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

In [2]:
```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df
flight_df.drop(['Unnamed: 0'],axis=1,inplace=True)
flight_df
```

Out[2]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderab
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderab
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderab
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab

300153 rows × 11 columns

DATAFRAME QUICK CHECKS

In [3]:
```
cat=flight_df.select_dtypes(include='object').columns
num=flight_df.select_dtypes(exclude='object').columns
```

In [4]:
```
cat
```

Out[4]:
```
Index(['airline', 'flight', 'source_city', 'departure_time', 'stops',
       'arrival_time', 'destination_city', 'class'],
      dtype='object')
```

In [5]:
```
num
```

Out[5]:
```
Index(['duration', 'days_left', 'price'], dtype='object')
```

In [6]:
```
flight_df.head()
```

Out[6]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city	
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mumbai	E
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mumbai	E
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mumbai	E
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mumbai	E
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mumbai	E

In [7]:
```
flight_df.tail()
```

Out[7]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderabad
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderabad
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderabad
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderabad
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderabad

In [8]:
```
flight_df.shape
```

Out[8]:
```
(300153, 11)
```

In [9]:
```
flight_df.size
```

Out[9]:
```
3301683
```

In [10]:
```
flight_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 300153 entries, 0 to 300152
Data columns (total 11 columns):
 #   Column            Non-Null Count   Dtype  
---  ------            --------------   -----  
 0   airline           300153 non-null  object 
 1   flight            300153 non-null  object 
 2   source_city       300153 non-null  object 
 3   departure_time    300153 non-null  object 
 4   stops             300153 non-null  object 
 5   arrival_time      300153 non-null  object 
 6   destination_city  300153 non-null  object 
 7   class             300153 non-null  object 
 8   duration          300153 non-null  float64
 9   days_left         300153 non-null  int64  
 10  price             300153 non-null  int64  
dtypes: float64(1), int64(2), object(8)
memory usage: 25.2+ MB
```

In [11]:
```
flight_df.isnull().sum()
```

Out[11]:
```
airline             0
flight              0
source_city         0
departure_time      0
stops               0
arrival_time        0
destination_city    0
class               0
duration            0
days_left           0
price               0
dtype: int64
```

Catergorical Column Analysis

In [13]:
```
flight_df['airline'].unique()
```

Out[13]:
```
array(['SpiceJet', 'AirAsia', 'Vistara', 'GO_FIRST', 'Indigo',
       'Air_India'], dtype=object)
```

In [14]:
```
flight_df['airline'].nunique()
```

Out[14]:
```
6
```

In [15]:
```
flight_df['airline']
con=flight_df['airline']=='SpiceJet'
len(flight_df[con])
```

Out[15]:
```
9011
```

In [16]:
```
unique=flight_df['airline'].unique()
for i in unique:
    flight_df['airline']
    con=flight_df['airline']==i
    count=len(flight_df[con])
    print(f"the number of passengers travelling from {i} are : {count}" )
```

```
the number of passengers travelling from SpiceJet are : 9011
the number of passengers travelling from AirAsia are : 16098
the number of passengers travelling from Vistara are : 127859
the number of passengers travelling from GO_FIRST are : 23173
the number of passengers travelling from Indigo are : 43120
the number of passengers travelling from Air_India are : 80892
```

In [17]:
```
for i in flight_df['airline'].unique():
    con=flight_df['airline']==i
    print(f"the {len(flight_df[con])} number of passengers travelling from {i}")
```

```
the 9011 number of passengers travelling from SpiceJet
the 16098 number of passengers travelling from AirAsia
the 127859 number of passengers travelling from Vistara
the 23173 number of passengers travelling from GO_FIRST
the 43120 number of passengers travelling from Indigo
the 80892 number of passengers travelling from Air_India
```

In [18]:
```
unique=flight_df['airline'].unique()
count=[]
for i in unique:
    flight_df['airline']
    con=flight_df['airline']==i
    count.append(len(flight_df[con]))
```

In [19]:
```
count
```

Out[19]:
```
[9011, 16098, 127859, 23173, 43120, 80892]
```

Create a Frequency Table

In [21]:
```
cols=['airlines','no.of passengers']
pd.DataFrame(zip(unique,count),columns=cols)
```

Out[21]:

	airlines	no.of passengers
0	SpiceJet	9011
1	AirAsia	16098
2	Vistara	127859
3	GO_FIRST	23173
4	Indigo	43120
5	Air_India	80892

Create a table using value counts

In [23]:
```
flight_df['airline'].value_counts()
```

Out[23]:
```
airline
Vistara      127859
Air_India     80892
Indigo        43120
GO_FIRST      23173
AirAsia       16098
SpiceJet       9011
Name: count, dtype: int64
```

In [24]:
```
keys=flight_df['airline'].value_counts().keys()
values=flight_df['airline'].value_counts().values
```

In [25]:
```
keys
```

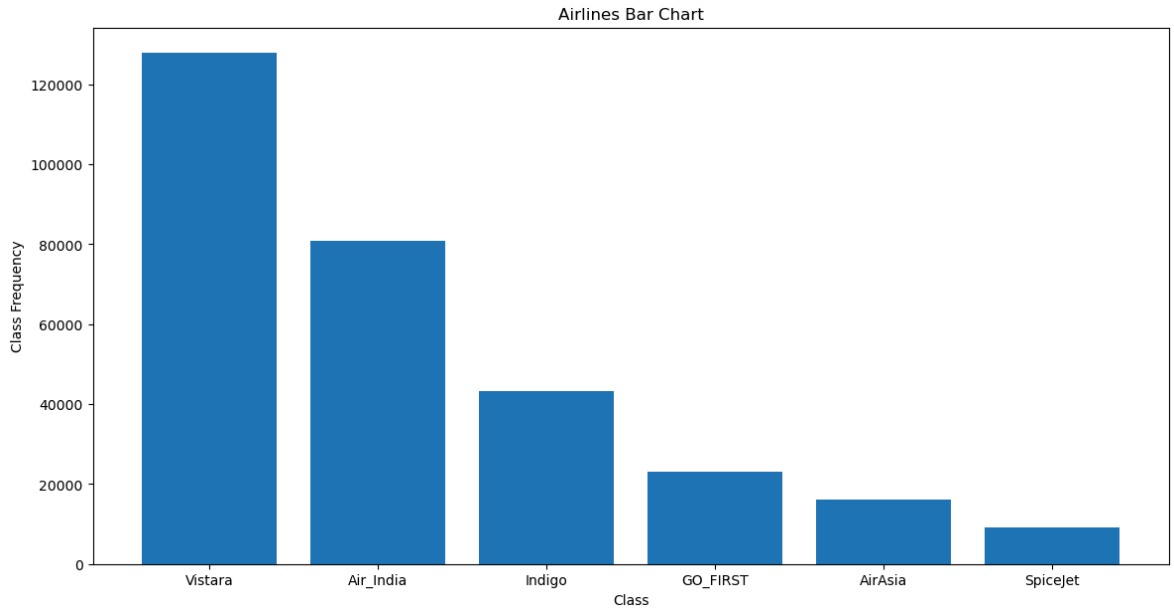
Out[25]:
```
Index(['Vistara', 'Air_India', 'Indigo', 'GO_FIRST', 'AirAsia', 'SpiceJet'], dt
ype='object', name='airline')
```

In [26]:
```
values
```

Out[26]:
```
array([127859,  80892,  43120,  23173,  16098,   9011], dtype=int64)
```

Bar Plot

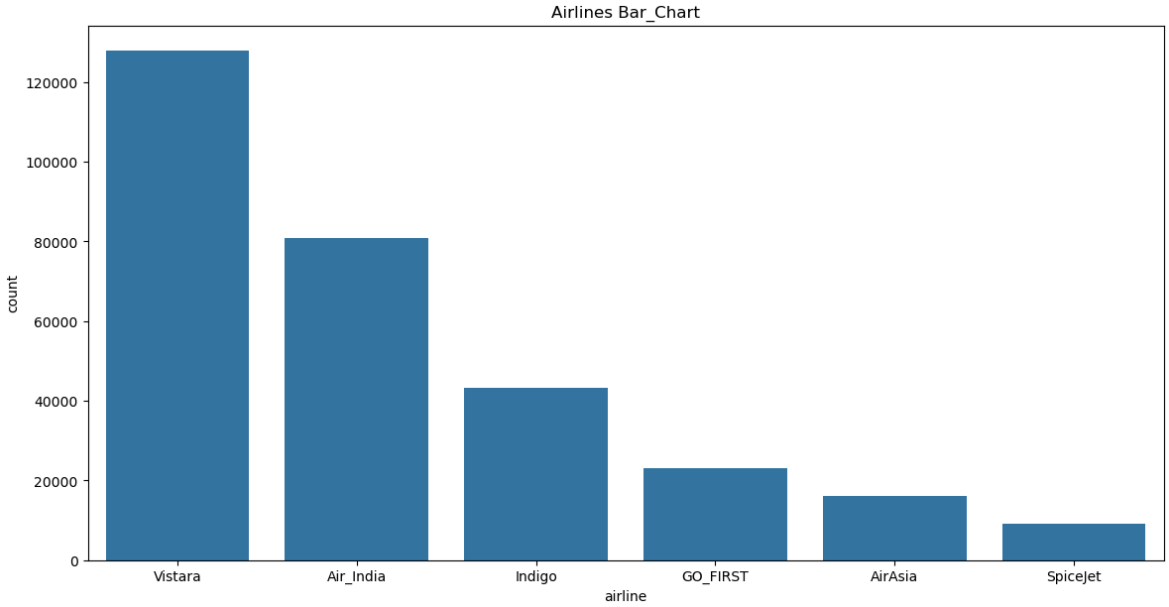
In [28]:
```
keys=flight_df['airline'].value_counts().keys()
values=flight_df['airline'].value_counts().values
plt.figure(figsize=(14,7))
plt.bar(keys,values)
plt.xlabel('Class')
plt.ylabel('Class Frequency')
plt.title('Airlines Bar Chart')
plt.savefig('Airlines_barchart.jpg')
plt.show()
```



Draw the bar plot using countplot

In [30]:
```
keys=flight_df['airline'].value_counts().keys()
plt.figure(figsize=(14,7))
sns.countplot(data=flight_df,x='airline',order=keys)
```

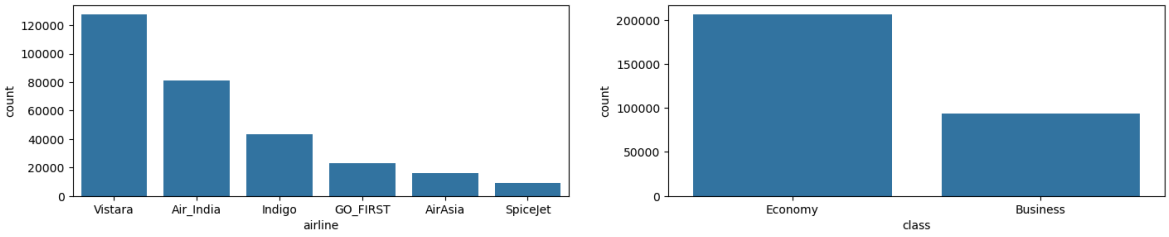
```
plt.title('Airlines Bar_Chart')
plt.show()
```



SubPlots

In [32]:
```
keys=flight_df['airline'].value_counts().keys()
plt.figure(figsize=(17,3))
plt.subplot(1,2,1)
sns.countplot(data=flight_df,x='airline',order=keys)

keys=flight_df['class'].value_counts().keys()
plt.subplot(1,2,2)
sns.countplot(data=flight_df,x='class',order=keys)
```

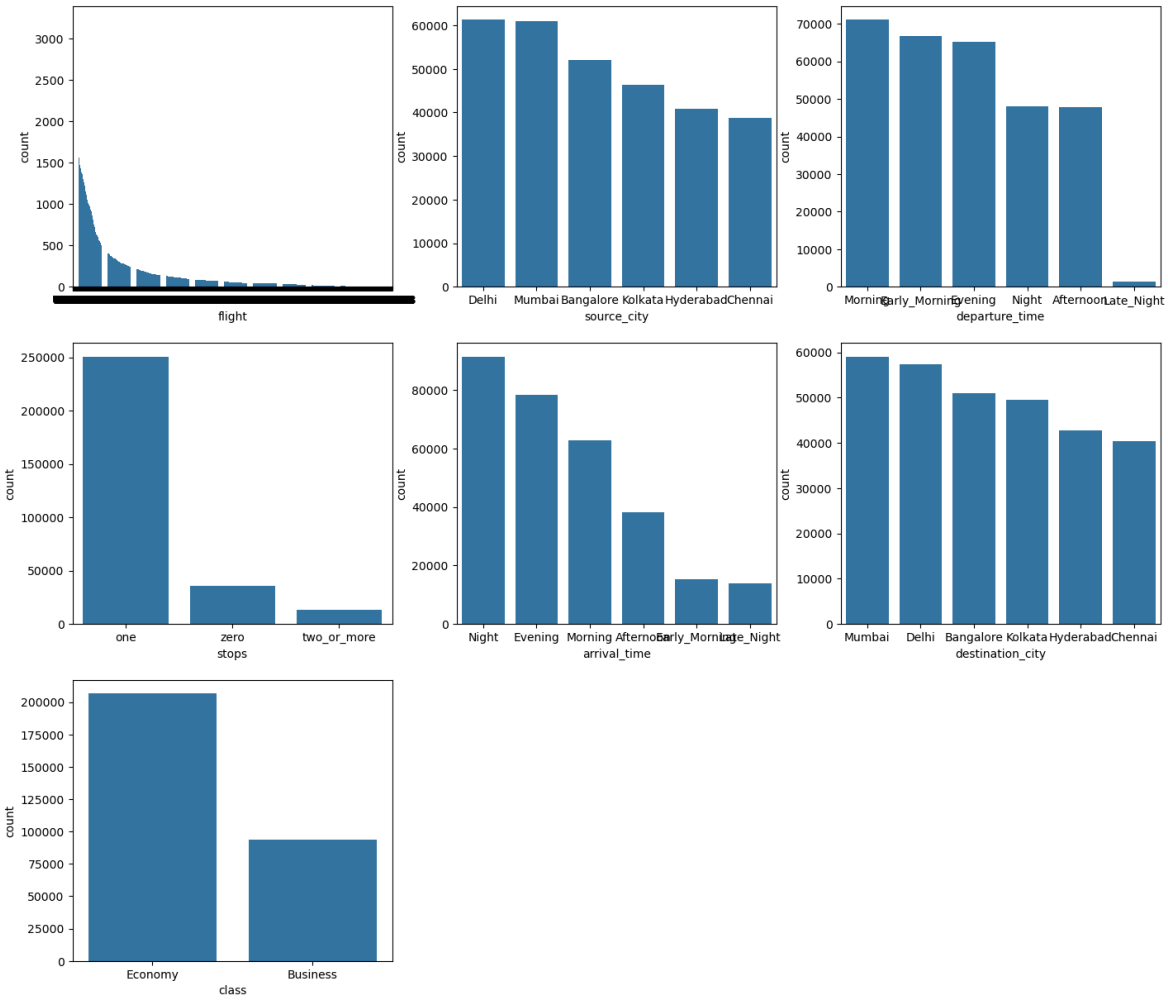
Out[32]:
```
<Axes: xlabel='class', ylabel='count'>
```



