

19CSP14 - PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

Airlines Data Analytics for Aviation Industry

Team ID: PNT2022TMID22187

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Team member 1: Sanjay Kumar C

Team member 2: Prince Xavier A

Team member 3: Sarvesh H

1 . INTRODUCTION

Project Overview

In the present world, the major components of any transportation system include passenger airline, cargo airline, and air traffic control system. With the passage of time, nations around the world have tried to evolve numerous techniques for improving the airline transportation system. This has brought a drastic change in airline operations. Flight delays occasionally cause inconvenience to modern passengers. Every year approximately 20% of airline flights are canceled or delayed, costing passengers more than 20 billion dollars in money and time.

Purpose

Average aircraft delay is regularly referred to as an indication of airport capacity. Flight delay is a prevailing problem in the world. It's very tough to explain the reason for the delay. A few factors responsible for the flight delays like runway construction and excessive traffic are rare, but bad weather seems to be a common cause. Some flights are delayed because of reactionary delays, due to the late arrival of the previous flight. It hurts airports, and airlines, and affects a company's marketing strategies as companies rely on customer loyalty to support their frequent flying programs.

2. LITERATURE SURVEY

1. Towards a maturity model for big data analytics in airline network planning (Iris Hausladen, Maximilian Schosser -2020)

- In this study, **Iris Hausladen, Maximilian Schosser** address this challenge by developing a maturity model for big data readiness for airline network planning.
- The transfer steps have been combined with the model evaluation. In the second stage, the maturity levels are conceptualized and formulated, before the complete model is evaluated by the practitioner group.

2. Life Data Analytics with Application for the Airline Industry (Julio Pulido, NortekDana Moore, William Hill -2020)

- In this study, **Julio Pulido, NortekDana Moore, William Hill** proposed the analysis of non-repairable systems.
- The three techniques, namely the time to failure, stress-strength or condition-based approach, is generally adopted.
- The mixed Weibull distribution (also known as a multimodal Weibull) is used to model data that do not fall on a straight line on a Weibull probability plot.

3. Exploratory Data Analysis on Aviation Dataset (Saba Firdous, Haseeba Fathiya, Lipsa Sadath -2021)

- In this work, **Saba Firdous, Haseeba Fathiya, Lipsa Sadath** performed Aviation informational collection and performed analytics.
- The first step was to organize all the events into categories depending on their risk level.
- The next step was to use an SVM to learn the relationships between the events.

- The third step was to combine the results from both models to improve the accuracy of the predictions made.

4. Applying Machine Learning to Aviation Big Data for Flight Delay Prediction

(Yushan Jiang, Yushan Jiang -2020)

- In this study, Yushan Jiang, and Yushan Jiang developed several machine learning models to predict flight arrival delays.
- Firstly data pre-processing is needed including data merging and cleansing.
- Next, data visualization can be performed to extract and visualise the graphic representation of data clearly and efficiently.

5. Transportation Research Part E IN Aviation

(Xu et al- 2020)

- In this work, Xu et al proposed a hybrid model to forecast statistical indicators in the aviation industry, which employs the seasonal autoregressive integrated moving average (SARIMA) and support vector regression (SVR) methods.
- SARIMA is employed to analyze the raw time series. Gaussian White Noise is then used for calculation according to the SARIMA's results.

References

1. Iris Hausladen, Maximilian Schosser “ *Towards a maturity model for big data analytics in airline network planning*”, ELSEVIER-Journal of Air Transport Management, Volume 82,(2020).
2. Julio Pulido, NortekDana Moore, William Hill “*Life Data Analysis with Applications for the Airline Industry* ”, IEEE XPLORE-**Published in** 2016 Annual Reliability and Maintainability Symposium (RAMS)
3. Saba Firdous, Haseeba Fathiya, Lipsa Sadath “ *Exploratory Data Analysis on Aviation Dataset* ”, IEEE XPLORE, Conferences-2021
4. Yushan Jiang, Yushan Jiang “*Applying Machine Learning to Aviation Big Data for Flight Delay Prediction*” IEEE XPLORE, Conferences -2021

5.Xu et al “*Transportation Research Part E IN AVIATION*”, SCIENCE DIRECT- Journals and books, Volume 167,(2022).

