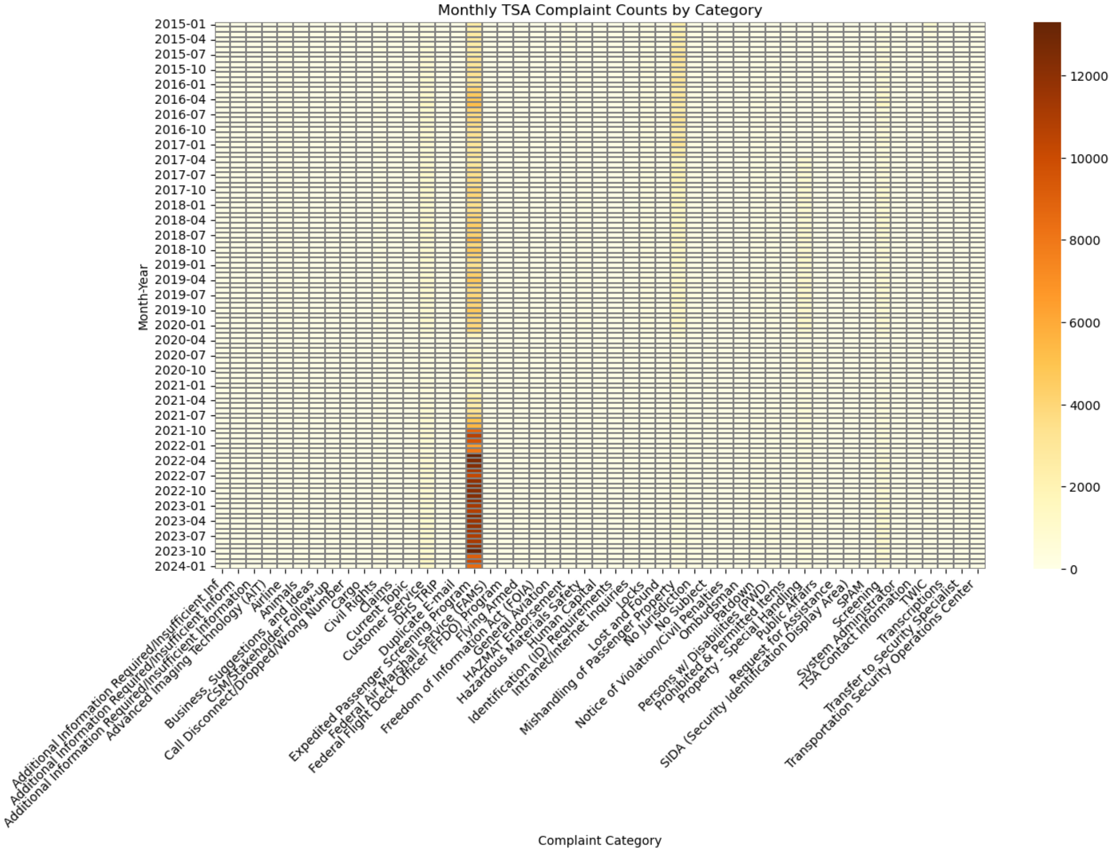
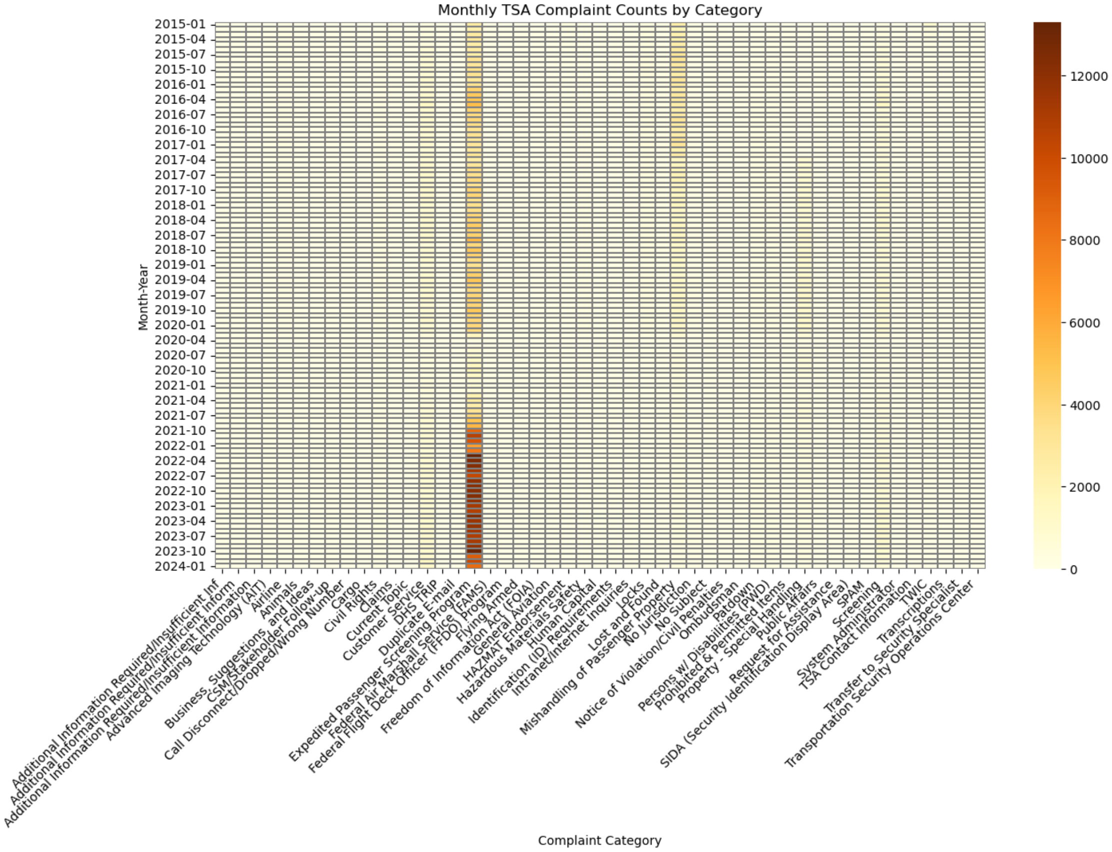
Week_9_10_Chatila

