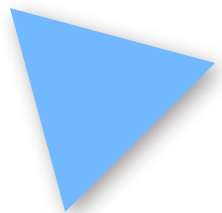# Flight Prediction System

Team 2

Members:
Li Hongyi Liu Moyang Luo Jihao Wen Xingdi Wong Yi Lun Yan Binghao Tang Mingyang

Overview

Background

- **Aviation Industry Recovery**: The aviation industry, after a significant downturn due to the COVID-19 pandemic, has recovered by 2023 and is expected to see record numbers of flights in 2024.
- **Flight Delays**: With global on-time arrival rates varying between 70% and 90%, flight delays remain a critical issue, affecting up to one in five flights.
- **Passenger Priorities**: Travellers increasingly prioritize choosing flights with lower delay risks, seeking reliability and punctuality in their travel plans.
- **Flight Price Volatility**: Flight prices fluctuate due to factors like demand, seasonality, and economic conditions, making it challenging for passengers to identify the best time to purchase tickets.
- **Need for Predictive Solutions**: The unpredictability in flight delays and ticket pricing creates a demand for advanced predictive tools that can help travellers make more informed decisions, reducing stress and financial strain.
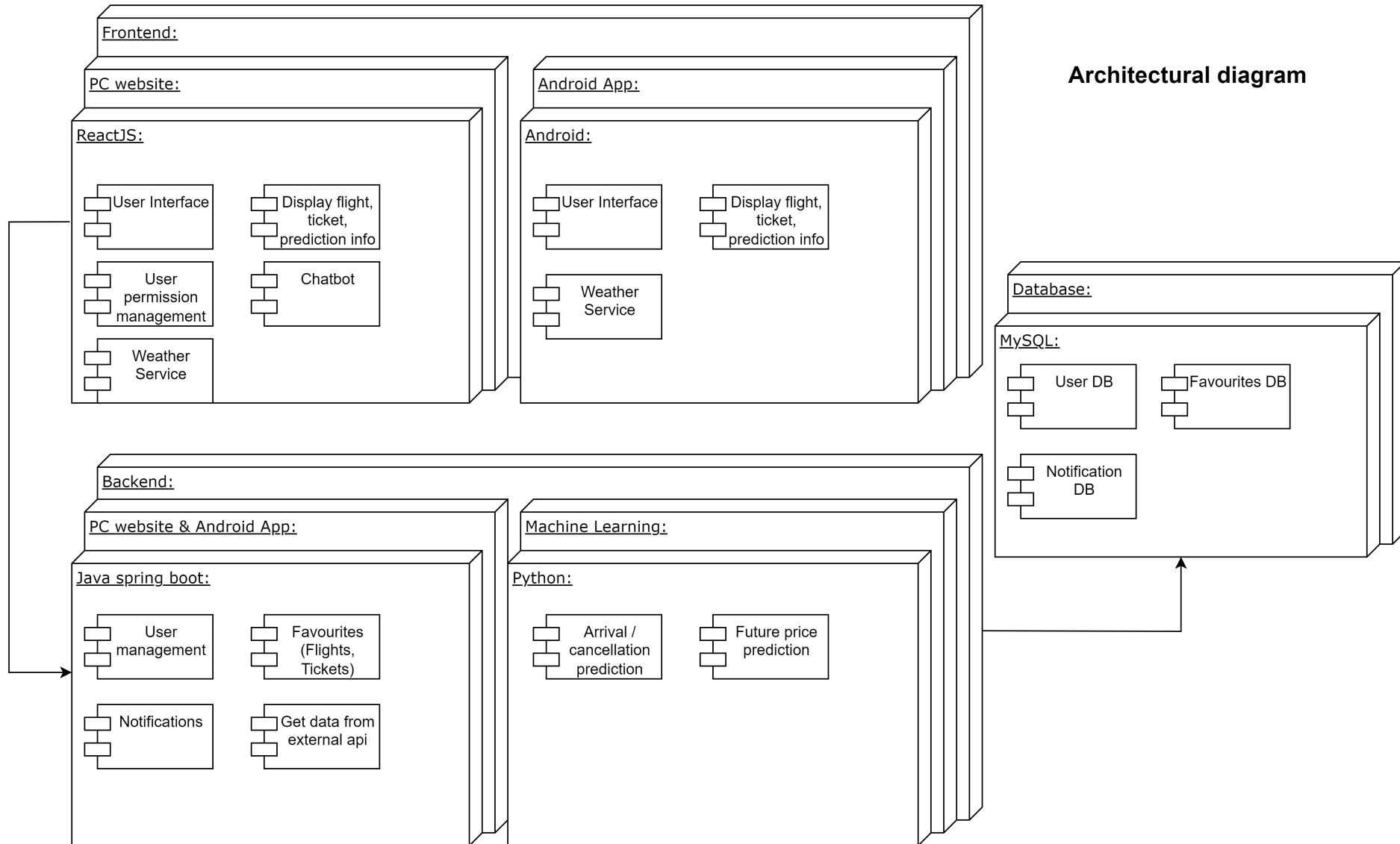
Our Goal

- **Accurate Price Predictions**: The application aims to empower travellers by providing accurate and personalized flight ticket price forecasts using machine learning, helping them make informed booking decisions and minimize expenses.
- **Delay Risk Assessment**: It will assess flight delay risks, enabling travellers to select flights with higher punctuality, thereby reducing stress and enhancing their overall travel planning experience.
- **Real-Time Updates and Notifications:** It provides current information on ticket availability, flight status, and forecasted weather conditions, while also sending timely notifications e.g. flight departure alerts, helping travelers stay informed and adjust their plans accordingly.
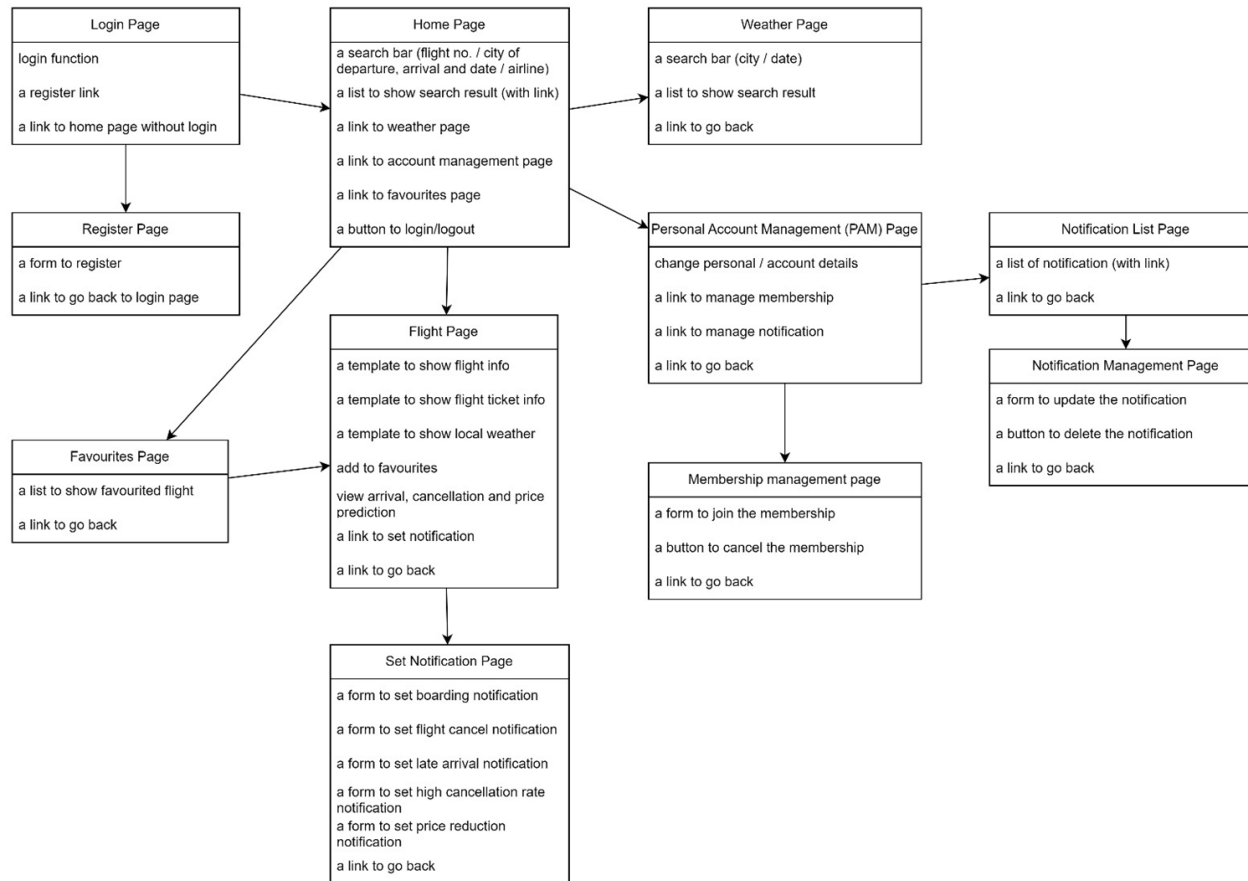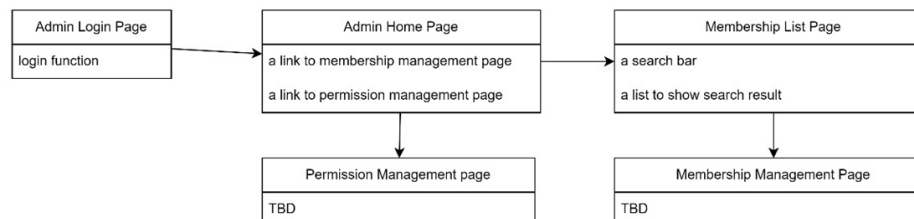
Architectural Diagram

Architectural diagram

Frontend:

PC website:

ReactJS:

- User Interface
- Display flight, ticket, prediction info
- User permission management
- Chatbot
- Weather Service

Android App:

Android:

- User Interface
- Display flight, ticket, prediction info
- Weather Service

Database:

MySQL:

- User DB
- Favourites DB
- Notification DB

Backend:

PC website & Android App:

Java spring boot:

- User management
- Favourites (Flights, Tickets)
- Notifications
- Get data from external api

Machine Learning:

Python:

- Arrival / cancellation prediction
- Future price prediction

Entity Relationship Diagram

Public User

Login Page
- login function
- a register link
- a link to home page without login

Home Page
- a search bar (flight no. / city of departure, arrival and date / airline)
- a list to show search result (with link)
- a link to weather page
- a link to account management page
- a link to favourites page
- a button to login/logout

Weather Page
- a search bar (city / date)
- a list to show search result
- a link to go back

Register Page
- a form to register
- a link to go back to login page

Personal Account Management (PAM) Page
- change personal / account details
- a link to manage membership
- a link to manage notification
- a link to go back

Notification List Page
- a list of notification (with link)
- a link to go back

Flight Page
- a template to show flight info
- a template to show flight ticket info
- a template to show local weather
- add to favourites
- view arrival, cancellation and price prediction
- a link to set notification
- a link to go back

Notification Management Page
- a form to update the notification
- a button to delete the notification
- a link to go back

Favourites Page
- a list to show favourited flight
- a link to go back

Membership management page
- a form to join the membership
- a button to cancel the membership
- a link to go back

Set Notification Page
- a form to set boarding notification
- a form to set flight cancel notification
- a form to set late arrival notification
- a form to set high cancellation rate notification
- a form to set price reduction notification
- a link to go back

Admin

Admin Login Page
- login function

Admin Home Page
- a link to membership management page
- a link to permission management page

Membership List Page
- a search bar
- a list to show search result

Permission Management page
- TBD

Membership Management Page
- TBD

Users

Non-member

❏ **search and view flight tickets**

❏ **search and view flight info**

❏ **search and view weather forecast info**

❏ **conversation with chatbot**

Member

❏ **login/logout**

❏ **all non-member features**

❏ **view and update account info**

❏ **search and view flight prediction info**

❏ **favourites feature**

❏ **notification feature**

Users

admin

- ❑ **login/logout**
- ❑ **manage members**
- ❑ **manage permissions**

Main Features

Prediction Functions

- Estimate arrival times of commercial flights.
- Predict future ticket price fluctuations.
- Forecast cancellation rates of flights.

Flight Optimisation

Recommend the best flight combinations based on cost-effectiveness, allowing users to choose options with the lowest price or shortest travel time.

Basic Information Retrieval

- Access weather forecasts for future dates.
- Browse specific flight information.
- Look up ticket details for flights.

User Input and Customization

Allow users to input departure, destination, waypoints, and travel date to customize their flight recommendations.

Web Application

KEY WEB FEATURES

Main

Navigation to subpages

Chatbot

Predict2fly

Search for all available tickets through various third-party flight booking sites.

Ticket Search

Flig

Prediction

Weathe

Conversation with FlyBot

B Hello! I am FlyBot, your virtual assistant from Predict2fly. How may I assist you today?

About Predict2fly
Search Flight Tickets
Track Flight
Get Flight Prediction
Check Weather Forecast
Membership Policy

About Us   📞 +65 6516 2093 ✉ info@predict2fly.com   🅕 🐦 📷

Ticket Search - Form

Ticket Search - Results

🔍 Search

Favourited

Flight TR808 ⭐

Airline: HR

From: SIN

To: TYO

Scheduled Departure: 18/08/2024 10:15PM

Scheduled Arrival: 19/08/2024 6:15AM

Price: 374.30 SGD

Cabin: ECONOMY

Included Checked Bags: N/A

Duration: 08:00

Go To Prediction

Book Ticket

Flight SQ12 ★

Airline: SQ

From: SIN

To: TYO

Scheduled Departure: 18/08/2024 9:25AM

Scheduled Arrival: 18/08/2024 5:30PM

Price: 3256.80 SGD

Cabin: ECONOMY

Included Checked Bags: N/A

Duration: 08:05

Go To Prediction

Book Ticket

Flight SQ638 ★

Airline: SQ

From: SIN

To: TYO

Scheduled Departure: 18/08/2024 11:55PM

Scheduled Arrival: 19/08/2024 8:00AM

Price: 3256.80 SGD

Cabin: ECONOMY

Included Checked Bags: N/A

Duration: 08:05

Go To Prediction

Book Ticket

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Flight Prediction - Form

Predict2fly

Autofill (redirected from ticket search)

Flight Prediction

Flight Number

TR808

Departure Airport

SIN

Arrival Airport

TYO

Scheduled Departure

18/08/2024 10:15 pm

Flight Prediction - Results

Flight Tracker

Weather Forecast

Predict2fly

Weather Forecast

Destination City

Shanghai

Shanghai, China

18/08/2024

Travel End Date

22/08/2024

Get Weather

📅 Date	🌡° Temperature	💧 Humidity	🌧 Rain Probability	🌬 Wind Speed
8/18/2024	29.5°C	77.66%	0.20%	2.48 m/s
8/19/2024	30.3°C	75.17%	2.20%	4.81 m/s
8/20/2024	30.9°C	74.55%	6.70%	3.92 m/s
8/21/2024	30.1°C	77.53%	45.90%	2.79 m/s
8/22/2024	29.3°C	72.39%	20.90%	2.13 m/s

Mobile Application

KEY ANDROID FEATURES

Mobile Design

Main
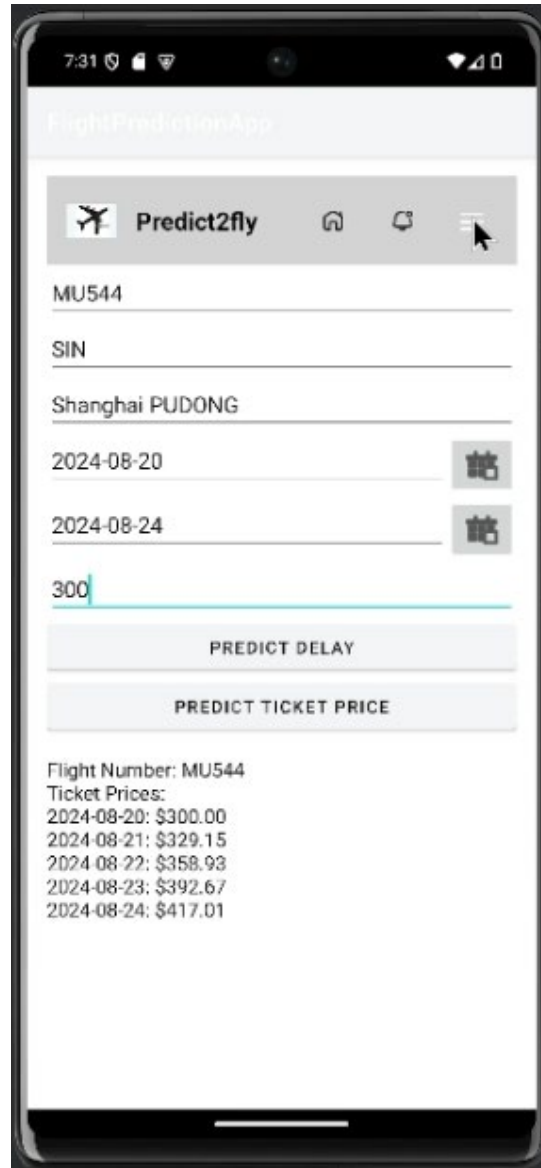
Prediction

Weather Forecast

Machine Learning

Algorithms for Prediction

Models

- Random Forest

What is a Random Forest?

A random forest is an ensemble learning method that combines multiple decision trees to improve prediction accuracy.

Why Use Random Forest?

It is robust against overfitting, handles large datasets well, and can manage both classification and regression tasks.

- Neural Network

What is a Neural Network?

A neural network is a type of machine learning model designed to mimic the way human brains work. It's highly effective in finding patterns in complex datasets.

Why Use a Neural Network?

Neural networks are especially powerful for tasks like predicting flight delays due to their ability to learn and generalize from data, leading to accurate and reliable predictions.

Random Forest
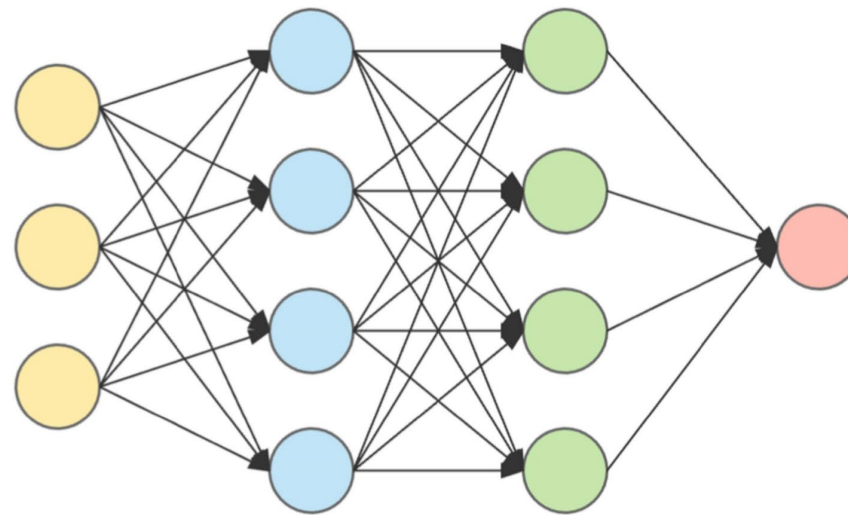
Purpose: Predict the future flight ticket prices

Date_of_Journey,
Airline, Source,
Destination, Route,
Dep_Time,
Arrival_Time,
Duration,
Total_Stops

Result 1   Result 2   Result 3

Majority voting / Averaging

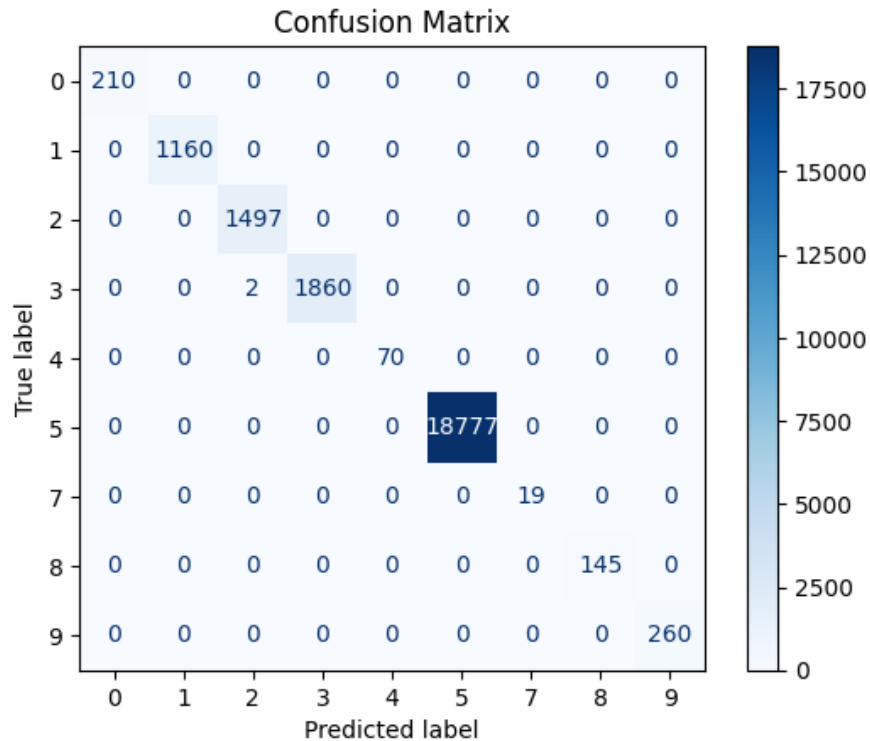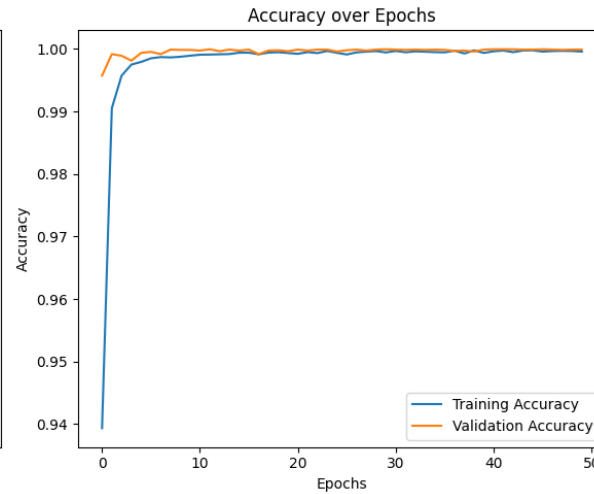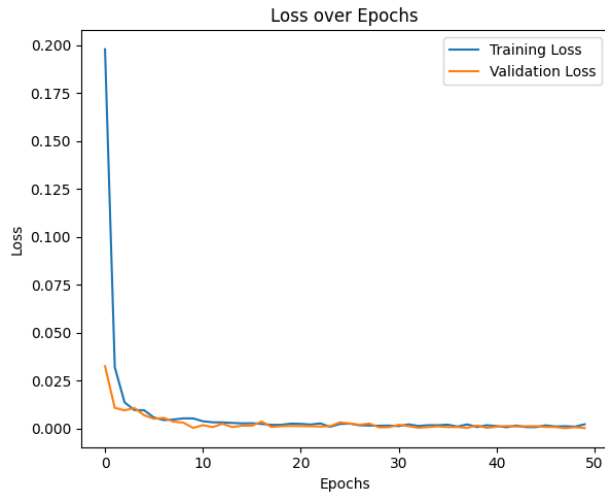Flight Price
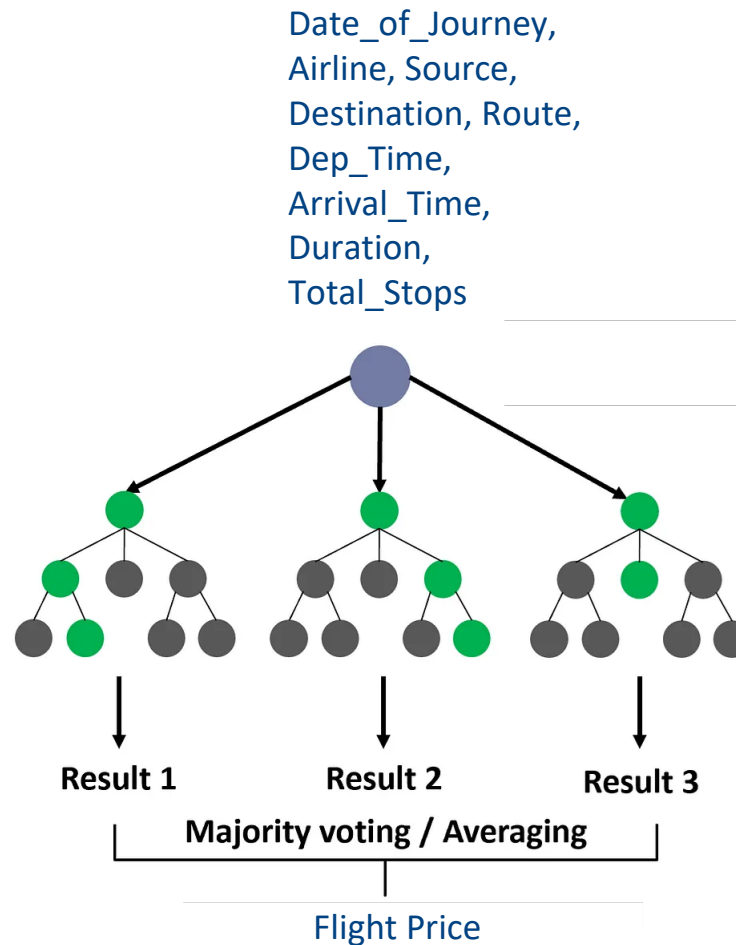
Accuracy ≈ 80%

Neural Network

Purpose: Predict the reasons for flight delays

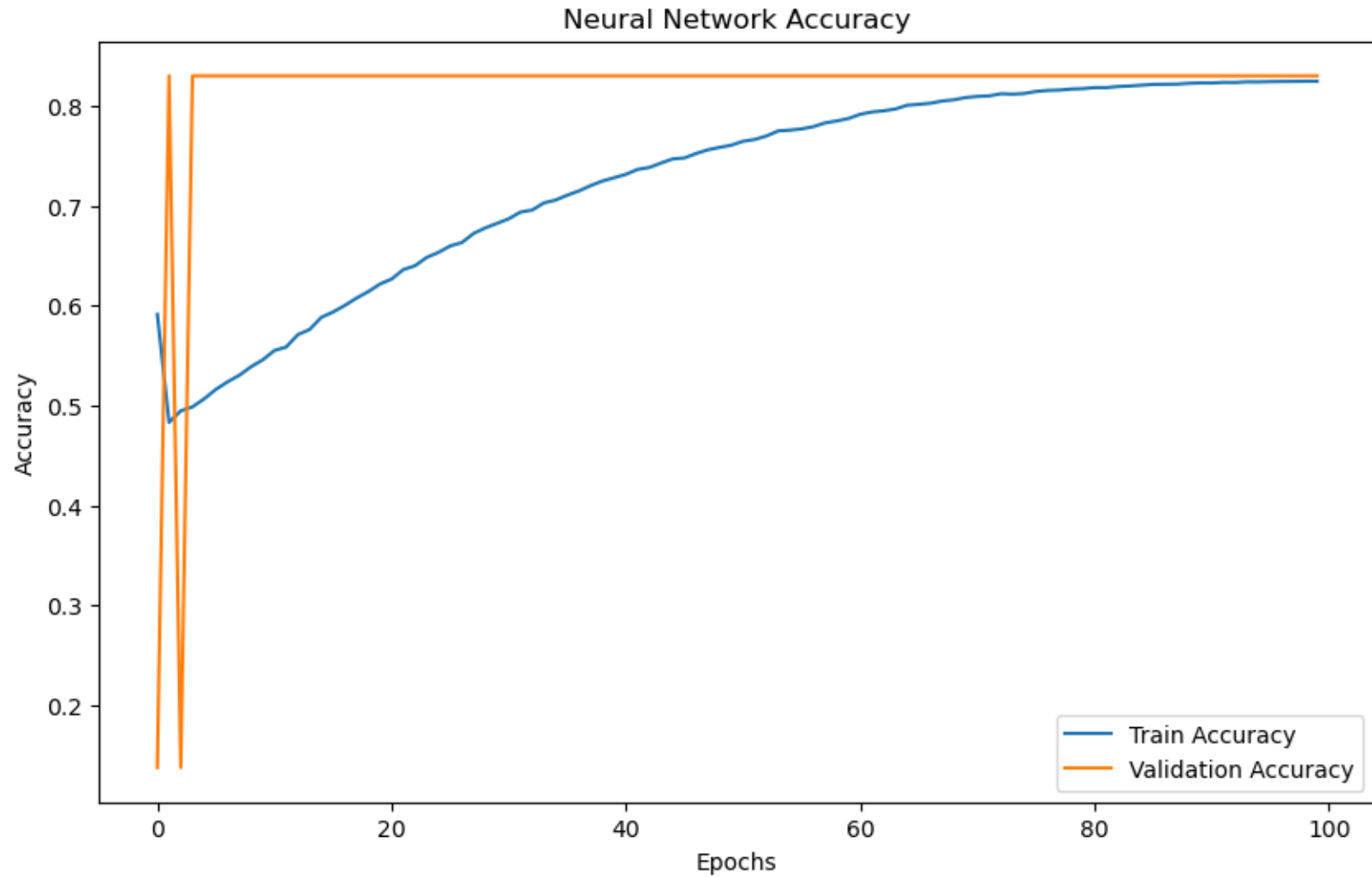various features from
the flight data

reason for the delay

Neural Network

Neural Network

Thank You

Team 2