Problem Statement Definition

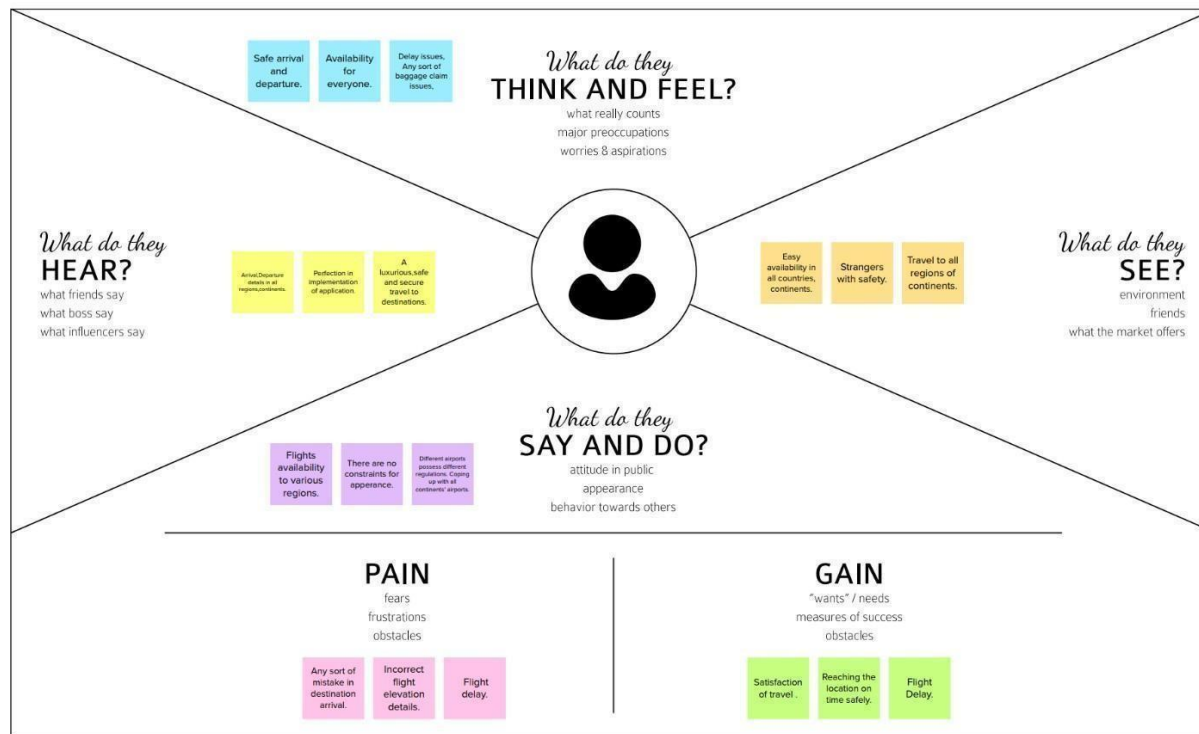
Flight delays in air transportation are a major concern that has adverse effects on the economy, the passengers, and the aviation industry. This matter critically requires an accurate estimation for future flight delays that can be implemented to improve airport operations and customer satisfaction. Thus, we propose an interactive dashboard in which user can predict the delays if occurs.

To build a user interface application to analyze the delays so airports organizations can adjust and allocate the resources(airports) nearby 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

