Problem Statement:-

For each Airline mostly having how many stops

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
```

In [2]:
```
df = pd.read_excel(r"C:\Users\HP\Downloads\Data_Train.xlsx")
df
```

Out[2]:

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

10683 rows × 11 columns

In [3]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          10683 non-null  object
 1   Date_of_Journey  10683 non-null  object
 2   Source           10683 non-null  object
 3   Destination      10683 non-null  object
 4   Route            10682 non-null  object
 5   Dep_Time         10683 non-null  object
 6   Arrival_Time     10683 non-null  object
 7   Duration         10683 non-null  object
 8   Total_Stops      10682 non-null  object
 9   Additional_Info  10683 non-null  object
 10  Price            10683 non-null  int64 
dtypes: int64(1), object(10)
memory usage: 918.2+ KB
```

In [4]:
```
1 df.isnull().sum()
```

Out[4]:
```
Airline           0
Date_of_Journey   0
Source            0
Destination       0
Route             1
Dep_Time          0
Arrival_Time      0
Duration          0
Total_Stops       1
Additional_Info   0
Price             0
dtype: int64
```

In [5]:
```
1 df.fillna(method='ffill',inplace=True)
```

In [6]:
```
1 df.isnull().sum()
```

Out[6]:
```
Airline           0
Date_of_Journey   0
Source            0
Destination       0
Route             0
Dep_Time          0
Arrival_Time      0
Duration          0
Total_Stops       0
Additional_Info   0
Price             0
dtype: int64
```

In [7]:
```
1 df['Airline'].value_counts()
```

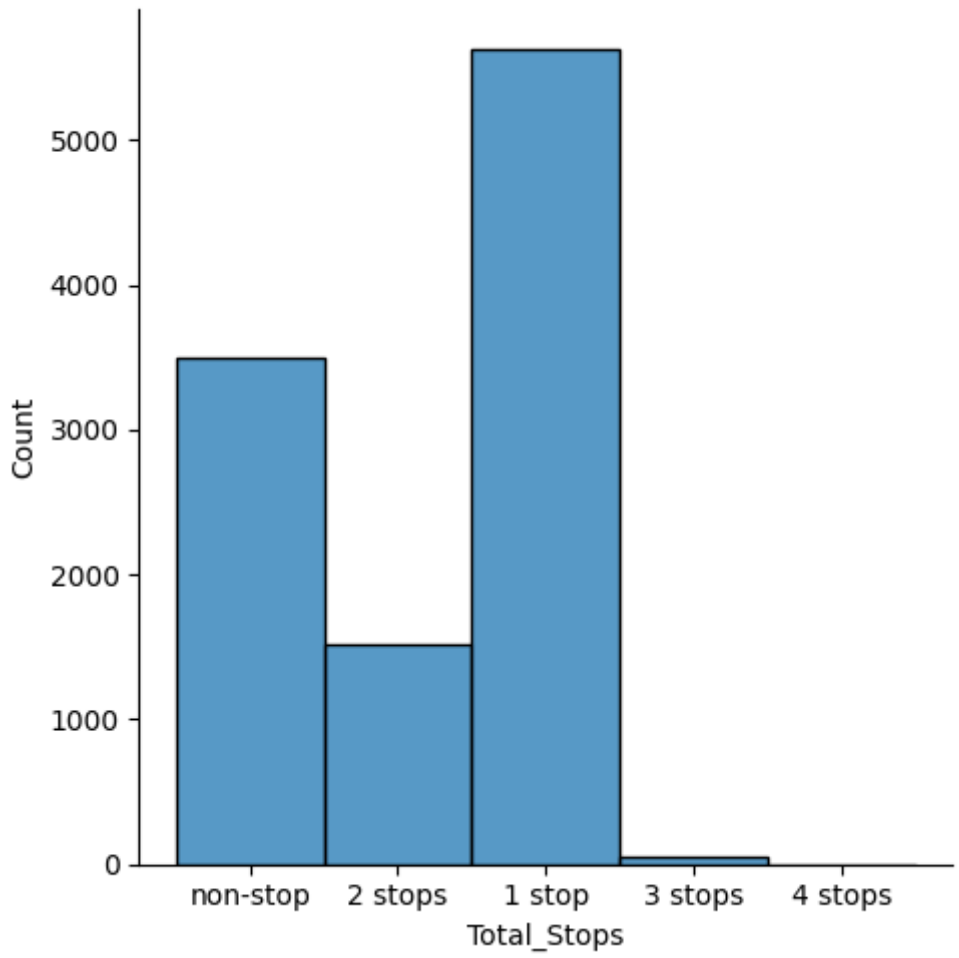
Out[7]:
```
Airline
Jet Airways                          3849
IndiGo                               2053
Air India                            1752
Multiple carriers                    1196
SpiceJet                              818
Vistara                               479
Air Asia                              319
GoAir                                 194
Multiple carriers Premium economy      13
Jet Airways Business                    6
Vistara Premium economy                 3
Trujet                                  1
Name: count, dtype: int64
```

