DATA VISUALIZATION PROJECT DOCUMENTATION

Team Members

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DAX Commands

Maximum Altitude for Each Trajectory

```
Aggregate Function Max in Altitude Column
```

DAX to find out the source place of the flight using table FlightData and airports:

```
From =

VAR AID =
    FIRSTNONBLANK(
        FlightData[Origin],
    )
VAR Source =
    CALCULATE(
        MAX(airports[municipality]),
        FILTER(
            airports,
            airports[ident] = AID
        )
    )
RETURN
    Source
```

DAX to find out the destination place of the flight using table FlightData and airports:

```
To =

VAR AID =
    FIRSTNONBLANK(
        FlightData[Destination],
    )
VAR Source =
    CALCULATE(
```

```
        MAX(airports[municipality]),
        FILTER(
            airports,
            airports[ident] = AID
        )
    )
RETURN
    Source
```

DAX to extract the latest Wind Speed measured by the station:

```
WindSpeed = VAR MaxDate = MAX('Origin Weather'[valid])
RETURN
    CALCULATE(
        LASTNONBLANK('Origin Weather'[sknt], 1),
        FILTER('Origin Weather', 'Origin Weather'[valid] = MaxDate)
    )
```

DAX to extract the latest visibility measured by the station:

```
Visibility = VAR MaxDate = MAX('Origin Weather'[valid])
RETURN
    CALCULATE(
        LASTNONBLANK('Origin Weather'[vsby], 1),
        FILTER('Origin Weather', 'Origin Weather'[valid] = MaxDate)
    )
```

DAX to estimate the delay of the flight based on the past data:

```
Delay Estimate =
VAR WindSpeedThreshold = 25
VAR VisibilityThreshold = 3
RETURN
    IF(
        'Origin Weather'[Visibility] < VisibilityThreshold || 'Origin Weather'[WindSpeed] >
WindSpeedThreshold,
        "Delayed",
        "On Time"
    )
```

Insights

Weather Stations Across India

An earth map showing all the Indian weather stations with blue bubbles.

This visual helps to understand the distribution of weather stations that shows how well-covered different regions of India are in terms of weather monitoring. Areas with fewer stations might have less reliable and timely weather information, which could pose challenges for aviation in those regions.

Past Flight Trajectories

A plot with five flight trajectories on earth map with size of the circle representing the altitude at that point of flight.

This can help in identifying recurring flight patterns, congested airspace, and areas prone to delays, aiding in route optimization. Access to historical flight trajectories and meteorological data can enable airlines to optimize flight routes based on weather patterns and past performance. This leads to reduced flight times, fuel consumption, and greenhouse gas emissions, aligning with environmental sustainability goals.

Real-time Ongoing Flight Trajectory

A map showing the real-time location of the selected flight on the map, an experience of the flight route from the top.

- ✓ **Operational Efficiency:** Airlines can optimize routes.
- ✓ **Safety:** Enhanced situational awareness.
- ✓ **Weather Impact:** Correlates speed and altitude with weather.
- ✓ **Environmental Benefits:** Helps reduce emissions.
- ✓ **Passenger Engagement:** Improves travel experience.

Real-time tracking and visualization of domestic flight trajectories are essential for ensuring efficient airspace utilization and avoiding congestion. Current systems lack comprehensive coverage integrated with the ability to monitor individual flight paths, leading to suboptimal route planning and potential safety concerns.

Source and Destination Weather Report

A page with visualization reports (different graphs, cards and calculations) of last 12 months METAR data from the station associated with departure and arrival airport.

- ✓ **Visibility Analysis**: The bar chart displaying the average visibility with the hour provides insights into how visibility varies throughout the day. This is crucial for flight planning and ensuring safe takeoffs.
- ✓ **Wind Direction Variability**: The waterfall chart showing the standard deviation of wind direction by sky coverage category1 helps in understanding the variability of wind direction under different sky conditions, aiding pilots and air traffic controllers.
- ✓ **Sky Coverage**: The pie chart illustrating sky coverage categories in percentage informs stakeholders about prevailing sky conditions at the departure airport, which is vital for flight operations, especially during adverse weather.
- ✓ **Temperature Variance**: The line and clustered column chart comparing actual and apparent (feel) temperatures reveal how weather conditions affect perceived temperature. It aids in passenger comfort assessment and cabin preparation.
- ✓ **Dew Point Analysis**: The scatterplot of dew point formation temperature with hour and weather codes offers insights into humidity levels, helping airlines anticipate potential fog or icing conditions.

- ✓ **Wind Speed Distribution**: The tree map displaying the number of hours for each wind speed provides an overview of the wind patterns, aiding in flight planning and runway selection.
- ✓ **Month Slicer**: The slicer allows users to filter data by month, aiding in seasonal analysis and planning for weather-related flight disruptions.
- ✓ **Flight Delay Probability**: The card with a DAX command comparing current wind speed and visibility with thresholds can help assess the likelihood of flight delays due to weather conditions, assisting airlines and passengers in making informed decisions.

Datasets and APIs

METAR Weather Data- Real-time Iowa Environmental Mesonet APIs

Historical Flight Data- Real-time scraping from flightaware.com

Airports Data- openairport.com

Bibliometric

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