In [33]:
```
cat
```

Out[33]:
```
Index(['airline', 'flight', 'source_city', 'departure_time', 'stops',
       'arrival_time', 'destination_city', 'class'],
      dtype='object')
```

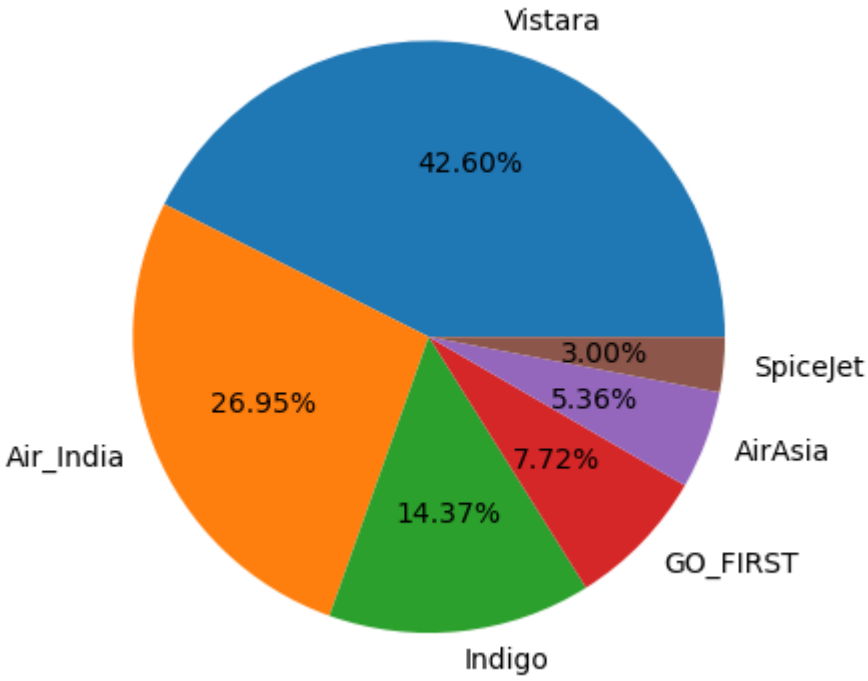
In [34]:
```
plt.figure(figsize=(17,15))
for i in range(1,8):
    keys=flight_df[cat[i]].value_counts().keys()
    plt.subplot(3,3,i)
    sns.countplot(data=flight_df,x=cat[i],order=keys)
```



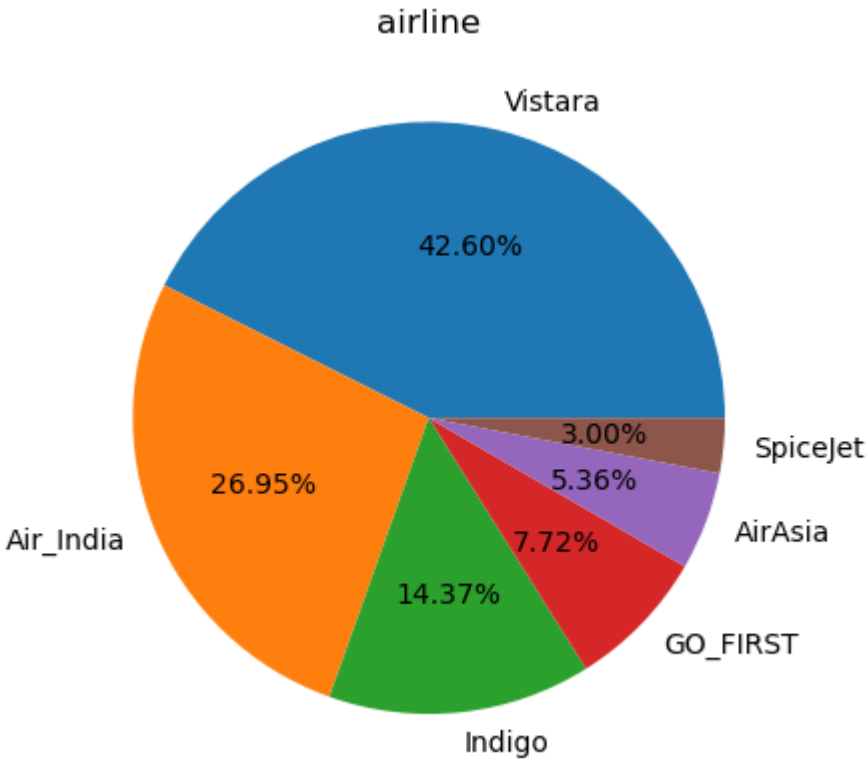
PieChart

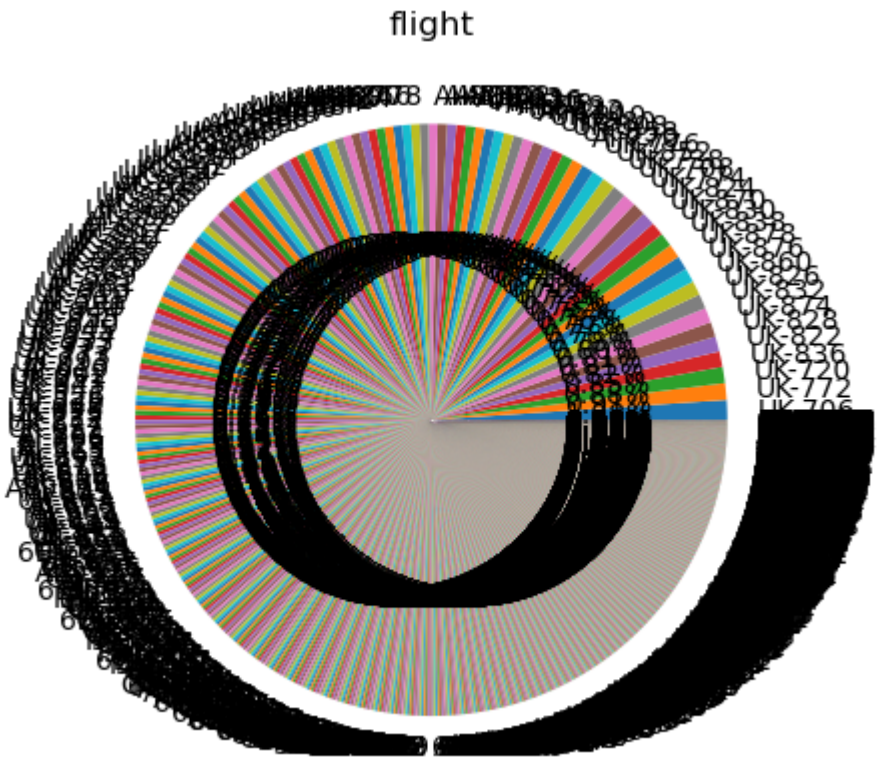
In [36]:
```
keys=flight_df['airline'].value_counts().keys()
values=flight_df['airline'].value_counts().values
plt.pie(values,labels=keys,autopct='%0.2f%%',radius=1)
```

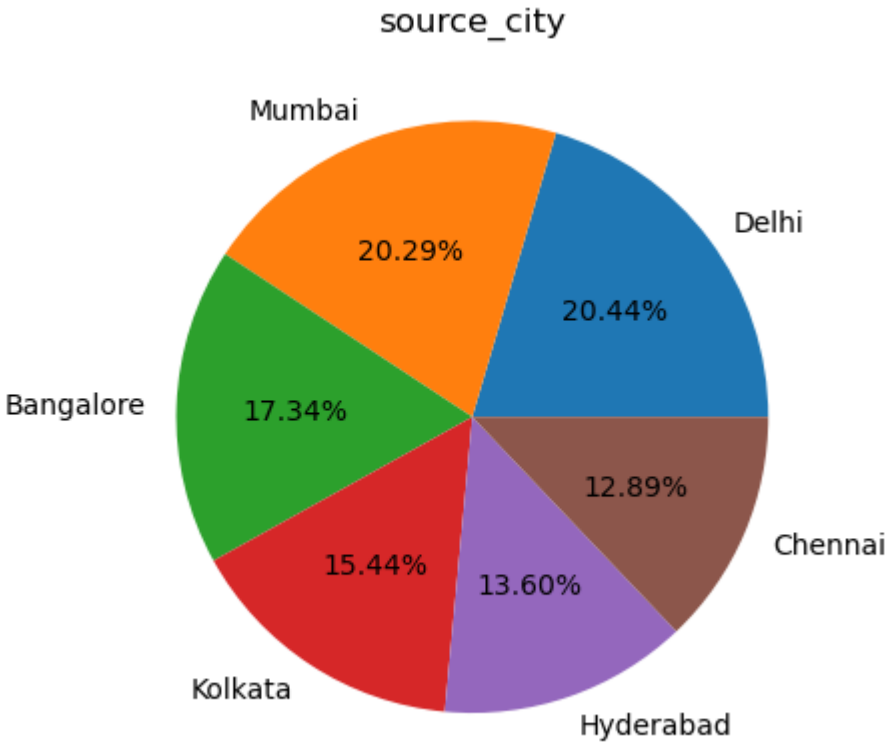
Out[36]:
```
([<matplotlib.patches.Wedge at 0x2018bdd4d10>,
  <matplotlib.patches.Wedge at 0x2018bc41ee0>,
  <matplotlib.patches.Wedge at 0x2018b20e030>,
  <matplotlib.patches.Wedge at 0x2018b20eb70>,
  <matplotlib.patches.Wedge at 0x2018b20f5f0>,
  <matplotlib.patches.Wedge at 0x2018b25c260>],
 [Text(0.2534976232555898, 1.0703919632563426, 'Vistara'),
  Text(-1.0208842955506634, -0.40962819128817995, 'Air_India'),
  Text(0.1194160755622762, -1.0934988801536585, 'Indigo'),
  Text(0.7911116107509573, -0.7642921034100942, 'GO_FIRST'),
  Text(1.0305975642945853, -0.384536942919752, 'AirAsia'),
  Text(1.0951112046845128, -0.10359270907952613, 'SpiceJet')],
 [Text(0.13827143086668534, 0.5838501617761868, '42.60%'),
  Text(-0.5568459793912709, -0.22343355888446176, '26.95%'),
  Text(0.065136041215787, -0.5964539346292682, '14.37%'),
  Text(0.43151542404597665, -0.41688660186005133, '7.72%'),
  Text(0.5621441259788645, -0.2097474234107738, '5.36%'),
  Text(0.5973333843733706, -0.05650511404337788, '3.00%')])
```

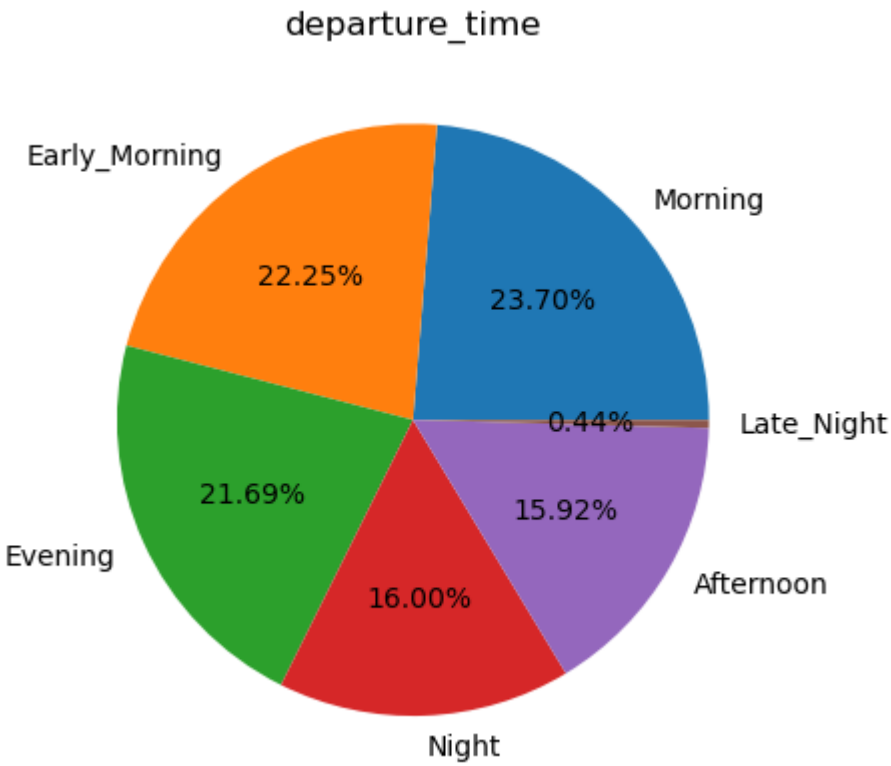


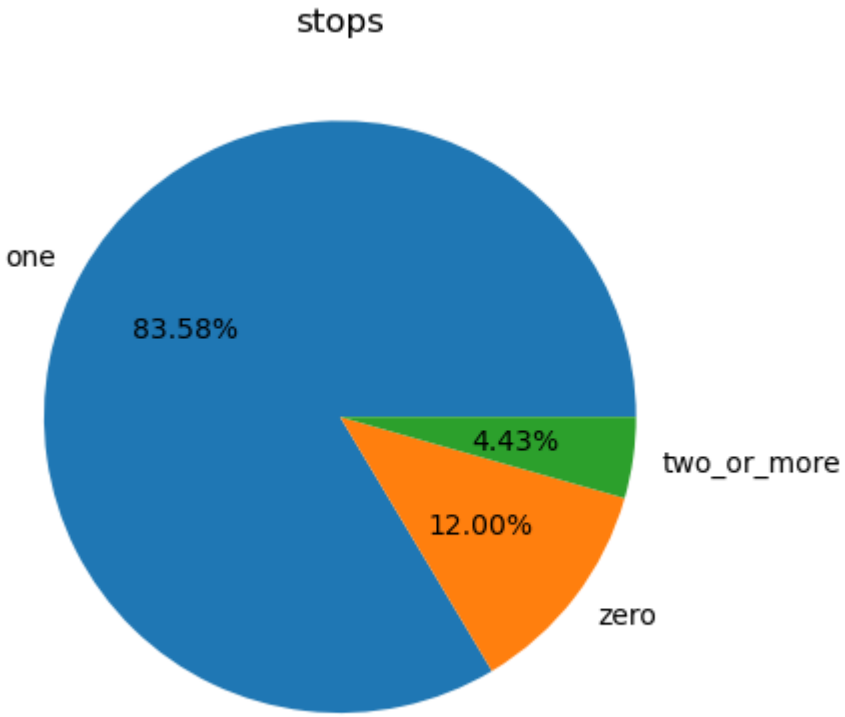
In [37]:
```
for i in cat:
 data=flight_df[i].value_counts()
 ke=data.keys()
 va=data.values
 plt.pie(labels=ke,x=va,autopct='%0.2f%%',radius=1)
 plt.title(i)
 plt.show()
```