In [8]:
```
1 df['Total_Stops'].value_counts()
```

Out[8]:
```
Total_Stops
1 stop      5625
non-stop    3492
2 stops     1520
3 stops       45
4 stops        1
Name: count, dtype: int64
```

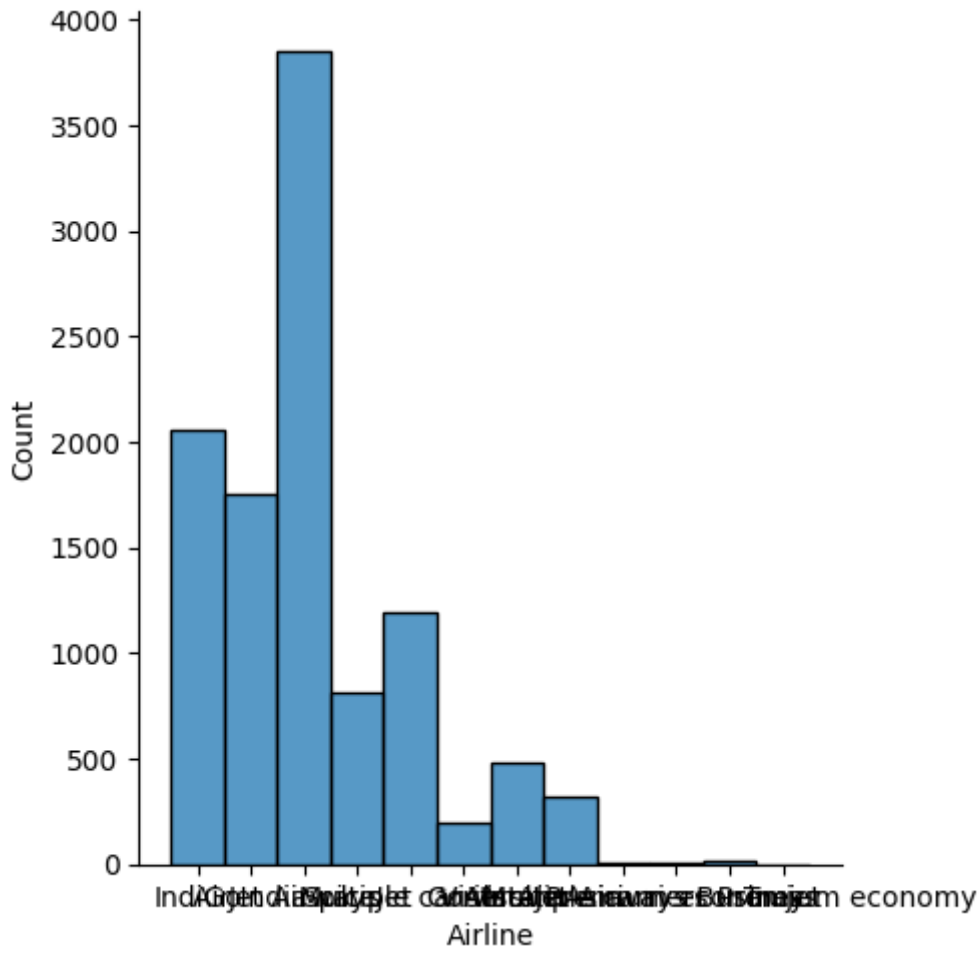
In [9]:
```
1 sns.displot(df['Total_Stops'])
```

