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

In [2]:
```
flight_data = pd.read_csv('airlines_flights_data.csv')
flight_data.head()
```

Out[2]:

	index	airline	flight	source_city	departure_time	stops	arrival_time	destination_city	class	duration	days_left	price
0	0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mumbai	Economy	2.17	1	5953
1	1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mumbai	Economy	2.33	1	5953
2	2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mumbai	Economy	2.17	1	5956
3	3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mumbai	Economy	2.25	1	5955
4	4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mumbai	Economy	2.33	1	5955

In [3]:
```
flight_data.drop(columns = 'index', inplace = True)
flight_data.head()
```

Out[3]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city	class	duration	days_left	price
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mumbai	Economy	2.17	1	5953
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mumbai	Economy	2.33	1	5953
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mumbai	Economy	2.17	1	5956
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mumbai	Economy	2.25	1	5955
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mumbai	Economy	2.33	1	5955

In [4]:
```
flight_data.shape
```

Out[4]: (300153, 11)

In [5]:
```
flight_data.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 [6]:
```
flight_data.duplicated().sum()
```

Out[6]: np.int64(0)

In [7]:
```
flight_data.describe()
```

Out[7]:

	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 [8]:
```
flight_data.isna().sum()
```

Out[8]:
```
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
```

In [9]:
```
flight_data['airline'].nunique()
```

Out[9]:
```
6
```

In [10]:
```
flight_data['airline'].unique()
```

Out[10]:
```
array(['SpiceJet', 'AirAsia', 'Vistara', 'GO_FIRST', 'Indigo',
       'Air_India'], dtype=object)
```

In [11]:
```
flights_by_airline = flight_data['airline'].value_counts()
flights_by_airline
```

Out[11]:
```
airline