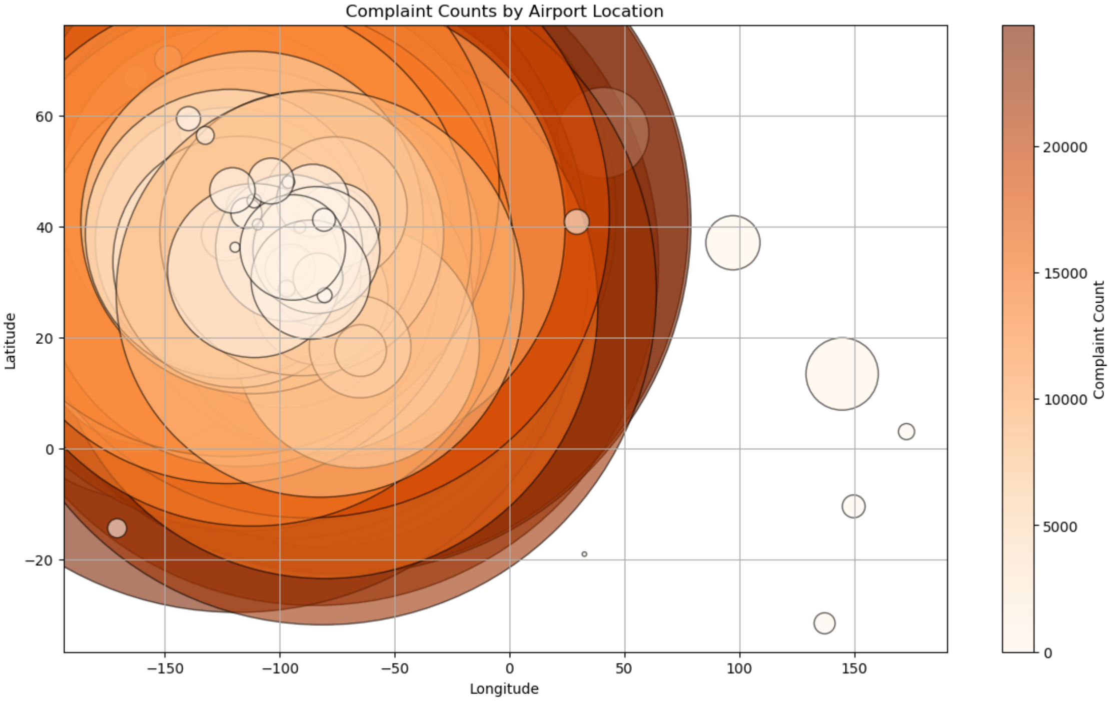
October 31, 2024

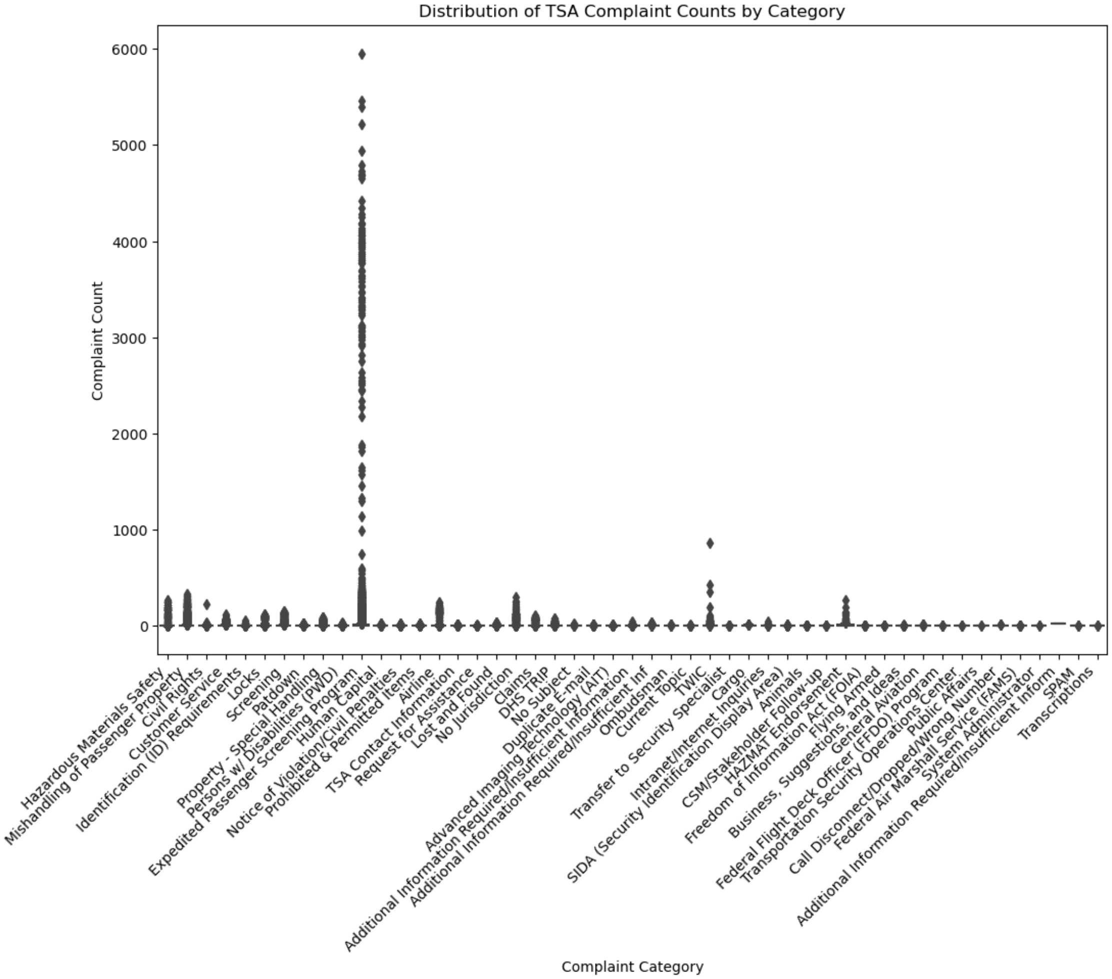
```
[13]: import pandas as pd
      import matplotlib.pyplot as plt
      import seaborn as sns
      import warnings

      warnings.filterwarnings("ignore")

      # Load the datasets
      complaints_by_airport = pd.read_csv('/Users/shadinchatila/Downloads/
       ↪complaints-by-airport.csv')
      complaints_by_category = pd.read_csv('/Users/shadinchatila/Downloads/
       ↪complaints-by-category.csv')
      complaints_by_subcategory = pd.read_csv('/Users/shadinchatila/Downloads/
       ↪complaints-by-subcategory.csv')
      iata_icao = pd.read_csv('/Users/shadinchatila/Downloads/iata-icao.csv')

      # Merge complaints data with IATA/ICAO
      complaints_by_airport_merged = complaints_by_airport.merge(iata_icao[['iata',␣
       ↪'airport', 'latitude', 'longitude']],
                                                                left_on='airport',␣
       ↪right_on='iata', how='left')

      # Prepare the data for the heat map visualization
      complaints_by_category['year_month'] = pd.
       ↪to_datetime(complaints_by_category['year_month'])
      category_monthly_complaints = complaints_by_category.groupby(
          [complaints_by_category['year_month'].dt.to_period("M"), 'category']
      )['count'].sum().unstack().fillna(0)

      # Heatmap of Monthly Complaint Counts by Category
      plt.figure(figsize=(14, 8))
      sns.heatmap(category_monthly_complaints, cmap="YlOrBr", linewidths=0.3,␣
       ↪linecolor='gray')
      plt.title("Monthly TSA Complaint Counts by Category")
      plt.xlabel("Complaint Category")
      plt.ylabel("Month-Year")
      plt.xticks(rotation=45, ha='right')
plt.yticks(rotation=0)
plt.show()

# Prepare the data for the heat map visualization
complaints_by_category['year_month'] = pd.
 ↪to_datetime(complaints_by_category['year_month'])
category_monthly_complaints = complaints_by_category.groupby(
    [complaints_by_category['year_month'].dt.to_period("M"), 'category']
)['count'].sum().unstack().fillna(0)

# Heatmap of Monthly Complaint Counts by Category
plt.figure(figsize=(14, 8))
sns.heatmap(category_monthly_complaints, cmap="YlOrBr", linewidths=0.3,␣
 ↪linecolor='gray')
plt.title("Monthly TSA Complaint Counts by Category")
plt.xlabel("Complaint Category")
plt.ylabel("Month-Year")
plt.xticks(rotation=45, ha='right')
plt.yticks(rotation=0)
plt.show()