Out[9]: <seaborn.axisgrid.FacetGrid at 0x1c9db51ffa0>



In [10]:
```
1 sns.displot(df['Airline'])
2
```

Out[10]: <seaborn.axisgrid.FacetGrid at 0x1c9db726bc0>



In [11]:
```
s={'Airline':{'Jet Airways':1,'IndiGo':2,'Air India':3,'Multiple carriers':4,'SpiceJet':5,'Vistara':6,'Air As
df = df.replace(s)
print(df)
```

```
       Airline Date_of_Journey    Source Destination                  Route
0            2      24/03/2019  Banglore   New Delhi              BLR → DEL  \
1            3       1/05/2019   Kolkata    Banglore  CCU → IXR → BBI → BLR
2            1       9/06/2019     Delhi      Cochin  DEL → LKO → BOM → COK
3            2      12/05/2019   Kolkata    Banglore        CCU → NAG → BLR
4            2      01/03/2019  Banglore   New Delhi        BLR → NAG → DEL
...        ...             ...       ...         ...                    ...
10678        7       9/04/2019   Kolkata    Banglore              CCU → BLR
10679        3      27/04/2019   Kolkata    Banglore              CCU → BLR
10680        1      27/04/2019  Banglore       Delhi              BLR → DEL
10681        6      01/03/2019  Banglore   New Delhi              BLR → DEL
10682        3       9/05/2019     Delhi      Cochin  DEL → GOI → BOM → COK

      Dep_Time  Arrival_Time Duration Total_Stops Additional_Info  Price
0        22:20  01:10 22 Mar   2h 50m    non-stop         No info   3897
1        05:50         13:15   7h 25m     2 stops         No info   7662
2        09:25  04:25 10 Jun      19h     2 stops         No info  13882
3        18:05         23:30   5h 25m      1 stop         No info   6218
4        16:50         21:35   4h 45m      1 stop         No info  13302
...        ...           ...      ...         ...             ...    ...
10678    19:55         22:25   2h 30m    non-stop         No info   4107
10679    20:45         23:20   2h 35m    non-stop         No info   4145
10680    08:20         11:20      3h     non-stop         No info   7229
10681    11:30         14:10   2h 40m    non-stop         No info  12648
10682    10:55         19:15   8h 20m     2 stops         No info  11753

[10683 rows x 11 columns]
```

In [12]:
```
t={'Total_Stops':{'1 stop':1,'2 stops':2,'3 stops':3,'4 stops':4,'non-stop':5}}
df = df.replace(t)
print(df)
```

