Covid-19's Lingering in the Air

DSE 241 - Data Visualization - Final Project Proposal - Adelle, Bo, Yuan

DATA

MOTIVATION: Many global industries were heavily impacted due to the pandemic, the airline industry being one of them

SOURCE: "Crowdsourced air traffic data from The OpenSky Network" - public

DESCRIPTION:

- **callsign**: the identifier of the flight displayed on ATC screens (usually the first three letters are reserved for an airline: AFR for Air France, DLH for Lufthansa, etc.)
- **number**: the commercial number of the flight, when available (the matching with the callsign comes from public open API)
- **icao24**: the transponder unique identification number;
- **registration**: the aircraft tail number (when available);
- **typecode**: the aircraft model type (when available);
- **origin**: a four letter code for the origin airport of the flight (when available);
- **destination**: a four letter code for the destination airport of the flight (when available);
- **firstseen**: the UTC timestamp of the first message received by the OpenSky Network;
- **lastseen**: the UTC timestamp of the last message received by the OpenSky Network;
- **day**: the UTC day of the last message received by the OpenSky Network;
- **latitude_1**, **longitude_1**, **altitude_1**: the first detected position of the aircraft;
- **latitude_2**, **longitude_2**, **altitude_2**: the last detected position of the aircraft.

TASKS

1. What's the trend in number of departing aircrafts from top 5 airports in United States during pandemic?
   Solution: ***Time Series Spaghetti Plot*** **- data exploration**

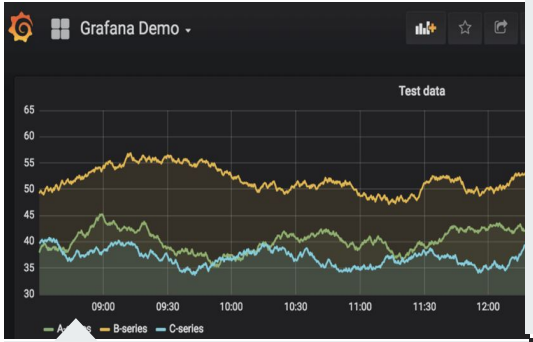
2. What are the different reactions made by United States, European and Asian airline companies?
   Solution: ***Time Series Spaghetti Plot*** **- data exploration**

3. Was there "Covid-19 Revengeful Travel Recovery" in 2021 Summer?
   Solution: ***Density Histogram*** **- hypothesis confirmation**

4. Monitor the change in number of departing aircrafts weekly/monthly from Jan, 2020.
   Solution: ***Heat-Map Animation with timeline*** **- presentation**

5. Can we visualize the daily (a specific day during Covid-19) aircrafts "Network" in United States?
   Solution: ***Network Graph*** **- presentation**

SOLUTION DETAILS - 1

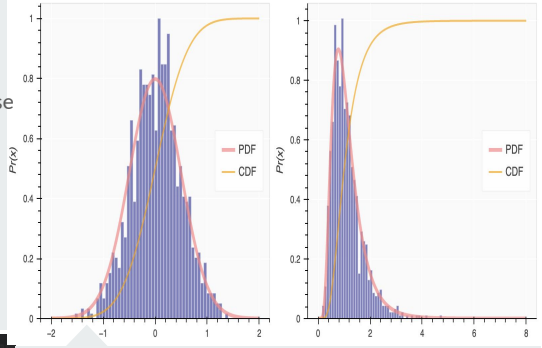


2. What are the different reactions made by United States, European and Asian airline companies?

IMPLEMENTATION: **influxDB/grafana** with zoom in, mouse hover, field selection and filtering

DATA TRANSFORMATION: processing time-series, data aggregation by airline companies along a timeline, importing to influxDB database

USE CASES: make marketing decisions

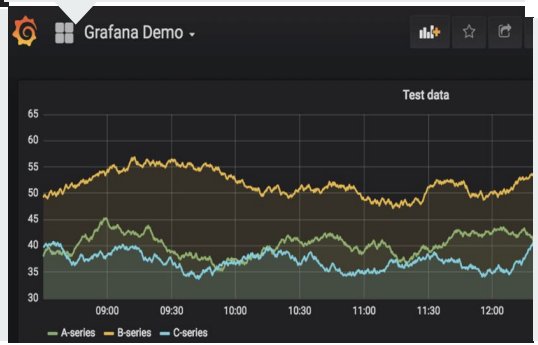


1. What's the trend in number of departing aircrafts from top 5 airports in United States?

IMPLEMENTATION: **influxDB/grafana** with zoom in, mouse hover, field selection and filtering

DATA TRANSFORMATION: processing time-series, data aggregation by airports along a timeline, importing to influxDB database

USE CASES: identify air traffic trend and spikes



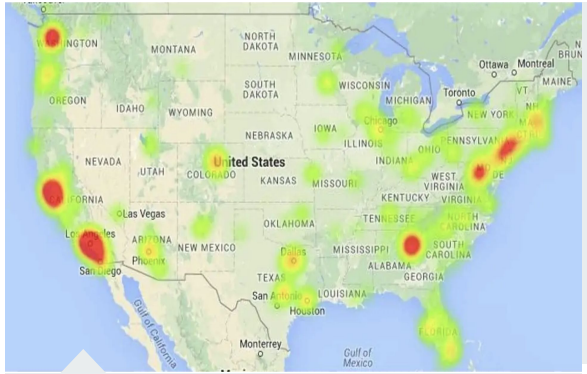
3. Was there "Revengeful Travel Recovery" in 2021 Summer?

IMPLEMENTATION: **plotly/bokeh** with zoom in, mouse hover

DATA TRANSFORMATION: processing time-series, data aggregation from different period of time

USE CASES: hypothesis testing, statistical analysis

SOLUTION DETAILS - 2



5. Visualize daily aircraft "Network" of United States?

IMPLEMENTATION: tableau/gephi/NetworkX with zoom in, mouse hover

DATA TRANSFORMATION: airports as nodes, trajectory as links, mapping out geo-locations

USE CASES: monitor the current air traffic under specific regulations or conditions

4. Monitor the change in number of departing aircrafts weekly/monthly from Jan 2020.

IMPLEMENTATION: python **folium** heatmap with animated timeline, zoom in features

DATA TRANSFORMATION: processing spatio-temporal information, data aggregation by airports, mapping out geo-location

USE CASES: identify the trend with geospatial and timestamp indicators

python

pandas

Grafana + influxdb

+ableau

Folium

plotly

D3

TARGET STAKEHOLDERS

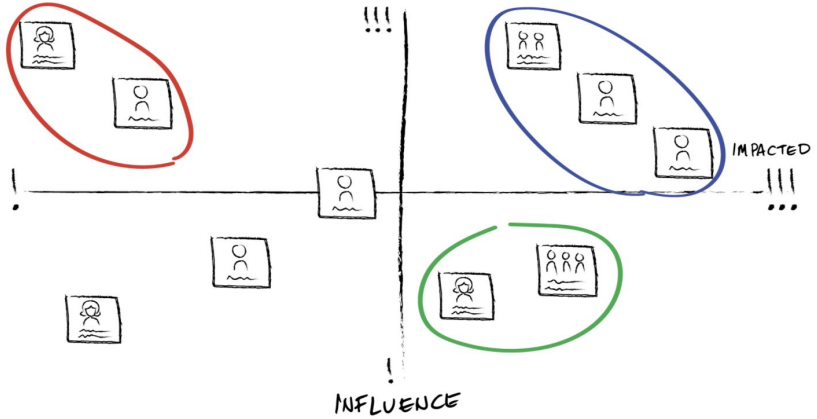
01 | Internal - Data Analysis Team & Managers

02 | Internal - Modeling/Algorithms/Scientific Team

03 | External - Public Media

04 | External - Airline Industry Companies, Travel Agencies

05 | External - Government Regulators



Data Reference: *Martin Strohmeier, Xavier Olive, Jannis Lübbe, Matthias Schäfer, and Vincent Lenders*
"Crowdsourced air traffic data from the OpenSky Network 2019–2020"
Earth System Science Data 13(2), 2021
https://doi.org/10.5194/essd-13-357-2021