United Airlines Hackathon Project Dashboard

Overview

This project was developed as part of a data-driven hackathon challenge aimed at addressing the complexity of frontline operations for United Airlines flights. The goal was to systematically quantify the operational difficulty of flights, moving beyond manual, experience-based assessments to a scalable, consistent, and actionable Flight Difficulty Score.

Project Objective

The core objective was to design and implement a Flight Difficulty Score that captures the relative complexity of each flight using detailed datasets spanning two weeks of flight departures. The score integrates flight-level data, passenger data, baggage data, and operational factors to:

- Rank flights daily by their difficulty
- Classify flights into Easy, Medium, or Difficult categories for prioritization
- Identify key operational drivers impacting flight complexity
- Provide insights for proactive planning and optimized resource allocation

Data and Approach

The Flight Difficulty Score was built by engineering a diverse set of features reflecting turnaround constraints, passenger service needs, flight characteristics, and baggage operations. The methodology combined weighted binary indicators with continuous normalized metrics to produce a comprehensive score updated daily.

The solution includes:

- Data integration from multiple airline datasets, including flight level, PNR (passenger name record), remarks (special service requests), and baggage details
- Extensive Exploratory Data Analysis exploring delays, ground time, load factors, and service requests
- Development of a robust daily ranking and classification scheme for flight difficulty

- Interactive dashboards built in Power BI visualizing key KPIs, difficulty distributions, operational timelines, and destination-specific insights

Key Results

- Dataset analyzed contained 8,099 flights over 15 days.
- Approximately 20% of flights are classified as "Difficult," correlated with operational challenges like minimal turnaround time and elevated special service requests.
- Critical high-difficulty destinations identified include ORF, FRA, and PDX, with difficulty rates exceeding 60%.
- On-time performance averaged 73.3%, highlighting opportunities to focus on difficult flights for improvement.
- Flight Difficulty Score enables prioritization and quantitative operational decision making, replacing subjective manual assessments.

Dashboards

The interactive Power BI dashboards summarize:

- Flight counts and distribution by difficulty category (easy, medium, difficult)
- Average load factor trends by hour identifying peak operational periods
- Flight type proportion (mainline vs express) and baggage/SSR type breakdowns
- Destination difficulty heatmaps and operational time series for granular visibility
- KPI cards showcasing on-time performance, critical flight percentages, and average difficulty

Impact and Usage

This Flight Difficulty Score framework empowers United Airlines frontline teams and airport planners to allocate resources proactively and tailor operational strategies dynamically. The data-driven insights drive enhanced operational efficiency, improved passenger service, and reduced delays.