DSC640-T301_Week_9&10_Damico

November 3, 2024

[87]:
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import folium
from folium.plugins import MarkerCluster
import squarify
```

[86]:
```
# Load datasets
complaints_by_airport = pd.read_csv(r"C:\Users\Joseph\Desktop\School\Masters␣
 ↪Data Science\Data Presentation\complaints-by-airport.csv")
complaints_by_category = pd.read_csv(r"C:\Users\Joseph\Desktop\School\Masters␣
 ↪Data Science\Data Presentation\complaints-by-category.csv")
complaints_by_subcategory = pd.read_csv(r"C:
 ↪\Users\Joseph\Desktop\School\Masters Data Science\Data␣
 ↪Presentation\complaints-by-subcategory.csv")
iata_icao = pd.read_csv(r"C:\Users\Joseph\Desktop\School\Masters Data␣
 ↪Science\Data Presentation\iata-icao.csv")
```

[88]:
```
# Display the first few rows
display(complaints_by_airport.head())
display(complaints_by_category.head())
display(complaints_by_subcategory.head())
display(iata_icao.head())
```

```
  pdf_report_date airport year_month  count
0         2019-02     ABE    2015-01      0
1         2019-02     ABE    2015-02      0
2         2019-02     ABE    2015-03      0
3         2019-02     ABE    2015-04      0
4         2019-02     ABE    2015-05      2
```

```
  pdf_report_date airport                            category year_month  \
0         2019-02     ABE         Hazardous Materials Safety    2015-01
1         2019-02     ABE  Mishandling of Passenger Property    2015-01
2         2019-02     ABE         Hazardous Materials Safety    2015-02
3         2019-02     ABE  Mishandling of Passenger Property    2015-02
4         2019-02     ABE         Hazardous Materials Safety    2015-03

   count                           clean_cat clean_cat_status
```

```
0      0         Hazardous Materials Safety         original
1      0  Mishandling of Passenger Property         original
2      0         Hazardous Materials Safety         original
3      0  Mishandling of Passenger Property         original
4      0         Hazardous Materials Safety         original

  pdf_report_date airport                           category  \
0         2019-02     ABE         Hazardous Materials Safety
1         2019-02     ABE  Mishandling of Passenger Property
2         2019-02     ABE         Hazardous Materials Safety
3         2019-02     ABE  Mishandling of Passenger Property
4         2019-02     ABE         Hazardous Materials Safety

                              subcategory year_month  count  \
0                                 General    2015-01      0
1  Damaged/Missing Items--Checked Baggage    2015-01      0
2                                 General    2015-02      0
3  Damaged/Missing Items--Checked Baggage    2015-02      0
4                                 General    2015-03      0

                         clean_cat                                clean_subcat  \
0         Hazardous Materials Safety                                     General
1  Mishandling of Passenger Property  *Damaged/Missing Items--Checked Baggage
2         Hazardous Materials Safety                                     General
3  Mishandling of Passenger Property  *Damaged/Missing Items--Checked Baggage
4         Hazardous Materials Safety                                     General

  clean_cat_status clean_subcat_status  is_category_prefix_removed
0         original            original                       False
1         original            original                       False
2         original            original                       False
3         original            original                       False
4         original            original                       False

  country_code region_name iata  icao                          airport  \
0           AE    Abu Zaby  AAN  OMAL     Al Ain International Airport
1           AE    Abu Zaby  AUH  OMAA  Abu Dhabi International Airport
2           AE    Abu Zaby  AYM   NaN         Yas Island Seaplane Base
3           AE    Abu Zaby  AZI  OMAD      Al Bateen Executive Airport
4           AE    Abu Zaby  DHF  OMAM               Al Dhafra Air Base

   latitude  longitude
0   24.2617    55.6092
1   24.4330    54.6511
2   24.4670    54.6103
3   24.4283    54.4581
4   24.2482    54.5477
```

[89]:
```
# Merge complaints datasets with IATA/ICAO data on the 'airport' code
complaints_by_airport = complaints_by_airport.merge(iata_icao,␣
 ↪left_on='airport', right_on='iata', how='left')
complaints_by_category = complaints_by_category.merge(iata_icao,␣
 ↪left_on='airport', right_on='iata', how='left')
complaints_by_subcategory = complaints_by_subcategory.merge(iata_icao,␣
 ↪left_on='airport', right_on='iata', how='left')
```

[90]:
```
# Complaints by Airport
complaints_by_airport = complaints_by_airport[['pdf_report_date', 'airport_x',␣
 ↪'year_month', 'count',
                                                'country_code', 'region_name',␣
 ↪'latitude', 'longitude']]
complaints_by_airport = complaints_by_airport.rename(columns={'airport_x':␣
 ↪'airport'})

