

**19CSP14 - PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP**

## **Airlines Data Analytics for Aviation Industry**

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**Team member 2:** Priyadharshini T

**Team member 3:** Tippani Lavanya

# **1 . INTRODUCTION**

## **Project Overview**

In today's world, major components of transportation systems include passenger airlines, cargo airlines, and air traffic control systems. Over time, countries around the world have attempted to develop numerous technologies to improve air transportation systems. This resulted in a dramatic change in flight operations. Flight delays can be an inconvenience to modern passengers. About 20% of airline flights are canceled or delayed each year, costing passengers more than \$20 billion in her time and money.

## **Purpose**

Average aircraft delay is regularly cited as an indicator of airport capacity. Flight delays are a global problem. It is very difficult to explain the reason for the delay. While some factors that contribute to flight delays, such as runway construction and excessive traffic, are rare, bad weather appears to be a common cause. There is a flight delay. It damages airports and airlines and affects corporate marketing strategies. This is because companies rely on customer loyalty to support frequent flyer programs.

## **2. LITERATURE SURVEY**

### **1.Predictive Analytics Platform For Airline Industry (P.H.K Tissera ,M.A.L.Perera , K.T. Waduge , D. Kasthurirathna ,2020)**

- ◆ In this study, inquire about saying to plan and create the most excellent fit forecast flight OD level passenger request based on the verifiable information.
- ◆ An precise instrument to anticipate income for future months of OD(Origin Goal) is done utilizing admission and traveler information .
- ◆ The income is inferred by the number of traveler and the fare they pay which shif for each flight.

### **2)Development of the approach to the analysis of aviation industry's adaptation to seasonal disruptions (Sofiyat Bakreena, Elizaveta Markovskayaa,\*, Igor Merzlikinb, Asiat Mottaeva 2022)**

- ◆ In this,study is to develop a model that will forecast the stability of the aviation industry to various failures.
- ◆ The focus is primarily on the COVID-19 period as it has had a significant impact on the work of airlines and has had a huge economic impact depressed conditions.
- ◆ From analysis using a model of predictive machine learning, we can see that it is a dependable approach when it comes to choosing an operator for Managing failures, and the model could help air carriers identify likely risk factors and optimizing their business strategy.

### **3)Flight Delay Prediction: Data Analysis and Model Development (Azib Anees , Wei Huang 2021)**

- ◆ This paper develops a prediction version through analysing the facts of domestic flights.
- ◆ The proposed version profits perception into elements inflicting flight delays, cancellations and the connection among departure and arrival put off the use of exploratory statistics analysis.
- ◆ The Random Forest (RF) set of rules is used to educate and take a look at the huge dataset to assist the version development.

### **4)Exploratory Data Analysis on Aviation Dataset (Saba Firdous, Haseeba Fathiya, Lipsa Sadath -2021)**

- ◆ In this work, Saba Firdous, Haseeba Fathiya and Lipsa Sadath collected aviation information and carried out analyses.
- ◆ The first stage was to categorize all events according to their level of risk. The second stage was to use a SVM to learn inter-event relationships.
- ◆ The Final stage consisted of combining the results of the two models to improve the precision of the forecasts made.

#### **5) Airline Member Customer Value Analysis: Data Visualization (Haipei Zhong ,2021)**

- ◆ for the airlines, the pressure of competition has increased year after year and there are also conflicting relations between the multiple and different airlines.
- ◆ The use of the different customer factors provided by the existing customer information set may make use of data visualization methods for data analysis.
- ◆ Furthermore, relevant marketing strategies can be offered to enhance the level of the company as much as possible.

## **References**

- 1) P. H. K Tissera;A.N.M.R.S.P. Ilwana;K.T. Waduge;M.A.I. Perera;D.P. Nawinna;D. Kasthurirathna 2020  
“Predictive Analytics Platform For Airline Industry “ 2nd International Conference on Advancements in Computing (ICAC)Year: 2020 | Volume: 1 | Conference Paper | Publisher: IEEE
- 2) Sofiyat Bakreena, Elizaveta Markovskayaa,\*, Igor Merzlikinb, Asiat Mottaeva “Development of the approach to the analysis of aviation industry’s adaptation to seasonal disruptions”2020 The Authors. Published by ELSEVIER B.V. This is an open access article under the CC BY-NC-ND license (<https://creativecommons.org/licenses/by-nc-nd/4.0>)Peer-review under responsibility of the scientific committee of the X International Scientific Siberian Transport Forum
- 3) Azib Anees , Wei Huang “Flight Delay Prediction: Data Analysis and Model Development”Published in: 2021 26th International Conference on Automation and Computing (ICAC) Publisher: IEEE
- 4) Saba Firdous, Haseeba Fathiya, Lipsa Sadath “ Exploratory Data Analysis on Aviation Dataset ”, Publisher : IEEE XPLORE,Conferences-2021
- 5) Haipei Zhong, “Airline Member Customer Value Analysis: Data Visualization” Published in: ISCTT 2021; 6th International Conference on Information Science, Computer Technology and Transportation.

