Airplane Tracking System

Project Summary:

This system will provide an interface for tracking airline flight statuses, schedules, and passenger information. It will help airlines, passengers, and ground services to keep track of flights, cancellations, delays, and other important details. By organizing the data in an easy-to-access manner, it will improve communication between airline staff and customers, streamline operational procedures, and enhance overall efficiency.

Problem Statement:

Managing flight data, including schedules, cancellations, and flight statuses, can be challenging for airlines due to the large volume of real-time data. Additionally, passengers and airline personnel need a quick and reliable way to access flight information to ensure smooth operations. Currently, many airlines and travel services do not have an integrated, user-friendly solution for tracking and updating flight statuses or managing passenger records efficiently.

The problem is the lack of a centralized database system that can store, track, and update this data effectively for various stakeholders (airlines, passengers, staff). The existing systems might be hard to navigate.

Project Description:

Project overview:

We will make a multi-user-role application where users can log in as admin/passenger. If logged in as Admin, the user can create/delete/update data and if logged in as passenger, the passengers will be able to view data related to their flights.

We are developing a web-based application to track flight data, including:

1. Flight schedules
2. Delays and cancellations
3. Passenger information management (for airlines)
4. All upcoming flights for frequent flyers

Our system will allow users (passengers, airline staff) to easily retrieve and manage flight information in an organized way.

Data Description:

2019-2023 flight delay data which contains different attributes like departure airport, arrival airport, airline, flight number, date, status, departure time, arrival time, etc.

Creative components:

1. **Flight Delay Heatmaps by Airport and Time of Day:** Aggregate delays by airport and time of day (e.g., morning, afternoon, evening) and create an interactive heatmap to show average delays at specific times. Add filters for days of the week or months.

2. **Flight Schedule Table for Frequent Flyers:** Show scheduled flights with details like flight number, departure/arrival times, and origin/destination. This helps frequent flyers to easily manage and track their upcoming trips.

3. **Airline Performance Data and Rankings:** Display rankings of airlines based on historical performance (on-time percentage, cancellations, etc.), helping users choose more reliable carriers from next time onwards.

Usefulness:

1. The purpose of this application is to provide travellers a small "portfolio" of information about their upcoming flights, primarily to allow them to have a better idea of their flight status(on time, early, delayed etc...). This will reduce the amount of headache and stress travellers experience on the day of their flights by giving them an friendly and easy to access web application that displays relevant flight information to them. Some basic functions include displaying
    i. All of their flights and their current status
    ii. Alerts for travellers whose first leg delay could impact their future connecting flights
2. Some complex features include
    i. Displaying on average how on time a certain flight is(could be helpful in the booking process which is separate from the rest of the app which is more concerned about the passengers experience the day of a flight)
3. https://www.transtats.bts.gov/ontime/FlightNumber.aspx
    i. This is an example of a similar website. It shows the flight status data of any flight you want to look up for a certain time period. We will use this website to source data from, but ours is different because ours only displays the flights the user is concerned about. They can create an account and only their flight information will be displayed

Realness: Our data mainly comes in the form of csv files from The U.S. Department of Transportation's (DOT) Bureau of Transportation Statistics and a dataset pertaining to flights delayed and cancelled from 2019 to 2023. The dataset has a degree of 32 and a cardinality of around 30,000,000. The dataset contains information such as, flight number, flight status, airline, departure and arrival time/place, dates, and reasons for delay. The csv file from DOT has a degree of 13 and a cardinality based on the selected flight and date. By filtering by specific flight number, date, and airline, we can see the number of flights, average delay time for departure and arrival and number of cancelled flights for that specific flight over a certain time period. Dataset we are using:

https://www.kaggle.com/datasets/patrickzel/flight-delay-and-cancellation-dataset-2019-2023?select=flights_sample_3m.csv

Basic Functionality:

The home page of the web application will mainly consists of the following: login, heat map, airline data, and flight filter

1. **Login:** The web-application starts with a login page. It will have two options: login as Passenger or login as Admin. Admin refers to airport/airline staff who can create more flights, delete or update them and even manage passenger information. If logged in as a passenger, the user will be able to track their flights based on information such as airline, flight number, departure airport, arrival airport and time of departure. They can also pin/bookmark specific flights for easy access. Both of the options redirect the user to their chosen roles' webpage.
There will only be a total of 3 webpages. Login, Admin dashboard, and Passenger Dashboard. Every user activity is self-contained within their respective webpages.

2. **Flight Filter:** Passengers and admins can find specific flights by filtering by flight number, arrival/departure destination, dates, and/or airports. Filtering will list all flights matching the filter input. Clicking on a specific flight will display information about that flight. This information includes: arrival/departure airport, arrival/departure time, and flight status.

3. **Heat Map:** A color coded heat map will display the average delay time of different airports/flights. A brighter color indicates a higher average delay time and vice versa.

4. **Airline Data:** A bar graph to indicate information of airline/airport histories. It will show the number of delayed and cancelled flights within a year for each airline.

Low-fidelity UI Mockup:
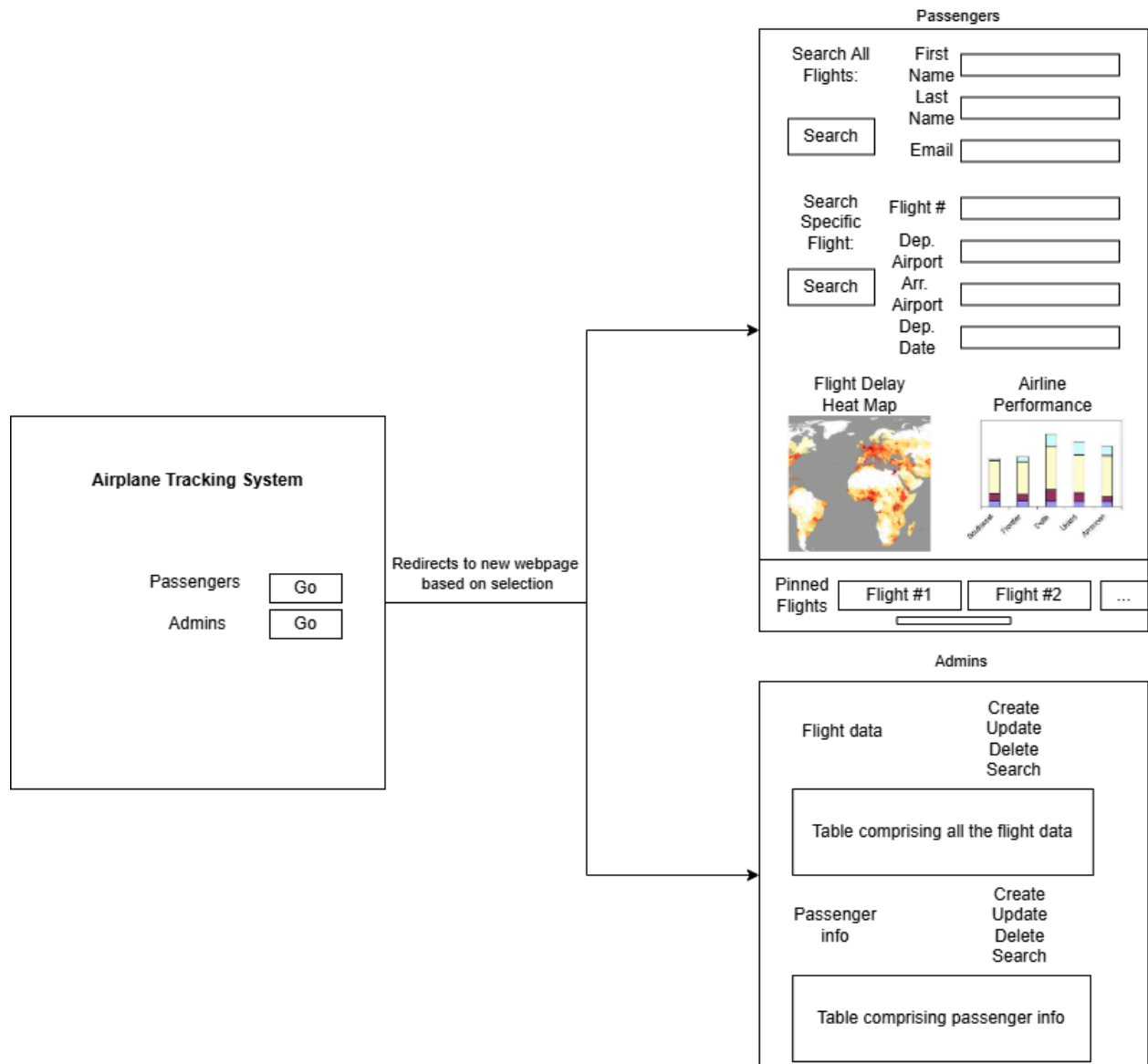
Project Work Distribution:
Arshiya Gupta (arshiya5): Backend Passenger/Admin Component
Ashwin Jain (ashwinj3): Frontend
Jiaxi Huang (jiaxih4): Backend Admin/Passenger Component
Rafael Wersom (rwers2): Google Cloud/ database set-up (includes aid in setting up connection between web-app and google cloud/database).