# Complaints by Category
complaints_by_category = complaints_by_category[['pdf_report_date',␣
 ↪'airport_x', 'category', 'year_month', 'count',
                                                  'clean_cat',␣
 ↪'clean_cat_status', 'country_code',
                                                  'region_name', 'latitude',␣
 ↪'longitude']]
complaints_by_category = complaints_by_category.rename(columns={'airport_x':␣
 ↪'airport'})

# Complaints by Subcategory
complaints_by_subcategory = complaints_by_subcategory[['pdf_report_date',␣
 ↪'airport_x', 'category', 'subcategory',
                                                        'year_month', 'count',␣
 ↪'clean_cat', 'clean_subcat',
                                                        'clean_cat_status',␣
 ↪'clean_subcat_status',
                                                        'country_code',␣
 ↪'region_name', 'latitude', 'longitude']]
complaints_by_subcategory = complaints_by_subcategory.
 ↪rename(columns={'airport_x': 'airport'})
```

[91]:
```
# Verify that data is properly cleaned
print("Complaints by Airport dtypes:\n", complaints_by_airport.dtypes)
print("\nComplaints by Category dtypes:\n", complaints_by_category.dtypes)
print("\nComplaints by Subcategory dtypes:\n", complaints_by_subcategory.dtypes)
```

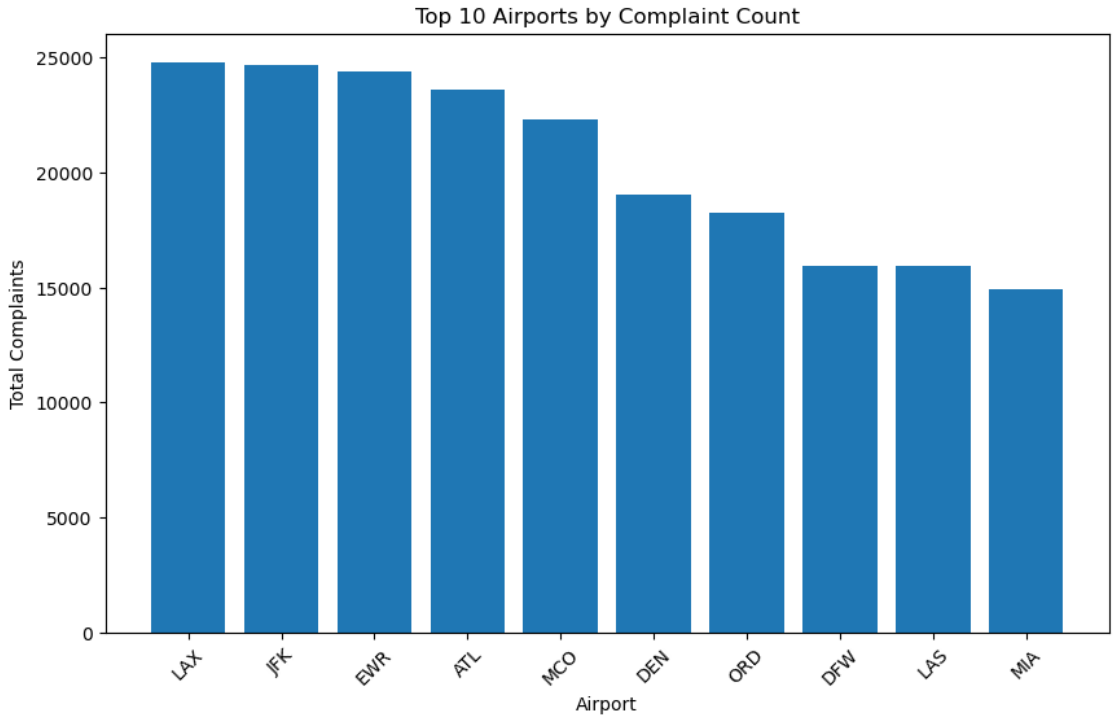
```
Complaints by Airport dtypes:
 pdf_report_date     object
airport              object
year_month           object
```

```
count                 int64
country_code         object
region_name          object
latitude            float64
longitude           float64
dtype: object

Complaints by Category dtypes:
 pdf_report_date      object
airport               object
category              object
year_month            object
count                  int64
clean_cat             object
clean_cat_status      object
country_code          object
region_name           object
latitude             float64
longitude            float64
dtype: object