Vishal T

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

Sanjay Kumar C

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		

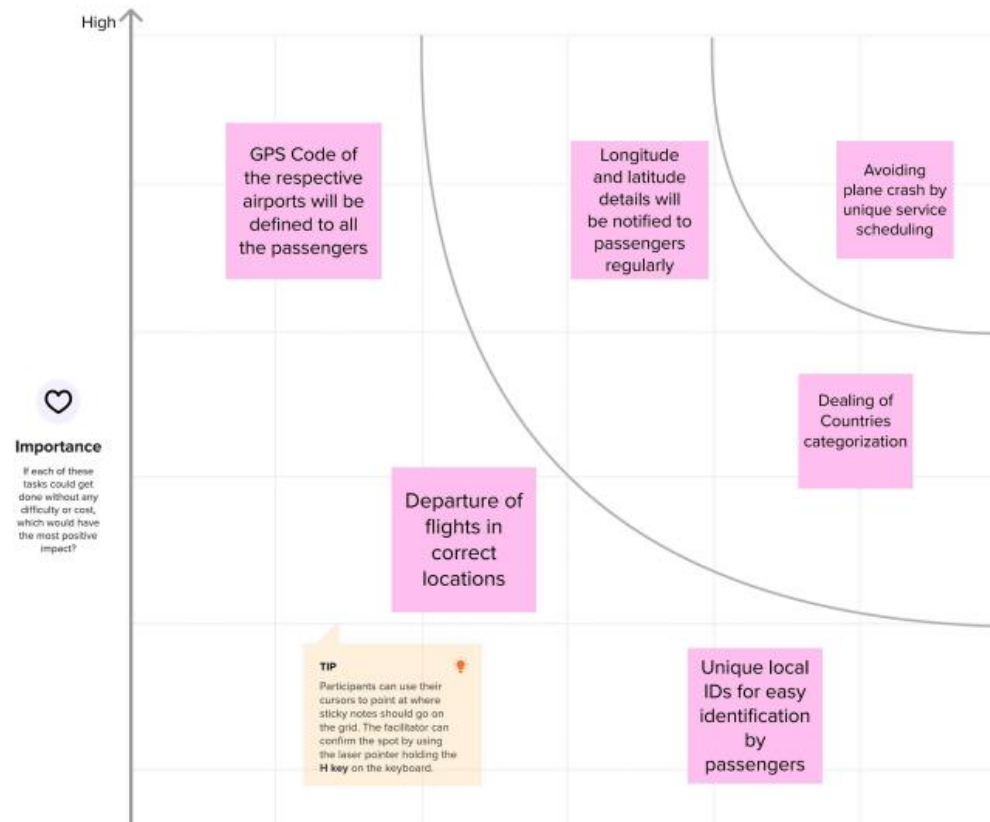
Sarvesh H

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

Prince Xavier

Boolean value of scheduling services to airport	Avoiding plane crash by unique service scheduling	In case international level circumstances arise, all such details would be provided
Regression details using machine learning techniques		

Idea Prioritization



3.4 Proposed Solution

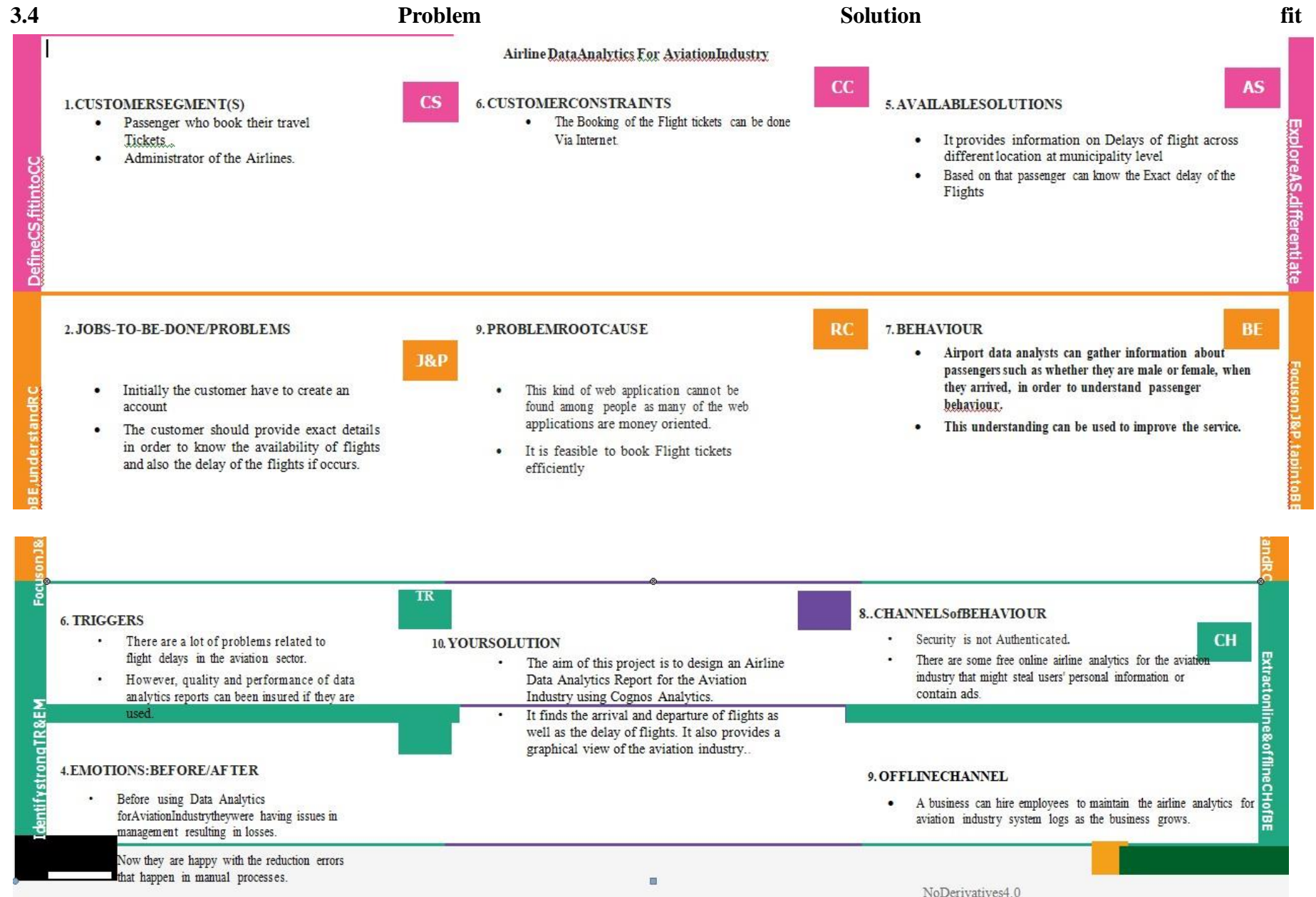
Project team shall fill in the following information in the proposed solution template

S.No.	Parameter	Description
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1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"> • Reduction of the causes of the flight delay. • With the growing demand for air transportation and the limited ability to increase capacity at some key points in the air transportation system, it is found to be difficult that in the future the system will not scale to meet demand. • This will result in the generation of delays throughout the system, impacting passengers' travel and more broadly the economy. • Passengers not knowing the status will be solved
2.	Idea / Solution description	<ul style="list-style-type: none"> • Grouping of the efficient data to reduce the delay of the travel period. • Traveler demand for specific city pairs and pricing flights can be done. • Airlines use this biometric technology as a boarding option. The equipment scans travellers' faces and matches them with photos stored in border control agency databases. These can be handled.