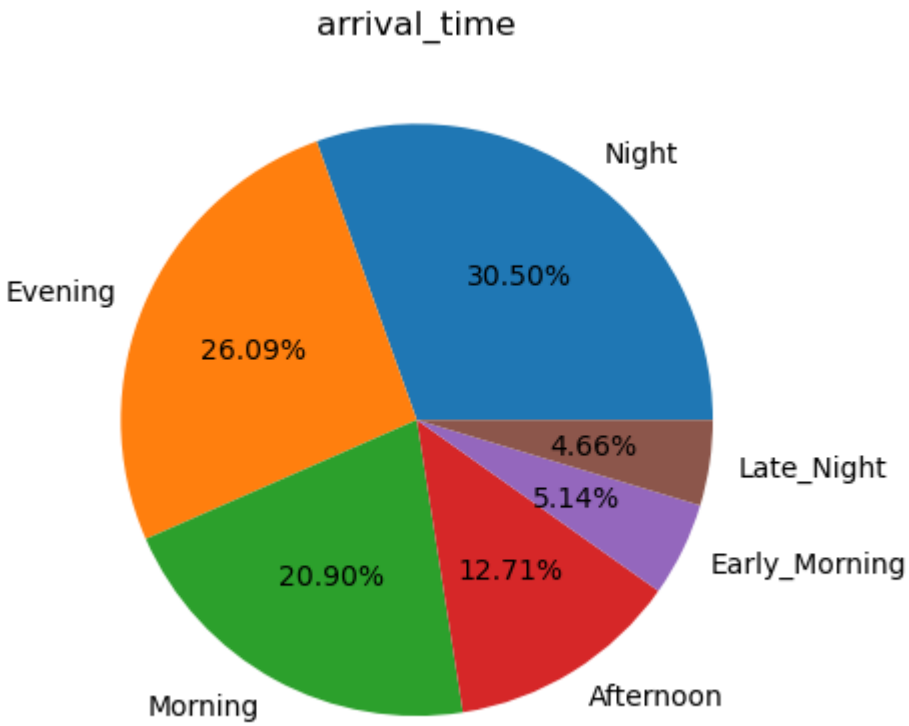


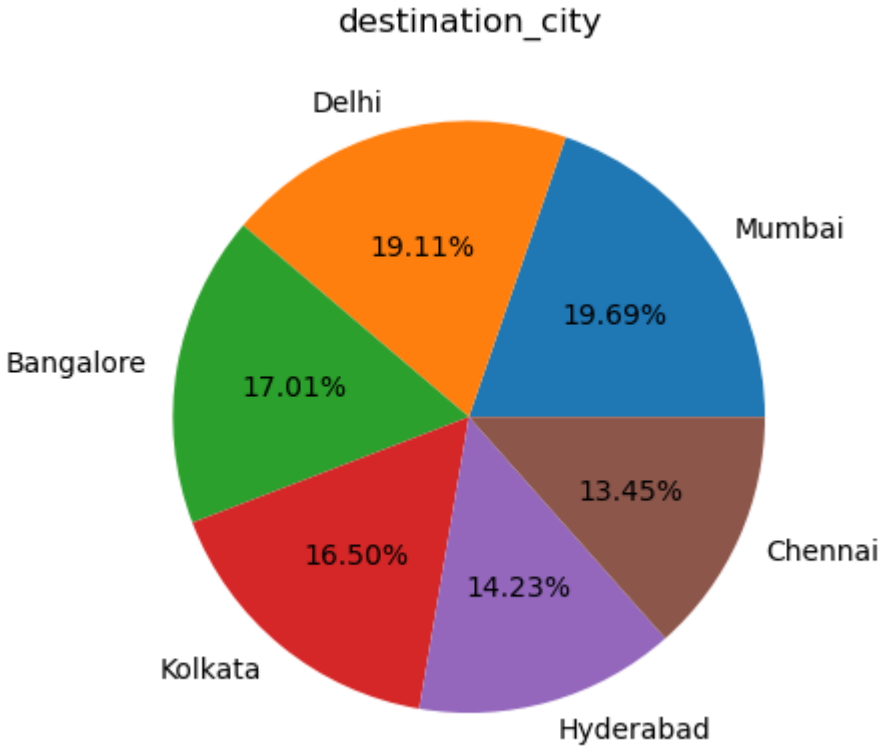

flight

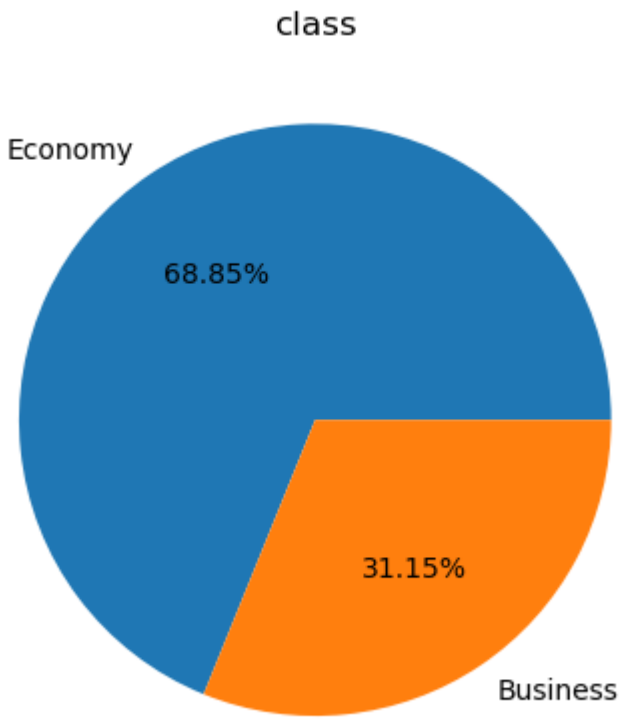

source_city
Mumbai
Delhi
20.29%
20.44%
Bangalore
17.34%
12.89%
Chennai
15.44%
13.60%
Kolkata
Hyderabad


departure_time
Early_Morning
Morning
22.25%
23.70%
0.44%
Late_Night
21.69%
15.92%
Evening
16.00%
Afternoon
Night


stops
one
83.58%
4.43%
two_or_more
12.00%
zero


arrival_time
Night
30.50%
Evening
26.09%
4.66%
Late_Night
5.14%
Early_Morning
20.90%
12.71%
Morning
Afternoon


destination_city
Delhi
19.11%
Mumbai
19.69%
Bangalore
17.01%
13.45%
Chennai
16.50%
14.23%
Kolkata
Hyderabad



Numerical Column Analysis

In [39]:
```
num
```

Out[39]:
```
Index(['duration', 'days_left', 'price'], dtype='object')
```

In [40]:
```
flight_df
```

Out[40]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderab
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderab
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderab
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab

300153 rows × 11 columns

In [41]:
```
flight_df['price'].nunique()
```

Out[41]: 12157

In [42]:
```
flight_df['days_left'].nunique()
```

Out[42]: 49

In [43]:
```
flight_data=flight_df['price']
flight_min=min(flight_data)
flight_max=max(flight_data)
flight_mean=round(flight_data.mean(),2)
flight_med=round(flight_data.median(),2)
flight_std=round(flight_data.std(),2)

print(f" the min price of flight is :{flight_min}")
print(f"the max price of flight is : {flight_max}")
print(f" the mean price of flight is : {flight_mean}")
print(f"the median price of flight is : {flight_med}")
print(f" the std price of flight is : {flight_std}")
```

```
 the min price of flight is :1105
the max price of flight is : 123071
 the mean price of flight is : 20889.66
the median price of flight is : 7425.0
 the std price of flight is : 22697.77
```

Convert into a dataframe

In [45]:
```
flight_data=flight_df['price']
flight_count=len(flight_data)
flight_min=min(flight_data)
flight_max=max(flight_data)
flight_mean=round(flight_data.mean(),2)
flight_med=round(flight_data.median(),2)
flight_std=round(flight_data.std(),2)

idx=['count','min','max','mean','med','std']
data=[flight_count,flight_min,flight_max,flight_mean,flight_med,flight_std]
cols=['price']
pd.DataFrame(data,index=idx,columns=cols)
```

Out[45]:

	price
count	300153.00
min	1105.00
max	123071.00
mean	20889.66
med	7425.00
std	22697.77

PERCENTILE AND QUANTILE

In [47]:
```
flight_data=flight_df['price']
np.percentile(flight_data,25)
```

Out[47]: 4783.0

In [48]:
```
flight_data=flight_df['price']
np.quantile(flight_data,0.25)
```

Out[48]: 4783.0

In [49]:
```
25*300153/100
```

Out[49]: 75038.25

In [50]:
```
flight_data=flight_df['price']
flight_25p=np.percentile(flight_data,25)
con=flight_data<flight_25p
len(flight_data[con])
```

Out[50]: 74828

In [51]:
```
flight_data=flight_df['price']
flight_50p=np.percentile(flight_data,50)
con=flight_data<flight_50p
len(flight_data[con]), 50*300153/100
```

Out[51]: (149514, 150076.5)

In [52]:
```
flight_data=flight_df['price']
flight_75p=np.percentile(flight_data,75)
con=flight_data<flight_75p
len(flight_data[con]), 75*300153/100
```

Out[52]: (224984, 225114.75)

In [53]:
```
flight_data=flight_df['price']
flight_count=len(flight_data)
flight_min=min(flight_data)
flight_max=max(flight_data)
flight_mean=round(flight_data.mean(),2)
flight_med=round(flight_data.median(),2)
flight_std=round(flight_data.std(),2)
flight_25p=np.percentile(flight_data,25)
flight_50p=np.percentile(flight_data,50)
flight_75p=np.percentile(flight_data,75)

idx=['count','min','max','mean','median','std','25%','50%','75%']
data=[flight_count,flight_min,flight_max,flight_mean,flight_med,flight_std,fligh
cols=['Price']
pd.DataFrame(data,index=idx,columns=cols)
```

Out[53]:

	Price
count	300153.00
min	1105.00
max	123071.00
mean	20889.66
median	7425.00
std	22697.77
25%	4783.00
50%	7425.00
75%	42521.00

In [54]:
```
num
```

Out[54]: Index(['duration', 'days_left', 'price'], dtype='object')

In [55]:
```
flight_df.describe()
```

Out[55]:

	duration	days_left	price
count	300153.000000	300153.000000	300153.000000
mean	12.221021	26.004751	20889.660523
std	7.191997	13.561004	22697.767366
min	0.830000	1.000000	1105.000000
25%	6.830000	15.000000	4783.000000
50%	11.250000	26.000000	7425.000000
75%	16.170000	38.000000	42521.000000
max	49.830000	49.000000	123071.000000

In [56]:
```
flight_data=flight_df['price']
flight_25p=np.percentile(flight_data,25)
flight_df[flight_data<flight_25p]
```

Out[56]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_
2504	Vistara	UK-975	Delhi	Early_Morning	zero	Early_Morning	Mum
2505	Vistara	UK-953	Delhi	Night	zero	Night	Mum
2506	Vistara	UK-927	Delhi	Morning	zero	Morning	Mum
2507	Vistara	UK-993	Delhi	Afternoon	zero	Afternoon	Mum
2508	Vistara	UK-951	Delhi	Afternoon	zero	Evening	Mum
...	...	...	...	...	...	...	
206634	Air_India	AI-766	Chennai	Morning	one	Night	Hydera
206635	Air_India	AI-539	Chennai	Evening	one	Morning	Hydera
206636	Air_India	AI-430	Chennai	Morning	one	Morning	Hydera
206637	Air_India	AI-440	Chennai	Early_Morning	one	Morning	Hydera
206638	Air_India	AI-539	Chennai	Evening	one	Morning	Hydera

74828 rows × 11 columns

In [57]:
```
flight_data=flight_df['price']
flight_50p=np.percentile(flight_data,50)
```

```
flight_df[flight_data<flight_50p]
```

Out[57]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
206656	Vistara	UK-822	Chennai	Morning	one	Night	Hydera
206657	Vistara	UK-828	Chennai	Early_Morning	one	Night	Hydera
206658	Air_India	AI-569	Chennai	Early_Morning	one	Night	Hydera
206659	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hydera
206660	Vistara	UK-822	Chennai	Morning	one	Evening	Hydera