Complaints by Subcategory dtypes:
 pdf_report_date         object
airport                  object
category                 object
subcategory              object
year_month               object
count                     int64
clean_cat                object
clean_subcat             object
clean_cat_status         object
clean_subcat_status      object
country_code             object
region_name              object
latitude                float64
longitude               float64
dtype: object
```

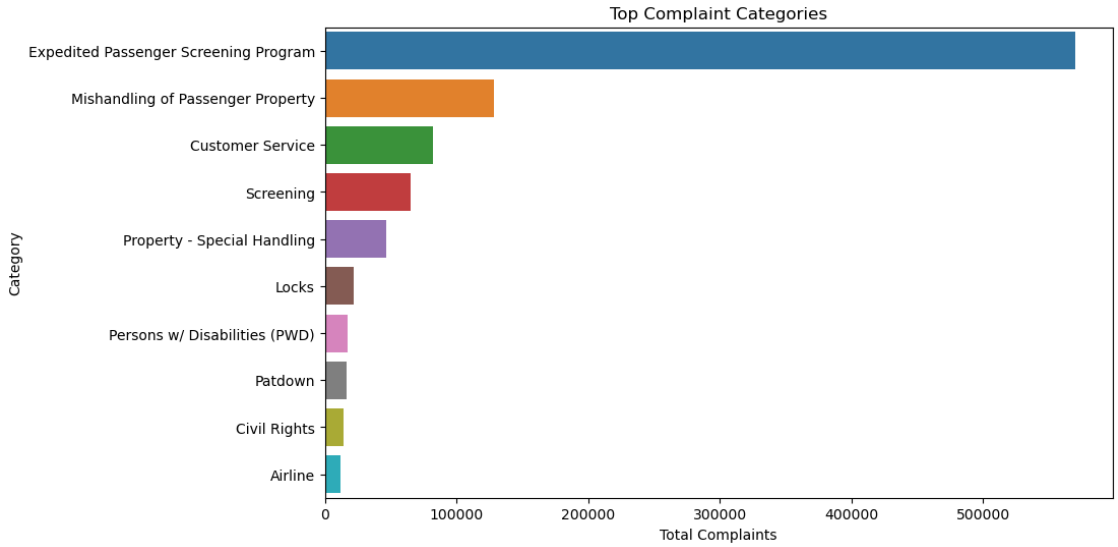
1 VISUALS

[92]:
```
# Top 10 Airports by Complaint Count
top_airports = complaints_by_airport.groupby('airport')['count'].sum().
 ↪nlargest(10)
plt.figure(figsize=(10, 6))
plt.bar(top_airports.index, top_airports.values)