3.	Novelty / Uniqueness	<ul style="list-style-type: none"> • The advantage of big data analytics includes timely responses to current and future market demands, improved planning and strategically aligned decision-making. • It also includes crystal clear comprehension and monitoring of all main performance drivers relevant to the airline industry. • Due to the use of smart data analytics, passengers will avoid many issues with baggage tracking. • While radiofrequency identification prevents mishandling the baggage, predictive analysis assists in improving the predictability of fleet reliability.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> • Passenger satisfaction is obtained. No passenger undergoes discomfort during travel or post or pr-travel traumas. • Data analytics helps the industry to understand customers' preferences and other maintenance issues.
		<ul style="list-style-type: none"> • As a result, by gathering meaningful data, airlines can fetch more bookings in the given timeframe.

5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> • This solution can be implemented in various government and private sectors which helps enable predictive measures. • Innovation in airlines can contribute to the creation of value, competitive advantage and profitability with new possibilities of action. • A revenue model is a blueprint that shows how a startup business will earn revenue or gross income from its standard business operations, and how it will pay for operating costs and expenses.
6.	Scalability of the Solution	<ul style="list-style-type: none"> • This solution would be highly scalable for any platform implementation and application. • The Cloud Cognos Analytics is not only for organization/governments. • Aviation industry acting internationally, domestically, or privately is also getting satisfied with the aviation data analyzing process provided.



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.

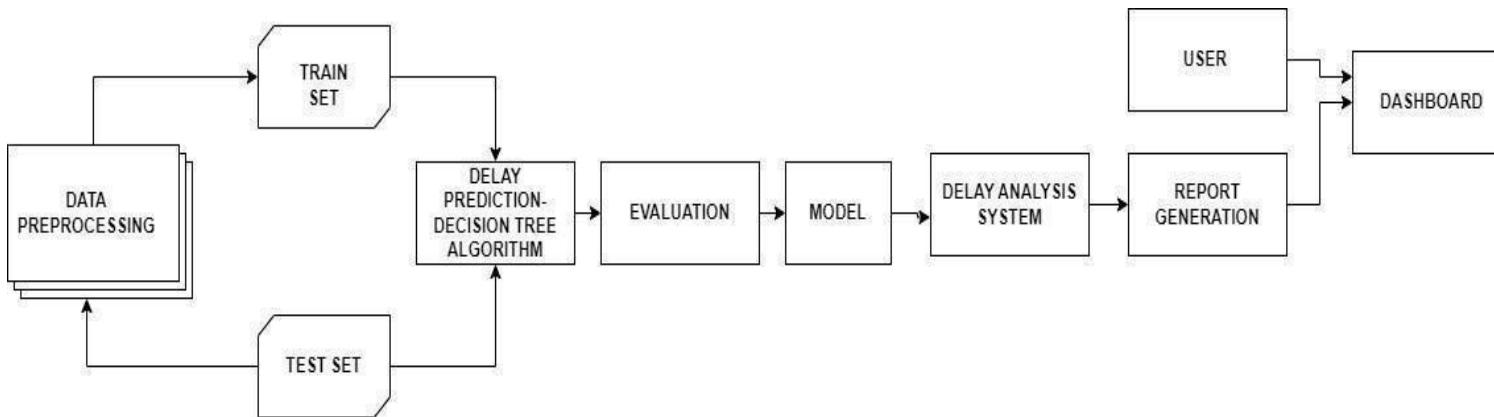
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The application will have a simple and user-friendly graphical interface. Users will be able to understand and use all the features of the application easily. Any action has to be performed with just a few clicks

NFR-2	Security	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	Reliability	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	Performance	The system should require a fair amount of speed, especially while browsing through the catalogue.
NFR-5	Availability	The system shall be available 24 hours a day 7 days a week. Users can access it at any time.
NFR-6	Scalability	Large Number of users can access the website