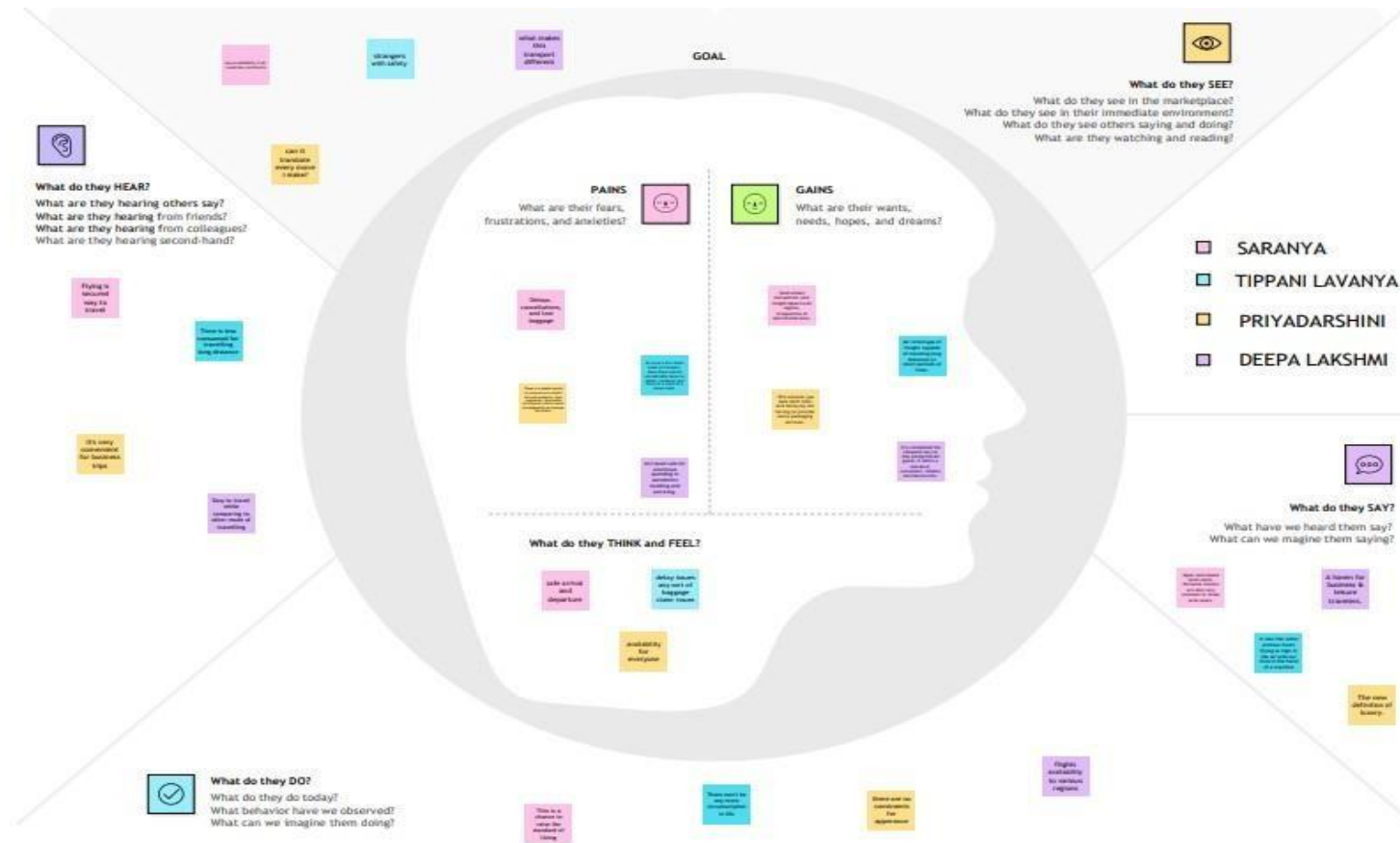
## **Problem Statement Definition**

Delays in air transportation are a major concern affecting the economy, passengers and the aerospace industry. This problem requires a specific estimation of future flight delays which can be implemented to improve airport operations and customer satisfaction.. For example, we offer an interactive dashboard where users can log their contact details to book flights and anticipate delays, if they occur, To build a user interface application to analyze delays so that the airport organization can adjust and allocate resources (airports) in the vicinity quickly.

## **3. IDEATION & PROPOSED SOLUTION**

### **Empathy Map Canvas**

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



## Ideation and Brainstorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem-solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

## Brainstorm, Idea Listing and Grouping

### Saranya R

Passengers safe Departure	Departure in correct location	Airport details in clear understanding to the passengers
Passenger's feasability to airport		

### Tippani Lavanya

Unique Identification Country code and ID	GPS code of respective airports will be defined to all passengers	Latitude and longitude will be notified to passengers regularly
Details of elevation levels of flight during travel to the airport		

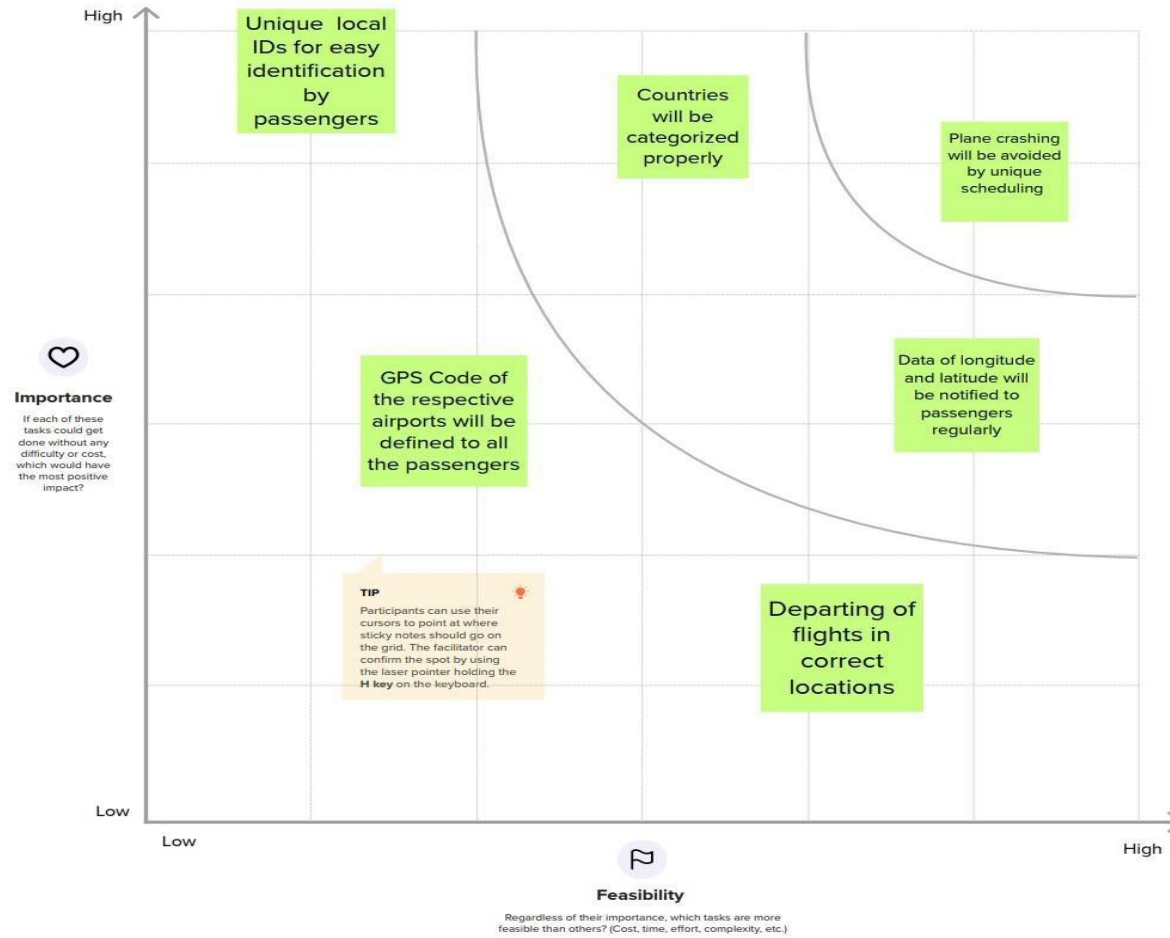
### Priyadharshini T

Dealing of countries categorization	Identification of country name	Dealing with region name
Unique local codes for easier identification by Passenger		

### Deepalakshmi L

Boolean value of scheduling services to airport	Avoiding plane crash by unique service scheduling	In case international travel continent's name, id and details would be provided
Regression details using machine learning techniques.		

# Idea Prioritization





### 3.4 Proposed Solution

Project team shall fill in the following information in the proposed solution template

S.N o.	Parameter	Description
1	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"><li>□ With the increasing demand for air transport and the limited ability to increase capacity at some key points in the air transport system, the inability to scale the system to meet future demands is recognized as difficult. I'm here.</li><li>□ This will result in the generation of delays throughout the system, impacting passengers' travel and more broadly the economy.</li><li>□ Passengers who do not know their status will be resolved</li></ul>
2.	Idea / Solution description	<ul style="list-style-type: none"><li>□ Efficient date grouping to reduce travel duration delays.</li><li>□ Allows you to price traveler demand and flights for specific city pairs.</li><li>□ Airlines are using this biometric technology as a boarding option. The device scans the faces of travelers and matches them to photographs stored in border control agency databases. These are treatable..</li></ul>

3.	Novelty / Uniqueness	<ul style="list-style-type: none"> <li>□ . The benefits of big data analytics include timely response to current and future market needs, improved planning, and strategically aligned decision-making.</li> <li>□ It also includes a clear understanding and monitoring of all key performance drivers relevant to the airline industry. Using intelligent data analytics, passengers can avoid many baggage tracking problems.</li> <li>□ Radio Frequency Identification Prevents Baggage Mishandling, Predictive Analytics Improves Fleet Reliability Predictability</li> </ul>
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> <li>□ Passenger satisfaction is obtained. No passenger undergoes discomfort during travel or post or pr-travel traumas.</li> <li>□ Data analytics helps the industry to understand customers' preferences and other maintenance issues.</li> <li>□ As a result, by gathering meaningful data, airlines can fetch more bookings in the given timeframe.</li> </ul>

5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> <li>□ The solution can be deployed in a variety of government and private sector sectors, enabling proactive action.</li> <li>□ Airline innovation can contribute to added value, competitive advantage and profitability through new action options.</li> <li>□ A revenue model is a blueprint that describes how a start-up will generate revenue or gross revenue from a standard business and how it will pay operating expenses and expenses</li> </ul>
6.	Scalability of the Solution	<ul style="list-style-type: none"> <li>□ This solution is highly scalable for any platform implementation and application.</li> <li>□ Cloud Cognos Analytics isn't just for organizations and governments.</li> <li>□ The aviation industry, whether international, domestic or private, is pleased with the aviation data analysis methods offered..</li> </ul>

### 3.4 Problem Solution fit

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <ul style="list-style-type: none"> <li>➤ Urgent travellers</li> <li>➤ Business travellers</li> <li>➤ Passenger who will book their travel Tickets</li> </ul>	<b>6. CUSTOMER CONSTRAINTS</b> <p>The Booking of the Flight tickets can be done through web applications Via Internet.</p>	<b>5. AVAILABLE SOLUTIONS</b> <ul style="list-style-type: none"> <li>➤ It provides information on Delays of flight across different location at municipality</li> <li>➤ Based on that passenger can know the Exact delay of the Flights</li> </ul>	Explore AS, differentiate
Focus on J&P, map into BE, understand PC	<b>2. JOBS-TO-BE-DONE/PROBLEMS</b> <ul style="list-style-type: none"> <li>➤ Initially the customer should register for an account</li> <li>➤ The customer should provide exact details such as date and time in order to know the availability of flights and also the delay of the flights if occurs.</li> </ul>	<b>9. PROBLEM ROOT CAUSE</b> <ul style="list-style-type: none"> <li>➤ This kind of web application cannot be found among people as many of the web applications are money oriented.</li> <li>➤ It is feasible to book Flight tickets efficiently</li> </ul>	<b>7. BEHAVIOUR</b> <ul style="list-style-type: none"> <li>➤ Airport data analysts can gather information about passengers such as whether they are male or female, when they arrived, in order to understand passenger's behaviour</li> <li>➤ This understanding can be used to improve the service.</li> </ul>	Focus on J&P, map into BE, understand PC
	<b>3. TRIGGERS</b> <ul style="list-style-type: none"> <li>➤ There are a lot of problems related to flight delays in the aviation sector.</li> <li>➤ However, quality and performance of data analytics reports can be insured if they are used.</li> </ul>	<b>10. YOUR SOLUTION</b> <ul style="list-style-type: none"> <li>➤ The aim of this project is to design an Airline Data Analytics Report for the Aviation Industry using Cognos Analytics.</li> <li>➤ It finds the arrival and departure of flights as well as the delay of flights. It also provides a complete visualization of the aviation industry</li> </ul>	<b>8. CHANNELS of BEHAVIOUR</b> <ul style="list-style-type: none"> <li>➤ Security is not Authenticated. There are some free online airline analytics for the aviation industry that might steal users' personal information or contain ads.</li> </ul>	Focus on J&P, map into BE, understand PC

<p>4. EMOTIONS: BEFORE / AFTER </p> <ul style="list-style-type: none"> <li>➤ Before using Data Analytics for Aviation Industry .They were having issues in management resulting in losses.</li> <li>➤ Now they are happy with the reduction errors that happen in manual processes.</li> </ul>		
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## 4. REQUIREMENT ANALYSIS

### Functional requirements

Following are the functional requirements of the proposed solution.

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR -1	customer Registration	customer can make Registration through Gmail
FR-2	User Confirmation	After the Registration the customer will get confirmation through the mail.
FR-3	Visualizing data	User can visualize the Regular trends of delay of flights Using IBM Cognos Analytics
FR-4	Generating Report	User can view the flight delay report

### Non-Functional requirements

Following are the non-functional requirements of the proposed solution.

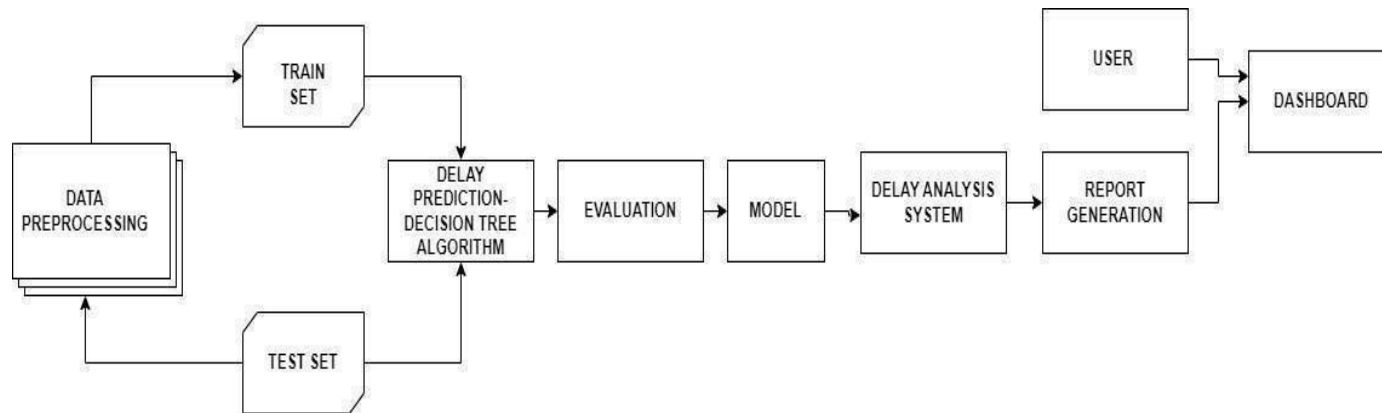
<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	<b>Usability</b>	The application will have a simple and user-friendly graphical interface. Users will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks

NFR-2	<b>Security</b>	The main security concern is for users' accounts hence proper login mechanism should be used to avoid hacking. The organization system should not disclose the personal information of users and other organization details to the public.
NFR-3	<b>Reliability</b>	When the system is disconnected or frozen due to over access at the same time, it should save all the process of the users made up to the point of abnormal happenings.
NFR-4	<b>Performance</b>	The system should require a fair amount of speed, especially while browsing through the catalogue.
NFR-5	<b>Availability</b>	The system shall be available 24 hours a day 7 days a week. Users can access it at any time.
NFR-6	<b>Scalability</b>	Large Number of users can access the website

# PROJECT DESIGN

## Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



## User Stories

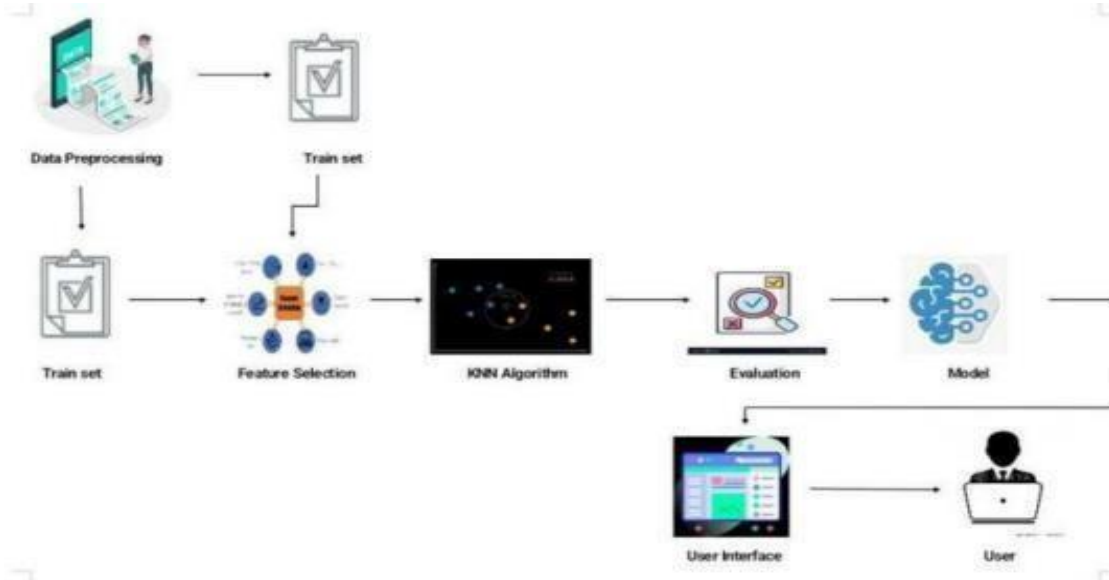
Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Login	USN1	As a user, I can log into the application by entering my email & password.	I can get to access myweb portal	High	Sprint-1
	Dashboard	USN-2	As a user, I can get to know how much time my flight's delay is in.	I can get details ofmy registration.	Low	Sprint-2
Customer Care Executive	Delay analysis	USN-3	Aviation industry which owns this aeroplane analysis system will enable the option to customers to reach out to the organization if there is any delay issue. Prediction of delays is the main concept here.	The customer care workers will help the customers in trouble.	High	Sprint-1



Customer Care Executive	Delay analysis- Report generation	USN-4	The analyzed report is then sent to the airline's aviation industry for the customers to get to know the delay status. The DGCA (Directorate General of Civil Aviation) will get to know the delays of flights and redirect safely with high customer safety.	The customer care workers will provide the users with the report.	Low	Sprint-2
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## Solution & Technical Architecture



**User Stories Table-1:**  
**Components & Technologies:**

Component	Description	Technology
User Interface	User can Interact with web Applications	HTML, CSS, JavaScript.
Data Preparation	Pre-processing of data should be done	Python
Feature selection	Feature selection of the Dataset using the Correlation Feature Selection method.	Python
Data Analytics	Prediction of Flight delay using Decision Tree.	Python
Data Visualization	Data Type, Configurations etc.	Python
Data storage	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
User Interface	Dashboard showing the details of the flight delay	HTML, CSS, JavaScript.

**Table 2: Application Characteristics:**

Characteristics	Description	Technology
Security Implementations	The main security concern is for users' accounts hence proper login mechanisms should be used to avoid hacking.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
Availability	The system will be available 24 hours a day 7 days a week. Users can access it at any time.	
Performance	The system should require a fair amount of speed, especially while browsing through the catalogue.	

**5 PROJECT PLANNING AND SCHEDULING**

**Sprint Planning & Estimation**

Activity Name	Activity Number	Activity Description	Tasks Assigned	Status
Preparation Phase	1	Access the resources in project dashboard. Explore the dataset provided in workspace. Create GitHub account & collaborate with Project Repository in project workspace. Set-up the prerequisites for the project.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed

Ideation Phase	2	<p>Literature survey relevant to the selected project.</p> <p>Preparation of Empathy Map to identify the user pros and cons.</p> <p>List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility &amp; importance.</p>	<p>SARANYA R</p> <p>DEEPALAKSHMI L</p> <p>PRIYADHARSHINI T</p> <p>TIPPANI LAVANYA</p>	Completed
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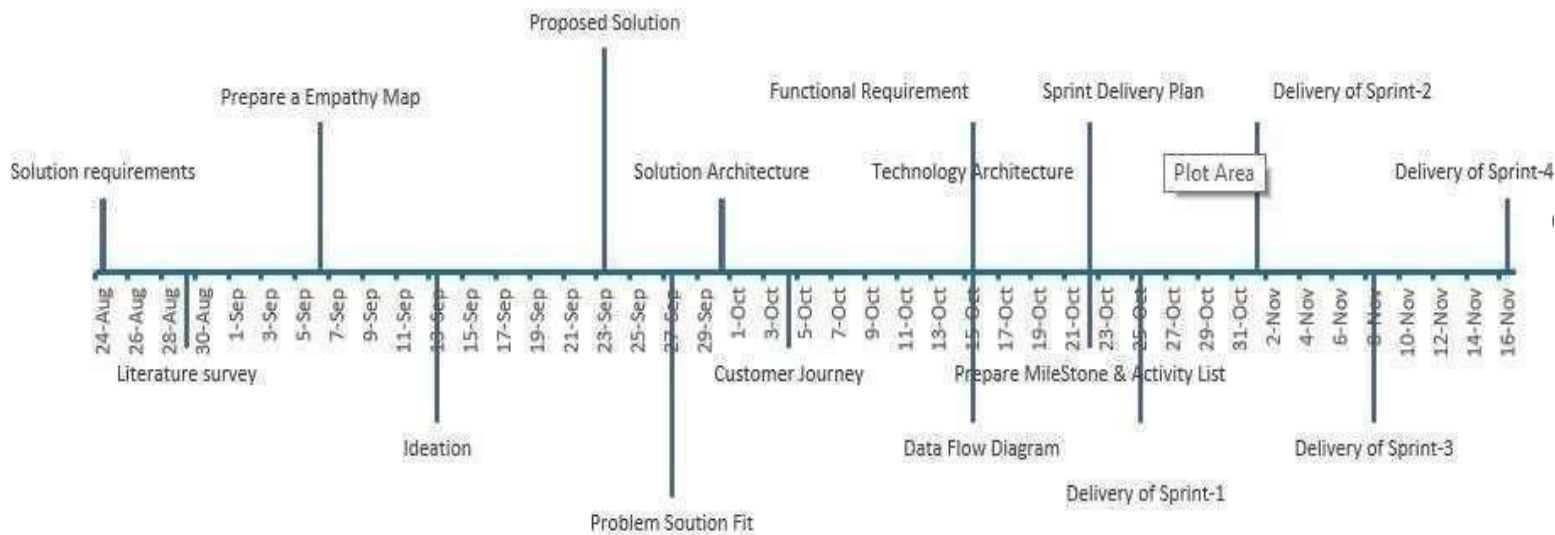
<b>Project Design Phase-I</b>	3			
Proposed Solution	3.1	Preparation of proposed solution document, which includes the Problem statement , Idea description, novelty,feasibility of idea, business model, social impact and scalability of the solution.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
Problem SolutionFit	3.2	Prepared problem solution fit document which have designed a value proposition that addresses the customers' job, pros and cons to the particular application.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
Solution Architecture	3.3	Develop effective architecture for the proposed solution which provides ground for application development projects.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
<b>Project Design Phase-II</b>	4			
Solution Requirements	4.1	Identify the Functional and Non- Functional requirements of the proposed solution.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
Customer Journey	4.2	Preparation of customer journey map to understand the user interactions which describes the stages that the customer experiences over time.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
Data Flow Diagram and User stories	4.3	Generate Data flow diagram for the Project which maps out the flow of information for the application.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed

Technology Architecture	4.4	Develop effective technical architecture for the proposed solution which describes the logical software and hardware capabilities that are required to support the development of the application.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
<b>Project Planning Phase</b>	5			
Milestones & Activity List	5.1	Prepare Milestone and Activity list of the project.	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
Sprint Plan	5.2	Prepare Sprint Delivery plan of the project	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	Completed
<b>Project Development</b>	6			
Delivery of Sprint-1	6.1	Implement the coding phase of Sprint-1	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	In Progress
Delivery of Sprint-2	6.2	Implement the coding phase of Sprint- 2	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	In Progress
Delivery of Sprint-3	6.3	Implement the coding phase of Sprint-3	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	In Progress
Delivery of Sprint-4	6.4	Implement the coding phase of Sprint-4	SARANYA R DEEPALAKSHMI L PRIYADHARSHINI T TIPPANI LAVANYA	In Progress

## 6.2 Sprint Delivery Schedule

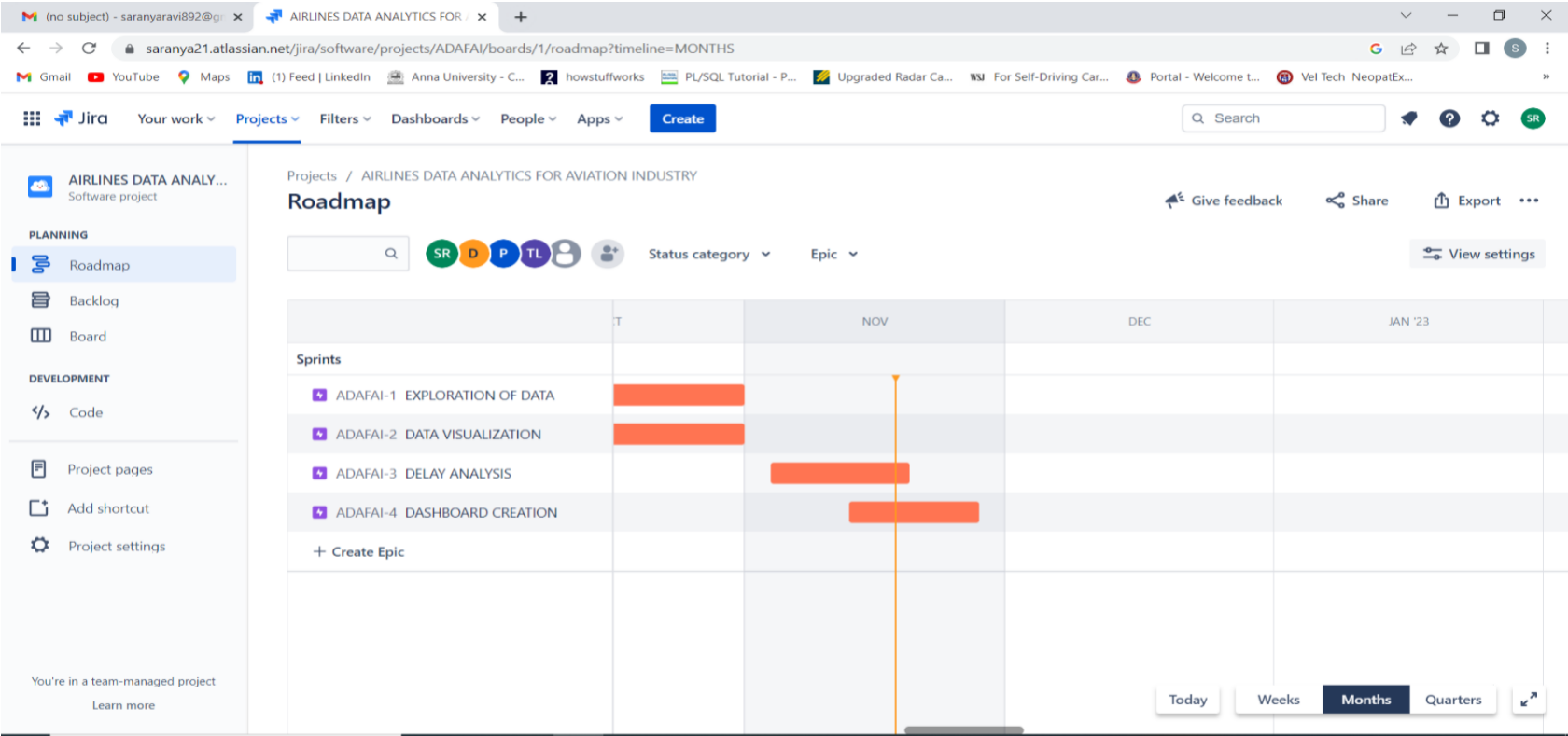
A milestone schedule, or milestone chart, is a timeline that uses milestones to divide a project schedule into major phases. A milestone chart is a way to visualize the most important steps of our project. Each milestone the team achieves brings us closer to completing the project. As a result, milestones provide a sense of accomplishment and show the team how the work they're doing contributes to the overarching project objective.

**Milestone Timeline Chart**



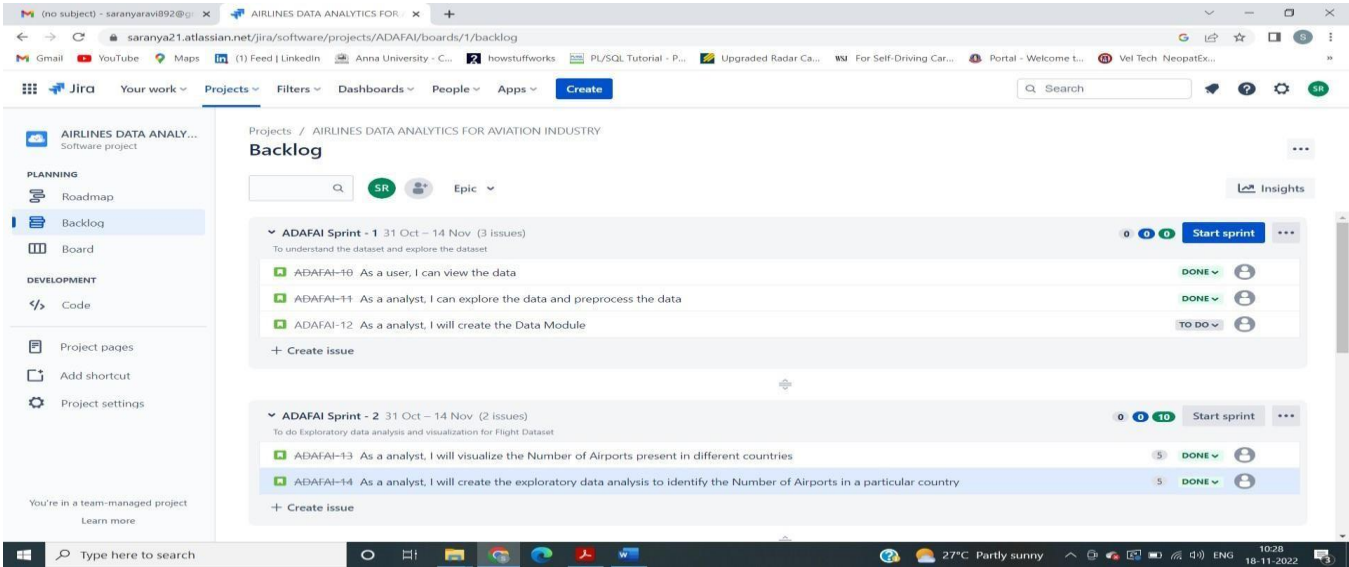
## 6. REPORT FROM JIRA

### Project RoadMap





Project Backlog



(no subject) - saranyaravi892@...

AIRLINES DATA ANALYTICS FOR ...

←

→

↻

🔒 saranya21.atlassian.net/jira/software/projects/ADAFAI/boards/1/backlog

Gmail

YouTube

Maps

(1) Feed | LinkedIn

Anna University - C...

howstuffworks

PU/SQL Tutorial - P...

Upgraded Radar Ca...

For Self-Driving Car...

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Create

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AIRLINES DATA ANALY...  
Software project

PLANNING

Roadmap

Backlog

Board

DEVELOPMENT

Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

[Learn more](#)

Projects / AIRLINES DATA ANALYTICS FOR AVIATION INDUSTRY

Backlog

🔍

SR

Epic ▾

Insights

▼ ADAFAI Sprint - 3 31 Oct – 14 Nov (2 issues)

Flight Delay Prediction

ADAFAI-15 I will create various models as a analyst to accurately predict the flight delay

IN PROGRESS ▾

ADAFAI-16 As a analyst, I will select the most effective model to accurately predict the flight delay

IN PROGRESS ▾

+ Create issue

▼ ADAFAI Sprint - 4 31 Oct – 14 Nov (2 issues)

To create a interactive Dashboard for Flight Delay Prediction

ADAFAI-17 As a analyst, I will import the suitable model into the framework

TO DO ▾

ADAFAI-18 As a analyst, I will generate the result of flight delay prediction and will develop a dashboard that display all the flight delays.

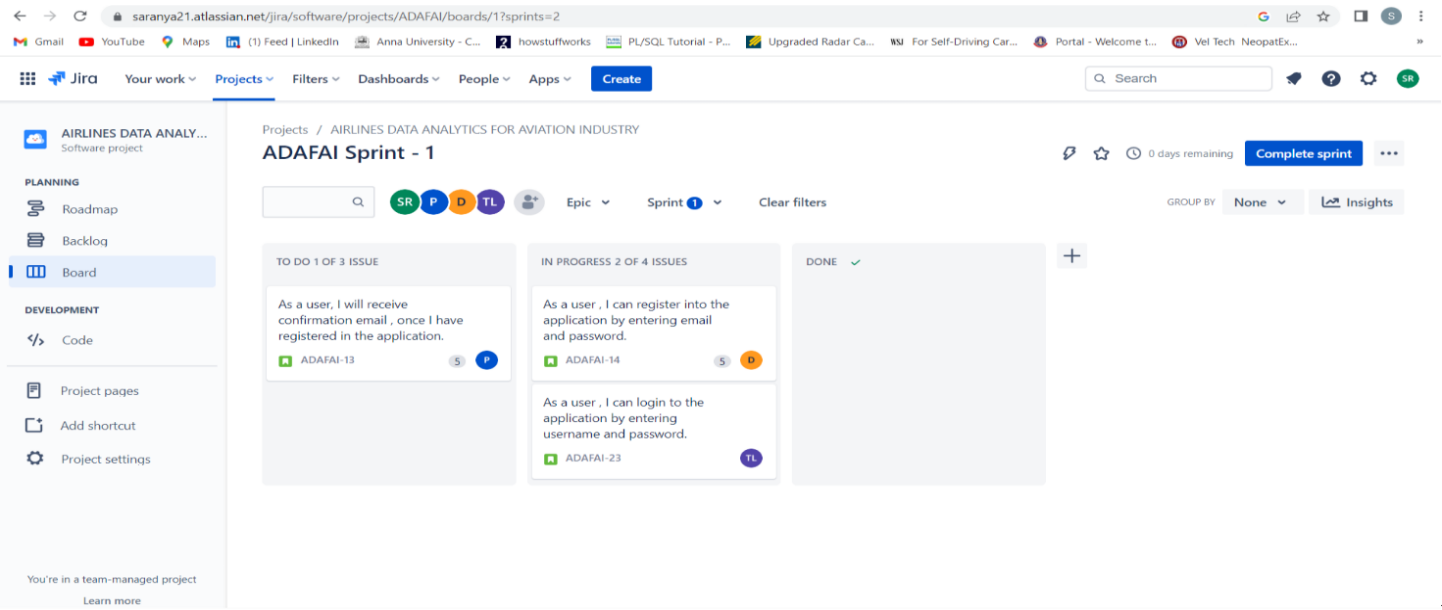
TO DO ▾


+ Create issue

## Board




[illegible]

**Sprint Creation:**




 AIRLINES DATA ANALY...  
Software project



PLANNING

-  Roadmap
-  Backlog
-  Board

DEVELOPMENT

-  Code





Project pages

-  Add shortcut
-  Project settings


You're in a team-managed project  
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Projects / AIRLINES DATA ANALYTICS FOR AVIATION INDUSTRY

## ADAFAI Sprint - 2



   0 days remaining [Complete sprint](#) 

     Epic Sprint  Clear filters

GROUP BY [None](#)  Insights



TO DO 1 OF 4 ISSUE


User can view the predicted delay data.


 ADAFAI-15 

IN PROGRESS 1 OF 3 ISSUE

As a user , I can get to know how much time my flight's delay is in.

 ADAFAI-16 

DONE 



You're in a team-managed project

ADAFI Sprint - 3

⚡ ☆ ⌚ 0 days remaining **Complete sprint** ⋮

SR
P
D
TL

Epic ▾
Sprint 1 ▾
Clear filters

GROUP BY **None**   Insights

TO DO 1 OF 3 ISSUE

Aviation industry which owns this airplane analysis system will enable the option to customers to reach out the organization if there is any delay issue.


A ADAFAI-17 D

IN PROGRESS 1 OF 4 ISSUE

Aviation industry analyzes the prediction of delay

A ADAFAI-18 TL

DONE ✓

 AIRLINES DATA ANALY...  
Software project

PLANNING

- Roadmap
- Backlog
- Board**

DEVELOPMENT

- Code




- Project pages
- Add shortcut
- Project settings

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Projects / AIRLINES DATA ANALYTICS FOR AVIATION INDUSTRY

ADAFAI Sprint - 4


   0 days remaining **Complete sprint** ⋮

SR

P

D

TL



Epic ▾

Sprint 1 ▾

Clear filters


GROUP BY 

None ▾


Insights

TO DO 2 OF 5 ISSUES

The analyzed report is then sent to the airlines aviation industry for the customers to get to know the delay status.

 ADAFAI-20

The DGCA(Directorate General of Civil Aviation) will get to know the delays of flights and redirect safely with high customers safety.

 ADAFAI-24

IN PROGRESS

DONE ✓

+

AIRLINES DATA ANALY...

Software project

PLANNING

Roadmap

Backlog

Board

DEVELOPMENT

Code

Project pages

Add shortcut

Project settings

You're in a team-managed project.

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Projects / AIRLINES DATA ANALYTICS FOR AVIATION INDUSTRY

All sprints

SR P D TL

Epic

Sprint

Clear filters

0 days remaining

Complete sprint

GROUP BY

None

Insights

TO DO 5 OF 5 ISSUES

IN PROGRESS 4 OF 4 ISSUES

DONE

As a user, I will receive confirmation email, once I have registered in the application.

ADAFAI-3

User can view the predicted delay data.

ADAFAI-5

Aviation industry which owns this airplane analysis system will enable the option to customers to reach out the organization if there is any delay issue.

ADAFAI-7

The analyzed report is then sent to the airlines aviation industry for the customers to get to know the delay status.

ADAFAI-20

The DGCA(Directorate General of Civil Aviation) will get to know the delays of flights and redirect safely with high customers safety.

ADAFAI-24

As a user, I can register into the application by entering email and password.

ADAFAI-14

As a user, I can get to know how much time my flight's delay is in.

ADAFAI-16

Aviation industry analyzes the prediction of delay

ADAFAI-18

As a user, I can login to the application by entering username and password.

ADAFAI-23



## 7. CODING & SOLUTIONING (Explain the features added in the project along with code)

### 7.1 Feature 1

The user can enter the Elevation feet of the flight to predict whether the delay has occurred or not.

#### CODE:

```
from flask import render_template, Flask, request
import pickle
```

```
app=Flask(__name__)
file=open("model.pkl", "rb")
```

```
knn=pickle.load(file)
file.close()
```

```
@app.route("/", methods=["GET", "POST"])
def index():
```

```
    if request.method=="POST":
        myDict = request.form
        type1= myDict["elevation_ft"]
```

```
    pred = [type1]
```

```
    res=knn.predict([pred])[0]
```

```
    return render_template('result.html',elevation_ft=type1,res=res)
```

```
    return render_template('index.html')
```

```
return 'OK'
```

```
if __name__ == "__main__":  
    appl.run(debug=True)
```

## **7.2 Feature 2**

If a delay occurred, the delay is predicted using the Elevation\_ft parameter given in the dataset which provides the delay, in minutes.

### **CODE:**

```
from sklearn.neighbors import KNeighborsClassifier
```

```
from sklearn.model_selection import train_test_split
```

```
import pandas as pd
```

```
import numpy as np
```

```
import pickle
```

```
dt = pd.read_csv(r"C:/Users/Anjana/Downloads/airports.csv")  
dt = dt.dropna()
```

```
dt=dt.replace('NaN',0)
```

```
dt=dt.replace('OC',1)
```

```
dt=dt.replace('AF',2)
```

```
dt=dt.replace('AN',3)
```

```
dt=dt.replace('EU',4)
```

```
dt=dt.replace('AS',5)
```

```
dt=dt.replace('SA',6)
```

```
#feature and target arrays
```

```
train=dt['elevation_ft']
```

```
target=dt['elevation_ft']
```

```
train=np.array(train)
```

```
target=np.array(target)
```

```
X_train, X_test, y_train, y_test = train_test_split(train,target, test_size = 0.2, random_state=42)
```

```
knn = KNeighborsClassifier(n_neighbors=5)
```

```
knn.fit(X_train.reshape(-1,1), y_train)
```

## 6. TESTING

### 8.1.Test Cases

1					Date	03-Nov-22				
2					Team ID	PNT2022TMD22160				
3					Project Name	Project - Airlines Data Analytics for				
4					Maximum Marks	4 marks				
5	Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
6	Main Page	UI	Home Page	User can explore the Web App.		1.Enter URL and click go		Elevation details should be displayed	Working as expected	Pass
7	Entering parameter_TC_001	Functional	Home Page	Verify the UI elements in Login/Signup popup		1.Click on the CHECK button displayed on the application page to check the delay.		Displays the Elevation details entries	Working as expected	Pass
8	Entering parameter_TC_001	Functional	Home page	Result will be displayed with the analysed delay		Delay Analysis is done if occurs.	Elevation Feet ID:100 Delay Predicted : 67min	Application should show below UI elements: a.Elevation feet Entry Area b.Checking the delay by CHECK button	Working as expected	Pass
9	Navigation to Resultpage_TC_002	Functional	second page	To check the delay for another elevation feet.		1.Click on the CHECK button displayed on the application page to check the delay.	Elevation Feet ID:2391 Delay Predicted : 100 min	User should be navigated from login page to the dashboard. The Dashboard displays the user name	Working as expected	Pass

## 8.2 User Acceptance Testing:

### 1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Airlines Data Analytics for Aviation Industry project at the time of the release to User Acceptance Testing (UAT).

### 2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

### 3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	30	0	0	30
Security	2	0	0	2

---

**9. RESULTS**

**9.1 Performance Metrics**

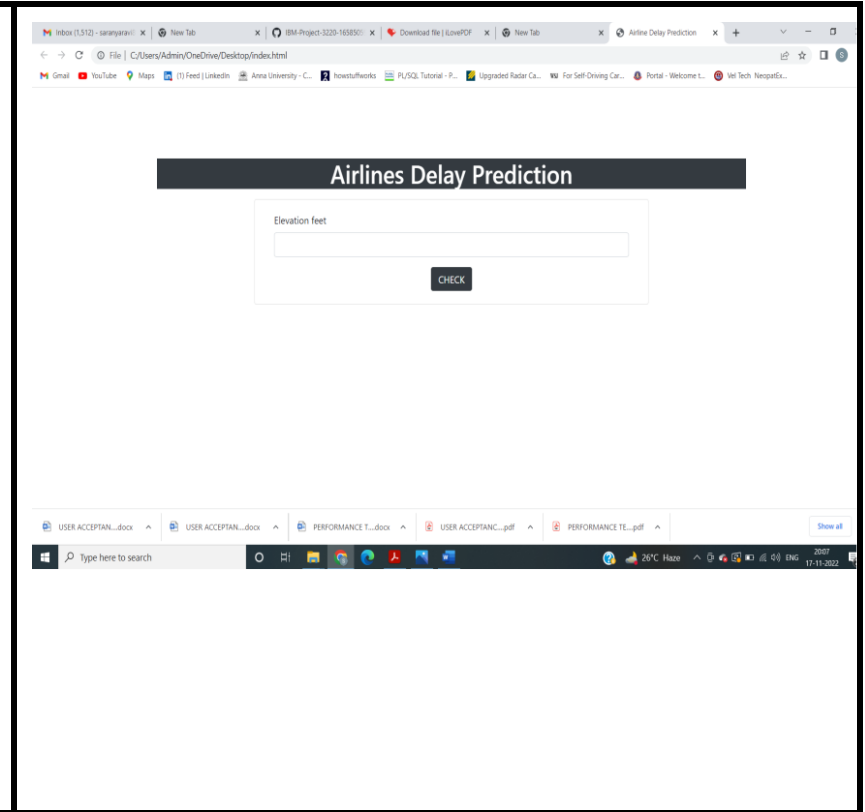
**Model Performance Testing:**

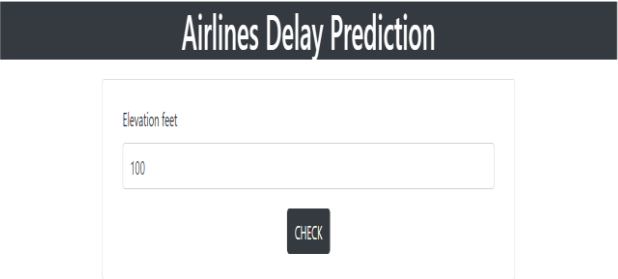
The project team shall fill in the following information in the model performance testing template.

S.No	Parameter	Screenshot
------	-----------	------------

1

## Dashboard design



2	Data entry	
3	Data responsiveness	The Delay rate is 67.0 minutes



4

## Descriptive report of delay analysis

### Airlines Delay Prediction

Elevation feet

100

The Delay rate is 67.0 minutes

Back

## **10.ADVANTAGES & DISADVANTAGES**

### **Advantages**

1. This application helps users predict the delays if they occur.
2. As a result, they can accurately predict these flight delays allowing passengers to be well prepared for the deterrent caused to their journey.
3. Enabling airlines to respond to the potential causes of flight delays in advance to diminish the negative impact.
4. Therefore, predicting flight delays can improve airline operations and passenger satisfaction, which will result in a positive impact on the economy

### **Disadvantages**

1. The people who are unaware of this application will have no idea about their flight delay unless they have been notified

## **11. CONCLUSION**

Flight delays are a major problem in civil aviation. They incur direct and indirect costs, such as maintenance at the gate, extra fees for crew, food service, and lodging. They also affect passenger satisfaction. Flight delay is inevitable and it plays an important role in both profits and losses of the airlines. An accurate estimation of flight delay is critical for airlines because the results can be applied to increase customer satisfaction and the incomes of airline agencies. So, the prediction and analysis of flight delays are of great significance to airlines, passengers, and airports. Predicting delays will help an airport to adjust resource allocations, quickly analyse the causes, and take measures to reduce or eliminate delays. Therefore, It delivers a well-friendly graphical UI and gives a proper delay rate to the users.

## 12. FUTURE SCOPE

There are still deficiencies in this application. Furthermore, this application can be enhanced for allocating various resources to the customers if a delay has occurred and they can also book tickets for their flights through this application.

## 13. APPENDIX

**Source Code:** main.py:

```
from flask import render_template, Flask, request import
```

```
pickle
```

```
appl=Flask(__name__)
```

```
file=open("model.pkl","rb")
```

```
knn=pickle.load(file)
```

```
file.close()
```

```
@app.route("/", methods=["GET", "POST"])
def index():
```

```
    if request.method=="POST":
```

```
        myDict = request.form
```

```
        type1= myDict["elevation_ft"] pred =
```

```
        [type1] res=knn.predict([pred])[0]
```

```
    return render_template('result.html',elevation_ft=type1,res=res)
```

```
return render_template('index.html')
```

```
return 'OK'
```

```
if __name__ == "__main__":
```

```
    appl.run(debug=True)
```

```
temp.py:
```

```
from sklearn.neighbors import KNeighborsClassifier from
```

```
sklearn.model_selection import train_test_split import pandas as
```

```
pd
```

```
import numpy as np
```

```
import pickle
```

```
dt = pd.read_csv(r"C:/Users/Anjana/Downloads/airports.csv")
```

```
dt = dt.dropna()
```

```
dt=dt.replace('NaN',0)
```

```
dt=dt.replace('OC',1)
```

```
dt=dt.replace('AF',2)
```

```
dt=dt.replace('AN',3)
```

```
dt=dt.replace('EU',4)
```

```
dt=dt.replace('AS',5)
```

```
dt=dt.replace('SA',6)
```

```
#feature and target arrays
```

```
train=dt['elevation_ft']
```

```
target=dt['elevation_ft']
```

```
train=np.array(train)
```

```
target=np.array(target)
```

```
X_train, X_test, y_train, y_test = train_test_split(train,target, test_size = 0.2, random_state=42)
```

```
knn = KNeighborsClassifier(n_neighbors=5)
```

```
knn.fit(X_train.reshape(-1,1), y_train)
```

```
file = open("model.pkl","wb")
```

```
pickle.dump(knn,file)
```

```
file.close()
```

index.html:

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<meta charset="UTF-8">
```



```
<link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">
```

```
<title>Airline Delay Prediction</title>
```

```
</head>
```

```
<style>
```

```
body{
background-image: url('im1.gif') ;
background-repeat: no-repeat;
background-attachment: fixed;
background-size: cover;
}
```

```
</style>
```

```
<body>
```

```
<br><br><br><br>
```

```
<div class="container">
```

```
<h1 class="text-center m-3 badge-dark text-wp"> Airlines Delay
```

Prediction

```
</h1>
```

```
<div class="card container" style="width: 65%; ">
```

```
<div class="card-body">
```

```
<form action="/" method="post">
```

```
<div class="form-group">
```

```
<label for="formGroupExampleInput1">Elevation feet</label>
```

```
<input type="text"
```

```
class="form-control"
```

```
id="formGroupExampleInput1"
```

```
name="elevation_ft"
```

```
required
```

```
/>
```

```
</div>
```

```
<center><button type="submit" class="btn btn-dark">CHECK</button></center>
```

```
</form>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</body>
```

```
</html>
```

result.html:

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<meta charset="UTF-8">
```

```
    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
    integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
crossorigin="anonymous">
```

```
<title>Delay-Prediction</title>
```

```
</head>
```

```
<style>
```

```
body{
background-image: url('im2.gif') ;
background-repeat: no-repeat;
background-attachment: fixed;
background-size: cover;
}
```

```
</style>
```

```
<body >
```

```
<br><br><br><br>
```

```
<div class="container" >
```

```
<h1 class="text-center m-3 badge-dark text-wrap">Airlines Delay Prediction</h1>
```

```
<div class="card container" style="width: 50%;">
```

```
<div class="card-body" >
```

```
<form action="/" method="post">
```

```
<div class="form-group">
```

```
<label for="formGroupExampleInput1">Elevation feet</label>
```

```
<input type="text"
```

```
class="form-control"
```

```
id="formGroupExampleInput1"
```

```
name="elevation_ft"
```

```
placeholder="{{ elevation_ft }}"
```

```
required
```

```
/>
```

```
</div>
```

```
<h2 class="text-center text-wrap" >The Delay rate is {{ res }} minutes </h2>
```

```
</form>
```

```
</div>
```

```
<center><a href="/"><button type="submit" class="btn btn-dark">Back</button></a></center>
```

```
</div>
```

```
</div>
```

```
</body>
```

```
</html>
```

GITHUB AND PROJECT DEMO LINK:

Github Link: <https://github.com/IBM-EPBL/IBM-Project-1843-1658417675>

Project Demo Link: [https://drive.google.com/file/d/1J68-u8iqPlkAQaCbt2ihTIpLNgwJ7vNM/view?usp=share\\_link](https://drive.google.com/file/d/1J68-u8iqPlkAQaCbt2ihTIpLNgwJ7vNM/view?usp=share_link)