plt.title('Top 10 Airports by Complaint Count')
plt.xlabel('Airport')
```

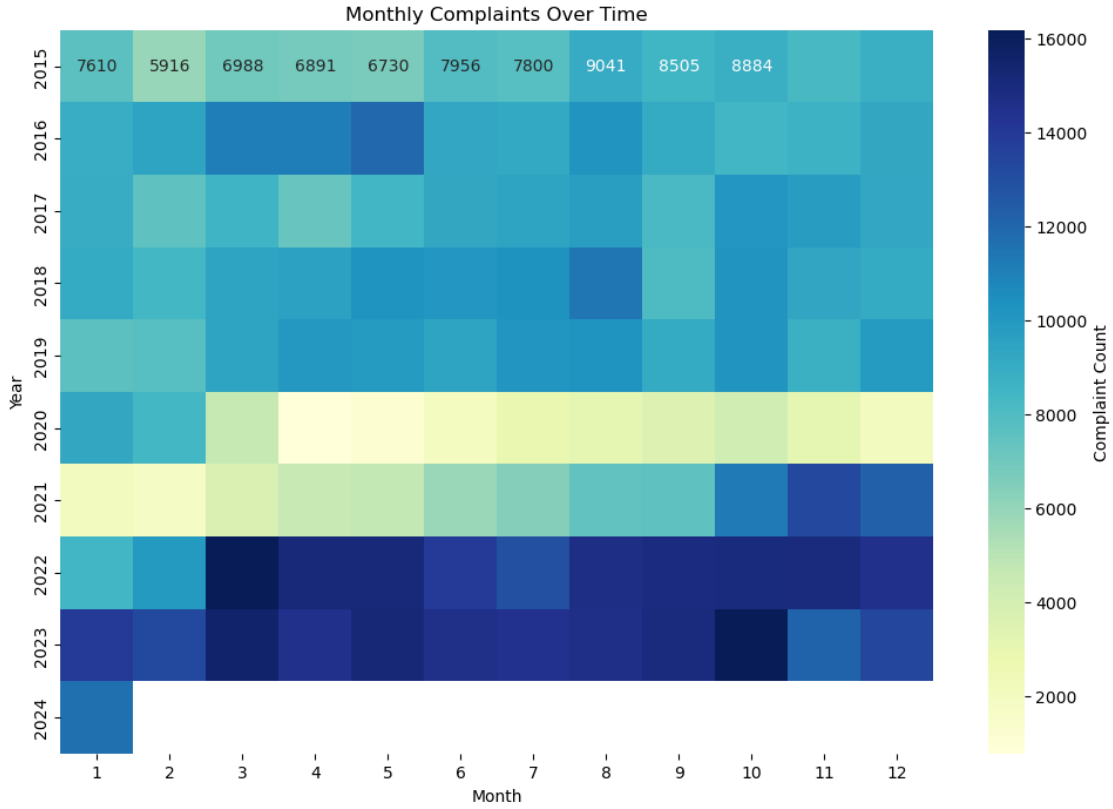
```
plt.ylabel('Total Complaints')
plt.xticks(rotation=45)
plt.show()
```



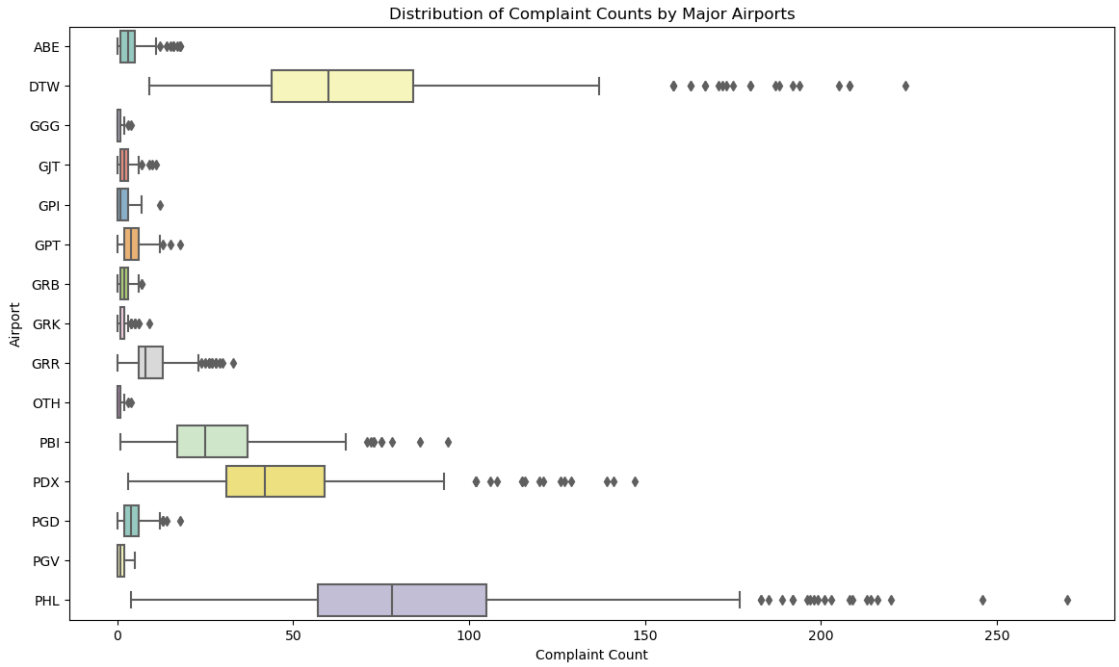
[93]:
```
# Top Complaint Categories
top_categories = complaints_by_category.groupby('category')['count'].sum().
  ↪nlargest(10)
plt.figure(figsize=(10, 6))
sns.barplot(x=top_categories.values, y=top_categories.index)
plt.title('Top Complaint Categories')
plt.xlabel('Total Complaints')
plt.ylabel('Category')
plt.show()
```



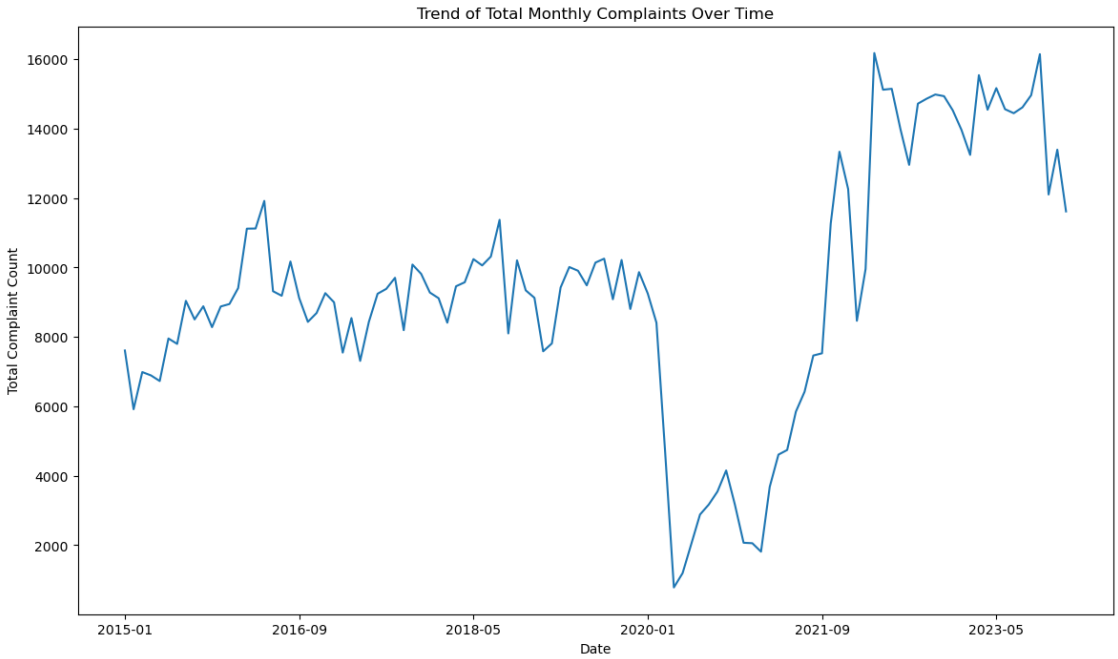
[96]:
```
# Convert 'year_month' to datetime format
complaints_by_time = complaints_by_airport.copy()
complaints_by_time['year_month'] = pd.
 ↪to_datetime(complaints_by_time['year_month'], errors='coerce')