5. 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



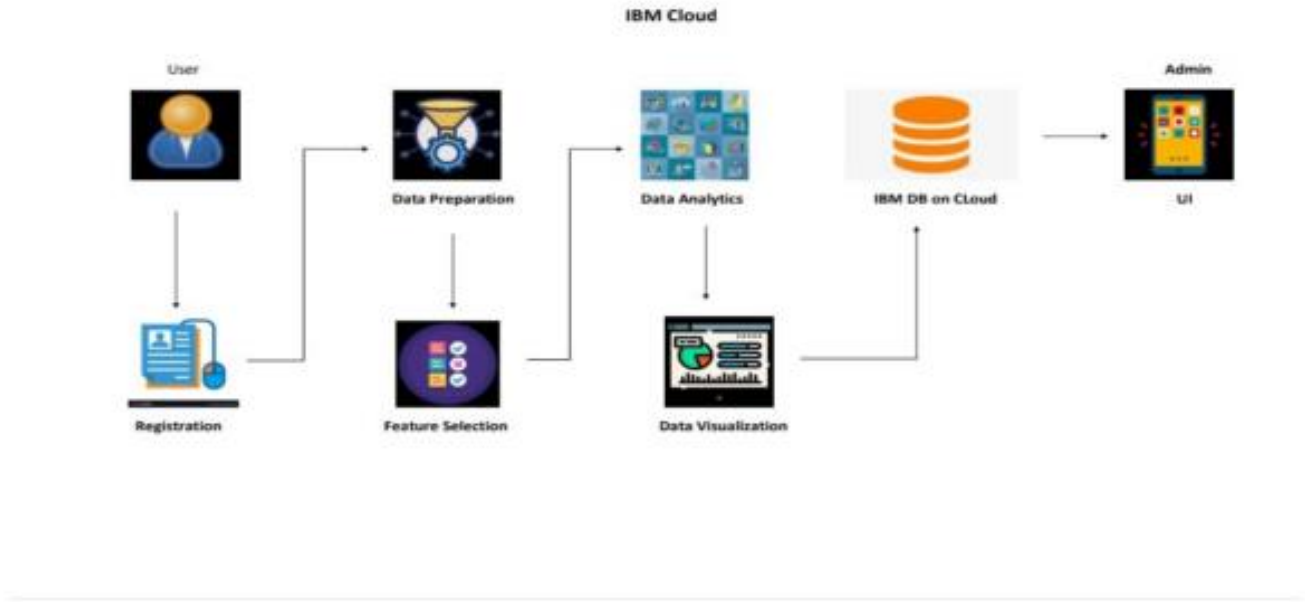
User Stories

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	<ul style="list-style-type: none"> As a user, I can log into the application by entering my email & password. 	I can get to access my web portal	High	Sprint-1
	Dashboard	USN-2	<ul style="list-style-type: none"> As a user, I can get to know how much time my flight's delay is in. 	I can get details of my registration.	Low	Sprint-2
Customer Care Executive	Delay analysis	USN-3	<ul style="list-style-type: none"> 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-3

Customer Care Executive	Delay analysis-Report generation	USN-4	<ul style="list-style-type: none">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.	
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6. PROJECT PLANNING AND SCHEDULING

Sprint Planning & Estimation

Activity Name	Activity Number	Activity Description	Tasks Assigned	Status
Preparation Phase	1	a) Access the resources in the project dashboard. b) Explore the dataset provided in the workspace. c) Create a GitHub account & collaborate with Project Repository in the project workspace. d) Set up the prerequisites for the project.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed
Ideation Phase	2	a) Literature survey relevant to the selected project. b) Preparation of an Empathy Map to identify the user pros and cons.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed

		c) List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on their feasibility & importance.		
Project Design Phase-I	3			
Proposed Solution	3.1	Preparation of proposed solution document, which includes the Problem statement, Idea description, novelty, feasibility of the idea, business model, social impact and scalability of the solution.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed
Problem SolutionFit	3.2	Prepared problem solution fit document which has designed a value proposition that addresses the customers' job, pros and cons to the particular application.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed
Solution Architecture	3.3	Develop effective architecture for the proposed solution which provides ground for application development projects.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed

Project Phase-II	Design	4			
Solution Requirements	4.1	Identify the Functional and Non- Functional requirements of the proposed solution.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	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.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	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.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	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.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed	

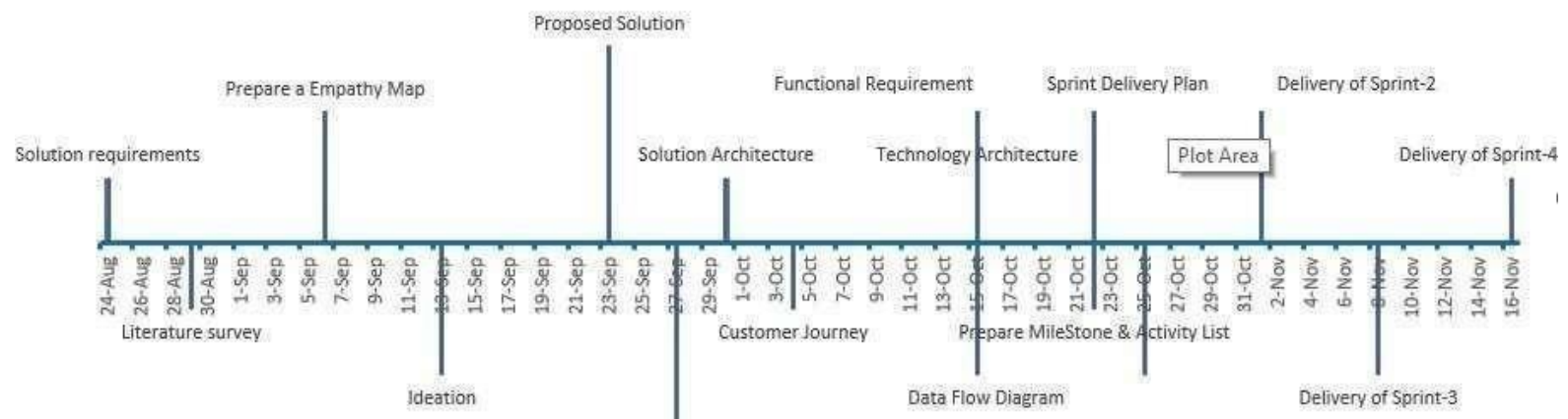
Project Planning Phase	5			
Milestones & Activity List	5.1	Prepare Milestone and Activity list of the project.	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed
Sprint Plan	5.2	Prepare Sprint Delivery plan of the project	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	Completed
Project Development	6			
Delivery of Sprint-1	6.1	Implement the coding phase of Sprint-1	VISHAL T SANJAY KUMAR C PRINE XAVIER A SARVESH H	In Progress
Delivery of Sprint-2	6.2	Implement the coding phase of Sprint- 2	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	In Progress

Delivery of Sprint-3	6.3	Implement the coding phase of Sprint-3	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	In Progress
Delivery of Sprint-4	6.4	Implement the coding phase of Sprint-4	VISHAL T SANJAY KUMAR C PRINCE XAVIER A SARVESH H	In Progress

Sprint Delivery Schedule

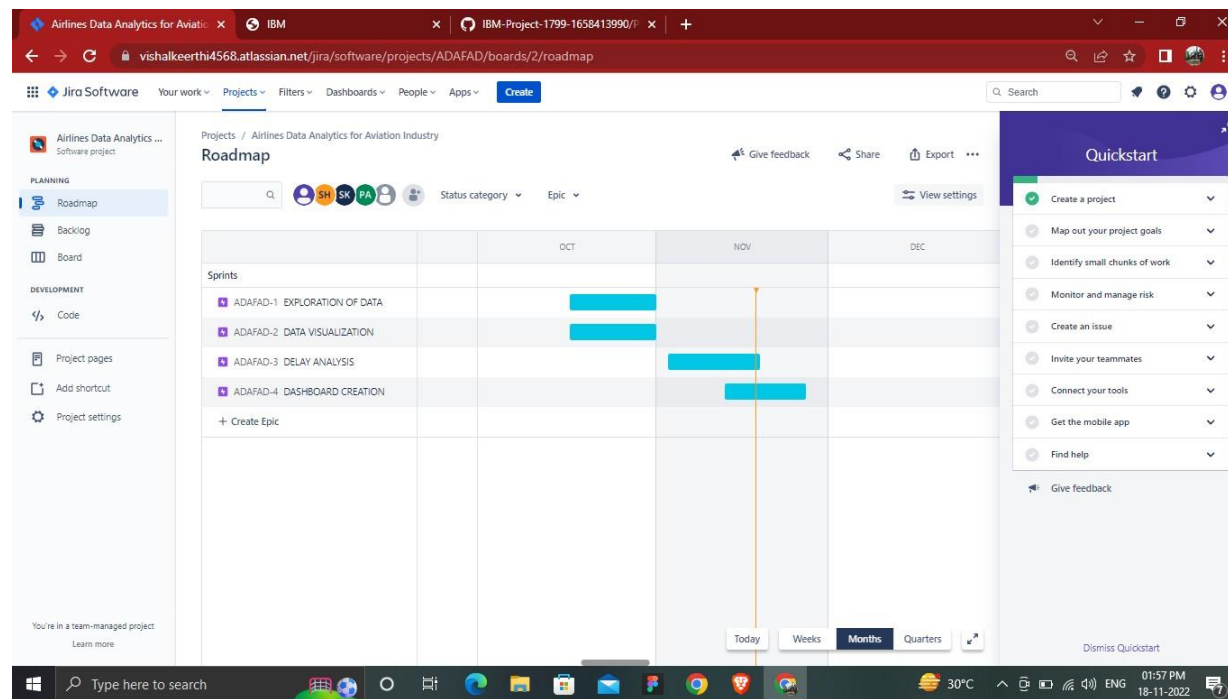
A milestone schedule, or milestone chart, is a timeline that uses milestones to divide a project schedule into major phases. A milestone chart is a way to visualize the most important steps of our project. Each milestone the team achieves brings us closer to completing the project. As a result, milestones 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