Vistara      127859
Air_India     80892
Indigo        43120
GO_FIRST      23173
AirAsia       16098
SpiceJet       9011
Name: count, dtype: int64
```

In [12]:
```
flight_data['flight'].value_counts()
```

Out[12]:
```
flight
UK-706     3235
UK-772     2741
UK-720     2650
UK-836     2542
UK-822     2468
           ...
6E-3211       1
6E-6474       1
6E-2914       1
SG-1058       1
6E-2939       1
Name: count, Length: 1561, dtype: int64
```

In [13]:
```
flight_data['source_city'].value_counts()
```

Out[13]:
```
source_city
Delhi        61343
Mumbai       60896
Bangalore    52061
Kolkata      46347
Hyderabad    40806
Chennai      38700
Name: count, dtype: int64
```

In [14]:
```
flight_data['departure_time'].value_counts()
```

Out[14]:
```
departure_time
Morning          71146
Early_Morning    66790
Evening          65102
Night            48015
Afternoon        47794
Late_Night        1306
Name: count, dtype: int64
```

In [15]:
```
flight_data['stops'].value_counts()
```

Out[15]:
```
stops
one           250863
zero           36004
two_or_more    13286
Name: count, dtype: int64
```

In [16]:
```
flight_data['arrival_time'].value_counts()
```

Out[16]:
```
arrival_time
Night            91538
Evening          78323
Morning          62735
Afternoon        38139
Early_Morning    15417
Late_Night       14001
Name: count, dtype: int64
```

In [17]:
```
flight_data['destination_city'].value_counts()
```

Out[17]:
```
destination_city
Mumbai       59097
Delhi        57360
Bangalore    51068
Kolkata      49534
Hyderabad    42726
Chennai      40368
Name: count, dtype: int64
```

In [18]:
```
flight_data['days_left'].value_counts()
```

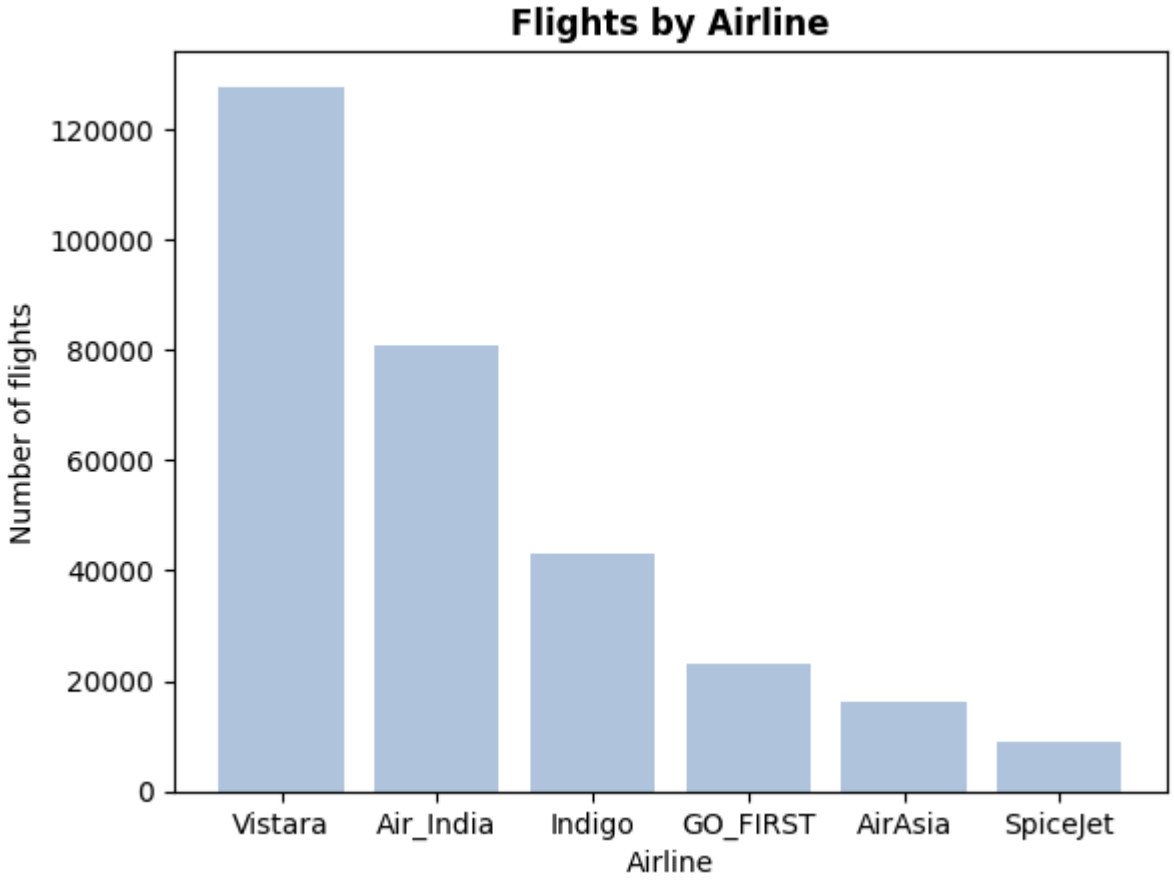
Out[18]:

	days_left
25	6633
18	6602
39	6593
32	6585
26	6573
24	6542
19	6537
31	6534
33	6532
40	6531
41	6525
28	6522
38	6512
20	6502
30	6501
42	6497
22	6494
36	6490
21	6479
37	6476
43	6472
44	6436
17	6419
11	6417
34	6412
13	6404
23	6401
29	6397
12	6381
27	6360
14	6349
15	6340
45	6314
35	6291
16	6272
46	6160
49	6154
48	6078
47	6069

```
10    5822
8     5767
6     5740
7     5703
9     5665
5     5392
4     5077
3     4248
2     4026
1     1927
Name: count, dtype: int64
```

In [19]:
```
plt.bar(flights_by_airline.index, flights_by_airline.values, color = 'lightsteelblue')
plt.title('Flights by Airline',fontweight = 'bold')
plt.xlabel('Airline')
plt.ylabel('Number of flights')
```

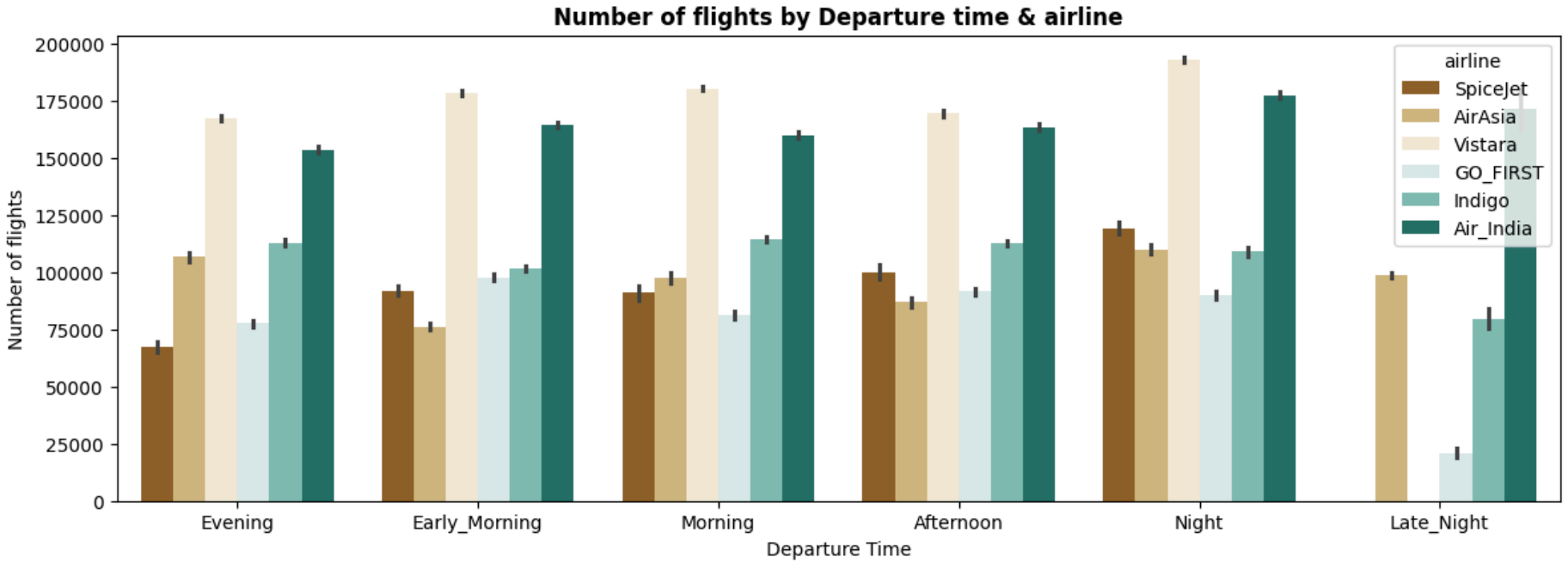
Out[19]:
```
Text(0, 0.5, 'Number of flights')
```

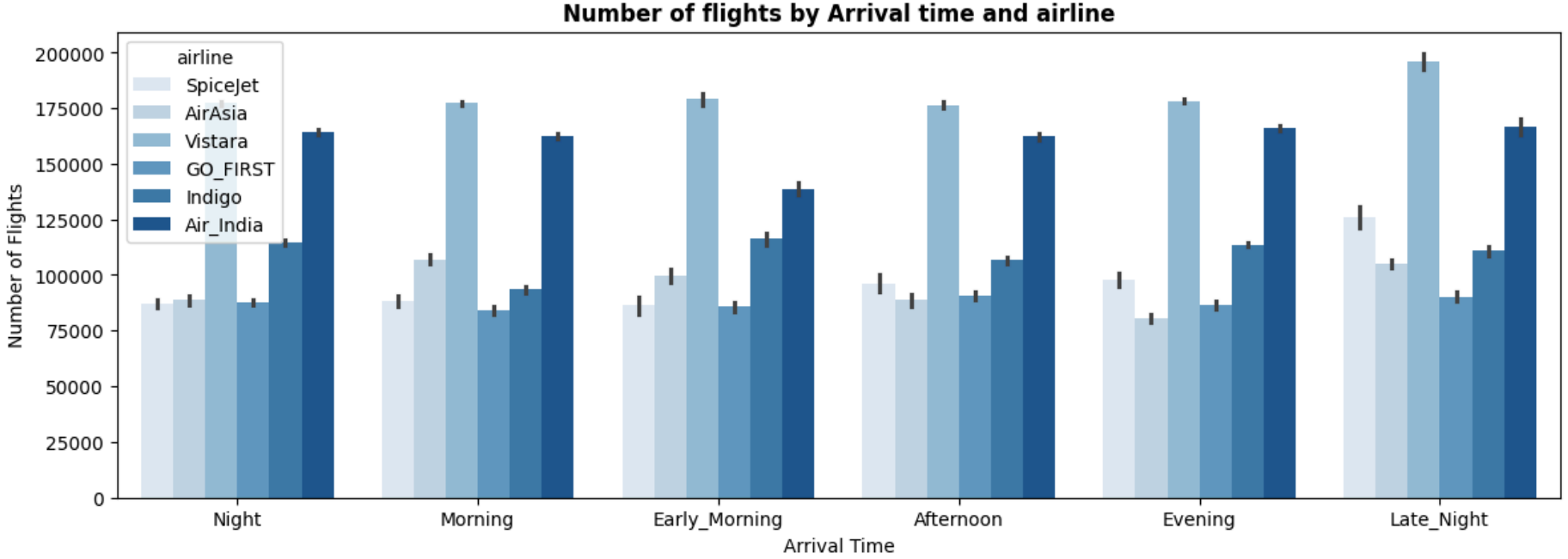


In [20]:
```
fig,axs = plt.subplots(2,1, figsize = (14,10))
plt.subplot(2,1,1)
d_time = flight_data['departure_time'].index
d_count = flight_data['departure_time'].values
sns.barplot(data = flight_data, x = d_count, y = d_time, hue = 'airline', palette= 'BrBG')
plt.title('Number of flights by Departure time & airline',fontweight = 'bold')
plt.xlabel('Departure Time')
plt.ylabel('Number of flights')

plt.subplot(2,1,2)
a_time = flight_data['arrival_time'].index
a_count = flight_data['arrival_time'].values
sns.barplot(data=flight_data, x = a_count, y = a_time , hue = 'airline', palette = 'Blues')
```

```
plt.title('Number of flights by Arrival time and airline',fontweight = 'bold')
plt.xlabel('Arrival Time')
plt.ylabel('Number of Flights')
```

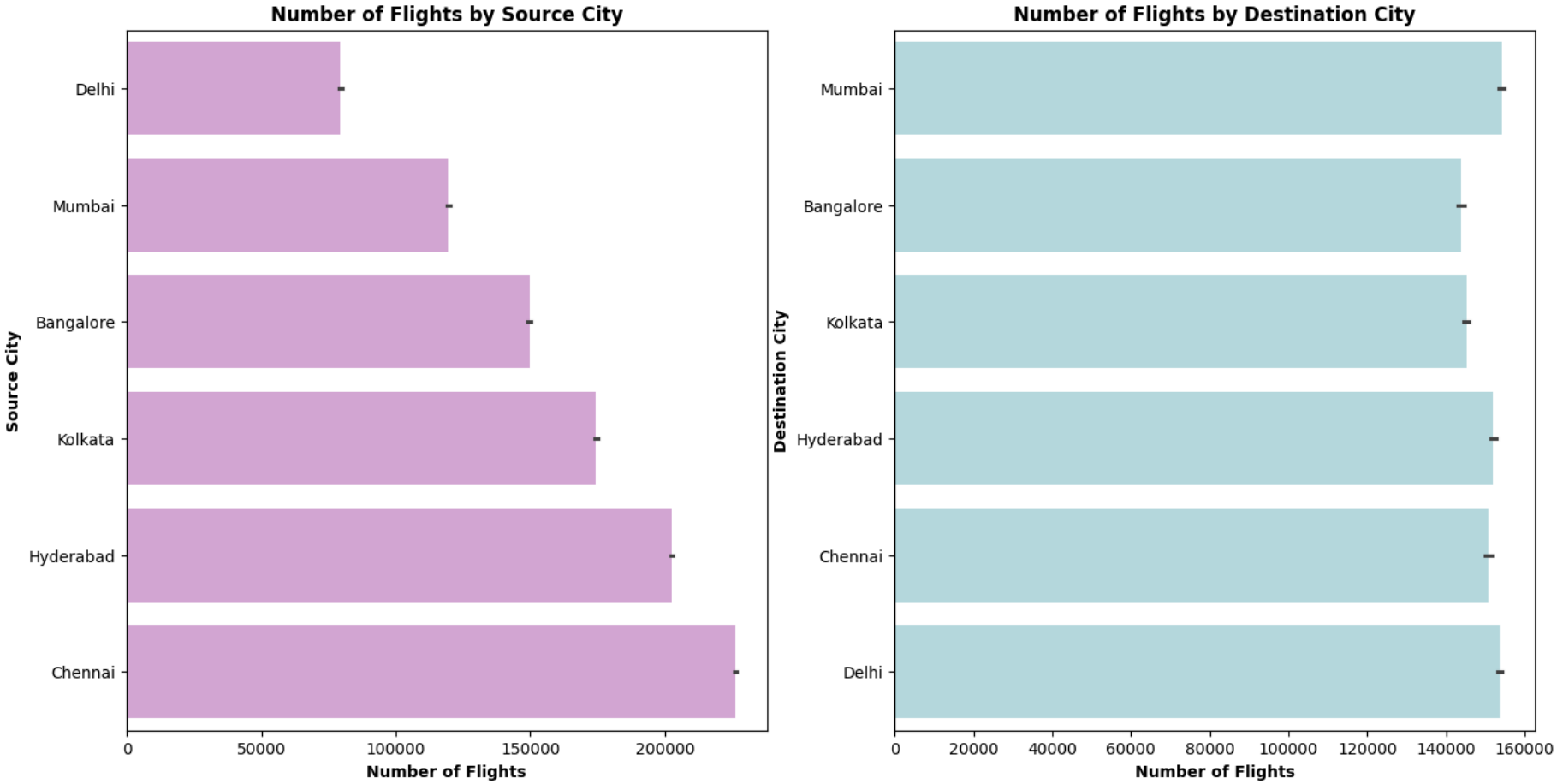
Out[20]: Text(0, 0.5, 'Number of Flights')


Number of flights by Departure time & airline
Number of flights
200000
175000
150000
125000
100000
75000
50000
25000
0
airline
SpiceJet
AirAsia
Vistara
GO_FIRST
Indigo
Air_India
Evening
Early_Morning
Morning
Afternoon
Night
Late_Night
Departure Time


Number of flights by Arrival time and airline
Number of Flights
200000
175000
150000
125000
100000
75000
50000
25000
0
airline
SpiceJet
AirAsia
Vistara
GO_FIRST
Indigo
Air_India
Night
Morning
Early_Morning
Afternoon
Evening
Late_Night
Arrival Time

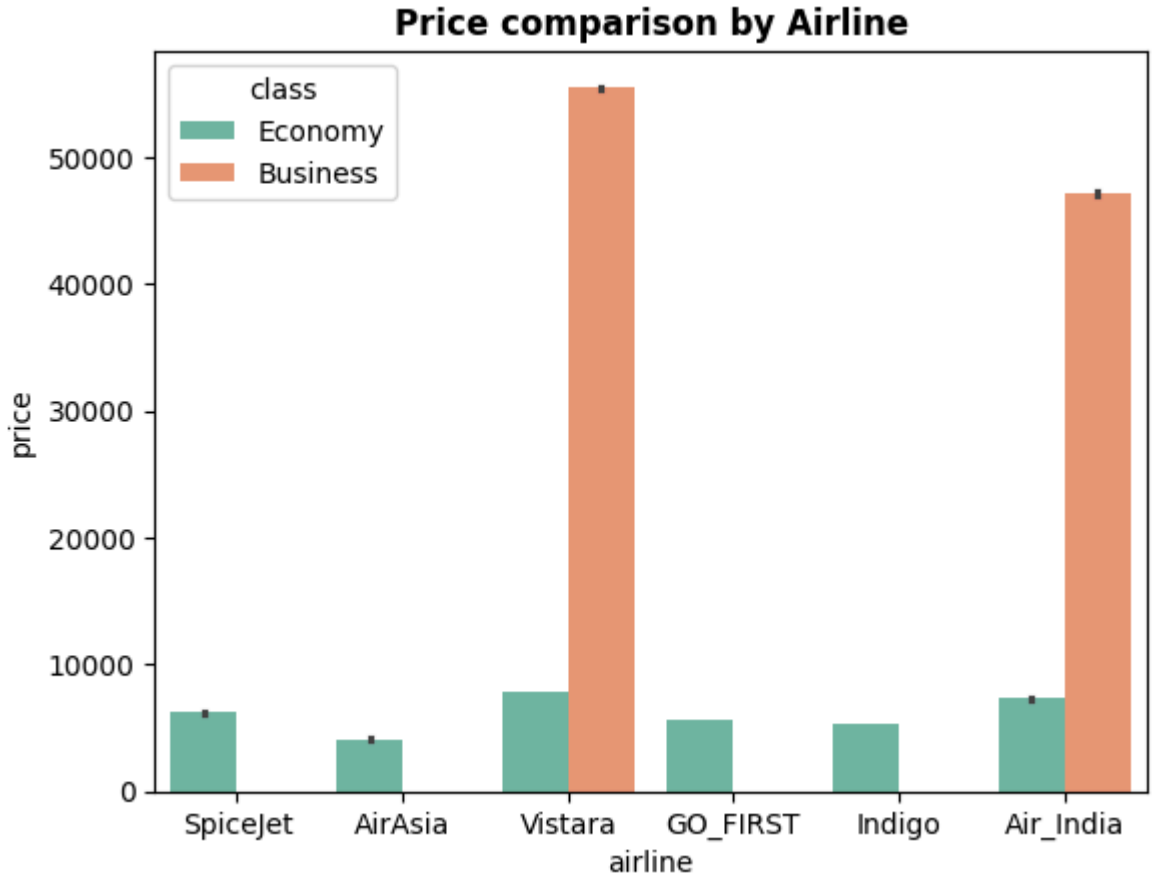
In [21]:
```
fig,axs = plt.subplots(1,2, figsize = (16,8))

plt.subplot(1,2,1)
source = flight_data['source_city'].index
freq = flight_data['source_city'].values

sns.barplot(data = flight_data, x = source, y = freq, color = 'plum')
plt.title('Number of Flights by Source City',fontweight = 'bold')
plt.xlabel('Number of Flights',fontweight = 'bold')
plt.ylabel('Source City',fontweight = 'bold')

plt.subplot(1,2,2)
dest = flight_data['destination_city'].index
freq_d = flight_data['destination_city'].values

sns.barplot(data = flight_data, x = dest, y = freq_d, color = 'powderblue')
plt.title('Number of Flights by Destination City',fontweight = 'bold')
plt.xlabel('Number of Flights',fontweight = 'bold')
plt.ylabel('Destination City',fontweight = 'bold')
```

Out[21]:
```
Text(0, 0.5, 'Destination City')
```



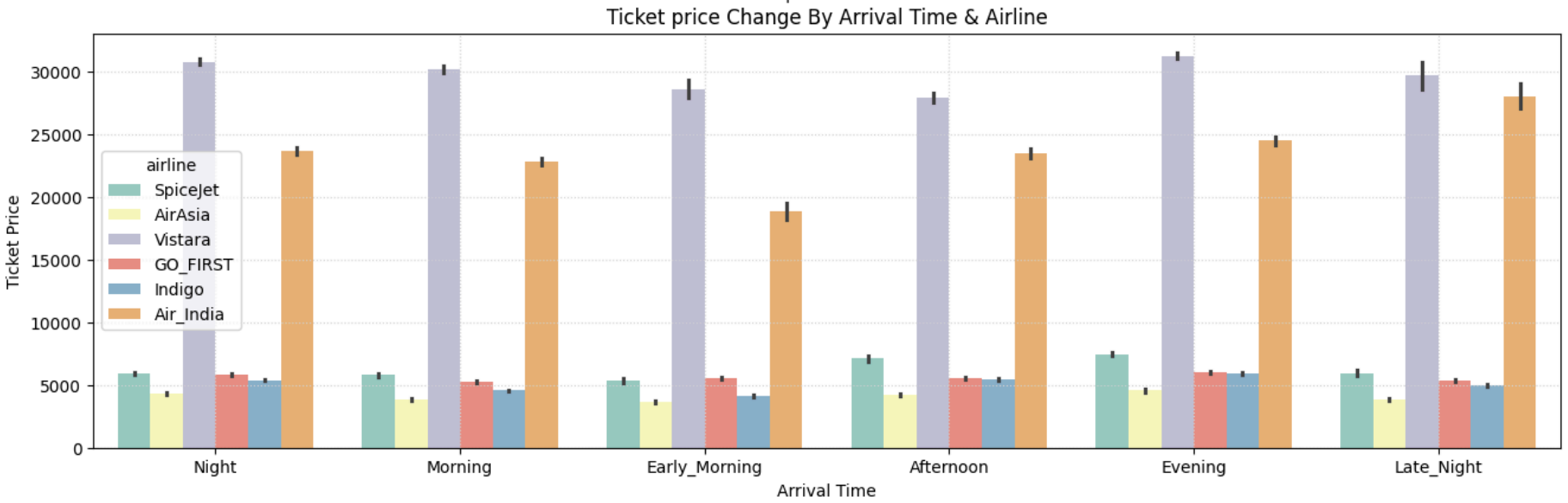
In [22]:
```
sns.barplot(data = flight_data, y = 'price', x = 'airline', hue = 'class', palette= 'Set2')
plt.title('Price comparison by Airline', fontweight = 'bold')
```

Out[22]:
```
Text(0.5, 1.0, 'Price comparison by Airline')
```



In [23]:
```
fig,axs = plt.subplots(2,1,figsize = (16,10))

plt.subplot(2,1,1)
sns.barplot(data = flight_data, x = 'departure_time', y = 'price', hue = 'airline', palette='Set3')
plt.title('Ticket Price Change by Departure Time & Airline')
plt.xlabel('Departure Time')
plt.ylabel('Ticket Price')
plt.grid(ls = ':', color = 'lightgray')

plt.subplot(2,1,2)
sns.barplot(data = flight_data, x = 'arrival_time', y = 'price', hue = 'airline', palette='Set3')
plt.title('Ticket price Change By Arrival Time & Airline')
plt.xlabel('Arrival Time')
```

```
plt.ylabel('Ticket Price')
plt.grid(ls = ':', color = 'lightgray')
```



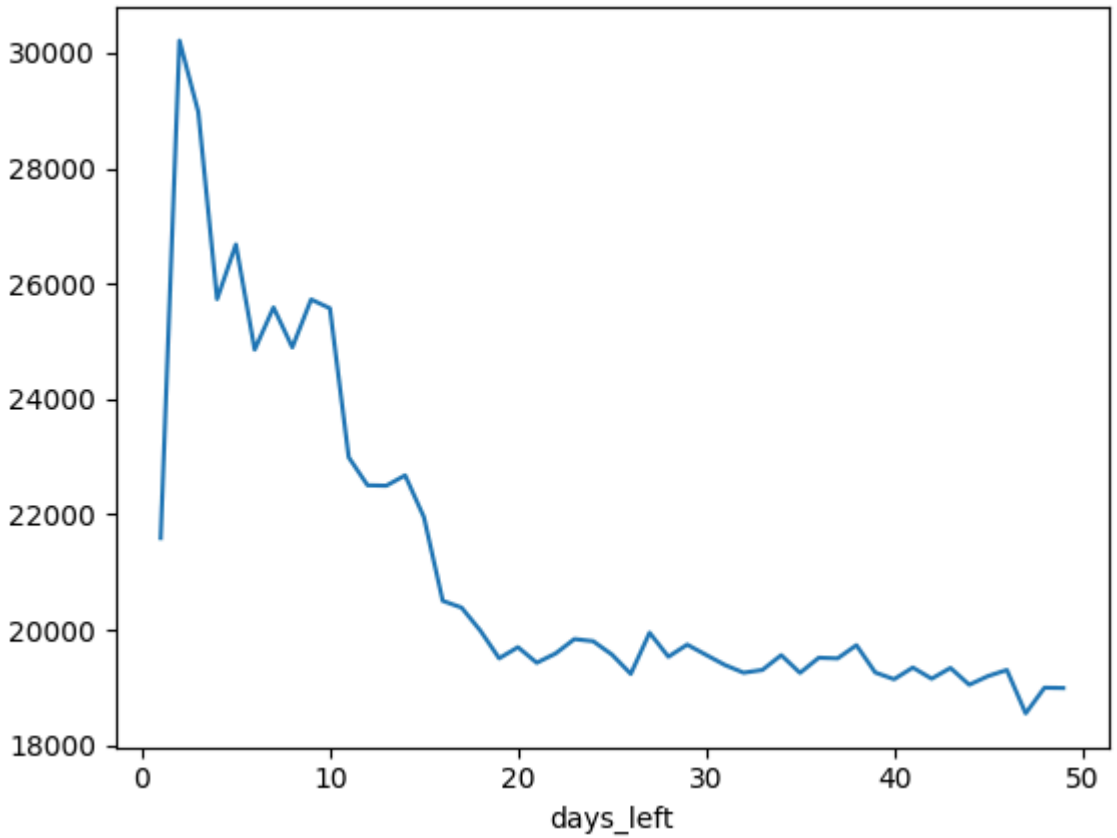
In [24]:
```
flight_data.head()
```

Out[24]:

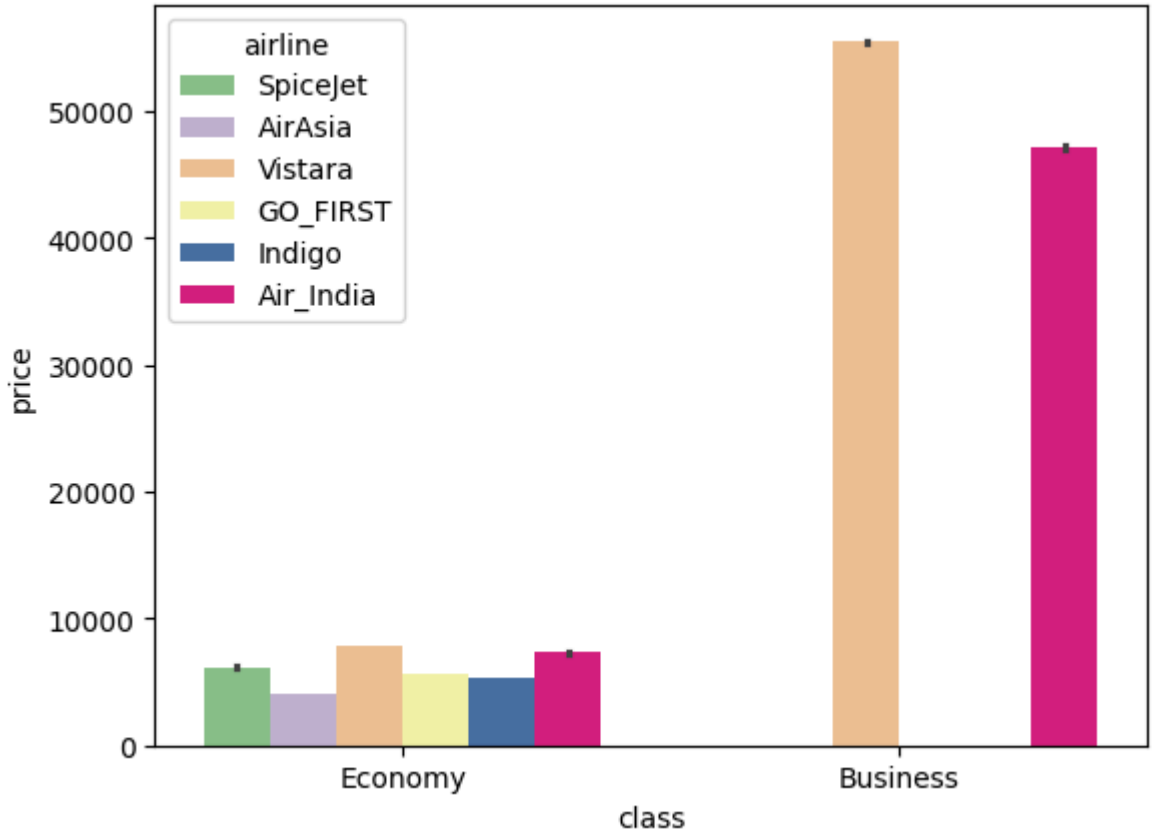
	airline	flight	source_city	departure_time	stops	arrival_time	destination_city	class	duration	days_left	price
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mumbai	Economy	2.17	1	5953
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mumbai	Economy	2.33	1	5953
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mumbai	Economy	2.17	1	5956
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mumbai	Economy	2.25	1	5955
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mumbai	Economy	2.33	1	5955

In [25]:
```
flight_data.groupby('days_left')['price'].mean().plot()
```

Out[25]:
```
<Axes: xlabel='days_left'>
```



In [26]:
```
fig = sns.barplot(data = flight_data, x = 'class', y = 'price', hue = 'airline', palette= 'Accent')
```



In [27]:
```
flight_data.head()
```

Out[27]:

	airline	flight	source_city	departure_time	stops	arrival_time	destination_city	class	duration	days_left	price
0	SpiceJet	SG-8709	Delhi	Evening	zero	Night	Mumbai	Economy	2.17	1	5953
1	SpiceJet	SG-8157	Delhi	Early_Morning	zero	Morning	Mumbai	Economy	2.33	1	5953
2	AirAsia	I5-764	Delhi	Early_Morning	zero	Early_Morning	Mumbai	Economy	2.17	1	5956
3	Vistara	UK-995	Delhi	Morning	zero	Afternoon	Mumbai	Economy	2.25	1	5955
4	Vistara	UK-963	Delhi	Morning	zero	Morning	Mumbai	Economy	2.33	1	5955

In [28]:
```
from sklearn.linear_model import LinearRegression
from sklearn.tree import DecisionTreeRegressor
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error, r2_score, confusion_matrix, classification_report, accuracy_score
```

In [29]:
```
y = flight_data['price']
X = flight_data[['airline','flight', 'source_city', 'departure_time','stops','arrival_time','destination_city', 'class', 'dura

X = pd.get_dummies(X, columns= ['airline','flight','source_city','departure_time','stops','arrival_time','destination_city','c

X.head()
```

Out[29]:

	duration	days_left	airline_Air_India	airline_GO_FIRST	airline_Indigo	airline_SpiceJet	airline_Vistara	flight_6.00E-102	flight_6.00E-105	flight_
0	2.17	1	0	0	0	1	0	0	0	
1	2.33	1	0	0	0	1	0	0	0	
2	2.17	1	0	0	0	0	0	0	0	
3	2.25	1	0	0	0	0	1	0	0	
4	2.33	1	0	0	0	0	1	0	0	

5 rows × 1590 columns

In [30]:
```
X_train, X_test, y_train, y_test = train_test_split(X,y, test_size=0.2, random_state=1)
```

In [31]:
```
model = LinearRegression()
```

In [32]:
```
model.fit(X_train,y_train)
```

Out[32]:

▾ LinearRegression

▶ Parameters

In [34]:
```
pre_y = model.predict(X_test)
```

In [36]:
```
r2_score = r2_score(y_test, pre_y)
r2_score
```

Out[36]:
```
0.9260622220968409
```