# Extract the year and month
complaints_by_time['year'] = complaints_by_time['year_month'].dt.year
complaints_by_time['month'] = complaints_by_time['year_month'].dt.month

# Aggregate complaints by year and month
monthly_complaints = complaints_by_time.groupby(['year', 'month'])['count'].
 ↪sum().unstack()

# Plot the heat map with adjusted annotation format
plt.figure(figsize=(12, 8))
sns.heatmap(monthly_complaints, cmap="YlGnBu", annot=True, fmt=".0f",␣
 ↪cbar_kws={'label': 'Complaint Count'})
plt.title('Monthly Complaints Over Time')
plt.xlabel('Month')
plt.ylabel('Year')
plt.show()
```



[97]:
```
# Filter for airports with significant data
top_airports = complaints_by_airport['airport'].value_counts().nlargest(15).
 ↪index
filtered_complaints_airport =␣
 ↪complaints_by_airport[complaints_by_airport['airport'].isin(top_airports)]

# Plot the box plot for complaints by airport
plt.figure(figsize=(14, 8))
sns.boxplot(data=filtered_complaints_airport, x='count', y='airport',␣
 ↪orient='h', palette='Set3')
plt.title('Distribution of Complaint Counts by Major Airports')
plt.xlabel('Complaint Count')
plt.ylabel('Airport')
plt.show()
```



[98]:
```
# Aggregate total complaints by month
monthly_trends = complaints_by_airport.groupby('year_month')['count'].sum()

# Plot the time series of total monthly complaints
plt.figure(figsize=(14, 8))
monthly_trends.plot()
plt.title('Trend of Total Monthly Complaints Over Time')
plt.xlabel('Date')
plt.ylabel('Total Complaint Count')
plt.show()
```



[101]:
```
# Filter to airports with location data and aggregate complaints by airport
complaints_map_data = complaints_by_airport.dropna(subset=['latitude',␣
 ↪'longitude'])
complaints_map_data = complaints_map_data.groupby(['airport', 'latitude',␣
 ↪'longitude'])['count'].sum().reset_index()

# Create a base map centered on the United States
m = folium.Map(location=[39.8283, -98.5795], zoom_start=4)

# Add a marker cluster for better visualization of overlapping points
marker_cluster = MarkerCluster().add_to(m)

# Plot each airport on the map
for _, row in complaints_map_data.iterrows():
    folium.CircleMarker(
        location=(row['latitude'], row['longitude']),
        radius=max(row['count'] / 500, 5),  # Adjust scale and ensure a minimum␣
 ↪size
        color='blue',
        fill=True,
        fill_color='blue',
        fill_opacity=0.6,
        tooltip=f"{row['airport']}: {row['count']} complaints"
    ).add_to(marker_cluster)
```

```
# Save and display the map
m.save("complaints_map.html")
m
```

[101]: <folium.folium.Map at 0x1948b8390d0>

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