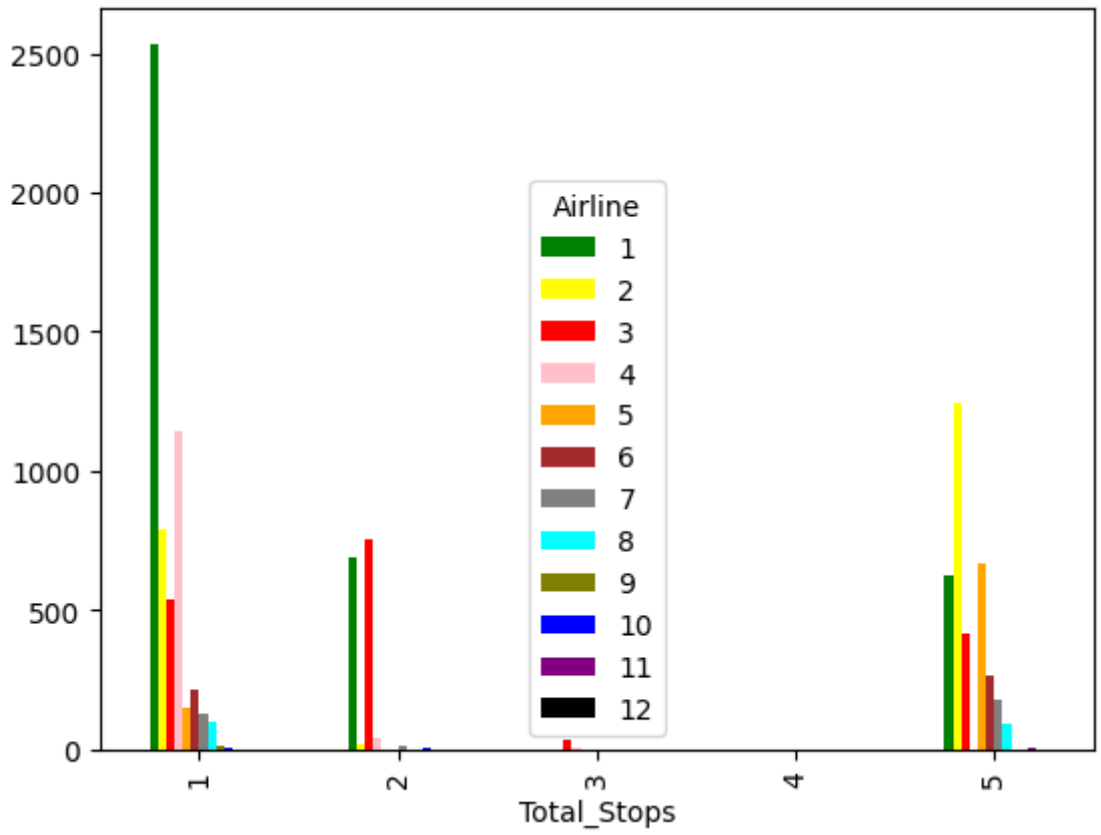
```
       Airline Date_of_Journey    Source Destination                  Route
0            2      24/03/2019  Banglore   New Delhi              BLR → DEL  \
1            3       1/05/2019   Kolkata    Banglore  CCU → IXR → BBI → BLR
2            1       9/06/2019     Delhi      Cochin  DEL → LKO → BOM → COK
3            2      12/05/2019   Kolkata    Banglore        CCU → NAG → BLR
4            2      01/03/2019  Banglore   New Delhi        BLR → NAG → DEL
...        ...             ...       ...         ...                    ...
10678        7       9/04/2019   Kolkata    Banglore              CCU → BLR
10679        3      27/04/2019   Kolkata    Banglore              CCU → BLR
10680        1      27/04/2019  Banglore       Delhi              BLR → DEL
10681        6      01/03/2019  Banglore   New Delhi              BLR → DEL
10682        3       9/05/2019     Delhi      Cochin  DEL → GOI → BOM → COK

      Dep_Time  Arrival_Time Duration  Total_Stops Additional_Info  Price
0        22:20  01:10 22 Mar   2h 50m            5         No info   3897
1        05:50         13:15   7h 25m            2         No info   7662
2        09:25  04:25 10 Jun      19h            2         No info  13882
3        18:05         23:30   5h 25m            1         No info   6218
4        16:50         21:35   4h 45m            1         No info  13302
...        ...           ...      ...          ...             ...    ...
10678    19:55         22:25   2h 30m            5         No info   4107
10679    20:45         23:20   2h 35m            5         No info   4145
10680    08:20         11:20      3h             5         No info   7229
10681    11:30         14:10   2h 40m            5         No info  12648
10682    10:55         19:15   8h 20m            2         No info  11753

[10683 rows x 11 columns]
```

In [13]:
```
r=pd.crosstab(df['Total_Stops'],df['Airline'])
print(r)
```

```
Airline        1     2    3     4    5    6    7    8   9   10  11  12
Total_Stops
1           2535   793  540  1145  148  215  129  102  13   4   0   1
2            691    19  756    43    0    0    9    0   0   2   0   0
3              0     0   37     8    0    0    0    0   0   0   0   0
4              0     0    1     0    0    0    0    0   0   0   0   0
5            623  1241  418     0  670  264  181   92   0   0   3   0
```

In [14]:
```
r.plot(kind='bar', stacked=False, color=['green','yellow','red','pink','orange','brown','gray','cyan','olive'
```

Out[14]: <Axes: xlabel='Total_Stops'>



In [15]:
```
x=df[['Total_Stops','Airline']]
y=df[['Price']]
```

In [16]:
```
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size=0.3)
```

Linear Regression

In [17]:
```
lr=LinearRegression()
lr.fit(x_train,y_train)
```

Out[17]: LinearRegression()

In a Jupyter environment, please rerun this cell to show the HTML representation or trust the notebook.
On GitHub, the HTML representation is unable to render, please try loading this page with nbviewer.org.

In [18]:
```
print(lr.score(x_train,y_train))
print(lr.score(x_test,y_test))
```

```
0.3588965505895584
0.3547193238050983
```

Ridge, Lasso, RidgeCV, LassoCV and ElasticNet

In [21]:
```
from sklearn.linear_model import Lasso,Ridge,LassoCV,RidgeCV
```

In [22]:
```
lasso = Lasso(alpha=10)
lasso.fit(x_train,y_train)
print(lasso.score(x_test,y_test))
print(lasso.score(x_train,y_train))
```

```
0.3547509900593633
0.3588942010344687
```

In [23]:
```
ridge = Ridge(alpha=10)
ridge.fit(x_train,y_train)
print(ridge.score(x_test,y_test))
print(ridge.score(x_train,y_train))
```

```
0.3547234452726441
0.3588965011593923
```

In [24]:
```
lasso_cv = LassoCV(alphas=[2,5,10,20,40,50])
lasso_cv.fit(x_train,y_train)
print(lasso_cv.score(x_test,y_test))
print(lasso_cv.score(x_train,y_train))
```

```
0.35472602049387103
0.35889645718648144
```

In [26]:
```
ridge_cv = RidgeCV(alphas=[2,5,10,20,40,50])
ridge_cv.fit(x_train,y_train)
print(ridge_cv.score(x_test,y_test))
print(ridge_cv.score(x_train,y_train))
```

```
0.3547274620637978
0.35889635302276923
```

In [31]:
```
from sklearn.linear_model import ElasticNet
en=ElasticNet()
en.fit(x_train,y_train)
print(en.score(x_train,y_train))
print(en.score(x_test,y_test))
```

```
0.35360949118514984
0.3506565913735198
```

Logistic Regression

In [19]:
```
from sklearn.linear_model import LogisticRegression
import warnings
warnings.simplefilter(action='ignore')
```

In [20]:
```
lg=LogisticRegression()
lg.fit(x_train,y_train)
print(lg.score(x_test,y_test))
```

```
0.08985959438377535
```

Random Forest

In [28]:
```
from sklearn.ensemble import RandomForestClassifier
rfc=RandomForestClassifier()
rfc.fit(x_train,y_train)
print(rfc.score(x_test,y_test))
print(rfc.score(x_train,y_train))
```

```
0.10514820592823713
0.11152714629580102
```

Decision Tree

In [30]:
```
from sklearn.tree import DecisionTreeClassifier
dt = DecisionTreeClassifier()
dt.fit(x_train,y_train)
print(dt.score(x_test,y_test))
print(dt.score(x_train,y_train))
```

```
0.10546021840873634
0.11152714629580102
```

Conclussion:-

For Jet Airways Airline mostly having Single stop
For Air India Airline mostly having 2-stops
only Air India Airline having 3 stops
IndiGo this Airline is non-stop

In [ ]:
```

```