149514 rows × 11 columns

In [58]:

```
flight_data=flight_df['price']
flight_75p=np.percentile(flight_data,75)
flight_df[flight_data<flight_75p]
```

Out[58]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300122	Vistara	UK-822	Chennai	Morning	one	Early_Morning	Hyderab
300123	Vistara	UK-826	Chennai	Afternoon	one	Afternoon	Hyderab
300124	Vistara	UK-824	Chennai	Night	one	Night	Hyderab
300125	Vistara	UK-828	Chennai	Early_Morning	one	Early_Morning	Hyderab
300126	Vistara	UK-822	Chennai	Morning	one	Afternoon	Hyderab

224984 rows × 11 columns

EMPHERICAL RULE

In [60]:
```
mean=flight_df['price'].mean()
std=flight_df['price'].std()
lb=mean-1*std

mean=flight_df['price'].mean()
std=flight_df['price'].std()
ub=mean+1*std

con1=flight_df['price']>lb
con2=flight_df['price']<ub
con3=con1&con2
len(flight_df[con]), 68*300153/100
```

Out[60]: (224984, 204104.04)

In [61]:
```
mean=flight_df['price'].mean()
std=flight_df['price'].std()
lb=mean-2*std

mean=flight_df['price'].mean()
std=flight_df['price'].std()
```

```
ub=mean+2*std

con1=flight_df['price']>lb
con2=flight_df['price']<ub
con3=con1&con2
len(flight_df[con]), 95*300153/100
```

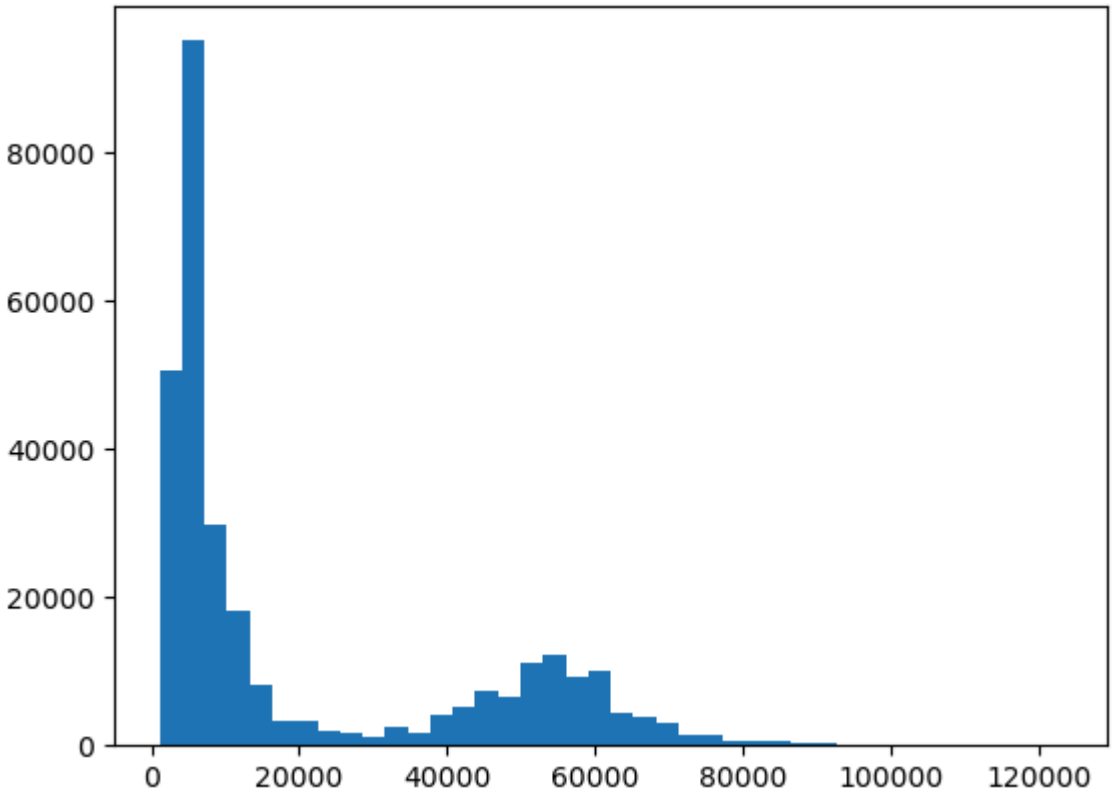
Out[61]: (224984, 285145.35)

In [62]:
```
mean=flight_df['price'].mean()
std=flight_df['price'].std()
lb=mean-3*std

mean=flight_df['price'].mean()
std=flight_df['price'].std()
ub=mean+3*std

con1=flight_df['price']>lb
con2=flight_df['price']<ub
con3=con1&con2
len(flight_df[con]) , 99.7*300153/100
```

Out[62]: (224984, 299252.541)

HIstogram

In [64]:
```
count,intervals,n=plt.hist(flight_df['price'],
bins=40)
```



In [65]:
```
count
```

Out[65]:
```
array([5.0582e+04, 9.5145e+04, 2.9733e+04, 1.8201e+04, 8.0720e+03,
       3.1860e+03, 3.2200e+03, 1.9510e+03, 1.6440e+03, 1.2500e+03,
       2.4410e+03, 1.6560e+03, 4.2390e+03, 5.1480e+03, 7.5080e+03,
       6.6920e+03, 1.1158e+04, 1.2167e+04, 9.3560e+03, 9.9880e+03,
       4.2900e+03, 3.9370e+03, 3.0540e+03, 1.3570e+03, 1.4240e+03,
       7.3800e+02, 7.4800e+02, 4.8200e+02, 2.1300e+02, 2.6000e+02,
       1.0900e+02, 7.4000e+01, 4.1000e+01, 4.0000e+01, 2.5000e+01,
       9.0000e+00, 6.0000e+00, 7.0000e+00, 1.0000e+00, 1.0000e+00])
```

In [66]:
```
intervals
```

Out[66]:
```
array([  1105.  ,   4154.15,   7203.3 ,  10252.45,  13301.6 ,  16350.75,
        19399.9 ,  22449.05,  25498.2 ,  28547.35,  31596.5 ,  34645.65,
        37694.8 ,  40743.95,  43793.1 ,  46842.25,  49891.4 ,  52940.55,
        55989.7 ,  59038.85,  62088.  ,  65137.15,  68186.3 ,  71235.45,
        74284.6 ,  77333.75,  80382.9 ,  83432.05,  86481.2 ,  89530.35,
        92579.5 ,  95628.65,  98677.8 , 101726.95, 104776.1 , 107825.25,
       110874.4 , 113923.55, 116972.7 , 120021.85, 123071.  ])
```

In [67]:
```
lb=5.0582e+04
ub=9.5145e+04

con1=flight_df['price']<lb
con2=flight_df['price']>ub
con3=con1&con2
len(flight_df['price'])
```

Out[67]:
```
300153
```

BOXPLOT

In [69]:
```
flight_data=flight_df['price']
q1=round(np.quantile(flight_data,0.25),2)
q3=round(np.quantile(flight_data,0.75),2)

IQR=q3-q1

lb=q1-1.5*IQR
ub=q3+1.5*IQR

con1=flight_df['price']<lb
con2=flight_df['price']>ub
con3=con1|con2
count=len(flight_df[con3])
```

In [70]:
```
count
```

Out[70]:
```
123
```

In [71]:
```
outliers_data=flight_df[con3]
outliers_data
```

Out[71]:

	airline	flight	source_city	departure_time	stops	arrival_time	destinati
215858	Vistara	UK-809	Delhi	Evening	two_or_more	Evening	
215859	Vistara	UK-809	Delhi	Evening	two_or_more	Evening	
216025	Vistara	UK-817	Delhi	Evening	two_or_more	Morning	
216094	Vistara	UK-995	Delhi	Morning	one	Evening	
216095	Vistara	UK-963	Delhi	Morning	one	Evening	
...	...	...	...	...	...	...	
293474	Vistara	UK-836	Chennai	Morning	one	Night	Ba
296001	Vistara	UK-838	Chennai	Night	one	Morning	
296081	Vistara	UK-832	Chennai	Early_Morning	one	Night	
296170	Vistara	UK-838	Chennai	Night	one	Morning	
296404	Vistara	UK-838	Chennai	Night	one	Evening	

123 rows × 11 columns

In [72]:
```
flight_data=flight_df['price']
q1=round(np.quantile(flight_data,0.25),2)
q3=round(np.quantile(flight_data,0.75),2)

IQR=q3-q1

lb=q1-1.5*IQR
ub=q3+1.5*IQR

con1=flight_df['price']>lb
con2=flight_df['price']<ub
con3=con1&con2
count=len(flight_df[con])
count
```

Out[72]: 224984

In [73]:
```
non_outliers_data=flight_df[con3]
non_outliers_data
```

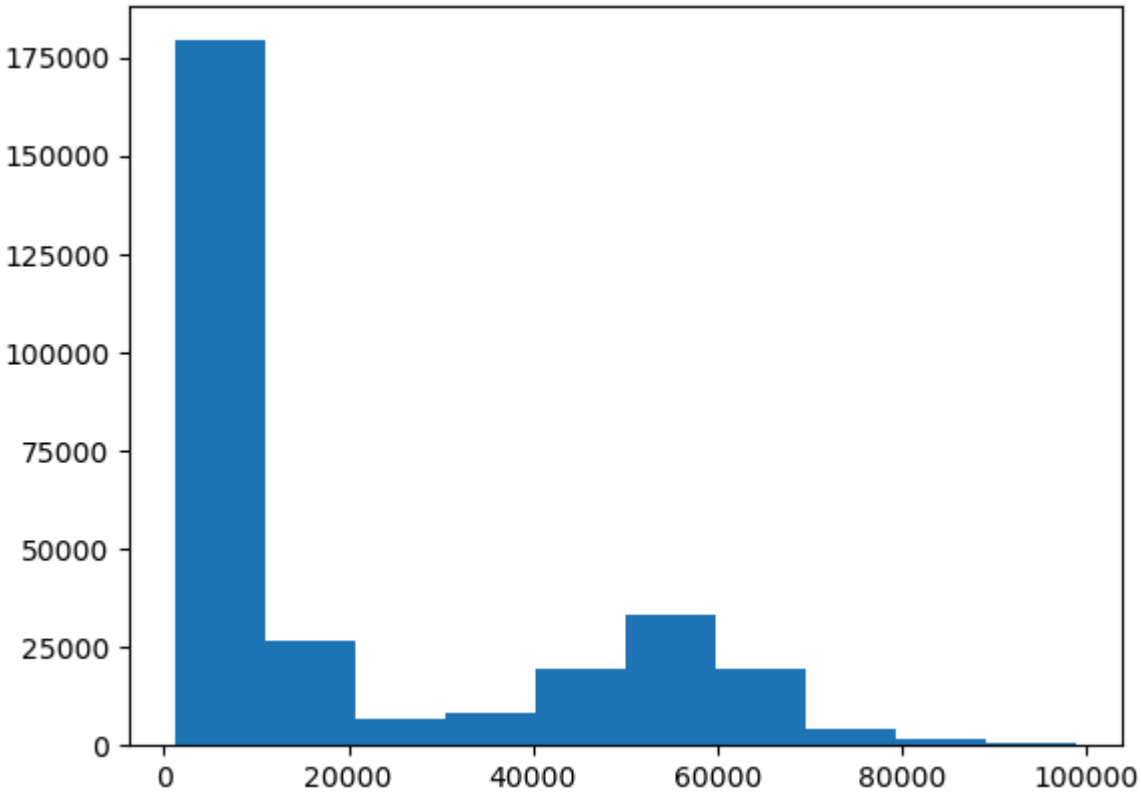
Out[73]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderab
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderab
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderab
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab

300030 rows × 11 columns

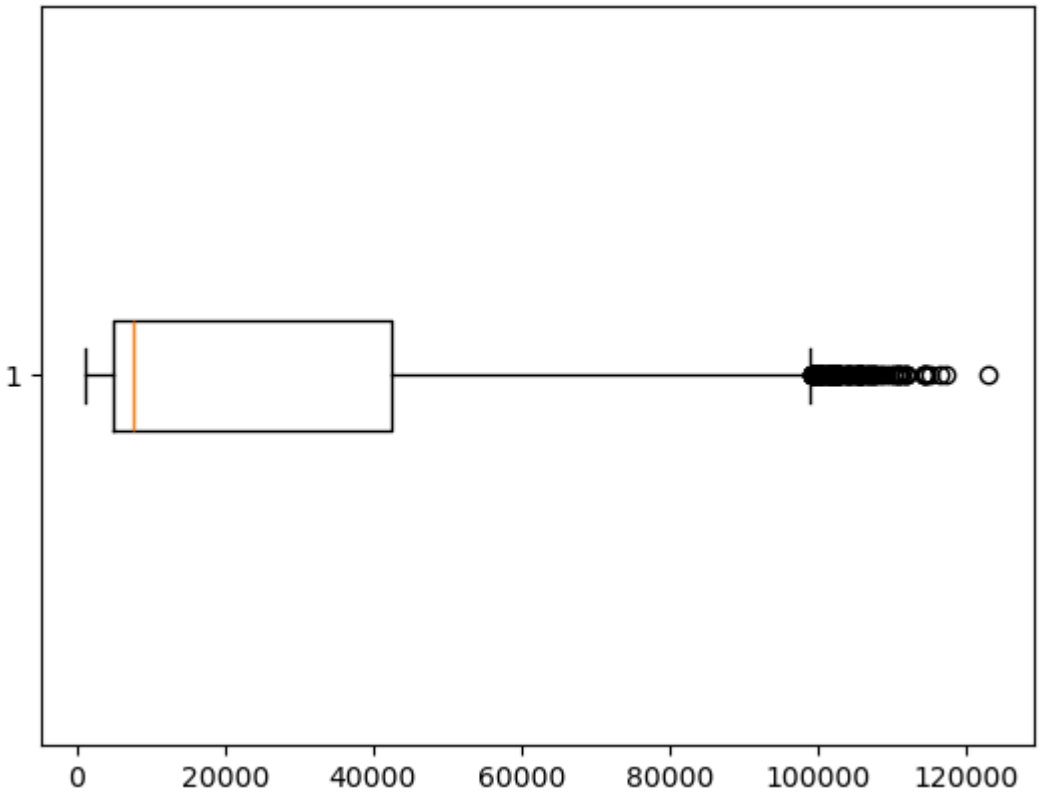
In [74]:
```
plt.hist(non_outliers_data['price'])
```