# Rename the 'airport' column in complaints_by_airport to avoid issues when␣
 ↪merging
complaints_by_airport = complaints_by_airport.rename(columns={'airport':␣
 ↪'airport_code'})

# Merge complaints_by_airport and iata_icao
airport_complaints = complaints_by_airport.merge(
    iata_icao[['iata', 'airport', 'latitude', 'longitude']],
    left_on="airport_code", right_on="iata", how="left"
).groupby(["airport_code", "latitude", "longitude"])["count"].sum().
 ↪reset_index()

# Scatter plot for complaints by airport location
plt.figure(figsize=(14, 8))
scatter = plt.scatter(
    airport_complaints['longitude'], airport_complaints['latitude'],
    s=airport_complaints['count'] * 10, alpha=0.6,␣
 ↪c=airport_complaints['count'],
    cmap='Oranges', edgecolor='k', marker='o'
)
plt.colorbar(scatter, label='Complaint Count')
plt.title("Complaint Counts by Airport Location")
plt.xlabel("Longitude")
plt.ylabel("Latitude")
plt.grid(True)
plt.show()

# Box plot of complaint counts by category
plt.figure(figsize=(12, 8))
sns.boxplot(data=complaints_by_category, x='category', y='count')
plt.title("Distribution of TSA Complaint Counts by Category")
plt.xlabel("Complaint Category")
plt.ylabel("Complaint Count")
plt.xticks(rotation=45, ha='right')
plt.show()


# Convert 'year_month' to datetime format for plotting purposes
complaints_by_airport['year_month'] = pd.
 ↪to_datetime(complaints_by_airport['year_month'])

# Aggregate total complaints by month across all airports
monthly_complaints = complaints_by_airport.groupby('year_month')['count'].sum().
 ↪reset_index()

# Line plot to show the trend of complaints over time
plt.figure(figsize=(14, 8))
plt.plot(monthly_complaints['year_month'], monthly_complaints['count'],␣
 ↪color='orange', marker='o')
plt.title("Trend of TSA Complaints Over Time")
plt.xlabel("Date")
plt.ylabel("Total Complaints")
plt.grid(True)
plt.xticks(rotation=45, ha='right')
plt.show()


# Define the number of top subcategories to show per category
top_subscribers = 5

# Group and filter to get top subcategories
top_subcategories = (complaints_by_subcategory.groupby(['category',␣
 ↪'subcategory'])['count']
                     .sum()
                     .groupby(level=0, group_keys=False)
                     .nlargest(top_subscribers)
                     .reset_index())

# Pivot the data for plotting
filtered_subcategory_complaints = top_subcategories.pivot(index='category',␣
 ↪columns='subcategory', values='count').fillna(0)
```

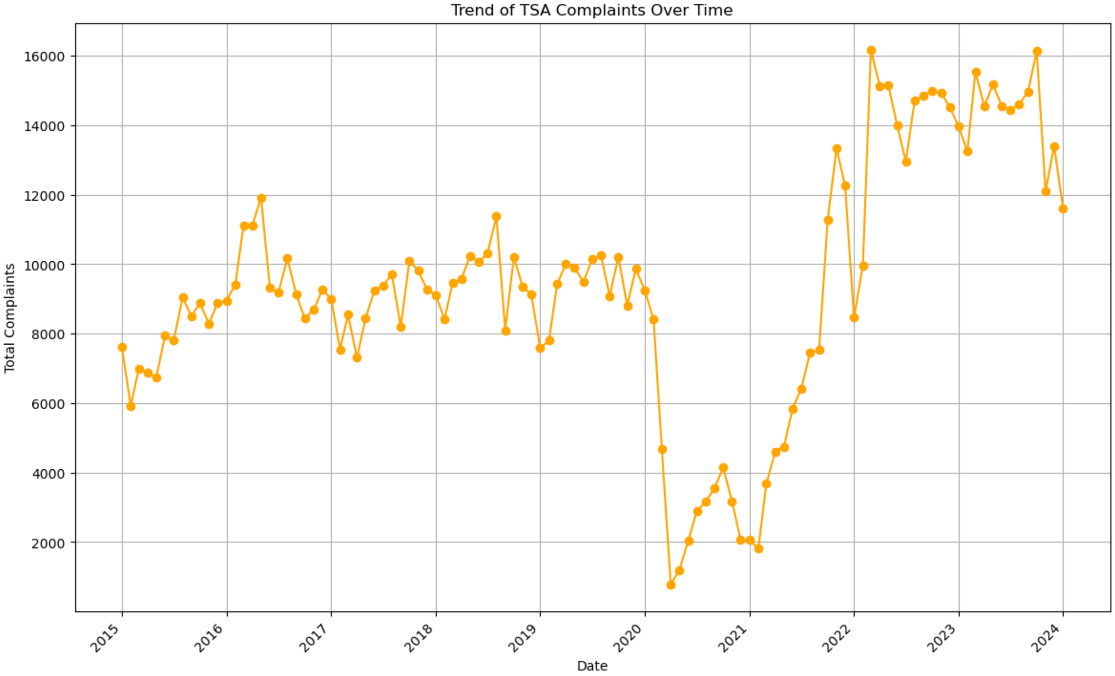
```
# Plot stacked bar chart of complaints by category and filtered top␣
 ↪subcategories
filtered_subcategory_complaints.plot(kind='bar', stacked=True, figsize=(14, 8),␣
 ↪colormap="viridis")
plt.title("Distribution of Top Subcategories within Each Complaint Category")
plt.xlabel("Complaint Category")
plt.ylabel("Complaint Count")
plt.xticks(rotation=45, ha='right')
plt.legend(title="Subcategory", bbox_to_anchor=(1.05, 1), loc='upper left')
plt.tight_layout()
plt.show()


# Aggregate complaint counts by airport and category
airport_category_complaints = complaints_by_category.groupby(['airport',␣
 ↪'category'])['count'].sum().reset_index()

# Filter for high-complaint (top 10) airports to reduce clutter and provide a␣
 ↪clearer visual
top_airports = airport_category_complaints.groupby('airport')['count'].sum().
 ↪nlargest(10).index
filtered_data =␣
 ↪airport_category_complaints[airport_category_complaints['airport'].
 ↪isin(top_airports)]

# Plot bubble chart for top complaint airports and categories
plt.figure(figsize=(14, 8))
bubble = plt.scatter(
    filtered_data['airport'],
    filtered_data['category'],
    s=filtered_data['count'] * 5,
    alpha=0.6,
    c=filtered_data['count'],
    cmap='Blues',
    edgecolor='k'
)
plt.colorbar(bubble, label='Complaint Count')
plt.title("Complaint Volumes by Top 10 Airports and Category")
plt.xlabel("Airport")
plt.ylabel("Complaint Category")
plt.xticks(rotation=45, ha='right')
plt.savefig('tsa_complaints_bubble_chart_filtered.png')
plt.show()
```

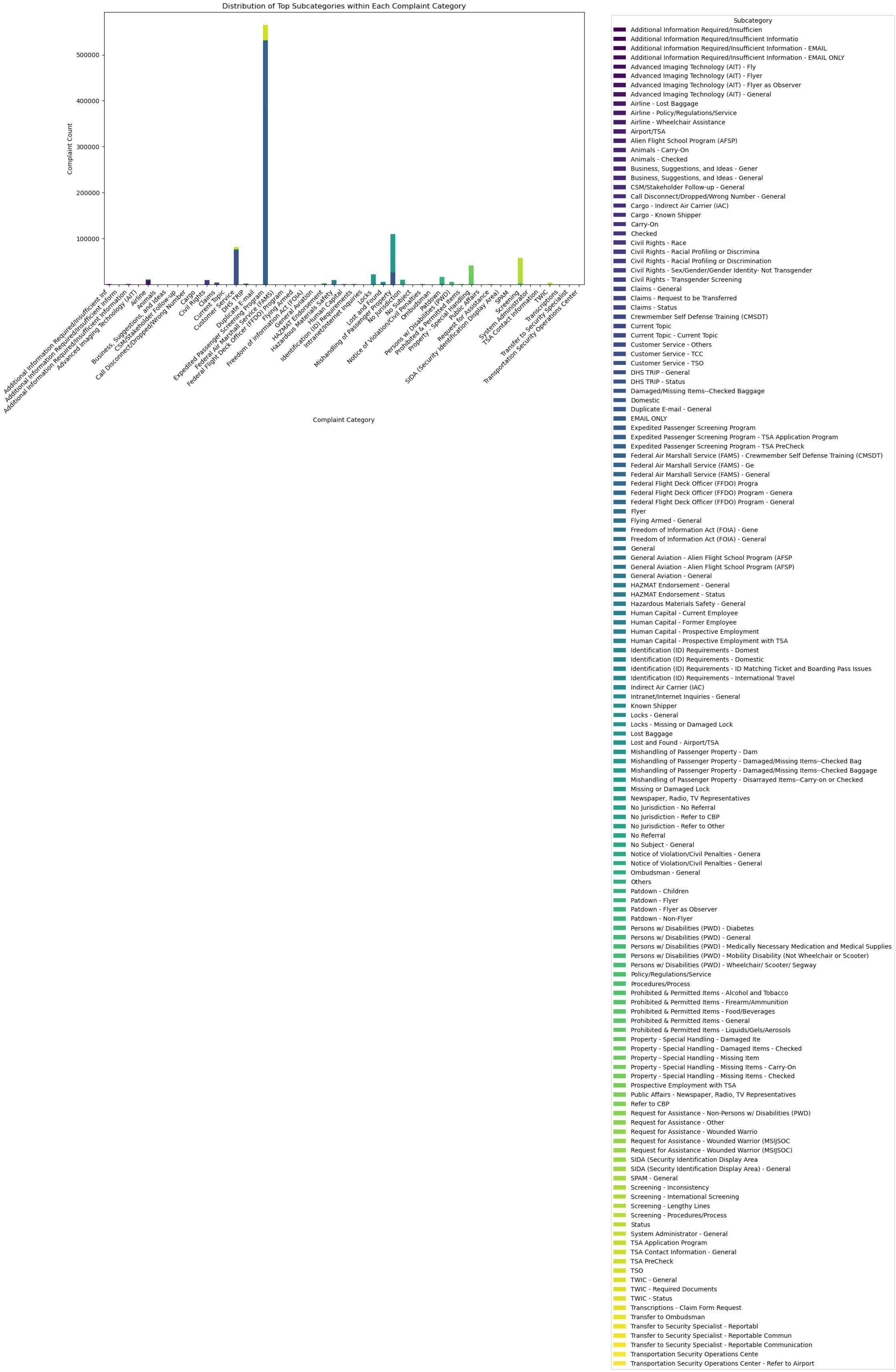

Monthly TSA Complaint Counts by Category
Month-Year
2015-01
2015-04
2015-07
2015-10
2016-01
2016-04
2016-07
2016-10
2017-01
2017-04
2017-07
2017-10
2018-01
2018-04
2018-07
2018-10
2019-01
2019-04
2019-07
2019-10
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
2022-07
2022-10
2023-01
2023-04
2023-07
2023-10
2024-01
Additional Information Required/Insufficient Inf
Additional Information Required/Insufficient Inform
Additional Information Required/Insufficient Information
Advanced Imaging Technology (AIT)
Airline
Animals
Business, Suggestions, and Ideas
CSM/Stakeholder Follow-up
Call Disconnect/Dropped/Wrong Number
Cargo
Civil Rights
Claims
Current Topic
Customer Service
DHS TRIP
Duplicate E-mail
Expedited Passenger Screening Program
Federal Air Marshall Service (FAMS)
Federal Flight Deck Officer (FFDO) Program
Flying Armed
Freedom of Information Act (FOIA)
General Aviation
HAZMAT Endorsement
Hazardous Materials Safety
Human Capital
Identification (ID) Requirements
Intranet/Internet Inquiries
Locks
Lost and Found
Mishandling of Passenger Property
No Jurisdiction
No Subject
Notice of Violation/Civil Penalties
Ombudsman
Patdown
Persons w/ Disabilities (PWD)
Prohibited & Permitted Items
Property - Special Handling
Public Affairs
Request for Assistance
SIDA (Security Identification Display Area)
SPAM
Screening
System Administrator
TSA Contact Information
TWIC
Transcriptions
Transfer to Security Specialist
Transportation Security Operations Center
Complaint Category
12000
10000
8000
6000
4000
2000
0

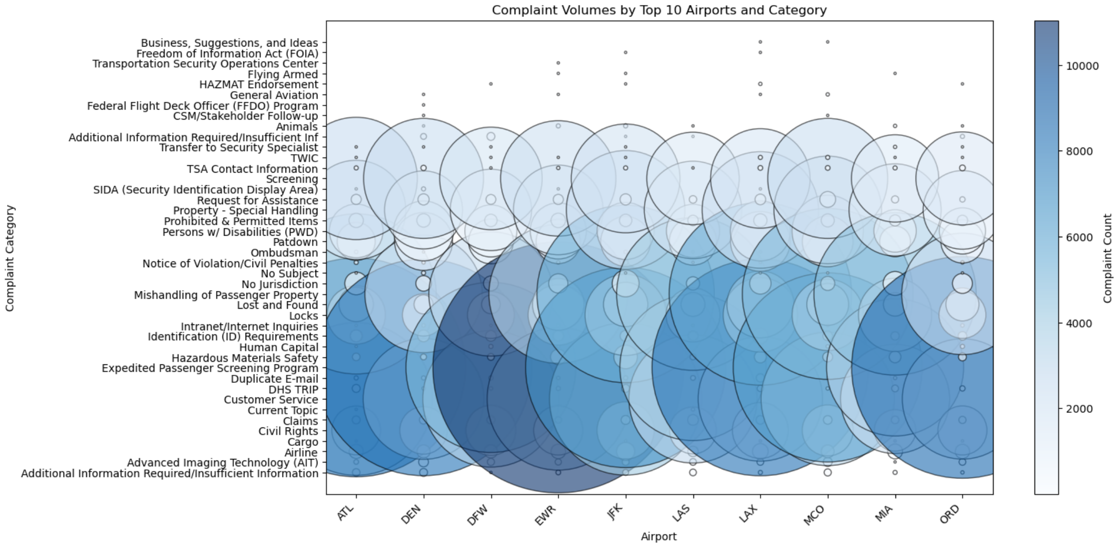

Monthly TSA Complaint Counts by Category
Month-Year
2015-01
2015-04
2015-07
2015-10
2016-01
2016-04
2016-07
2016-10
2017-01
2017-04
2017-07
2017-10
2018-01
2018-04
2018-07
2018-10
2019-01
2019-04
2019-07
2019-10
2020-01
2020-04
2020-07
2020-10
2021-01
2021-04
2021-07
2021-10
2022-01
2022-04
2022-07
2022-10
2023-01
2023-04
2023-07
2023-10
2024-01
Additional Information Required/Insufficient Inf
Additional Information Required/Insufficient Inform
Additional Information Required/Insufficient Information
Advanced Imaging Technology (AIT)
Airline
Animals
Business, Suggestions, and Ideas
CSM/Stakeholder Follow-up
Call Disconnect/Dropped/Wrong Number
Cargo
Civil Rights
Claims
Current Topic
Customer Service
DHS TRIP
Duplicate E-mail
Expedited Passenger Screening Program
Federal Air Marshall Service (FAMS)
Federal Flight Deck Officer (FFDO) Program
Flying Armed
Freedom of Information Act (FOIA)
General Aviation
HAZMAT Endorsement
Hazardous Materials Safety
Human Capital
Identification (ID) Requirements
Intranet/Internet Inquiries
Locks
Lost and Found
Mishandling of Passenger Property
No Jurisdiction
No Subject
Notice of Violation/Civil Penalties
Ombudsman
Patdown
Persons w/ Disabilities (PWD)
Prohibited & Permitted Items
Property - Special Handling
Public Affairs
Request for Assistance
SIDA (Security Identification Display Area)
SPAM
Screening
System Administrator
TSA Contact Information
TWIC
Transcriptions
Transfer to Security Specialist
Transportation Security Operations Center
Complaint Category
12000
10000
8000
6000
4000
2000
0