The screenshot shows the Jira Software interface for the project 'Airlines Data Analytics for Aviation Industry'. The left sidebar contains navigation options: Roadmap, Backlog (selected), Board, Code, Project pages, Add shortcut, and Project settings. The main area displays the 'Backlog' view with three sprints:

- ADAFAD Sprint 1** (31 Oct – 14 Nov, 3 issues):
 - ADAFAD-6: As a user, I can view the data (DONE)
 - ADAFAD-7: As a analyst, I will explore the data and preprocess the data (DONE)
 - ADAFAD-8: As a analyst, I will create a Data Module (TO DO)
- ADAFAD Sprint 2** (31 Oct – 14 Nov, 2 issues):
 - ADAFAD-9: As a analyst, I will visualize the Number of Airports present in different countries (DONE)
 - ADAFAD-10: As a analyst, I will create the exploratory data analysis to identify the Number of airports in a particular country (DONE)
- ADAFAD Sprint 3** (Add dates, 0 issues):
 - Plan a sprint by dragging the sprint footer down below some issues, or by dragging issues here.

The bottom of the screen shows the Windows taskbar with the time 02:27 PM on 18-11-2022.

The screenshot shows the Jira Software interface for the project 'Airlines Data Analytics for Aviation Industry'. The left sidebar contains navigation options: Roadmap, Backlog (selected), Board, Code, Project pages, Add shortcut, and Project settings. The main area displays the 'Backlog' view with three sprints:

- ADAFAD Sprint 3** (31 Oct – 14 Nov, 2 issues):
 - ADAFAD-13: I will create various models as a analyst to accurately predict the Flight delay (IN PROGRESS)
 - ADAFAD-14: As a analyst I will select the most effective model to accurately predict the flight delay (IN PROGRESS)
- ADAFAD Sprint 4** (31 Oct – 14 Nov, 2 issues):
 - ADAFAD-15: As a analyst, I will import the suitable model into the framework (TO DO)
 - ADAFAD-16: 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)
- Backlog** (0 issues):
 - Your backlog is empty.

The bottom of the screen shows the Windows taskbar with the time 02:35 PM on 18-11-2022.

Board

The screenshot displays a Jira Agile board interface. The browser address bar shows the URL: `vishalkeerthi4568.atlassian.net/jira/software/projects/ADAFAD/boards/2`. The Jira Software header includes navigation links: **Projects**, **Filters**, **Dashboards**, **People**, **Apps**, and a **Create** button. A search bar is located on the right.

The left sidebar for the project "Airlines Data Analytics for Aviation Industry" contains the following sections:

- PLANNING**: Roadmap, Backlog, **Board** (selected), Code, Project pages, Add shortcut, Project settings.
- DEVELOPMENT**: Code, Project pages, Add shortcut, Project settings.

The main content area is titled "All sprints" and shows a sprint with 9 days remaining. It is divided into three columns:

- TO DO 3 ISSUES**:
 - As a analyst, I will create a Data Module (ADAFAD-8)
 - As a analyst, I will import the suitable model into the framework (ADAFAD-15)
 - As a analyst, I will generate the result of flight delay prediction and will develop a dashboard that display all the flight delays (ADAFAD-16)
- IN PROGRESS 2 ISSUES**:
 - I will create various models as a analyst to accurately predict the Flight delay (ADAFAD-13)
 - As a analyst I will select the most effective model to accurately predict the flight delay (ADAFAD-14)
- DONE 4 ISSUES**:
 - As a user, I can view the data (ADAFAD-6)
 - As a analyst, I can explore the data and preprocess the data (ADAFAD-7)
 - As a analyst, I will visualize the Number of Airports present in different countries (ADAFAD-9)
 - As a analyst, I will create the exploratory data analysis to identify the Number of airports in a particular country (ADAFAD-10)

At the bottom right, there is a "Quickstart" button. The Windows taskbar at the very bottom shows the search bar, taskbar icons, and system tray information (30°C, 02:36 PM, 18-11-2022).

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

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
```

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

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

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

```
file.close()
```

```
@appl.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)
```

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)
```

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

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

```
file.close()
```

8. TESTING

8.1.Test Cases

1					Date	03-Nov-22				
2					Team ID	PNT2022TMD22187				
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		Login/Signup popup should display	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

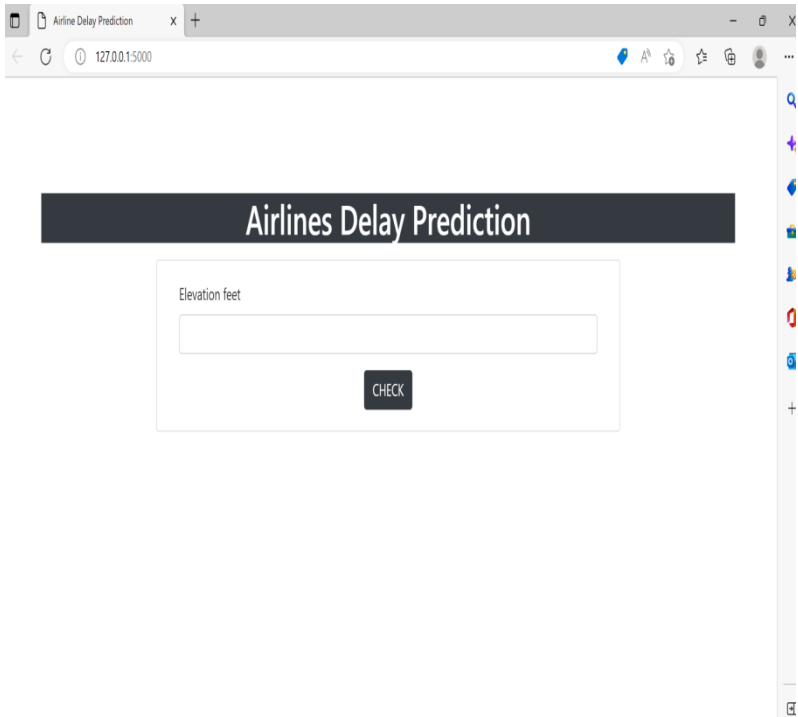
9. RESULTS

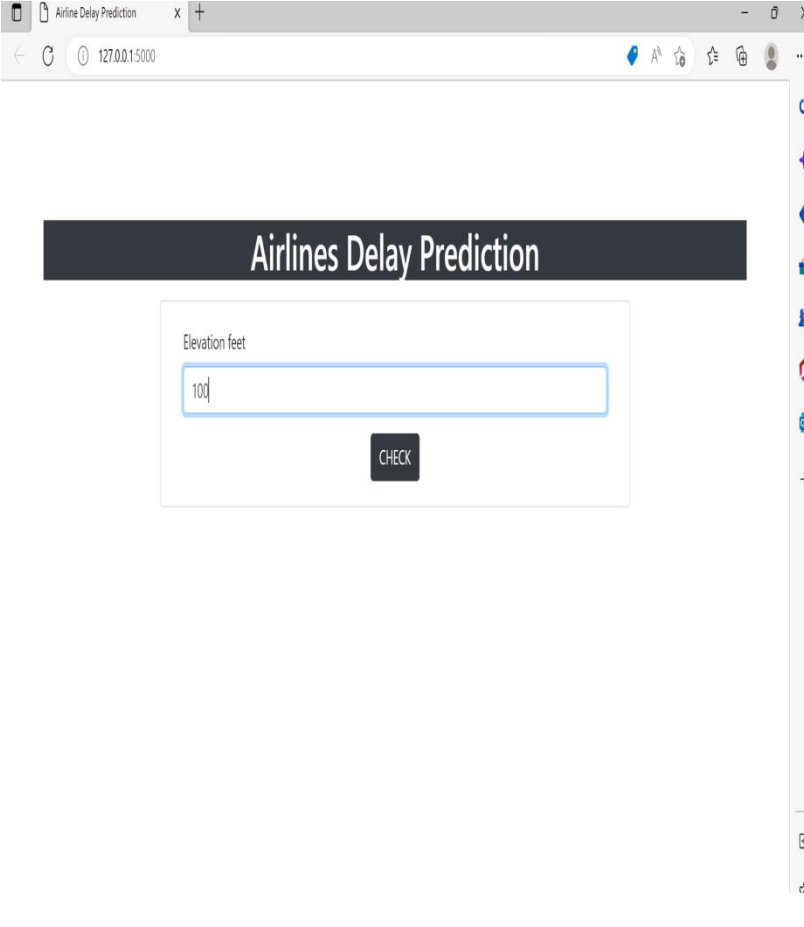
Performance Metrics

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

The screenshot shows a web browser window with a single tab titled 'Delay-Prediction'. The address bar displays '127.0.0.1:5000'. The webpage has a dark header with the title 'Airlines Delay Prediction'. Below the header, there is a form with a label 'Elevation feet' and a text input field containing the value '100'. Underneath the input field, the text 'The Delay rate is 67.0 minutes' is displayed. At the bottom of the form, there is a dark button labeled 'Back'. The browser's sidebar on the right shows various icons for search, extensions, and settings.

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()
```

```
@appl.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-w
```

p">

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

</div>

</div>

</body>

</html>

GITHUB AND PROJECT DEMO LINK:

Github Link: <https://github.com/IBM-EPBL/IBM-Project-1799-1658413990>

Project Demo Link: https://drive.google.com/file/d/1gs7Omo72PkDl6wV-r2yv0TwC6gpM-6Fc/view?usp=share_link