Out[74]:
```
(array([179192.,  26611.,   6749.,   8510.,  19733.,  33220.,  19477.,
         4393.,   1678.,    467.]),
 array([ 1105. , 10891.7, 20678.4, 30465.1, 40251.8, 50038.5, 59825.2,
        69611.9, 79398.6, 89185.3, 98972. ]),
 <BarContainer object of 10 artists>)
```



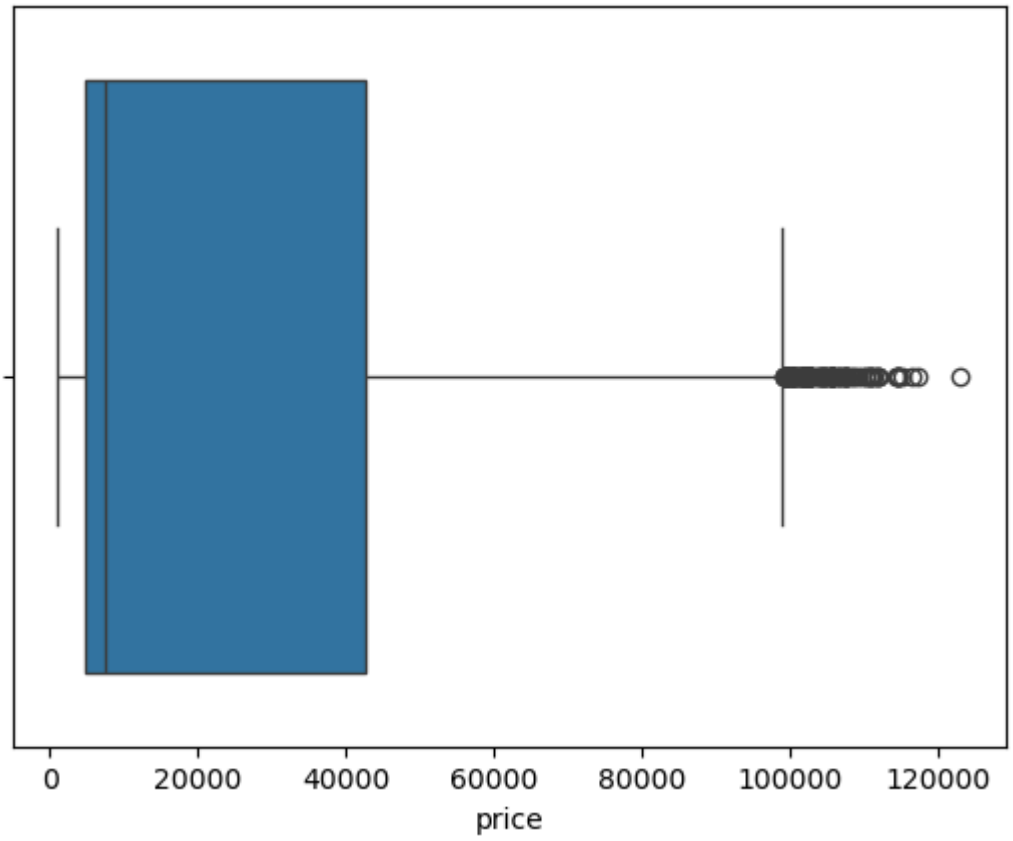
In [75]:
```
plt.boxplot(flight_df['price'],vert=False)
```

Out[75]:
```
{'whiskers': [<matplotlib.lines.Line2D at 0x2018c96bbc0>,
  <matplotlib.lines.Line2D at 0x2018c9d3ef0>],
 'caps': [<matplotlib.lines.Line2D at 0x2018c9d1d00>,
  <matplotlib.lines.Line2D at 0x2018af823f0>],
 'boxes': [<matplotlib.lines.Line2D at 0x2018cb92c60>],
 'medians': [<matplotlib.lines.Line2D at 0x2018af83650>],
 'fliers': [<matplotlib.lines.Line2D at 0x2018af82c00>],
 'means': []}
```



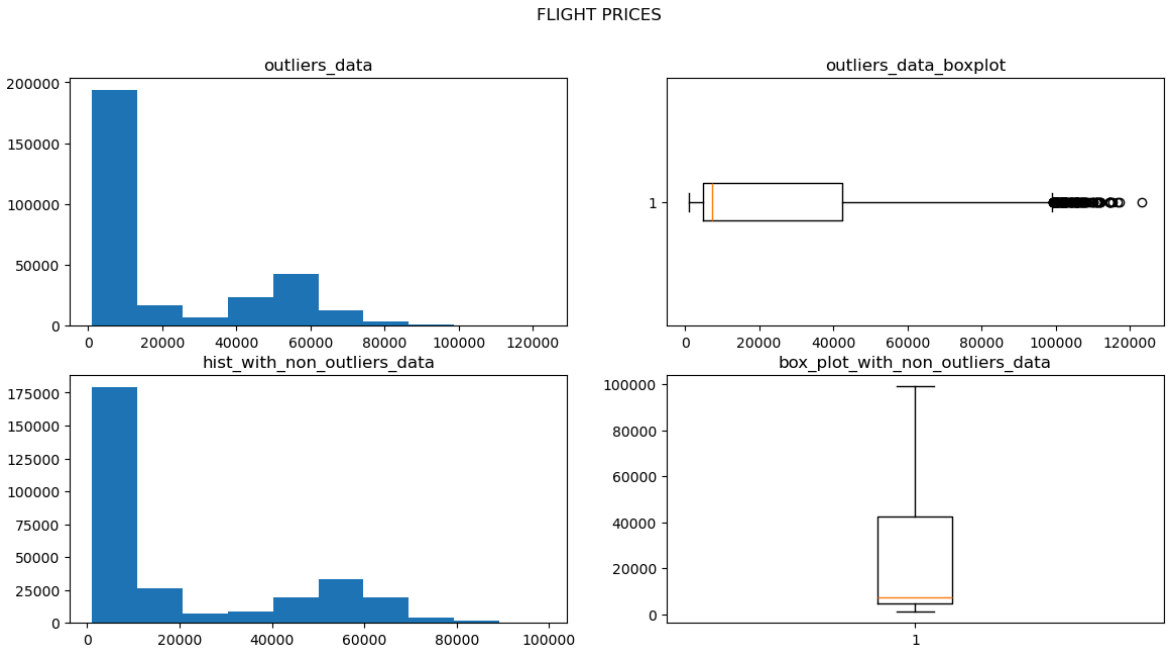
In [76]:
```
sns.boxplot(flight_df['price'],orient='h')
```

Out[76]: <Axes: xlabel='price'>



In [77]:
```
plt.figure(figsize=(14,7))
plt.suptitle('FLIGHT PRICES')
plt.subplot(2,2,1)
plt.hist(flight_df['price'])
plt.title('outliers_data')
plt.subplot(2,2,2)
plt.boxplot(flight_df['price'],vert=False)
plt.title('outliers_data_boxplot')
plt.subplot(2,2,3)
plt.hist(non_outliers_data['price'])
plt.title('hist_with_non_outliers_data')
plt.subplot(2,2,4)
plt.boxplot(non_outliers_data['price'])
plt.title('box_plot_with_non_outliers_data')
```

Out[77]: Text(0.5, 1.0, 'box_plot_with_non_outliers_data')



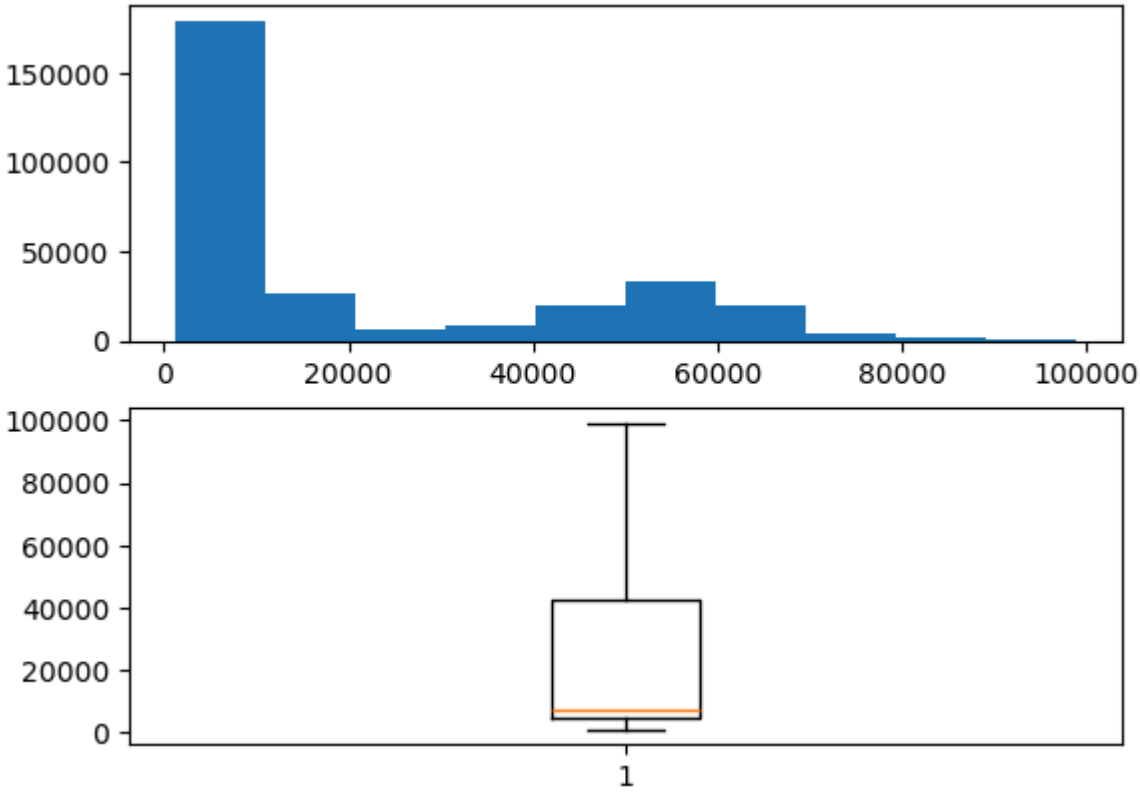
Outlier_Analysis

- how to treat the outliers
- drop the outliers
- fill with median
- fill with cap values

In [79]:
```
flight_data=flight_df['price']
q1=round(np.quantile(flight_data,0.25),2)
q3=round(np.quantile(flight_data,0.75),2)

IQR=q3-q1

lb=q1-1.5*IQR
ub=q3+1.5*IQR

median=flight_data.median()
new_data=[]
for i in flight_data:
    if i<lb or i>ub:
        new_data.append(median)
    else:
        new_data.append(i)
flight_df['pflight']=new_data
```

In [80]:
```
plt.subplot(2,1,1).hist(flight_df['pflight'])
plt.subplot(2,1,2).boxplot(flight_df['pflight'])
```

Out[80]:
```
{'whiskers': [<matplotlib.lines.Line2D at 0x2018cdb28d0>,
  <matplotlib.lines.Line2D at 0x2018bef17c0>],
 'caps': [<matplotlib.lines.Line2D at 0x2018c906d50>,
  <matplotlib.lines.Line2D at 0x2018cdb11f0>],
 'boxes': [<matplotlib.lines.Line2D at 0x2018cdb23c0>],
 'medians': [<matplotlib.lines.Line2D at 0x2018cdb2b10>],
 'fliers': [<matplotlib.lines.Line2D at 0x2018cdb2e40>],
 'means': []}
```

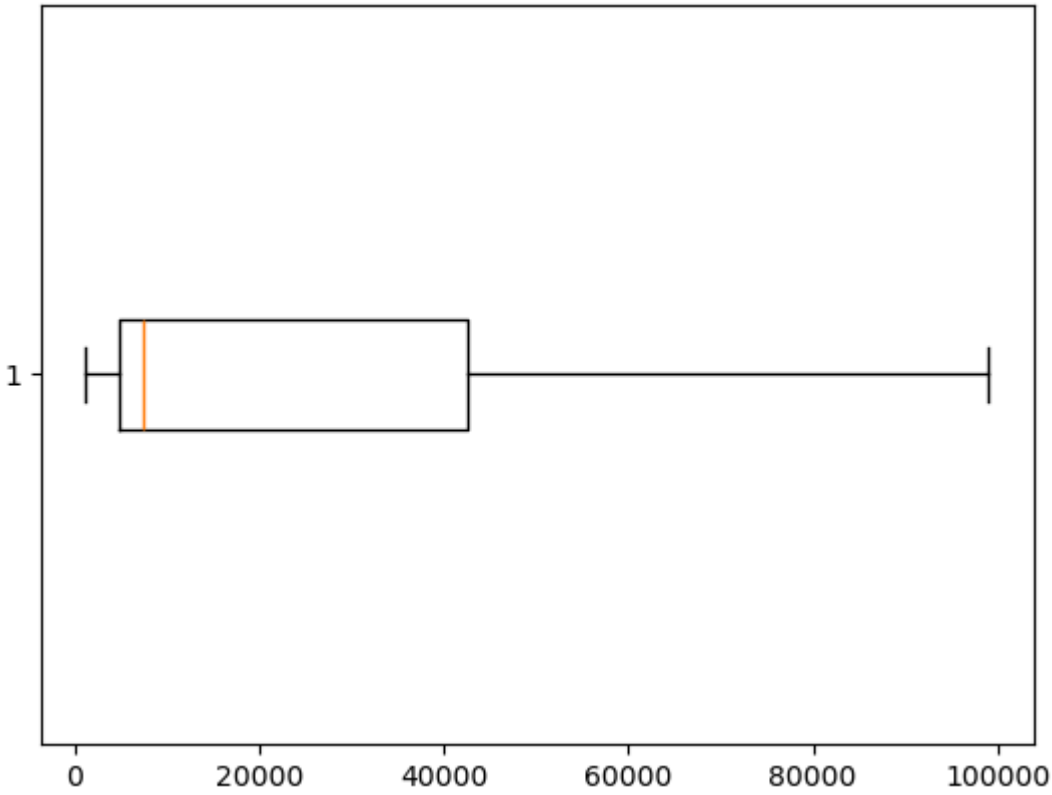


Replacing the outliers using np.where

In [82]:
```
flight_data=flight_df['price']
q1=round(np.quantile(flight_data,0.25),2)
q3=round(np.quantile(flight_data,0.75),2)

IQR=q3-q1

lb=q1-1.5*IQR
ub=q3+1.5*IQR

median=flight_data.median()

con=(flight_df['price']<lb)|(flight_df['price']>ub)
true=median
false=flight_df['price']
flight_df['pflight_1']=np.where(con,true,false)
```

In [83]:
```
plt.boxplot(flight_df['pflight_1'],vert=False)
```

Out[83]:
```
{'whiskers': [<matplotlib.lines.Line2D at 0x2018d819a90>,
  <matplotlib.lines.Line2D at 0x2018d81a030>],
 'caps': [<matplotlib.lines.Line2D at 0x2018d81a360>,
  <matplotlib.lines.Line2D at 0x2018d81a2d0>],
 'boxes': [<matplotlib.lines.Line2D at 0x2018d8199a0>],
 'medians': [<matplotlib.lines.Line2D at 0x2018d81a6f0>],
 'fliers': [<matplotlib.lines.Line2D at 0x2018d81aa50>],
 'means': []}
```



BIVARIATE ANALYSIS

In [85]:
```
con1=flight_df['airline']=='Vistara'
con2=flight_df['class']=='Business'
con3=con1&con2
len(flight_df[con3])
```

Out[85]: 60589

In [86]:
```
unique=flight_df['airline'].unique()
for i in unique:
    con1=flight_df['airline']==i
    con2=flight_df['class']=='Economy'
    con3=con1&con2
    count=len(flight_df[con3])
    print(f"the number of business class tickets in {i} are : {count}")
```

```
the number of business class tickets in SpiceJet are : 9011
the number of business class tickets in AirAsia are : 16098
the number of business class tickets in Vistara are : 67270
the number of business class tickets in GO_FIRST are : 23173
the number of business class tickets in Indigo are : 43120
the number of business class tickets in Air_India are : 47994
```

In [87]:
```
unique=flight_df['airline'].unique()
Economy,Business=[],[]
```

```
for i in unique:
    con1=flight_df['airline']==i
    con2=flight_df['class']=='Economy'
    con3=flight_df['class']=='Business'
    Eco_con=con1&con2
    Bus_con=con1&con3
    Economy.append(len(flight_df[Eco_con]))
    Business.append(len(flight_df[Bus_con]))
```

In [88]:
```
Economy,Business
```

Out[88]:
```
([9011, 16098, 67270, 23173, 43120, 47994], [0, 0, 60589, 0, 0, 32898])
```

In [89]:
```
pd.DataFrame(zip(Economy,Business),index=unique,columns=['Economy','Business'])
```

Out[89]:

	Economy	Business
SpiceJet	9011	0
AirAsia	16098	0
Vistara	67270	60589
GO_FIRST	23173	0
Indigo	43120	0
Air_India	47994	32898

CROSS TAB

In [91]:
```
con1=flight_df['airline']
con2=flight_df['class']
pd.crosstab(con1,con2)
```

Out[91]:

class	Business	Economy
airline		
AirAsia	0	16098
Air_India	32898	47994
GO_FIRST	0	23173
Indigo	0	43120
SpiceJet	0	9011
Vistara	60589	67270

In [92]:
```
pd.crosstab(con2,con1)
```

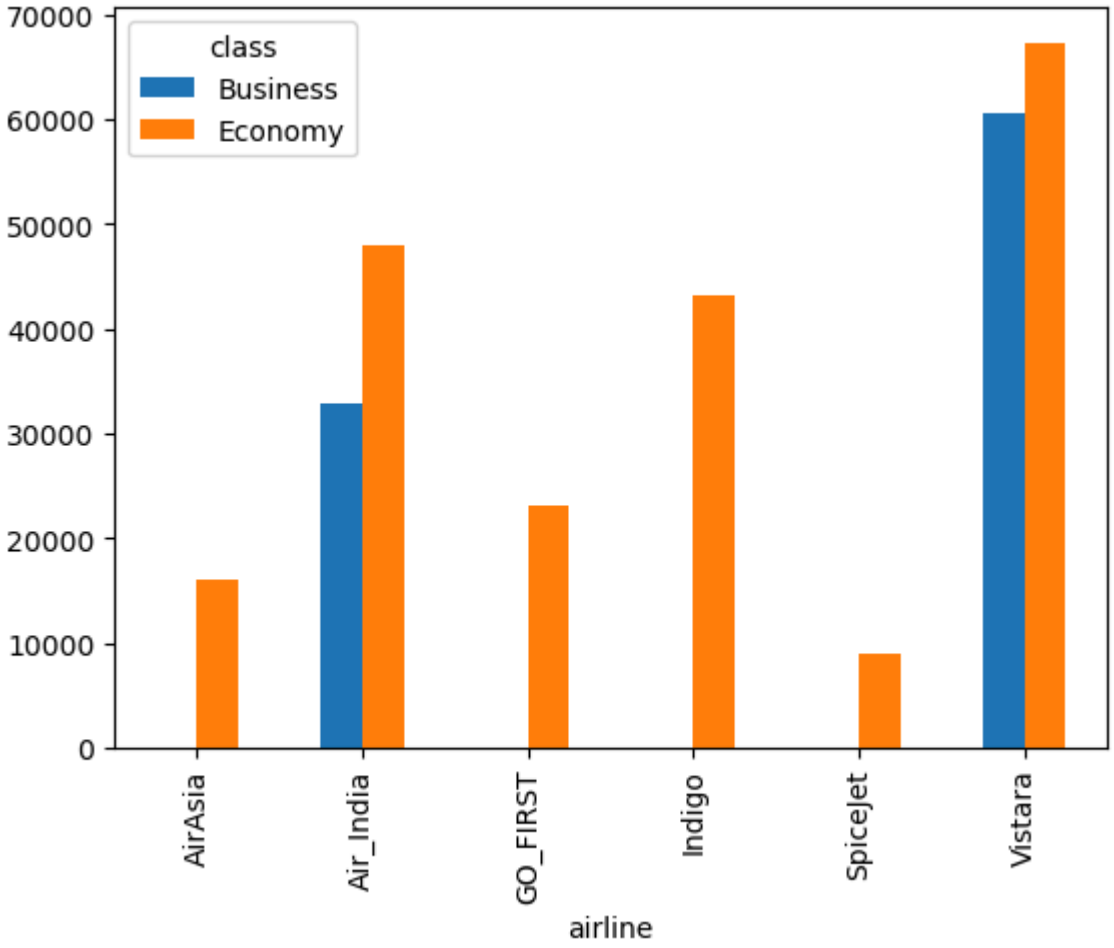
Out[92]:

airline class	AirAsia	Air_India	GO_FIRST	Indigo	SpiceJet	Vistara
Business	0	32898	0	0	0	60589
Economy	16098	47994	23173	43120	9011	67270

In [93]:
```
col1=flight_df['airline']
col2=flight_df['class']
r1=pd.crosstab(col1,col2)
r2=pd.crosstab(col2,col1)
```

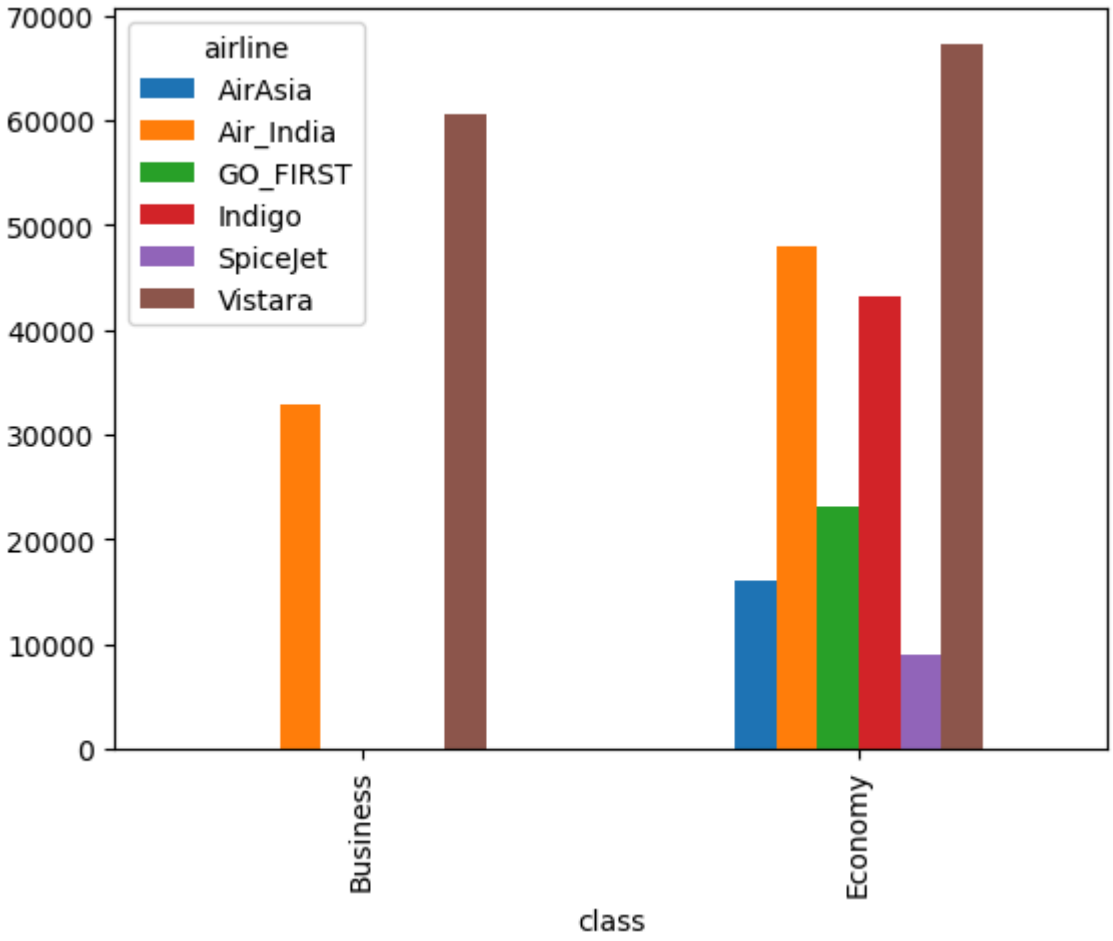
In [94]:
```
r1.plot(kind='bar')
```

Out[94]: <Axes: xlabel='airline'>



In [95]:
```
r2.plot(kind='bar')
```

Out[95]: <Axes: xlabel='class'>



In [96]:
```
flight_df
```

Out[96]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderab
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderab
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderab
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab

300153 rows × 13 columns

Multivarite

In [98]:
```
col1=flight_df['airline']
col2=flight_df['class']
col3=flight_df['source_city']
r1=pd.crosstab(col1,[col2,col3])
r1
```

Out[98]:

class	Business							
source_city	Bangalore	Chennai	Delhi	Hyderabad	Kolkata	Mumbai	Bangalore	Chen
airline								
AirAsia	0	0	0	0	0	0	3364	1
Air_India	4840	4137	7202	4392	4990	7337	7212	5
GO_FIRST	0	0	0	0	0	0	4498	1
Indigo	0	0	0	0	0	0	7080	6
SpiceJet	0	0	0	0	0	0	1255	1
Vistara	11601	8392	11114	8478	8483	12521	12211	9

In [99]:
```
r2=pd.crosstab(col2,[col1,col3])
r2
```

Out[99]:

airline	AirAsia							
source_city	Bangalore	Chennai	Delhi	Hyderabad	Kolkata	Mumbai	Bangalore	Chen
class								
Business	0	0	0	0	0	0	4840	4
Economy	3364	1498	4387	1844	2829	2176	7212	5

2 rows × 36 columns

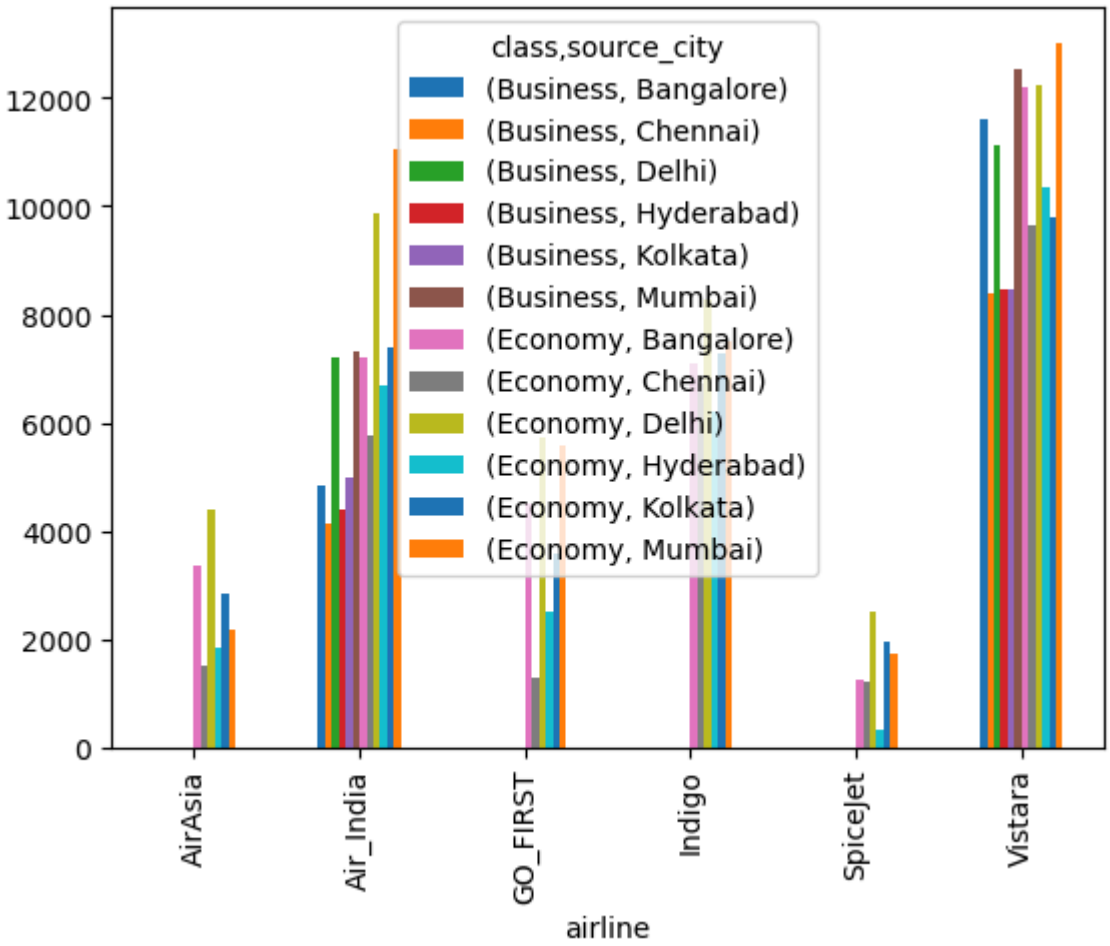
In [100…
```
r3=pd.crosstab(col3,[col2,col1])
r3
```

Out[100…

class	Business			Economy				
airline	Air_India	Vistara	AirAsia	Air_India	GO_FIRST	Indigo	SpiceJet	Vistara
source_city								
Bangalore	4840	11601	3364	7212	4498	7080	1255	12211
Chennai	4137	8392	1498	5775	1289	6746	1219	9644
Delhi	7202	11114	4387	9861	5724	8277	2524	12254
Hyderabad	4392	8478	1844	6696	2504	6215	332	10345
Kolkata	4990	8483	2829	7410	3590	7296	1947	9802
Mumbai	7337	12521	2176	11040	5568	7506	1734	13014

In [101…
```
r1.plot(kind='bar')
```

Out[101…
```
<Axes: xlabel='airline'>
```

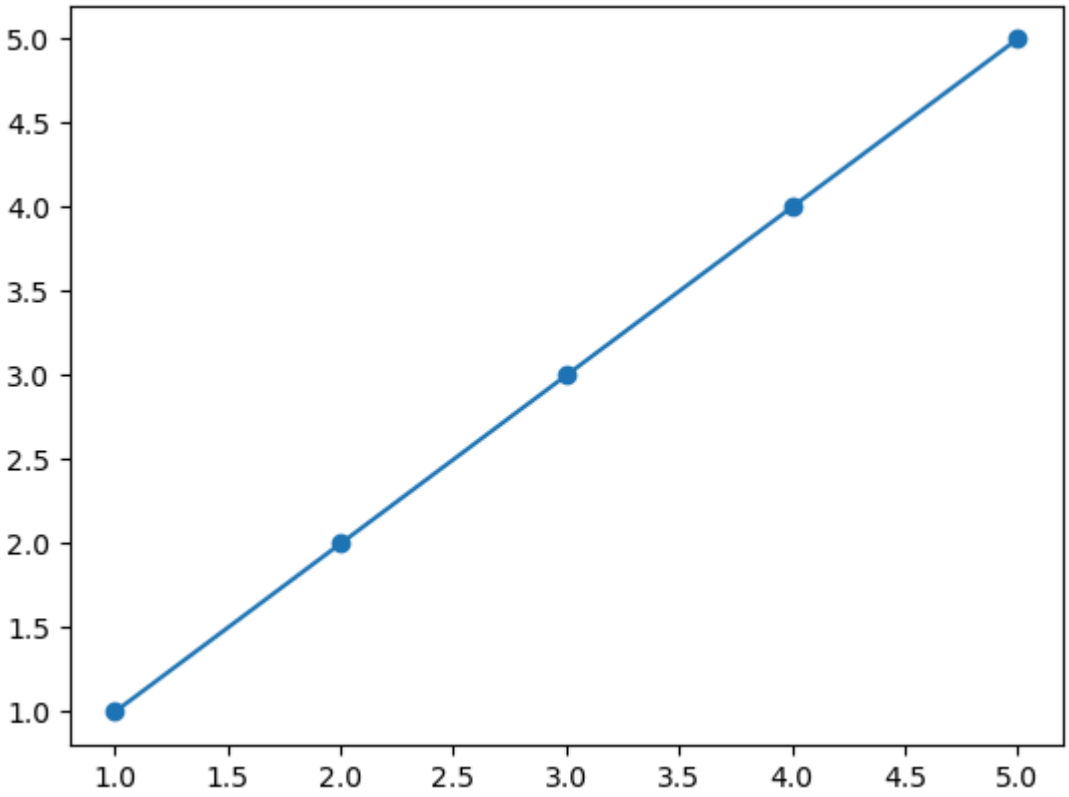


Numerical vs Numerical

- Scatter plots are used to plot between two numerical columns
- it is under matplotlib
- it is represented as plt.scatter()

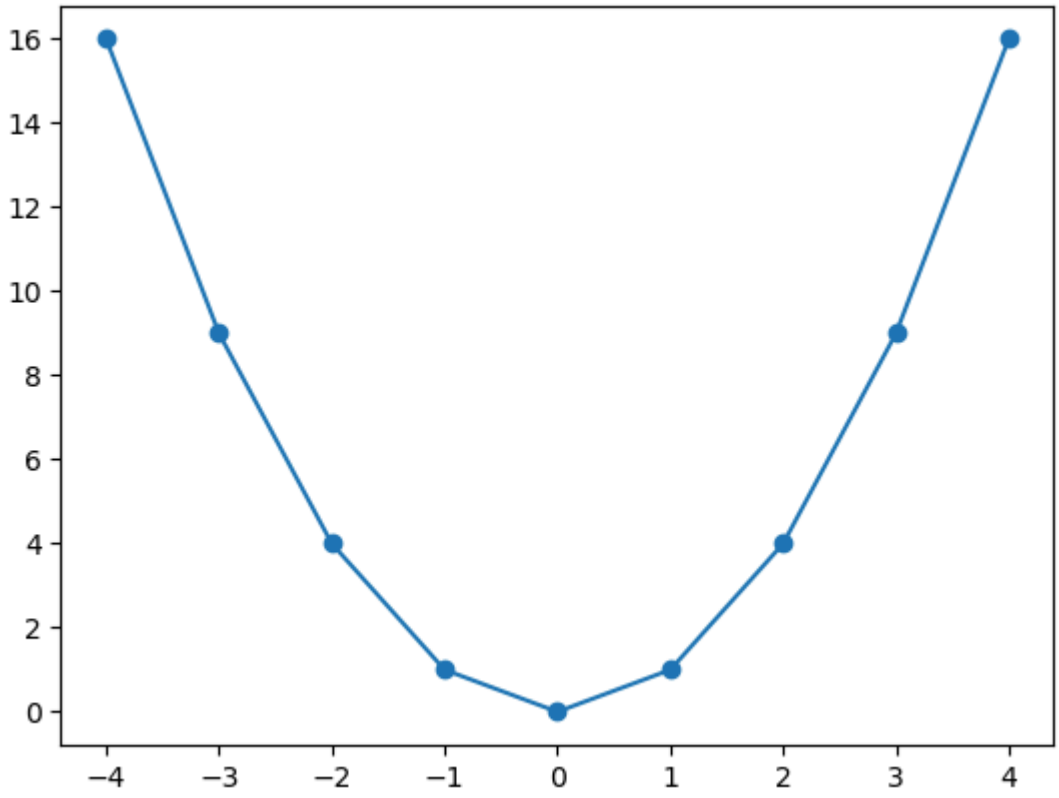
In [103…
```
x=[1,2,3,4,5]
y=[1,2,3,4,5]
plt.scatter(x,y)
plt.plot(x,y)
```

Out[103…
```
[<matplotlib.lines.Line2D at 0x201879bdb50>]
```



In [104…
```
x=[i for i in range(-4,5)]
y=[i*i for i in range(-4,5)]
plt.scatter(x,y)
plt.plot(x,y)
```

Out[104… `[<matplotlib.lines.Line2D at 0x2018be1d5e0>]`

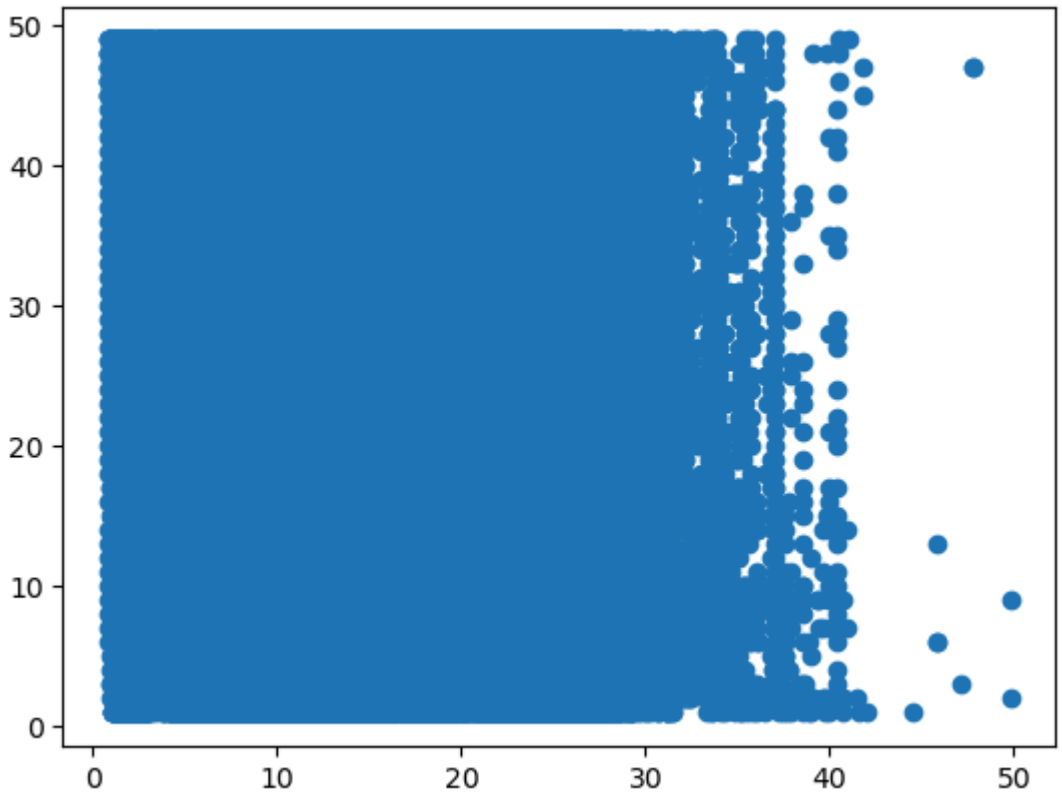


In [105…
```
num
```

Out[105… `Index(['duration', 'days_left', 'price'], dtype='object')`

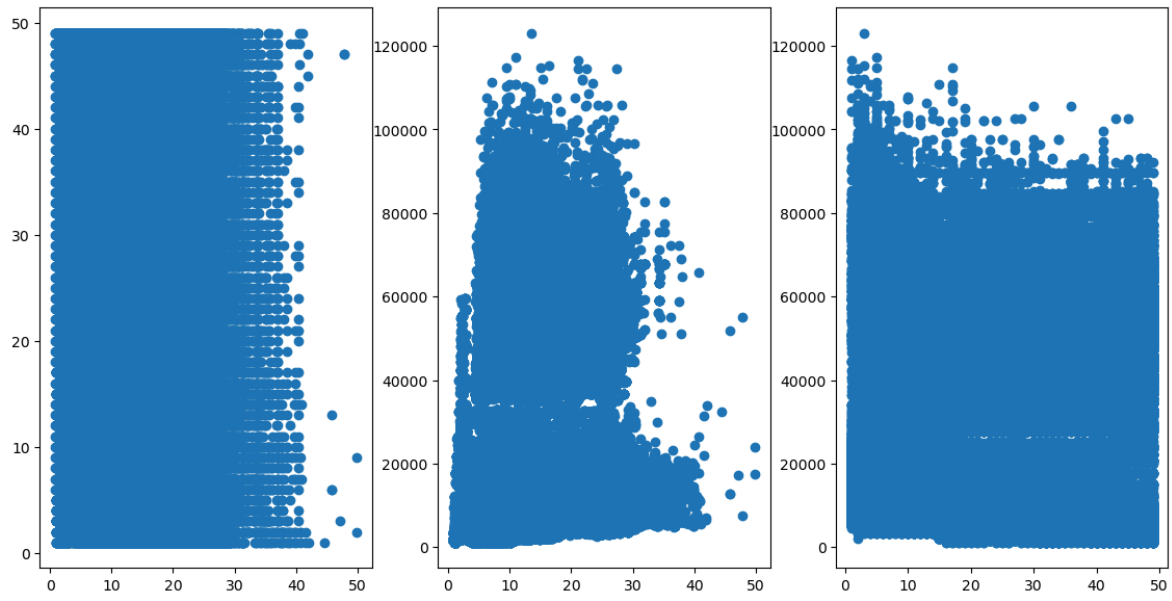
In [106…
```
col1=flight_df['duration']
col2=flight_df['days_left']
col3=flight_df['price']
plt.scatter(col1,col2)
```

Out[106… `<matplotlib.collections.PathCollection at 0x2018b197560>`



In [107…
```
plt.figure(figsize=(14,7))
plt.subplot(1,3,1).scatter(col1,col2)
plt.subplot(1,3,2).scatter(col1,col3)
plt.subplot(1,3,3).scatter(col2,col3)
```