Complaint Counts by Airport Location
Latitude
60
40
20
0
−20
−150
−100
−50
0
50
100
150
Longitude
Complaint Count
20000
15000
10000
5000
0


Distribution of TSA Complaint Counts by Category
Complaint Count
6000
5000
4000
3000
2000
1000
0
Hazardous Materials Safety
Mishandling of Passenger Property
Civil Rights
Customer Service
Identification (ID) Requirements
Locks
Screening
Patdown
Property - Special Handling
Persons w/ Disabilities (PWD)
Expedited Passenger Screening Program
Human Capital
Notice of Violation/Civil Penalties
Prohibited & Permitted Items
Airline
TSA Contact Information
Request for Assistance
Lost and Found
No Jurisdiction
Claims
DHS TRIP
No Subject
Duplicate E-mail
Advanced Imaging Technology (AIT)
Additional Information Required/Insufficient Information
Additional Information Required/Insufficient Inf
Ombudsman
Current Topic
TWIC
Transfer to Security Specialist
Cargo
Intranet/Internet Inquiries
SIDA (Security Identification Display Area)
Animals
CSM/Stakeholder Follow-up
HAZMAT Endorsement
Freedom of Information Act (FOIA)
Flying Armed
Business, Suggestions, and Ideas
General Aviation
Federal Flight Deck Officer (FFDO) Program
Transportation Security Operations Center
Public Affairs
Call Disconnect/Dropped/Wrong Number
Federal Air Marshall Service (FAMS)
System Administrator
Additional Information Required/Insufficient Inform
SPAM
Transcriptions
Complaint Category


Trend of TSA Complaints Over Time
Total Complaints
16000
14000
12000
10000
8000
6000
4000
2000
Date
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024


Distribution of Top Subcategories within Each Complaint Category
Complaint Count
500000
400000
300000
200000
100000
Complaint Category
Additional Information Required/Insufficient Inf
Additional Information Required/Insufficient Inform
Additional Information Required/Insufficient Information
Advanced Imaging Technology (AIT)
Airline
Animals
Business, Suggestions, and Ideas
CSM/Stakeholder Follow-up
Call Disconnect/Dropped/Wrong Number
Cargo
Civil Rights
Claims
Current Topic
Customer Service
DHS TRIP
Duplicate E-mail
Expedited Passenger Screening Program
Federal Air Marshall Service (FAMS)
Federal Flight Deck Officer (FFDO) Program
Flying Armed
Freedom of Information Act (FOIA)
General Aviation
HAZMAT Endorsement
Hazardous Materials Safety
Human Capital
Identification (ID) Requirements
Intranet/Internet Inquiries
Locks
Lost and Found
Mishandling of Passenger Property
No Jurisdiction
No Subject
Notice of Violation/Civil Penalties
Ombudsman
Patdown
Persons w/ Disabilities (PWD)
Prohibited & Permitted Items
Property - Special Handling
Public Affairs
Request for Assistance
SIDA (Security Identification Display Area)
SPAM
Screening
System Administrator
TSA Contact Information
TWIC
Transcriptions
Transfer to Security Specialist
Transportation Security Operations Center
Subcategory
Additional Information Required/Insufficien
Additional Information Required/Insufficient Informatio
Additional Information Required/Insufficient Information - EMAIL
Additional Information Required/Insufficient Information - EMAIL ONLY
Advanced Imaging Technology (AIT) - Fly
Advanced Imaging Technology (AIT) - Flyer
Advanced Imaging Technology (AIT) - Flyer as Observer
Advanced Imaging Technology (AIT) - General
Airline - Lost Baggage
Airline - Policy/Regulations/Service
Airline - Wheelchair Assistance
Airport/TSA
Alien Flight School Program (AFSP)
Animals - Carry-On
Animals - Checked
Business, Suggestions, and Ideas - Gener
Business, Suggestions, and Ideas - General
CSM/Stakeholder Follow-up - General
Call Disconnect/Dropped/Wrong Number - General
Cargo - Indirect Air Carrier (IAC)
Cargo - Known Shipper
Carry-On
Checked
Civil Rights - Race
Civil Rights - Racial Profiling or Discrimina
Civil Rights - Racial Profiling or Discrimination
Civil Rights - Sex/Gender/Gender Identity- Not Transgender
Civil Rights - Transgender Screening
Claims - General
Claims - Request to be Transferred
Claims - Status
Crewmember Self Defense Training (CMSDT)
Current Topic
Current Topic - Current Topic
Customer Service - Others
Customer Service - TCC
Customer Service - TSO
DHS TRIP - General
DHS TRIP - Status
Damaged/Missing Items--Checked Baggage
Domestic
Duplicate E-mail - General
EMAIL ONLY
Expedited Passenger Screening Program
Expedited Passenger Screening Program - TSA Application Program
Expedited Passenger Screening Program - TSA PreCheck
Federal Air Marshall Service (FAMS) - Crewmember Self Defense Training (CMSDT)
Federal Air Marshall Service (FAMS) - Ge
Federal Air Marshall Service (FAMS) - General
Federal Flight Deck Officer (FFDO) Progra
Federal Flight Deck Officer (FFDO) Program - Genera
Federal Flight Deck Officer (FFDO) Program - General
Flyer
Flying Armed - General
Freedom of Information Act (FOIA) - Gene
Freedom of Information Act (FOIA) - General
General
General Aviation - Alien Flight School Program (AFSP
General Aviation - Alien Flight School Program (AFSP)
General Aviation - General
HAZMAT Endorsement - General
HAZMAT Endorsement - Status
Hazardous Materials Safety - General
Human Capital - Current Employee
Human Capital - Former Employee
Human Capital - Prospective Employment
Human Capital - Prospective Employment with TSA
Identification (ID) Requirements - Domest
Identification (ID) Requirements - Domestic
Identification (ID) Requirements - ID Matching Ticket and Boarding Pass Issues
Identification (ID) Requirements - International Travel
Indirect Air Carrier (IAC)
Intranet/Internet Inquiries - General
Known Shipper
Locks - General
Locks - Missing or Damaged Lock
Lost Baggage
Lost and Found - Airport/TSA
Mishandling of Passenger Property - Dam
Mishandling of Passenger Property - Damaged/Missing Items--Checked Bag
Mishandling of Passenger Property - Damaged/Missing Items--Checked Baggage
Mishandling of Passenger Property - Disarrayed Items--Carry-on or Checked
Missing or Damaged Lock
Newspaper, Radio, TV Representatives
No Jurisdiction - No Referral
No Jurisdiction - Refer to CBP
No Jurisdiction - Refer to Other
No Referral
No Subject - General
Notice of Violation/Civil Penalties - Genera
Notice of Violation/Civil Penalties - General
Ombudsman - General
Others
Patdown - Children
Patdown - Flyer
Patdown - Flyer as Observer
Patdown - Non-Flyer
Persons w/ Disabilities (PWD) - Diabetes
Persons w/ Disabilities (PWD) - General
Persons w/ Disabilities (PWD) - Medically Necessary Medication and Medical Supplies
Persons w/ Disabilities (PWD) - Mobility Disability (Not Wheelchair or Scooter)
Persons w/ Disabilities (PWD) - Wheelchair/ Scooter/ Segway
Policy/Regulations/Service
Procedures/Process
Prohibited & Permitted Items - Alcohol and Tobacco
Prohibited & Permitted Items - Firearm/Ammunition
Prohibited & Permitted Items - Food/Beverages
Prohibited & Permitted Items - General
Prohibited & Permitted Items - Liquids/Gels/Aerosols
Property - Special Handling - Damaged Ite
Property - Special Handling - Damaged Items - Checked
Property - Special Handling - Missing Item
Property - Special Handling - Missing Items - Carry-On
Property - Special Handling - Missing Items - Checked
Prospective Employment with TSA
Public Affairs - Newspaper, Radio, TV Representatives
Refer to CBP
Request for Assistance - Non-Persons w/ Disabilities (PWD)
Request for Assistance - Other
Request for Assistance - Wounded Warrio
Request for Assistance - Wounded Warrior (MSIJSOC
Request for Assistance - Wounded Warrior (MSIJSOC)
SIDA (Security Identification Display Area
SIDA (Security Identification Display Area) - General
SPAM - General
Screening - Inconsistency
Screening - International Screening
Screening - Lengthy Lines
Screening - Procedures/Process
Status
System Administrator - General
TSA Application Program
TSA Contact Information - General
TSA PreCheck
TSO
TWIC - General
TWIC - Required Documents
TWIC - Status
Transcriptions - Claim Form Request
Transfer to Ombudsman
Transfer to Security Specialist - Reportabl
Transfer to Security Specialist - Reportable Commun
Transfer to Security Specialist - Reportable Communication
Transportation Security Operations Cente
Transportation Security Operations Center - Refer to Airport


Complaint Volumes by Top 10 Airports and Category
Complaint Category
Business, Suggestions, and Ideas
Freedom of Information Act (FOIA)
Transportation Security Operations Center
Flying Armed
HAZMAT Endorsement
General Aviation
Federal Flight Deck Officer (FFDO) Program
CSM/Stakeholder Follow-up
Animals
Additional Information Required/Insufficient Inf
Transfer to Security Specialist
TWIC
TSA Contact Information
Screening
SIDA (Security Identification Display Area)
Request for Assistance
Property - Special Handling
Prohibited & Permitted Items
Persons w/ Disabilities (PWD)
Patdown
Ombudsman
Notice of Violation/Civil Penalties
No Subject
No Jurisdiction
Mishandling of Passenger Property
Lost and Found
Locks
Intranet/Internet Inquiries
Identification (ID) Requirements
Human Capital
Hazardous Materials Safety
Expedited Passenger Screening Program
Duplicate E-mail
DHS TRIP
Customer Service
Current Topic
Claims
Civil Rights
Cargo
Airline
Advanced Imaging Technology (AIT)
Additional Information Required/Insufficient Information
ATL
DEN
DFW
EWR
JFK
LAS
LAX
MCO
MIA
ORD
Airport
Complaint Count
10000
8000
6000
4000
2000

[3]:

[ ]:

[5]:

[ ]:

[ ]:

[ ]:

[ ]:

[ ]: