Case Study: Air Traffic Data Analysis – Budapest Airspace

From Real-Time Flight Tracking Data to Operational Insights

Tools Used: Python • Jupyter Notebook • Pandas • NumPy • Matplotlib • Seaborn • API Data Sources

Project Overview

This project demonstrates a full data analytics workflow built around real-world air traffic data. Using flight tracking data from Flightradar24, the objective was to analyze aircraft activity in the Budapest airspace and extract meaningful operational insights related to traffic volume, aircraft types, and movement patterns.

This type of analysis is highly relevant for aviation analytics, transportation planning, logistics, infrastructure optimization, and mobility research.

Business & Research Problem

Airspace and traffic flow analysis plays a critical role in capacity planning, noise management, safety, and infrastructure investment decisions. The goal of this project was to transform raw flight tracking records into structured insights that support operational and strategic decision-making.

The core questions focused on how busy the airspace is, what types of aircraft dominate the traffic, and how movement patterns evolve over time.

Data Collection & Preparation

Flight data was collected using an external API, then cleaned and structured for analysis. This included timestamp handling, filtering for the Budapest airspace, correcting data types, and removing incomplete or inconsistent records.

Raw geographic, temporal, and aircraft attributes were converted into analysis-ready features.

Exploratory Data Analysis (EDA)

Exploratory analysis was used to understand traffic volume, aircraft distribution, and temporal patterns within the airspace. Key metrics included number of flights, aircraft categories, and activity trends across different time periods.

Professional visualizations were created to clearly communicate traffic density and behavioral patterns to both technical and non-technical stakeholders.

Spatial & Temporal Analysis

The project examined both spatial and temporal dimensions of flight activity. Spatial analysis focused on aircraft concentration and movement paths, while temporal analysis identified peak traffic periods and daily activity cycles.

This dual approach provides a comprehensive understanding of how the Budapest airspace is utilized over time.

Interpretation & Operational Insights

Results were translated into operational insights such as high-traffic periods, dominant aircraft categories, and congestion patterns. These findings can directly support planning, monitoring, and optimization tasks.

Skills Demonstrated

- API-Based Data Collection
- Data Cleaning & Structuring
- Exploratory Data Analysis (EDA)
- Temporal Trend Analysis
- Basic Spatial Data Exploration
- Data Visualization
- Operational Insight Interpretation
- Reproducible Analytical Workflows

Client Value

- Clear visibility into airspace traffic patterns
- Support for infrastructure and capacity planning
- Better understanding of peak usage periods
- Operational monitoring from real-world data
- Scalable framework for continuous air traffic analysis

Summary

This case study showcases the ability to turn raw, real-time flight tracking data into structured operational intelligence. By combining data engineering, visualization, and analytical reasoning, the project delivers actionable insights that support transportation, logistics, and infrastructure decision-making.