Out[107… `<matplotlib.collections.PathCollection at 0x2018d99d8b0>`



CORRELATION

In [109…
```
flight_df.corr(numeric_only=True)
```

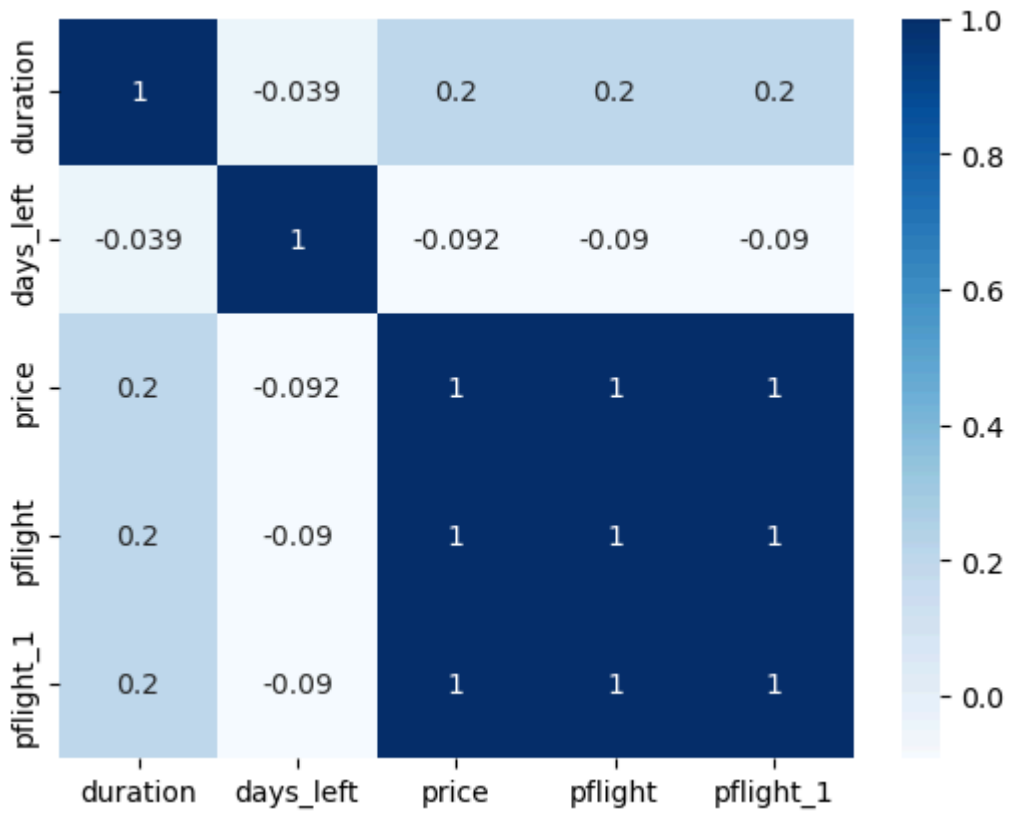
Out[109…

	duration	days_left	price	pflight	pflight_1
duration	1.000000	-0.039157	0.204222	0.204240	0.204240
days_left	-0.039157	1.000000	-0.091949	-0.089896	-0.089896
price	0.204222	-0.091949	1.000000	0.996228	0.996228
pflight	0.204240	-0.089896	0.996228	1.000000	1.000000
pflight_1	0.204240	-0.089896	0.996228	1.000000	1.000000

HEAT MAPS

In [111…
```
corr=flight_df.corr(numeric_only=True)
sns.heatmap(corr,annot=True,cmap='Blues')
```

Out[111… <Axes: >



ENCODING

- It is very important to convert categorical column to numerical column
- Some methods in ENCODING are
- Map
- Label Encoder

- np.where
- one hot encoder

MAP FUNCTION

In [114…
```
flight_df['class'].unique()
```

Out[114…
```
array(['Economy', 'Business'], dtype=object)
```

In [115…
```
d={'Business':0,'Economy':1}
flight_df['class']=flight_df['class'].map(d)
```

In [116…
```
flight_df[['class']]
```

Out[116…

	class
0	1
1	1
2	1
3	1
4	1
…	…
300148	0
300149	0
300150	0
300151	0
300152	0

300153 rows × 1 columns

In [117…
```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df.drop('Unnamed: 0',axis=1,inplace=True)
for col in cat:
    d={}
    labels=flight_df[col].unique()
    for i in range (len(labels)):
        d[labels[i]]=i
    flight_df[col]=flight_df[col].map(d)
```

In [118…
```
flight_df
```

Out[118...

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city
0	0	0	0	0	0	0	0
1	0	1	0	1	0	1	0
2	1	2	0	1	0	2	0
3	2	3	0	2	0	3	0
4	2	4	0	2	0	1	0
...	...	...	...	...	...	...	...
300148	2	1457	5	2	1	4	3
300149	2	1461	5	3	1	0	3
300150	2	1437	5	1	1	0	3
300151	2	1462	5	1	1	4	3
300152	2	1457	5	2	1	4	3

300153 rows × 11 columns

Label Encoder

- it is also used to convert categorical column to numerical column
- it is a sklearn package

In [120...
```
from sklearn.preprocessing import LabelEncoder
```

In [121...
```
le=LabelEncoder()
```

In [122...
```
flight_df['class']=le.fit_transform(flight_df['class'])
```

In [123...
```
flight_df['class']
```

Out[123...
```
0         0
1         0
2         0
3         0
4         0
         ..
300148    1
300149    1
300150    1
300151    1
300152    1
Name: class, Length: 300153, dtype: int64
```

In [124...
```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df.drop('Unnamed: 0',axis=1,inplace=True)
from sklearn.preprocessing import LabelEncoder
le=LabelEncoder()
for i in cat:
```

```
    flight_df[i]=le.fit_transform(flight_df[i])
flight_df
```

Out[124...

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city
0	4	1408	2	2	2	5	5
1	4	1387	2	1	2	4	5
2	0	1213	2	1	2	1	5
3	5	1559	2	4	2	0	5
4	5	1549	2	4	2	4	5
...	...	...	...	...	...	...	...
300148	5	1477	1	4	0	2	3
300149	5	1481	1	0	0	5	3
300150	5	1486	1	1	0	5	3
300151	5	1483	1	1	0	2	3
300152	5	1477	1	4	0	2	3

300153 rows × 11 columns

NP.WHERE

In [126...

```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df.drop('Unnamed: 0',axis=1,inplace=True)
con=flight_df['class']=='Business'
true=1
false=0
np.where(con,true,false)
```

Out[126...

```
array([0, 0, 0, ..., 1, 1, 1])
```

One Hot Encoder

- One hot means at a time only one will on another will off
- on represents 1
- off represents 0

In [128...

```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df.drop('Unnamed: 0',axis=1,inplace=True)
pd.get_dummies(flight_df['class'],prefix=['class'],dtype=int)
```

Out[128...

	['class']_Business	['class']_Economy
0	0	1
1	0	1
2	0	1
3	0	1
4	0	1
...	...	...
300148	1	0
300149	1	0
300150	1	0
300151	1	0
300152	1	0

300153 rows × 2 columns

In [129...
```
pd.get_dummies(flight_df,dtype=int)
```

Out[129...

	duration	days_left	price	airline_AirAsia	airline_Air_India	airline_GO_FIRST	a
0	2.17	1	5953	0	0	0	
1	2.33	1	5953	0	0	0	
2	2.17	1	5956	1	0	0	
3	2.25	1	5955	0	0	0	
4	2.33	1	5955	0	0	0	
...	...	...	...	...	...	...	
300148	10.08	49	69265	0	0	0	
300149	10.42	49	77105	0	0	0	
300150	13.83	49	79099	0	0	0	
300151	10.00	49	81585	0	0	0	
300152	10.08	49	81585	0	0	0	

300153 rows × 1599 columns

SCALE THE DATA

- Zscore=x-mean/std

In [131…
```
flight_data=flight_df['price']
mean=flight_data.mean()
std=flight_data.std()
data=(flight_data-mean/std)
```

In [132…
```
data
```

Out[132…
```
0          5952.07966
1          5952.07966
2          5955.07966
3          5954.07966
4          5954.07966
              ...
300148    69264.07966
300149    77104.07966
300150    79098.07966
300151    81584.07966
300152    81584.07966
Name: price, Length: 300153, dtype: float64
```

STANDARD SCALAR

In [134…
```
from sklearn.preprocessing import StandardScaler
```

In [135…
```
ss=StandardScaler()
```

In [136…
```
ss.fit_transform(flight_df[['price']])
```

Out[136…
```
array([[-0.65806849],
       [-0.65806849],
       [-0.65793631],
       ...,
       [ 2.56454459],
       [ 2.67407096],
       [ 2.67407096]])
```

In [137…
```
d=flight_df['price'].values.reshape(-1,1)
ss.fit_transform(d)
```

Out[137…
```
array([[-0.65806849],
       [-0.65806849],
       [-0.65793631],
       ...,
       [ 2.56454459],
       [ 2.67407096],
       [ 2.67407096]])
```

In [138…
```
flight_df=pd.read_csv(r"C:\Users\Lenovo\Music\EDA Practice\Clean_Dataset.csv")
flight_df.drop('Unnamed: 0',axis=1,inplace=True)
flight_data=flight_df['price']
mean=flight_data.mean()
std=flight_data.std()
flight_df['price_Z']=(flight_data-mean/std)
```

In [139…
```
flight_df['price_Z']
```

Out[139…
```
0          5952.07966
1          5952.07966
2          5955.07966
3          5954.07966
4          5954.07966
             ...
300148    69264.07966
300149    77104.07966
300150    79098.07966
300151    81584.07966
300152    81584.07966
Name: price_Z, Length: 300153, dtype: float64
```

In [140…
```
flight_df
```

Out[140…

	airline	flight	source_city	departure_time	stops	arrival_time	destination_c
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mum
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mum
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mum
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mum
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mum
...	...	...	...	...	...	...	
300148	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab
300149	Vistara	UK-826	Chennai	Afternoon	one	Night	Hyderab
300150	Vistara	UK-832	Chennai	Early_Morning	one	Night	Hyderab
300151	Vistara	UK-828	Chennai	Early_Morning	one	Evening	Hyderab
300152	Vistara	UK-822	Chennai	Morning	one	Evening	Hyderab

300153 rows × 12 columns

In [141…
```
flight_df[['price','price_Z']]
```

Out[141...

	price	price_Z
0	5953	5952.07966
1	5953	5952.07966
2	5956	5955.07966
3	5955	5954.07966
4	5955	5954.07966
...	...	...
300148	69265	69264.07966
300149	77105	77104.07966
300150	79099	79098.07966
300151	81585	81584.07966
300152	81585	81584.07966

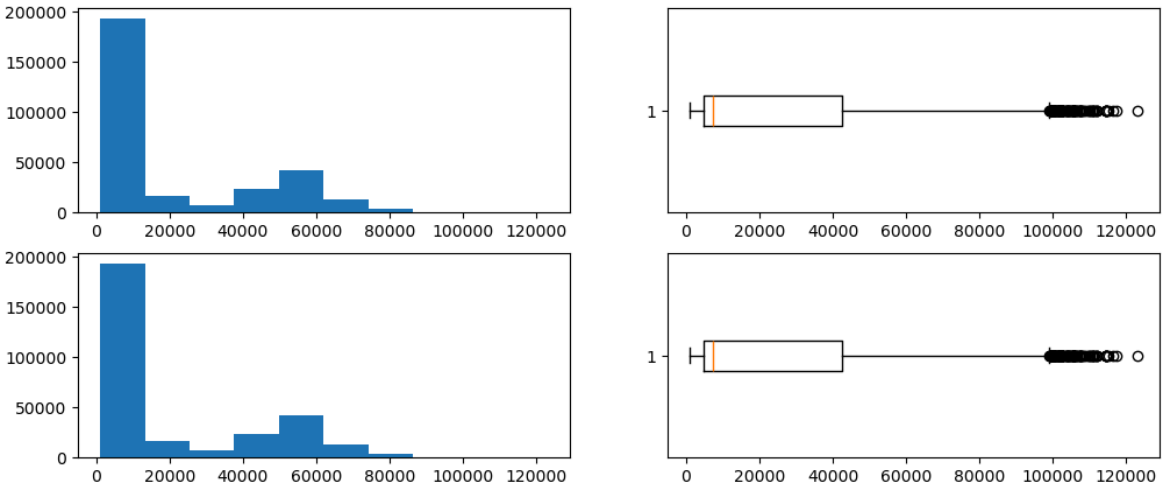
300153 rows × 2 columns

In [142...

```
plt.figure(figsize=(12,5))
plt.subplot(2,2,1).hist(flight_df['price'])
plt.subplot(2,2,2).boxplot(flight_df['price'],vert=False)
plt.subplot(2,2,3).hist(flight_df['price_Z'])
plt.subplot(2,2,4).boxplot(flight_df['price_Z'],vert=False)
```

Out[142...

```
{'whiskers': [<matplotlib.lines.Line2D at 0x2018b673200>,
  <matplotlib.lines.Line2D at 0x2018b5990d0>],
 'caps': [<matplotlib.lines.Line2D at 0x2018b59a3f0>,
  <matplotlib.lines.Line2D at 0x2018b599910>],
 'boxes': [<matplotlib.lines.Line2D at 0x2018bdbbbc0>],
 'medians': [<matplotlib.lines.Line2D at 0x2018b59af00>],
 'fliers': [<matplotlib.lines.Line2D at 0x2018b598170>],
 'means': []}
```



IDX MAX & IDX MIN

In [144...

```
flight_df['price'].idxmin(), flight_df['price_Z'].idxmax()
```

Out[144… (203807, 261377)

In [145…
```
flight_df[['price','price_Z']].iloc[[203807,261377]]
```

Out[145…

	price	price_Z
203807	1105	1104.07966
261377	123071	123070.07966

KNN IMPUTER

- KNN means K-Nearsert Neighbours
- we will choose the least distance sample

In [147…
```
from sklearn.impute import KNNImputer
knn=KNNImputer()
```

In [148…
```
knn.fit_transform(flight_df[['price']])
```

Out[148…
```
array([[ 5953.],
       [ 5953.],
       [ 5956.],
       ...,
       [79099.],
       [81585.],
       [81585.]])
```

In [ ]: