airways	2019-09-06	Delhi	Cochin	09:25	10-06-2020 04:25	19h	2	13882	Friday
3	IndiGo	2019-12-05	Kolkata	Bengaluru	18:05	23:30	5h 25m	1	6218	Thursday
4	IndiGo	2019-01-03	Bengaluru	New Delhi	16:50	21:35	4h 45m	1	13302	Thursday

In [808…

```
data.replace({'Monday':1,'Tuesday':2,'Wednesday':3,'Thursday':4,'Friday':5,'Saturday':6,'Sunday':7},inplace=True)
```

In [809…

```
data.head()
```

Out[809]:

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
0	IndiGo	2019-03-24	Bengaluru	New Delhi	22:20	22-03-2020 01:10	2h 50m	0	3897	7
1	Air India	2019-01-05	Kolkata	Bengaluru	05:50	13:15	7h 25m	2	7662	6
2	Jet Airways	2019-09-06	Delhi	Cochin	09:25	10-06-2020 04:25	19h	2	13882	5
3	IndiGo	2019-12-05	Kolkata	Bengaluru	18:05	23:30	5h 25m	1	6218	4
4	IndiGo	2019-01-03	Bengaluru	New Delhi	16:50	21:35	4h 45m	1	13302	4

In [810…

```
data.tail(50)
```

Out[810]:

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
10633	Multiple carriers	2019-05-27	Delhi	Cochin	18:15	28-05-2020 01:30	7h 15m	1	7308	1
10634	Jet Airways	2019-06-06	Delhi	Cochin	09:40	07-06-2020 12:35	26h 55m	2	11733	4
10635	Jet Airways	2019-01-06	Delhi	Cochin	22:50	02-06-2020 12:35	13h 45m	1	14714	7
10636	Jet Airways	2019-05-15	Kolkata	Bengaluru	06:30	12:00	5h 30m	1	14388	3
10637	Jet Airways	2019-04-24	Bengaluru	Delhi	18:55	22:00	3h 5m	0	7229	3
10638	Jet Airways	2019-03-21	Bengaluru	New Delhi	21:25	19-03-2020 11:25	14h	1	7832	4
10639	Air India	2019-03-06	Delhi	Cochin	05:15	04-06-2020 19:15	38h	3	10493	3
10640	Jet Airways	2019-09-03	Delhi	Cochin	18:15	10-03-2020 18:50	24h 35m	1	14053	2
10641	IndiGo	2019-06-03	Chennai	Kolkata	07:55	10:15	2h 20m	0	7295	1
10642	Air India	2019-05-21	Kolkata	Bengaluru	08:20	22-05-2020 11:10	26h 50m	2	11222	2
10643	Multiple carriers	2019-05-18	Delhi	Cochin	19:00	19-05-2020 01:30	6h 30m	1	7670	6
10644	Multiple carriers	2019-06-06	Delhi	Cochin	10:35	19:00	8h 25m	1	10877	4
10645	Multiple carriers	2019-03-03	Delhi	Cochin	07:05	15:30	8h 25m	1	17057	7
10646	Jet Airways	2019-06-06	Delhi	Cochin	05:30	19:00	13h 30m	2	11507	4
10647	Jet Airways	2019-06-18	Delhi	Cochin	09:50	13:05	3h 15m	0	4466	2
10648	Air India	2019-01-06	Delhi	Cochin	16:55	02-06-2020 19:15	26h 20m	2	13801	7
10649	IndiGo	2019-01-03	Kolkata	Bengaluru	21:25	02-03-2020 00:05	2h 40m	0	4778	4
10650	Jet Airways	2019-05-15	Kolkata	Bengaluru	09:35	18:00	8h 25m	1	12384	3
10651	Multiple carriers	2019-06-27	Delhi	Cochin	04:55	12:35	7h 40m	1	10678	4
10652	Air India	2019-09-03	Delhi	Cochin	05:15	10-03-2020 06:50	25h 35m	1	9790	2
10653	Jet Airways	2019-01-05	Kolkata	Bengaluru	14:05	02-05-2020 12:00	21h 55m	1	14388	6
10654	SpiceJet	2019-12-06	Bengaluru	Delhi	05:55	08:35	2h 40m	0	4319	5
10655	Jet Airways	2019-03-05	Mumbai	Hyderabad	02:55	04:20	1h 25m	0	5678	2
10656	Vistara	2019-06-04	Bengaluru	Delhi	07:00	09:40	2h 40m	0	5613	2

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
10657	Jet Airways	2019-06-05	Kolkata	Bengaluru	20:00	07-05-2020 09:20	13h 20m	1	9663	3
10658	Jet Airways	2019-06-18	Bengaluru	Delhi	11:10	14:05	2h 55m	0	5769	2
10659	Vistara	2019-01-05	Bengaluru	Delhi	21:00	23:50	2h 50m	0	4668	6
10660	Vistara	2019-03-21	Bengaluru	New Delhi	21:10	19-03-2020 00:05	2h 55m	0	4878	4
10661	Air India	2019-09-05	Delhi	Cochin	13:00	19:15	6h 15m	1	8372	4
10662	Air India	2019-03-24	Kolkata	Bengaluru	09:25	25-03-2020 05:35	20h 10m	2	12352	7
10663	Jet Airways	2019-06-06	Delhi	Cochin	19:30	07-06-2020 12:35	17h 5m	2	11733	4
10664	IndiGo	2019-09-04	Bengaluru	Delhi	18:55	21:50	2h 55m	0	4823	3
10665	IndiGo	2019-04-27	Kolkata	Bengaluru	15:15	17:45	2h 30m	0	4804	6
10666	Jet Airways	2019-12-06	Delhi	Cochin	18:15	13-06-2020 19:00	24h 45m	1	10262	5
10667	Jet Airways	2019-12-03	Bengaluru	New Delhi	22:55	13-03-2020 20:20	21h 25m	1	11087	2
10668	Jet Airways	2019-09-05	Delhi	Cochin	11:40	19:00	7h 20m	2	21219	4
10669	Air India	2019-06-15	Delhi	Cochin	08:00	19:15	11h 15m	1	9929	6
10670	Air India	2019-12-05	Kolkata	Bengaluru	05:50	23:15	17h 25m	2	11411	4
10671	Air India	2019-06-06	Mumbai	Hyderabad	21:05	22:25	1h 20m	0	3100	4
10672	Jet Airways	2019-06-27	Delhi	Cochin	23:05	28-06-2020 19:00	19h 55m	2	11150	4
10673	Jet Airways	2019-05-27	Delhi	Cochin	13:25	28-05-2020 04:25	15h	2	16704	1
10674	Jet Airways	2019-12-03	Bengaluru	New Delhi	20:35	13-03-2020 21:20	24h 45m	1	11087	2
10675	Air India	2019-09-06	Mumbai	Hyderabad	06:20	07:40	1h 20m	0	3100	5
10676	Multiple carriers	2019-01-05	Delhi	Cochin	10:20	19:00	8h 40m	1	9794	6
10677	SpiceJet	2019-05-21	Bengaluru	Delhi	05:55	08:35	2h 40m	0	3257	2
10678	Air Asia	2019-09-04	Kolkata	Bengaluru	19:55	22:25	2h 30m	0	4107	3
10679	Air India	2019-04-27	Kolkata	Bengaluru	20:45	23:20	2h 35m	0	4145	6
10680	Jet Airways	2019-04-27	Bengaluru	Delhi	08:20	11:20	3h	0	7229	6

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
10681	Vistara	2019-01-03	Bengaluru	New Delhi	11:30	14:10	2h 40m	0	12648	4
10682	Air India	2019-09-05	Delhi	Cochin	10:55	19:15	8h 20m	2	11753	4

Develop and test the hypothesis:

1. Flight Prices on Weekdays are cheaper than flight prices on weekends.

Null Hypothesis: There is no significant difference between the flight prices on weekdays and flight prices on weekends

Alternate hypothesis: There is significant difference between the flight prices on weekdays and flight prices on weekends

In [811…

```
from scipy.stats import chi2_contingency
weekday_prices = data[data["day"] <= 5]["Price"]
weekend_prices = data[data["day"] > 5]["Price"]
observed = pd.DataFrame({
    "Weekday": [len(weekday_prices), weekday_prices.mean()],
    "Weekend": [len(weekend_prices), weekend_prices.mean()]}, index=["Count", "Mean"])

observed
```

Out[811]:

	Weekday	Weekend
Count	8418.000000	2265.00000
Mean	9055.336303	9204.98234

In [812…

```
#n = observed["Count"].sum()
n=10683
weekday_prop = observed.loc["Count", "Weekday"] / n
expected = pd.DataFrame({
    "Weekday": [n * weekday_prop, weekday_prices.mean()],
```

```
    "Weekend": [n * (1 - weekday_prop), weekend_prices.mean()]
}, index=["Count", "Mean"])

chi2, p, dof, expected = chi2_contingency(observed, correction=False)
print(f"Chi-square statistic: {chi2:.4f}")
print("p-value:", p_value)
```

```
Chi-square statistic: 2403.3136
p-value: 2.444279106755177e-07
```

SInce the p-value of the given condition is less than 0.05 which implies that we can reject the null hypothesis and go with the alternate hypothesis which again tells us that there is a significant difference between the flight prices on weekdays and flight prices on weekends

Develop and test the hypothesis:

1. Flight Prices during peak hours (9 AM till 9 PM) are costlier than flights at other times.

Null Hypothesis: There is no significant difference between the flight prices during peak hours (9 AM till 9 PM) and flight prices at other times.

Alternate hypothesis: There is significant difference between the flight prices during peak hours (9 AM till 9 PM) and flight prices at other times.

In [813…
```
from scipy.stats import ttest_ind
```

In [814…
```
data['Dep_Time'] = data['Dep_Time'].str.replace(':', '')
```

In [815…
```
data.head()
```

Out[815]:

	Airline	Date_of_Journey	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day
0	IndiGo	2019-03-24	Bengaluru	New Delhi	2220	22-03-2020 01:10	2h 50m	0	3897	7
1	Air India	2019-01-05	Kolkata	Bengaluru	0550	13:15	7h 25m	2	7662	6
2	Jet Airways	2019-09-06	Delhi	Cochin	0925	10-06-2020 04:25	19h	2	13882	5
3	IndiGo	2019-12-05	Kolkata	Bengaluru	1805	23:30	5h 25m	1	6218	4
4	IndiGo	2019-01-03	Bengaluru	New Delhi	1650	21:35	4h 45m	1	13302	4

In [816…

```
peak_hours = data[(data['Dep_Time'] >= '0900') & (data['Dep_Time'] <= '2100')]
other_times = data[(data['Dep_Time'] < '0900') | (data['Dep_Time'] > '2100')]
t_stat, p_value = ttest_ind(peak_hours['Price'], other_times['Price'], equal_var=False)
alpha = 0.05
print("p-value:", p_value)
if p_value < alpha:
    print("Reject null hypothesis")
else:
    print("Failed to reject null hypothesis")
```

```
p-value: 2.444279106755177e-07
Reject null hypothesis
```

SInce the p-value of the given condition is zero which implies that we can reject the null hypothesis and go with the alternate hypothesis which again tells us that there is significant difference between the flight prices during peak hours (9 AM till 9 PM) and flight prices at other times.

Resolving journey month and date

In [817…

```
data['Dep_Time'] = data['Dep_Time'].str[:2] + ':' + data['Dep_Time'].str[2:]
```

In [818…

```
data['Journey_day']= pd.to_datetime(data.Date_of_Journey, format='%d/%m/%Y').dt.day
data['Journey_month']=pd.to_datetime(data.Date_of_Journey, format='%d/%m/%Y').dt.month
```

In [819…

```
data.drop(['Date_of_Journey'], axis=1, inplace=True)
```

In [820…
```
data.head()
```

Out[820]:

	Airline	Source	Destination	Dep_Time	Arrival_Time	Duration	Total_Stops	Price	day	Journey_day	Journey_month
0	IndiGo	Bengaluru	New Delhi	22:20	22-03-2020 01:10	2h 50m	0	3897	7	24	3
1	Air India	Kolkata	Bengaluru	05:50	13:15	7h 25m	2	7662	6	5	1
2	Jet Airways	Delhi	Cochin	09:25	10-06-2020 04:25	19h	2	13882	5	6	9
3	IndiGo	Kolkata	Bengaluru	18:05	23:30	5h 25m	1	6218	4	5	12
4	IndiGo	Bengaluru	New Delhi	16:50	21:35	4h 45m	1	13302	4	3	1

In [821…
```
data['Dep_hour']=pd.to_datetime(data['Dep_Time']).dt.hour
data['Dep_min']=pd.to_datetime(data['Dep_Time']).dt.minute
```

In [822…
```
data.drop(['Dep_Time'], axis=1, inplace=True)
```

In [823…
```
data['Arrival_hour']=pd.to_datetime(data['Arrival_Time']).dt.hour
data['Arrival_min']=pd.to_datetime(data['Arrival_Time']).dt.minute
```

In [824…
```
data.drop(['Arrival_Time'], axis=1, inplace=True)
```

In [825…
```
duration=list(data['Duration'])

for i in range(len(duration)):
    if len(duration[i].split()) != 2:
        if "h" in duration[i]:
            duration[i] = duration[i].strip() + " 0m"
        else:
            duration[i] = "0h " + duration[i]

duration_hours = []
duration_mins = []
for i in range(len(duration)):
    duration_hours.append(int(duration[i].split(sep = "h")[0]))
    duration_mins.append(int(duration[i].split(sep = "m")[0].split()[-1]))
```

In [826…
```
data['Duration_hours']=duration_hours
data['Duration_mins']=duration_mins
```

In [827…
```
data.drop(['Duration'], axis=1, inplace=True)
```

In [828…
```
data['Airline'].value_counts()
```

Out[828]:
```
Jet Airways                          3849
IndiGo                               2053
Air India                            1752
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: Airline, dtype: int64
```

In [829…
```
Airline=data[['Airline']]
Airline=pd.get_dummies(Airline,  drop_first=True)
Airline.head()
```

Out[829]:

	Airline_Air India	Airline_GoAir	Airline_IndiGo	Airline_Jet Airways	Airline_Jet Airways Business	Airline_Multiple carriers	Airline_Multiple carriers Premium economy	Airline_SpiceJet	Airline_Trujet	Airline_Vistara	Airli
0	0	0	1	0	0	0	0	0	0	0	
1	1	0	0	0	0	0	0	0	0	0	
2	0	0	0	1	0	0	0	0	0	0	
3	0	0	1	0	0	0	0	0	0	0	
4	0	0	1	0	0	0	0	0	0	0	

In [830…
```
data['Source'].value_counts()
```

Out[830]:
```
Delhi        4537
Kolkata      2871
Bengaluru    2197
Mumbai        697
Chennai       381
Name: Source, dtype: int64
```

In [831…
```
Source=data[['Source']]
Source=pd.get_dummies(Source, drop_first=True)
Source.head()
```

Out[831]:

	Source_Chennai	Source_Delhi	Source_Kolkata	Source_Mumbai
0	0	0	0	0
1	0	0	1	0
2	0	1	0	0
3	0	0	1	0
4	0	0	0	0

In [832…
```
data['Destination'].value_counts()
```

Out[832]:
```
Cochin       4537
Bengaluru    2871
Delhi        1265
New Delhi     932
Hyderabad     697
Kolkata       381
Name: Destination, dtype: int64
```

In [833…
```
Destination=data[['Destination']]
Destination=pd.get_dummies(Destination, drop_first=True)
Destination.head()
```

Out[833]:

	Destination_Cochin	Destination_Delhi	Destination_Hyderabad	Destination_Kolkata	Destination_New Delhi
0	0	0	0	0	1
1	0	0	0	0	0
2	1	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	1

In [834…

```
data
```

Out[834]:

	Airline	Source	Destination	Total_Stops	Price	day	Journey_day	Journey_month	Dep_hour	Dep_min	Arrival_hour	Arrival_min	Duration_
0	IndiGo	Bengaluru	New Delhi	0	3897	7	24	3	22	20	1	10	
1	Air India	Kolkata	Bengaluru	2	7662	6	5	1	5	50	13	15	
2	Jet Airways	Delhi	Cochin	2	13882	5	6	9	9	25	4	25	
3	IndiGo	Kolkata	Bengaluru	1	6218	4	5	12	18	5	23	30	
4	IndiGo	Bengaluru	New Delhi	1	13302	4	3	1	16	50	21	35	
...	...	...	...	...	...	...	...	...	...	...	...	...	
10678	Air Asia	Kolkata	Bengaluru	0	4107	3	4	9	19	55	22	25	
10679	Air India	Kolkata	Bengaluru	0	4145	6	27	4	20	45	23	20	
10680	Jet Airways	Bengaluru	Delhi	0	7229	6	27	4	8	20	11	20	
10681	Vistara	Bengaluru	New Delhi	0	12648	4	3	1	11	30	14	10	
10682	Air India	Delhi	Cochin	2	11753	4	5	9	10	55	19	15	

10683 rows × 14 columns

In [835…

```
data_train=pd.concat([data, Airline, Source, Destination], axis=1)
data_train.head()
```

Out[835]:

	Airline	Source	Destination	Total_Stops	Price	day	Journey_day	Journey_month	Dep_hour	Dep_min	...	Airline_Vistara Premium economy	Source_Chennai	Sour
0	IndiGo	Bengaluru	New Delhi	0	3897	7	24	3	22	20	...	0	0	
1	Air India	Kolkata	Bengaluru	2	7662	6	5	1	5	50	...	0	0	
2	Jet Airways	Delhi	Cochin	2	13882	5	6	9	9	25	...	0	0	
3	IndiGo	Kolkata	Bengaluru	1	6218	4	5	12	18	5	...	0	0	
4	IndiGo	Bengaluru	New Delhi	1	13302	4	3	1	16	50	...	0	0	

5 rows × 34 columns

In [836…
```
data_train.drop(['Airline', 'Source', 'Destination'], axis=1, inplace=True)
```

In [837…
```
data_train
```

Out[837]:

	Total_Stops	Price	day	Journey_day	Journey_month	Dep_hour	Dep_min	Arrival_hour	Arrival_min	Duration_hours	...	Airline_Vistara Premium economy	Source
0	0	3897	7	24	3	22	20	1	10	2	...	0	
1	2	7662	6	5	1	5	50	13	15	7	...	0	
2	2	13882	5	6	9	9	25	4	25	19	...	0	
3	1	6218	4	5	12	18	5	23	30	5	...	0	
4	1	13302	4	3	1	16	50	21	35	4	...	0	
...	...	...	...	...	...	...	...	...	...	...	...	...	
10678	0	4107	3	4	9	19	55	22	25	2	...	0	
10679	0	4145	6	27	4	20	45	23	20	2	...	0	
10680	0	7229	6	27	4	8	20	11	20	3	...	0	
10681	0	12648	4	3	1	11	30	14	10	2	...	0	
10682	2	11753	4	5	9	10	55	19	15	8	...	0	

10683 rows × 31 columns

In [838...
```
data_train.shape
```

Out[838]:
```
(10683, 31)
```

Feature selection

In [839...
```
x=data_train.loc[:, ['Total_Stops', 'Journey_day', 'Journey_month', 'Dep_hour',
       'Dep_min', 'Arrival_hour', 'Arrival_min', 'Duration_hours',
       'Duration_mins', 'Airline_Air India', 'Airline_GoAir', 'Airline_IndiGo',
       'Airline_Jet Airways', 'Airline_Jet Airways Business',
       'Airline_Multiple carriers',
       'Airline_Multiple carriers Premium economy', 'Airline_SpiceJet',
       'Airline_Trujet', 'Airline_Vistara', 'Airline_Vistara Premium economy',
```

```
       'Source_Chennai', 'Source_Delhi', 'Source_Kolkata', 'Source_Mumbai',
       'Destination_Cochin', 'Destination_Delhi', 'Destination_Hyderabad',
       'Destination_Kolkata', 'Destination_New Delhi']]
x.head()
```

Out[839]:

	Total_Stops	Journey_day	Journey_month	Dep_hour	Dep_min	Arrival_hour	Arrival_min	Duration_hours	Duration_mins	Airline_Air India	...	Airline_Vista Premiu econon
0	0	24	3	22	20	1	10	2	50	0	...	
1	2	5	1	5	50	13	15	7	25	1	...	
2	2	6	9	9	25	4	25	19	0	0	...	
3	1	5	12	18	5	23	30	5	25	0	...	
4	1	3	1	16	50	21	35	4	45	0	...	

5 rows × 29 columns

In [840…

```
y=data_train.iloc[:, 1]
y.head()
```

Out[840]:

```
0     3897
1     7662
2    13882
3     6218
4    13302
Name: Price, dtype: int64
```

Model Creation and testing

In [841…

```
from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x,y,test_size=0.2, random_state=0)
```

Multiple linear regression

In [842...
```
from sklearn.linear_model import LinearRegression
regressor=LinearRegression()
regressor.fit(x_train, y_train)
y_pred = regressor.predict(x_test)
regressor.score(x_train, y_train)
print("Accuracy in MLP: ",regressor.score(x_test, y_test)*100)
```

```
Accuracy in MLP:  56.680690784392866
```

Decision Tree

In [843...
```
from sklearn.tree import DecisionTreeRegressor
regressor=DecisionTreeRegressor(random_state=0)
regressor.fit(x_train, y_train)
y_pred=regressor.predict(x_test)
regressor.score(x_train, y_train)
print("Accuracy in Decision Tree: ",regressor.score(x_test, y_test)*100)
```

```
Accuracy in Decision Tree:  67.69521133604076
```

Random Forest Regressor

In [844...
```
from sklearn.ensemble import RandomForestRegressor
regressor_rf=RandomForestRegressor(n_estimators=100, random_state=0)
regressor_rf.fit(x_train, y_train)
y_pred=regressor_rf.predict(x_test)
regressor_rf.score(x_train, y_train)
print("Accuracy in Decision Tree: ",regressor_rf.score(x_test, y_test)*100)
```

```
Accuracy in Decision Tree:  80.0546248133483
```

From the above we can see that we are getting the highest accuracy for random forest for dataset.

In [845...
```
from sklearn import metrics
```

In [846…
```
print("MAE value: ",metrics.mean_absolute_error(y_test, y_pred))
print("MSE value: ",metrics.mean_squared_error(y_test, y_pred))
print("R2 value: ",metrics.r2_score(y_test, y_pred))
```

```
MAE value:  1197.5462298245222
MSE value:  4223187.156698035
R2 value:  0.800546248133483
```

In [847…
```
import pickle
file = open('flight_model.pkl', 'wb')
pickle.dump(regressor_rf, file)
model=open('flight_model.pkl', 'rb')
flight_price=pickle.load(model)
```

Predictiong the price of flight of flight_test dtataset

In [869…
```
testing_data=pd.read_excel("/content/FlightPrice_test.xlsx")
```

In [870…
```
testing_data.head()
```

Out[870]:

	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 [871…
```
testing_data.isnull().sum()
```

Out[871]:
```
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 [875…
```
testing_data["Date_of_Journey"] = pd.to_datetime(testing_data["Date_of_Journey"])
testing_data["day"] =testing_data["Date_of_Journey"].dt.day_name()
testing_data.replace({'Monday':1,'Tuesday':2,'Wednesday':3,'Thursday':4,'Friday':5,'Saturday':6,'Sunday':7},inplace=True)
```

In [876…
```
# Date_of_Journey
testing_data["Journey_day"] = pd.to_datetime(testing_data.Date_of_Journey, format="%d/%m/%Y").dt.day
testing_data["Journey_month"] = pd.to_datetime(testing_data["Date_of_Journey"], format = "%d/%m/%Y").dt.month
testing_data.drop(["Date_of_Journey"], axis = 1, inplace = True)

# Dep_Time
testing_data["Dep_hour"] = pd.to_datetime(testing_data["Dep_Time"]).dt.hour
testing_data["Dep_min"] = pd.to_datetime(testing_data["Dep_Time"]).dt.minute
testing_data.drop(["Dep_Time"], axis = 1, inplace = True)

# Arrival_Time
testing_data["Arrival_hour"] = pd.to_datetime(testing_data.Arrival_Time).dt.hour
testing_data["Arrival_min"] = pd.to_datetime(testing_data.Arrival_Time).dt.minute
testing_data.drop(["Arrival_Time"], axis = 1, inplace = True)

# Duration
duration = list(testing_data["Duration"])

for i in range(len(duration)):
    if len(duration[i].split()) != 2:    # Check if duration contains only hour or mins
        if "h" in duration[i]:
            duration[i] = duration[i].strip() + " 0m"   # Adds 0 minute
        else:
            duration[i] = "0h " + duration[i]           # Adds 0 hour

duration_hours = []
duration_mins = []
```

```
for i in range(len(duration)):
    duration_hours.append(int(duration[i].split(sep = "h")[0]))    # Extract hours from duration
    duration_mins.append(int(duration[i].split(sep = "m")[0].split()[-1]))   # Extracts only minutes from duration

# Adding Duration column to test set
testing_data["Duration_hours"] = duration_hours
testing_data["Duration_mins"] = duration_mins
testing_data.drop(["Duration"], axis = 1, inplace = True)
```

In [877…

```
testing_data.head()
```

Out[877]:

	Airline	Source	Destination	Route	Total_Stops	Additional_Info	day	Journey_day	Journey_month	Dep_hour	Dep_min	Arrival_hour	Arrival_min
0	Jet Airways	Delhi	Cochin	DEL → BOM → COK	1 stop	No info	4	6	6	17	30	4	25
1	IndiGo	Kolkata	Banglore	CCU → MAA → BLR	1 stop	No info	4	5	12	6	20	10	20
2	Jet Airways	Delhi	Cochin	DEL → BOM → COK	1 stop	In-flight meal not included	2	21	5	19	15	19	0
3	Multiple carriers	Delhi	Cochin	DEL → BOM → COK	1 stop	No info	2	21	5	8	0	21	0
4	Air Asia	Banglore	Delhi	BLR → DEL	non-stop	No info	1	24	6	23	55	2	45

In [878…
```
testing_data['Airline'].unique()
```

Out[878]:
```
array(['Jet Airways', 'IndiGo', 'Multiple carriers', 'Air Asia',
       'Air India', 'Vistara', 'SpiceJet', 'Vistara Premium economy',
       'GoAir', 'Multiple carriers Premium economy',
       'Jet Airways Business'], dtype=object)
```

In [879…
```
Airline=testing_data[['Airline']]
Airline=pd.get_dummies(Airline,  drop_first=True)
```

In [880…
```
Source=testing_data[['Source']]
Source=pd.get_dummies(Source, drop_first=True)
```

In [881…
```
Destination=testing_data[['Destination']]
Destination=pd.get_dummies(Destination, drop_first=True)
```

In [882…
```
testing_data.drop(["Route", "Additional_Info"], axis = 1, inplace = True)
testing_data.replace({"non-stop": 0, "1 stop": 1, "2 stops": 2, "3 stops": 3, "4 stops": 4}, inplace = True)
test_data = pd.concat([testing_data, Airline, Source, Destination], axis = 1)
test_data.drop(["Airline", "Source", "Destination"], axis = 1, inplace = True)
```

In [883…
```
test_data.head()
```

Out[883]:

	Total_Stops	day	Journey_day	Journey_month	Dep_hour	Dep_min	Arrival_hour	Arrival_min	Duration_hours	Duration_mins	...	Airline_Vistara Premium economy	So
0	1	4	6	6	17	30	4	25	10	55	...	0	
1	1	4	5	12	6	20	10	20	4	0	...	0	
2	1	2	21	5	19	15	19	0	23	45	...	0	
3	1	2	21	5	8	0	21	0	13	0	...	0	
4	0	1	24	6	23	55	2	45	2	50	...	0	

5 rows × 29 columns

In [884…
```
test_data.columns
```

Out[884]:
```
Index(['Total_Stops', 'day', 'Journey_day', 'Journey_month', 'Dep_hour',
       'Dep_min', 'Arrival_hour', 'Arrival_min', 'Duration_hours',
       'Duration_mins', 'Airline_Air India', 'Airline_GoAir', 'Airline_IndiGo',
       'Airline_Jet Airways', 'Airline_Jet Airways Business',
       'Airline_Multiple carriers',
       'Airline_Multiple carriers Premium economy', 'Airline_SpiceJet',
       'Airline_Vistara', 'Airline_Vistara Premium economy', 'Source_Chennai',
       'Source_Delhi', 'Source_Kolkata', 'Source_Mumbai', 'Destination_Cochin',
       'Destination_Delhi', 'Destination_Hyderabad', 'Destination_Kolkata',
       'Destination_New Delhi'],
      dtype='object')
```

In [885…
```
test_data['Airline_Trujet'] =0
```

In [896…
```
test_data = test_data.drop('day', axis=1)
```

In [889…
```
import warnings
# Ignore specific warning
warnings.filterwarnings("ignore", message="Your warning message here")

# Ignore all warnings
warnings.filterwarnings("ignore")

# Your code here

# Reset warning filters
warnings.resetwarnings()
```

In [897…
```
import joblib

# Load the previously trained model
model = joblib.load('/content/flight_model.pkl')
```

In [900…
```
test_data = test_data[x.columns]
```

In [901…
```
predicted_prices = model.predict(test_data)
```

In [902…

```
np.savetxt('predicted_flight_prices.csv', predicted_prices, delimiter=',')
```