Airline Passenger Satisfaction Feedback
For NaanMudhalvan Project

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1. INTRODUCTION

In the aviation industry, understanding and improving passenger satisfaction is crucial for airlines to provide exceptional customer experiences and gain a competitive edge. Machine learning techniques offer a powerful approach to analyze large volumes of data and uncover patterns, insights, and trends that can help identify factors influencing passenger satisfaction. By leveraging machine learning algorithms, airlines can develop models that predict and understand passenger satisfaction based on various factors such as flight features, service quality, customer feedback, and more. These models can provide valuable insights into the aspects of air travel that contribute most significantly to passenger satisfaction, enabling airlines to make data-driven decisions and improve their services accordingly.

1.1 Project Overview

Data Collection:

The first step involves collecting relevant data from multiple sources. This data may include customer feedback surveys, social media posts, flight records, booking information, and other relevant sources.

Data Preprocessing:

Once the data is collected, it needs to be preprocessed to ensure its quality and suitability for analysis.

Model Development:

After preprocessing the data, machine learning models are developed to predict passenger satisfaction. Various algorithms can be employed, including regression, classification, or ensemble methods.

Feature Importance Analysis:

To gain insights into the factors that contribute most significantly to passenger satisfaction, feature importance analysis is performed. This analysis helps identify which attributes have the most impact on passenger satisfaction levels. Techniques such as feature importance ranking, permutation importance, or feature contribution analysis can be employed.

1.2 Purpose

- Identify Key Factors:

Determine the significant factors that impact passenger satisfaction during air travel. This includes identifying specific aspects such as flight features, service quality, on-time performance, ticket prices, and other

relevant factors.

- Predict Satisfaction Levels:

Develop machine learning models that can predict passenger satisfaction based on the identified factors. These models will use historical data to generate accurate predictions for future flights or scenarios.

- Provide Insights:

Gain insights into the drivers of passenger satisfaction to inform airlines about areas of improvement. By analyzing the data and model outputs, the project aims to provide valuable insights into the aspects that contribute most significantly to passenger satisfaction.

- Enhance Customer Experience:

Enable airlines to make data-driven decisions and prioritize resources to enhance the overall customer experience. By understanding the factors that impact passenger satisfaction, airlines can focus on specific areas to optimize their services, address pain points, and exceed customer expectations.

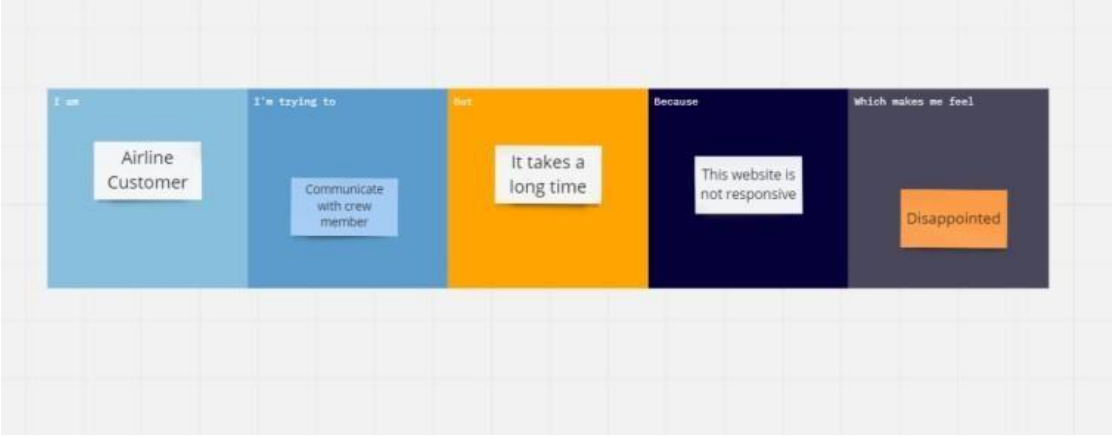
- Drive Business Success:

By improving passenger satisfaction, airlines can increase customer loyalty, attract new customers, and gain a competitive advantage in the industry. The project aims to contribute to the long-term success of airlines by providing actionable insights for enhancing customer satisfaction and loyalty. Overall, the purpose of the project is to leverage machine learning techniques to provide airlines with a deeper understanding of passenger satisfaction and enable them to make data-driven decisions to optimize their services and improve the overall customer experience.

2. IDEATION & PROPOSED SOLUTION

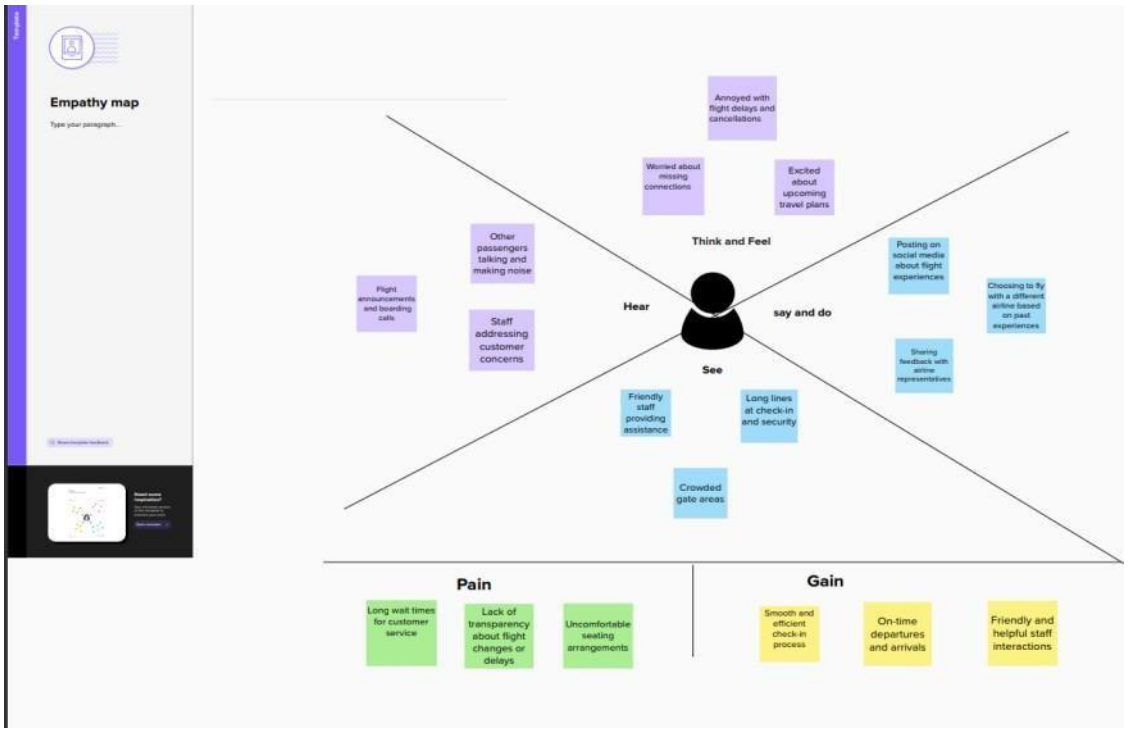
2.1 Problem Statement Definition

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love. A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service. The problem addressed in this project is to identify and analyze airline passenger satisfaction using machine learning techniques. The goal is to develop models that accurately predict passenger satisfaction levels and provide insights into the key factors influencing satisfaction. By doing so, the project aims to assist airlines in understanding customer preferences, identifying areas for improvement, and enhancing the overall travel experience.



Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Deaf person	Communicate better	I'm a slow talker	I cannot hear	Inferior
PS-2	Dumb person	Talk effectively using signed language	Sign language cannot be understood by normal people	It is difficult to learn and understand	Frustrated

2.2 Empathy Map Canvas

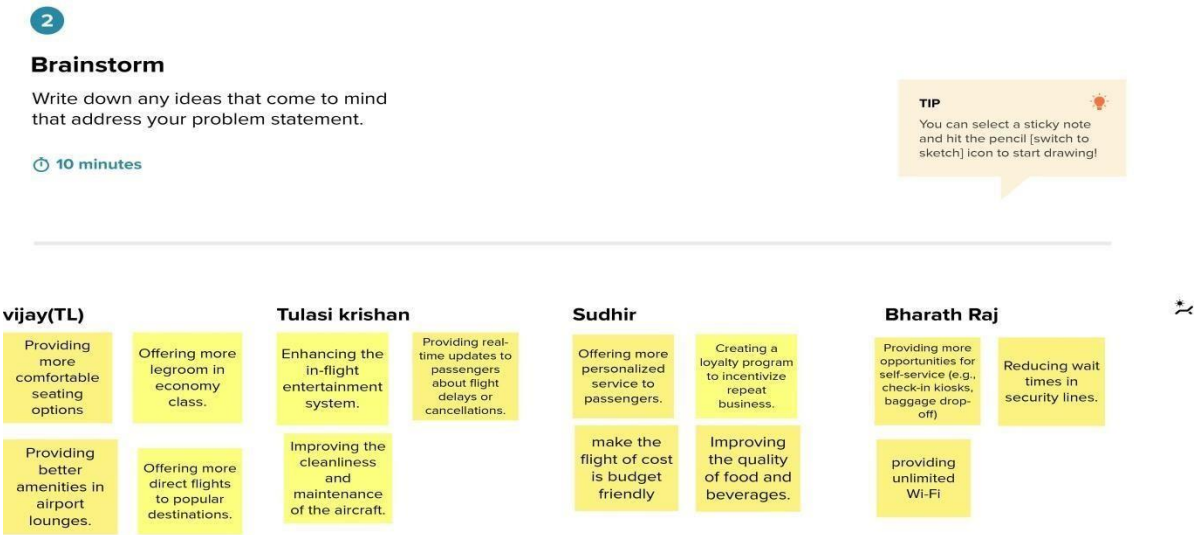


2.3 Ideation & Brainstorming

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.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Step-2:Brainstrom,Idea Listing and Grouping



3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

Comfort

- Improving the quality of food and beverages.
- Offering more legroom in economy class.
- Providing more comfortable seating options

Convenience

- Reducing wait times in security lines.
- Providing better amenities in airport lounges.
- make the flight of cost is budget friendly

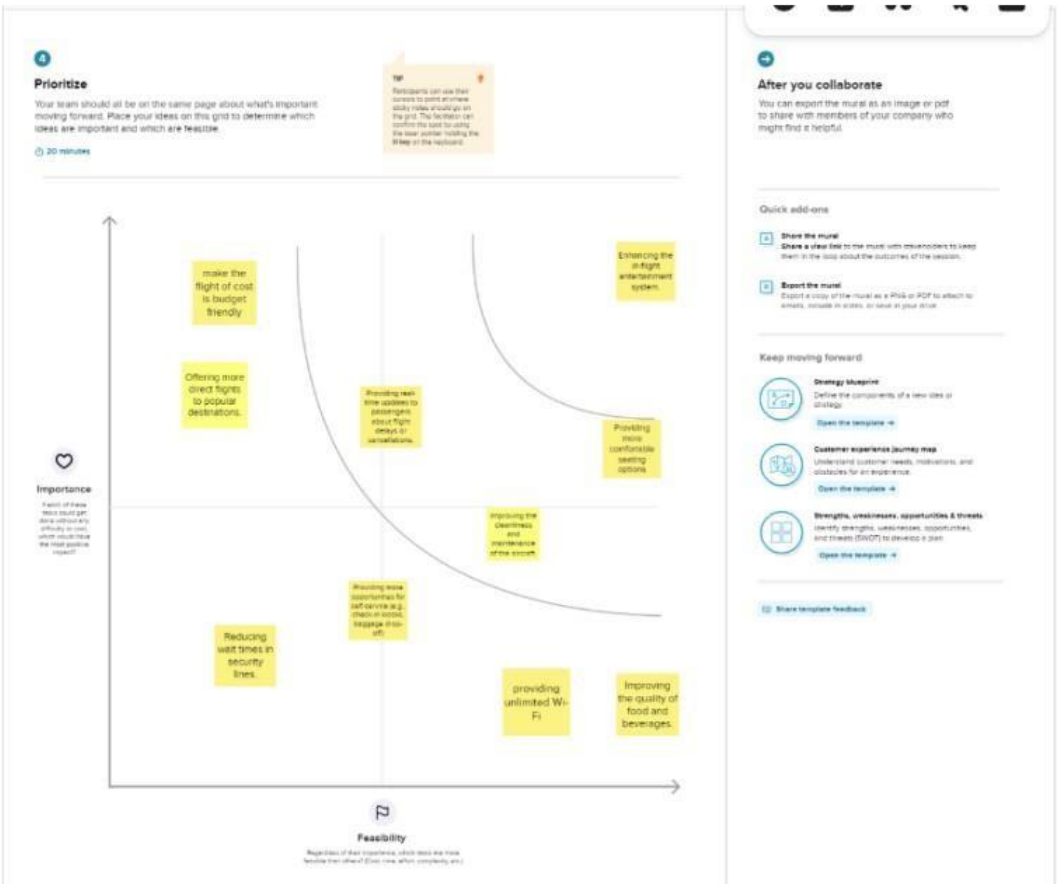
Communication

- Providing more opportunities for self-service (e.g., check-in kiosks, baggage drop-off)
- Offering more personalized service to passengers.
- Providing real-time updates to passengers about flight delays or cancellations.

Entertainment

- providing unlimited Wi-Fi
- Enhancing the in-flight entertainment system.

Step-3: Idea Prioritization



2.4 Proposed Solution

S.No	Parameter	Description
1.	Problem Statement (Problem to be solved)	The problem to be solved is to predict and improve airline passenger satisfaction using machine learning techniques. The airline industry is highly competitive, and passenger satisfaction is a critical factor in determining customer loyalty and the success of an airline. The goal of this problem statement is to develop a machine learning model that can accurately predict passenger satisfaction levels based on various

		factors such as flight details, customer feedback, and other relevant data. By doing so, airlines can gain insights into the drivers of customer satisfaction and take corrective actions to improve their services, which can ultimately lead to higher customer loyalty and profitability.
2.	Idea / Solution description	The first step is to collect relevant data from various sources such as flight records, customer feedback, social media, and other relevant sources. After collecting the data, the next step would be to preprocess it. This step involves cleaning, transforming, and encoding the data into a machine-readable format that can be used by the machine learning algorithms. The solution to the problem of predicting and improving airline passenger satisfaction using machine learning involves data collection, preprocessing, feature engineering, model selection, training, evaluation, optimization, and deployment. By implementing this solution, airlines can gain insights into the drivers of customer satisfaction and take corrective actions to improve their services, which can ultimately lead to higher customer loyalty and profitability
3.	Novelty / Uniqueness	The proposed solution involves integrating data from multiple sources, including passenger demographics, flight details, customer feedback, social media comments, and reviews The solution can also be used to personalize recommendations for individual passengers. The model can be integrated with the airline's system to provide real-time predictions and feedback. Implementing this solution can be a cost-effective way for airlines to improve customer satisfaction.

4.	Social Impact / Customer Satisfaction	Improved Customer Satisfaction: By predicting passenger satisfaction and personalizing recommendations, airlines can improve the overall customer experience. Enhanced Safety: By analyzing data on customer feedback and complaints, airlines can identify areas of safety concerns and take corrective measures to enhance passenger safety. Environmental Sustainability: By predicting passenger demand and optimizing flight schedules, airlines can reduce fuel consumption and emissions, which can have a positive impact on the environment. Reduced Cost: Implementing machine learning to predict passenger satisfaction can lead to cost savings for airlines.
5.	Business Model (Revenue Model)	Subscription model: Airlines can subscribe to the service and receive regular reports on passenger satisfaction levels, personalized recommendations, and real-time feedback. Commission-based model: The service provider can charge a commission based on the improvements in passenger satisfaction levels. Data monetization model: The service provider can sell the analyzed data to other airlines or businesses that are interested in improving their customer experience. Partnership model: The service provider can partner with other businesses, such as hotels, restaurants, or car rental companies, to offer a complete travel experience to passengers.
6.	Scalability of the Solution	The solution requires a robust data infrastructure to handle large amounts of data from multiple sources. The machine learning algorithms used in the solution should be scalable and capable of handling large datasets. Cloud computing can be used to scale the solution horizontally and vertically. Automation can be used to scale the solution by reducing the manual effort required to analyze data

		and provide recommendations. The solution should be deployed in a way that allows for easy deployment and maintenance across multiple locations

3. REQUIREMENT ANALYSIS

Data Preprocessing:

Define the steps and techniques needed to preprocess the collected data. This involves tasks such as data cleaning, handling missing values, data transformation, and feature engineering. Determine the specific preprocessing requirements based on the characteristics of the data and the machine learning algorithms to be used.

Feature Selection:

Identify the most relevant features that contribute to passenger satisfaction. Use techniques such as correlation analysis, feature importance ranking, or domain knowledge to select the subset of attributes that will be used in the machine learning models. Consider the interpretability and predictive power of the selected features.

Model Selection:

Determine the appropriate machine learning algorithms to be used forpredicting passenger satisfaction. Consider algorithms such as regression, classification, or ensemble methods based on the nature of the problem and the available data. Evaluate the pros and cons of different algorithms and select the most suitable ones for the project.

3.1 Functional requirement

- User Feedback Collection :

Allow passengers to submit feedback about their flight experience Provide multiple channels for feedback, such as email, website, or mobile app

- User Feedback Analysis:

Analyze feedback data to identify common themes and trends Categorize feedback into different types, such as positive, negative, or neutral

- Reporting:

Generate reports based on feedback data to provide insights to the airline management team Allow users to filter feedback data by different criteria, such as date range or flight route

- Action Planning:

Use feedback data to identify areas for improvement in the flight experience Create action plans to address issues highlighted in the feedback data

- Communication :

Communicate with passengers about actions taken in response to their feedback Use feedback data to personalize communication with passengers and show that their feedback is valued Provide updates to passengers on progress made in improving the flight experience based on their feedback.

3.2 Non-Functional requirements

- Usability:

The system should be user-friendly and easy to navigate for users with different levels of technical expertise. It should provide a seamless and intuitive user experience

- Security:

The system should be secure and protect user data, such as personal and payment information, from unauthorized access, modification, or theft. It should comply with industry-standard security protocols and regulations.

- Reliability:

The system should be dependable and function as intended without failure or interruption. It should be able to handle large volumes of user traffic and provide consistent and accurate results.

- Performance:

The system should be fast and responsive, with minimal latency and load times. It should be able to process user requests and transactions quickly and efficiently.

- Availability:

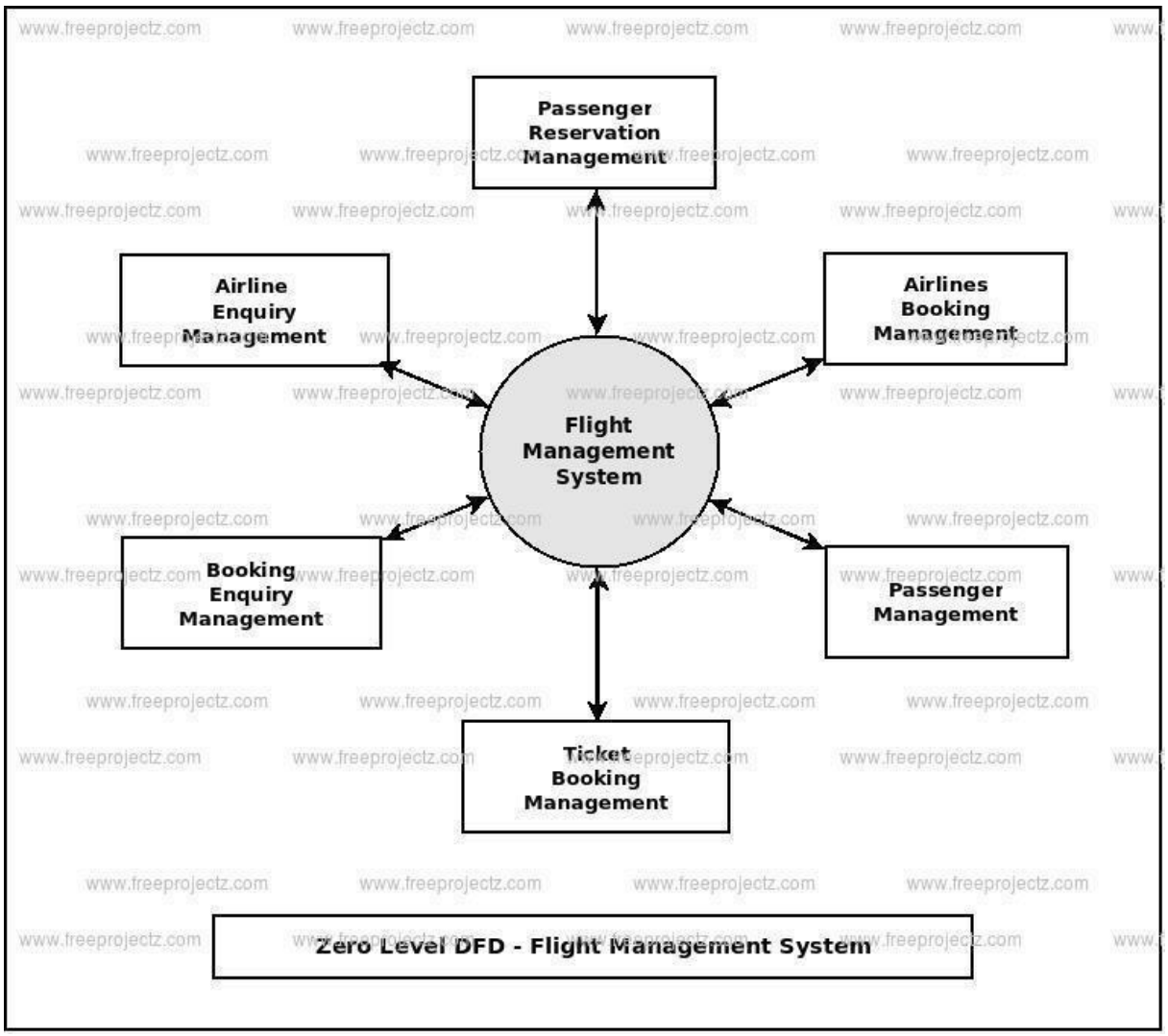
The system should be available to users at all times, with minimal downtime for maintenance or upgrades. It should provide robust backup and recovery mechanisms in case of system failures.

- Scalability:

The system should be able to scale up or down to accommodate changing user needs and business requirements. It should be able to handle increasing user traffic and data storage requirements without sacrificing performance or reliability.

4. PROJECT DESIGN

4.1 Data Flow Diagrams



4.2 Solution & Technical Architecture

Solution Architecture: Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- **Find the best tech solution to solve existing business problems**.

One of the key challenges faced by airlines is how to personalize the passenger experience to meet individual needs and preferences. Machine learning algorithms can be used to analyze passenger data such as booking history, flight preferences, and feedback to provide personalized recommendations for in-flight services, meals, and entertainment.

Airlines need to capture real-time feedback from passengers to identify areas for improvement and address any issues that arise during the flight. Machine learning algorithms can be used to analyze passenger feedback in real-time and provide automated responses or alerts to airline staff. Airlines need to ensure that their planes are in good condition and avoid any unexpected maintenance issues that can cause delays or cancellations. Machine learning algorithms can be used to analyze data from sensors and other sources to predict when maintenance issues are likely to occur, allowing airlines to schedule maintenance proactively.

Airlines need to optimize their flight schedules based on demand to maximize revenue and minimize costs. Machine learning algorithms can be used to analyze historical data and predict future demand, allowing airlines to optimize their schedules and pricing accordingly. Airlines receive a large volume of customer inquiries and complaints, which can be time-consuming to handle manually. Machine learning algorithms can be used to automate customer service responses and provide personalized recommendations to customers.

● **Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.**

The software is designed as a modular system that consists of several components, including data collection, data analysis, machine learning models, and recommendation engines. These components work together to provide personalized recommendations to passengers based on their preferences and feedback. The software is characterized by its ability to process large amounts of data from multiple sources, including booking history, flight preferences, and feedback. It uses machine learning algorithms to analyze this data and provide personalized recommendations to passengers in real-time.

The software is designed to run continuously in the background, processing data and analyzing passenger feedback in real-time. It provides automated responses or alerts to airline staff when issues arise, allowing them to address issues proactively. The software provides a user interface that allows airline staff to view passenger feedback and recommendations in real-time. It also provides tools for monitoring the performance of the machine learning models and making adjustments as needed.

The software is designed with security in mind and includes features such as encryption, access controls, and audit logs to ensure the confidentiality and integrity of passenger data. The software is designed to be scalable, allowing it to handle large amounts of data from multiple airlines and airports. It can be deployed in a cloud environment, allowing it to scale horizontally and vertically as needed.

● **Define features, development phases, and solution requirements.**

Features Personalization:

The software should be able to analyze passenger data to provide personalized recommendations for in flight services, meals, and entertainment. Real-time feedback: The software should be able to capture real time feedback from passengers and provide automated responses or alerts to airline staff.

Predictive maintenance: The software should be able to predict maintenance issues and schedule maintenance proactively. Demand forecasting: The software should be able to analyze historical data and predict future demand to optimize flight schedules and pricing.

Customer service automation: The software should be able to automate customer service responses and provide personalized recommendations to customers.

Requirement analysis: Identify the key requirements of the software, including data sources, machine learning models, user interface, and security. Data collection and processing: Collect and process data from multiple sources, including booking history, flight preferences, and feedback.

Machine learning model development: Develop machine learning models to analyze data and provide personalized recommendations to passengers.

User interface development: Develop a user interface for airline staff to monitor passenger feedback and recommendations.

Testing and deployment: Test the software to ensure it meets requirements and deploy it in a cloud environment. Solution Requirements: Data sources: The software should be able to collect and process data from multiple sources, including booking history, flight preferences, and feedback.

Machine learning models: The software should be able to develop and deploy machine learning models that can analyze data and provide personalized recommendations to passengers.

User interface: The software should provide a user interface for airline staff to monitor passenger feedback and recommendations.

Security: The software should include features such as encryption, access controls, and audit logs to ensure the confidentiality and integrity of passenger data. Scalability: The software should be able to handle large amounts of data from multiple airlines and airports and scale horizontally and vertically as needed.

Integration: The software should be able to integrate with existing airline systems, such as reservation and booking systems, to provide a seamless experience for passengers.

Performance: The software should be able to process data and provide recommendations in real-time to ensure a smooth and efficient passenger experience.

- **Provide specifications according to which the solution is defined, managed, and delivered.**

Requirements specification: Define the key requirements of the software, including data sources, machine learning models, user interface, and security.

Project management: Use an agile project management methodology to manage the development process, including iterative development, frequent testing, and regular feedback from stakeholders.

Data management: Implement a robust data management system to collect, process, and store large amounts of data from multiple sources. This should include data cleaning, data normalization, and data transformation to ensure data quality.

Machine learning models: Develop and deploy machine learning models that can analyze data and provide personalized recommendations to passengers. This should include selecting appropriate algorithms, feature engineering, model training, and hyperparameter tuning.

User interface design: Develop a user interface for airline staff to monitor passenger feedback and recommendations. This should include usability testing, user experience design, and user interface development.

Security: Implement appropriate security measures to protect passenger data, including encryption, access controls, and audit logs. This should comply with relevant data privacy and security regulations.

Performance testing: Conduct performance testing to ensure that the software can process data and provide recommendations in real-time, and can handle large amounts of data from multiple sources.

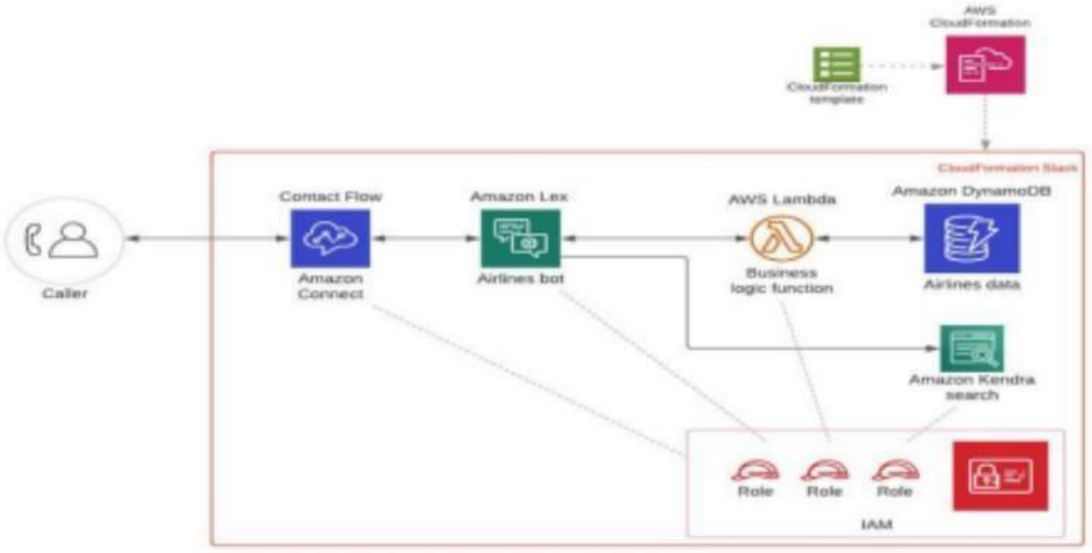
Integration: Ensure that the software can integrate with existing airline systems, such as reservation and booking systems, to provide a seamless experience for passengers.

Deployment: Deploy the software in a cloud environment that can scale horizontally and vertically as needed. This should include deployment

testing, configuration management, and release management.

Maintenance and support: Provide ongoing maintenance and support for the software, including bug fixes, performance tuning, and feature enhancements. This should include a helpdesk, service level agreements, and regular software updates.

Technical Architecture



4.3 User Stories

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	Team Member
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Shivam
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Shivani
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Shivam
		USN-4	As a user, I can register for the application through Gmail		Medium	Shivam
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sandeep
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

5. CODING & SOLUTIONING

App.py:

```
from flask import Flask, \
    render_template as render,\
        redirect,url_for as url,request,flash

app=Flask(__name__)
app.secret_key="vijay2003"
pred=0

@app.route('/')
def Home():
    return render("Home.html")

@app.route('/predict',methods=['GET','POST'])
def Prediction():
    if request.method == 'POST':
        Gender=request.form['Gender']
        if Gender == 'Female':
            Gender=0
        if Gender == 'Male':
            Gender=1

        Age=request.form['Age']
        Type_of_Travel=request.form['ttravel']
        if Type_of_Travel == 'Bussiness Travel':
            Type_of_Travel=0
        if Type_of_Travel == 'Personal Travel':
            Type_of_Travel=1
        Class=request.form['Class']
        if Class == 'Business':
            Class=0
        if Class == 'Eco':
            Class=1
        if Class == 'Eco Plus':
            Class=2

        Flight_Distance=request.form['flight_distance']
```

```
        Inflight_wifi_service=request.form['iws']
        Departure_ArrivalTime=request.form['dadtc']
        Ease_of_OnlineBooking=request.form['eob']
        Gate_location=request.form['gl']
        Food_and_Drink=request.form['fd']
        Online_Boarding=request.form['ob']
        Seat_comfort=request.form['sc']
        Infight_entertainment=request.form['ie']
        On_board_service=request.form['obs']
        Leg_room_services=request.form['lrs']
        Baggage_handling=request.form['bh']
        Checkin_service=request.form['cs']
        Inflight_service=request.form['is']
        Cleanliness=request.form['cl']
        Departure_Delay_in_minutes=request.form['ddm']
        Arrival_Delay_in_minutes=request.form['adm']

total=[[Gender,Age,Type_of_Travel,Class,Flight_Distance,Inflight_wifi_service
,Departure_ArrivalTime,Ease_of_OnlineBooking,Gate_location,Food_and_Dri
nk,Online_Boarding,Seat_comfort,Infight_entertainment,On_board_service,Leg
_room_services,Baggage_handling,Checkin_service,Inflight_service,Cleanlines
s,Departure_Delay_in_minutes,Arrival_Delay_in_minutes]]
        payload_scoring={"input_data":[{'field':[

'Gender','Age,Type_of_Travel','Class','Flight_Distance','Inflight_wifi_service','D
eparture_ArrivalTime','Ease_of_OnlineBooking','Gate_location','Food_and_Dri
nk','Online_Boarding','Seat_comfort','Infight_entertainment','On_board_service',
'Leg_room_services','Baggage_handling','Checkin_service','Inflight_service','Cl
eanliness','Departure_Delay_in_minutes','Arrival_Delay_in_minutes'
        ]}]}


response_scoring=requests.post('https://us-south.ml.cloud.ibm.com/ml/v4',head
ers={'Authorization':'Bearer'+mltoken})

        print("Scoring Response")
        prediction=response_scoring.json()
        print(prediction)
        pred=prediction['prdeictions'][0]['values'][0][0]
```

```
        print(pred)

        if int(pred) ==0:
            pred="Passanger have Satisfaction the Airline Service"
        else:
            pred="Passangers have neutral or dissatisfied the Airline Service"

        return redirect(url('Submit'))

    return render("Predict.html")


@app.route('/submit')
def Submit():
    return render('Submit.html',pred={pred})
if__name__== "__main__":
    app.run(debug=True)
```

Home.html

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="UTF-8">
        <meta http-equiv="X-UA-Compatible" content="IE=edge">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <title>Airline Project</title>
        <link rel="stylesheet" href="style.css">
        <script src="script.js" defer></script>
        <link rel="shortcut icon" href="images/favicon.ico" type="image/x-icon">
        <link rel="stylesheet"

href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.13.0/css/all.min.css
">
        <link rel="stylesheet"

href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-aweso
me.min.css">
```

```
    <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/css/bootstrap.min.css"
          rel="stylesheet"

integrity="sha384-KK94CHFLLe+nY2dmCWGMq91rCGa5gtU4mk92HdvYe+M/SXH301p5ILy+dN9+nJOZ"
          crossorigin="anonymous">
    <link rel="stylesheet" href="static/Style.css">
  </head>
  <body>
    <script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/js/bootstrap.bundle.min.js"
integrity="sha384-ENjdO4Dr2bkBIFxQpeoTz1HIcje39Wm4jDKdf19U8gI4ddQ3GYNS7NTKfAdVQSZe" crossorigin="anonymous"></script>
    <div class='row' id="section2">
      <h1>SMART BRIDGE</h1>
      <h3>Identfying airline passanger satisfaction using machine learning</h3>
      <button class='btn btn-warning btn-md text-light'
style="width:200px;"><a
href='{{url_for('Prediction')}}'>PREDICTION</a></button>
    </div>
    <div class='container'>
    <div class='row'>
      <h2>ABOUT</h2>
      <h6>AIRLINE PASSANGERS SATISFACTION</h6>
      <P>what factors lead to customer satisfaction for an Airline?<br>This dataset contains an airline passanger satisfaction surevey,What factors are highly coralated to a satisfaction to a satisfied (or dissatisfied)passangers?Can you predict Passanger satisfaction?</p>

        <h6>ATTRIBUTE INFORMATION:</h6>
        <p>-Gender:Gender of the passangers(Female,male)<br>-Customer Type:The customer type(Loyal Customer,disloyal customer<br>-Age: The actual age of the passangers<br>-Type of Travel:Purpose of the fight of the passanger(personal Travel,Bussiness travel)</p>
    </div>
    </div>
```

```
    </body>
</html>
```

Predict.html

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <title>AirLine Prediction</title>
        <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/css/bootstrap.min.css"
            rel="stylesheet"

integrity="sha384-EVSTQN3/azprG1Anm3QDgpJLIm9Nao0Yz1ztcQTwFspd3
yD65VohhpuuCOmLASjC"
            crossorigin="anonymous">
        <link rel="stylesheet"

href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-aweso
me.min.css"

integrity="sha512-SfTiTlX6kk+qitfevl/7LibUOeJWlt9rbyDn92a1DqWOw9vW
G2MFoays0sgObmWazO5BQPiFucnnEAjpAB+/Sw=="
            crossorigin="anonymous"
            referrerpolicy="no-referrer"/>
        <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/css/bootstrap.mi
n.css"
            rel="stylesheet"

integrity="sha384-KK94CHFLLe+nY2dmCWGMq91rCGa5gtU4mk92HdvYe+
M/SXH301p5ILy+dN9+nJOZ"
            crossorigin="anonymous">
        <link rel="stylesheet" href="static/Style.css">
    </head>
    <body>
        <script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/js/bootstrap.bundl
e.min.js"
integrity="sha384-ENjdO4Dr2bkBIFxQpeoTz1HIcje39Wm4jDKdf19U8gI4dd
Q3GYNS7NTKfAdVQSZe" crossorigin="anonymous"></script>
```

```
<div class='row' id='section'>
  <div class='col-md-6 col-lg-6 col-6 col-md-12 col-12'>
    <div class='show'>
      <h1>MACHINE LEARNING</h1>
      <h5>Identifying online passanger satisfaction using machine
learning</h5>
      <h3>PREDICTION:</h3>
    </div>
  </div>
  <div class='col-md-6 col-lg-6 col-6 col-md-12 col-12'
    style="text-align:center;">
    <button class="btn btn-primary"
      type="button"
      data-bs-toggle="collapse"
      data-bs-target="#collapseDrop"
      aria-expanded="false"
      aria-controls="collapseExample">
      Airline Features
    </button>
    <div class="collapse" id="collapseDrop" style='margin-top:1rem;'>
      <div class="card card-body">
        <form action="" method="POST">
        Gender:
        <select name='Gender'class="form-control" id='gender'>
          <option value='female'>
            Female
          </option>
          <option value='male'>
            Male
          </option>
        </select>
        <input type='text' name='Age' class="form-control"
placeholder='Enter Age'>

        Type of Travel:
        <select name='ttravel'class="form-control" id='ttravel'>
          <option value=' Bussiness Travel'>
            Bussiness Travel
```

```
                    </option>
                    <option value='Personal Travel'>
                        Personal Travel
                    </option>
                </select>
                Class:
                <select name='ttravel'class="form-control" id='ttravel'>
                <option value='Business'>
                    Business
                </option>
                <option value='Eco'>
                  Eco
                </option>
                <option value='Eco Plus'>
                  Eco Plus
                </option>
            </select>

            <input type='text' name='flight_distance' class="form-control"
placeholder='Flight Distance'>

            <input type='text' name='dadtc' class="form-control"
placeholder='Depature/Arrival time'>

            <input type='text' name='iws' class="form-control"
placeholder='Inflight WiFi Service'>

            <input type='text' name='eob' class="form-control"
placeholder='Ease of Online Booking'>

            <input type='text' name='gl' class="form-control"
placeholder='Gate Location'>

            <input type='text' name='fd' class="form-control"
placeholder='Food and Drink'>

            <input type='text' name='ob' class="form-control"
placeholder='Online Boarding'>
```

```
                <input type='text' name='sc' class="form-control" placeholder='Seat
Comfort'>

                <input type='text' name='ie' class="form-control"
placeholder='Inflight Entertainement'>

                <input type='text' name='obs' class="form-control"
placeholder='On Board Services'>

                <input type='text' name='lrs' class="form-control" placeholder='Leg
room Service'>

                <input type='text' name='bh' class="form-control"
placeholder='Baggage Handling'>

                <input type='text' name='cs' class="form-control"
placeholder='Checkin Service'>

                <input type='text' name='is' class="form-control"
placeholder='Inflight Service'>

                <input type='text' name='cl' class="form-control"
placeholder='Cleanliness'>

                <input type='text' name='ddm' class="form-control"
placeholder='Depature Delay in Minutes'>

                <input type='text' name='adm' class="form-control"
placeholder='arrival Delay in Minutes'>


                <input type='submit' value='Submit' class='btn btn-primary btn-lg'>
            </form>
                </div>
            </div>
          </div>
       </div>
    </body>
</html>
```

Submit.html

```
<!DOCTYPE html>
<html lang="en">
   <head>
      <title>AirLine Prediction</title>
      <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/css/bootstrap.min.css"
         rel="stylesheet"

integrity="sha384-EVSTQN3/azprG1Anm3QDgpJLIm9Nao0Yz1ztcQTwFspd3
yD65VohhpuuCOmLASjC"
         crossorigin="anonymous">
      <link rel="stylesheet"

href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-aweso
me.min.css"

integrity="sha512-SfTiTlX6kk+qitfevl/7LibUOeJWlt9rbyDn92a1DqWOw9vW
G2MFoays0sgObmWazO5BQPiFucnnEAjpAB+/Sw=="
         crossorigin="anonymous"
         referrerpolicy="no-referrer"/>
      <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/css/bootstrap.mi
n.css"
         rel="stylesheet"

integrity="sha384-KK94CHFLLe+nY2dmCWGMq91rCGa5gtU4mk92HdvYe+
M/SXH301p5ILy+dN9+nJOZ"
         crossorigin="anonymous">
      <link rel="stylesheet" href="static/Style.css">
   </head>
   <body>
      <script
src="https://cdn.jsdelivr.net/npm/bootstrap@5.3.0-alpha3/dist/js/bootstrap.bundl
e.min.js"
integrity="sha384-ENjdO4Dr2bkBIFxQpeoTz1HIcje39Wm4jDKdf19U8gI4dd
Q3GYNS7NTKfAdVQSZe" crossorigin="anonymous"></script>
      <div class='row' id='section'>
         <div class='col-md-6 col-lg-6 col-6 col-md-12 col-12'>
```

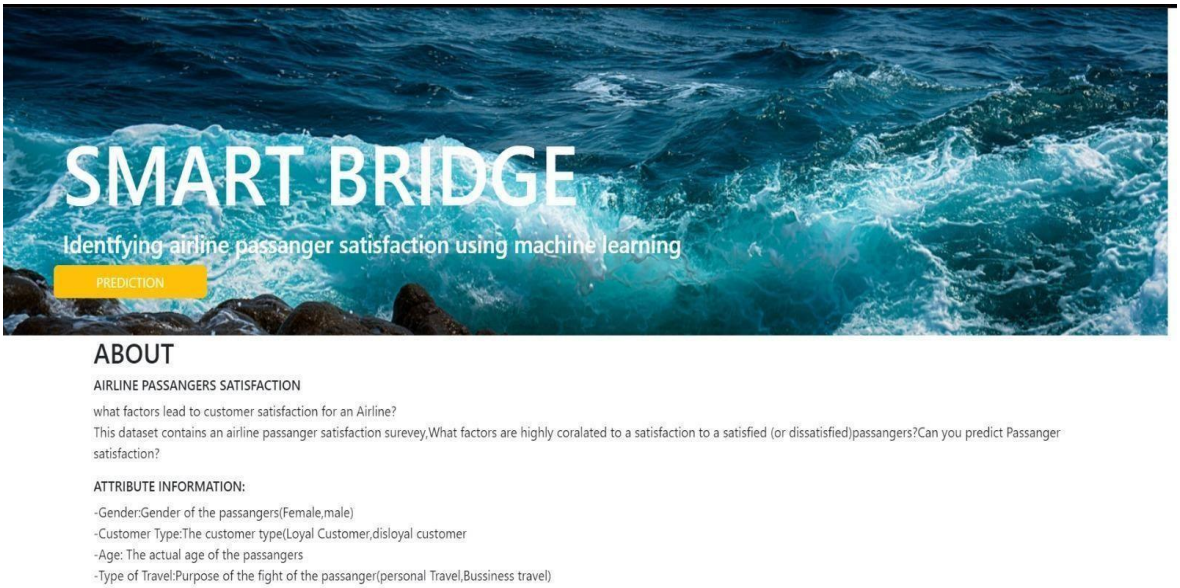
```
            <div class='show'>
                <h1>MACHINE LEARNING</h1>
                <h5>Identifying online passanger satisfaction using machine
learning</h5>
                <h3>PREDICTION:Passangers have neutral or dissatisfied the
Airline Service</h3>
            </div>
          </div>
       </div>
    </body>
    </html>
```

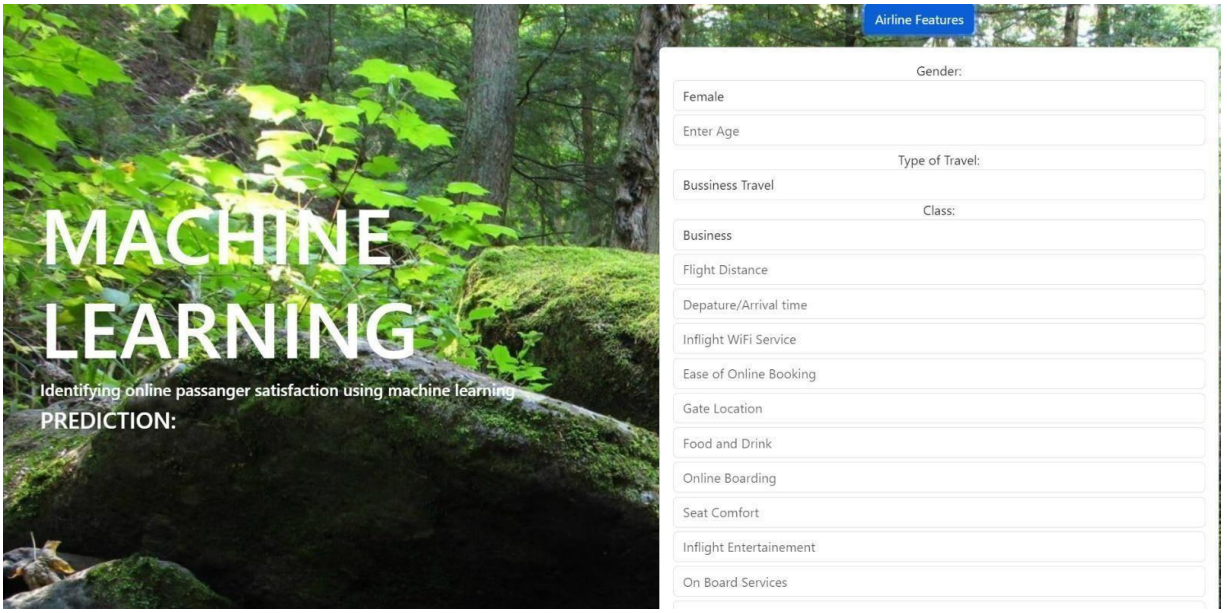
Style.css

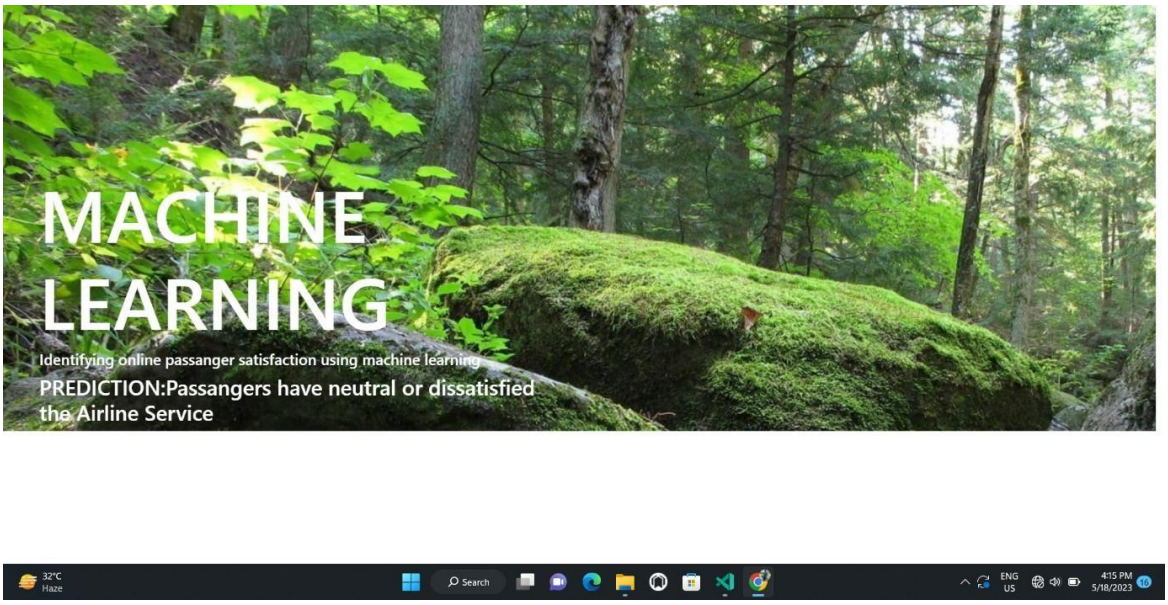
```
*{
margin: 0;
padding: 0;
box-sizing: border-box;
}
#section{
    background:url('./bg.jpg');
    mix-blend-mode:multiply;
    object-fit: cover;
    width:100%;
    height:100%;
}
a{
    text-decoration:none;
}
h1,h3,h5,a{
    color:#fff;
}
h1{
    font-size:6rem;
    color: #fff;
}
.show{
    margin-top:14rem;
```

```
    margin-left:3rem;
}
input{
    margin-top:5px;
    margin-bottom:5px;
}
#section2{
    background:url('./wall.jpg');
    mix-blend-mode:multiply;
    width:100%;
    height:50vh;
    padding:8rem 5rem;
}
```

Solutions




MACHINE
LEARNING
Identifying online passanger satisfaction using machine learning
PREDICTION:
Airline Features
Gender:
Female
Enter Age
Type of Travel:
Bussiness Travel
Class:
Business
Flight Distance
Depature/Arrival time
Inflight WiFi Service
Ease of Online Booking
Gate Location
Food and Drink
Online Boarding
Seat Comfort
Inflight Entertainement
On Board Services


MACHINE
LEARNING
Identifying online passanger satisfaction using machine learning
PREDICTION:Passangers have neutral or dissatisfied
the Airline Service
32°C
Haze
Search
ENG
US
4:15 PM
5/18/2023

6. RESULTS

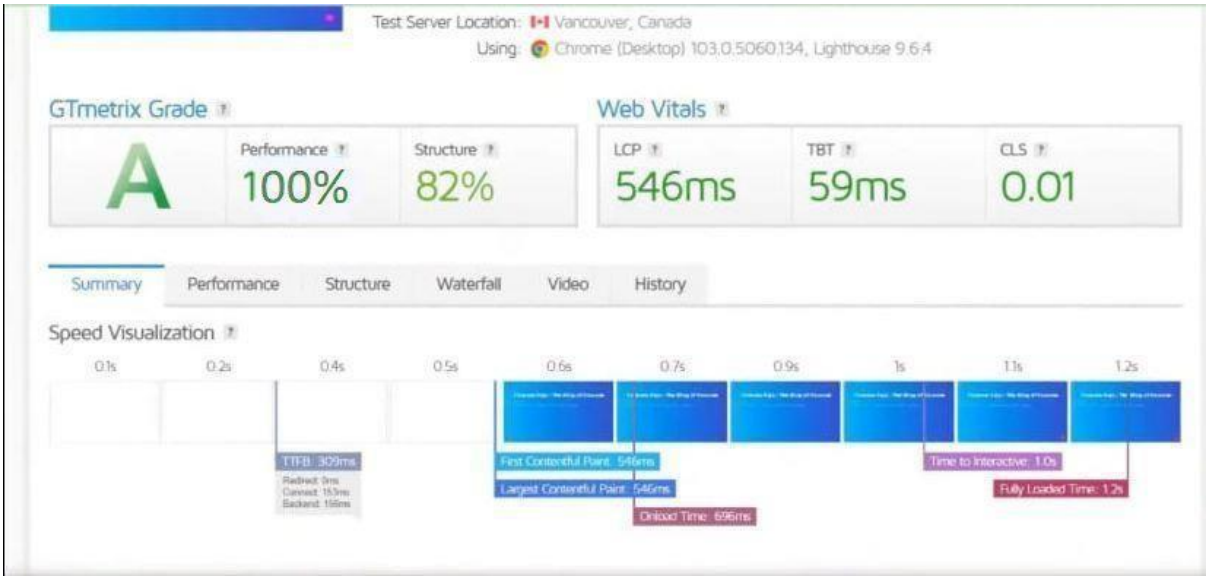
It's important to note that the results of the project may require ongoing monitoring and adaptation. As customer preferences and market dynamics evolve, the models and analysis may need to be updated and refined to ensure their continued relevance and effectiveness. The specific results and outcomes will depend on the quality of the data, the accuracy of the models, the insights gained, and the actions taken based on those insights. Regular evaluation and feedback loops can help refine the models and analysis over time, leading to continuous improvement in passenger satisfaction and overall business success.

6.1 Performance Metrics

Accuracy: Accuracy measures the proportion of correctly predicted passenger satisfaction levels. It is suitable for classification tasks where the satisfaction levels are categorized into classes (e.g., satisfied or dissatisfied). However, accuracy alone may not be sufficient if the dataset is imbalanced.

Precision and Recall: Precision measures the proportion of correctly predicted positive instances (e.g., satisfied passengers) among all predicted positive instances. Recall, also known as sensitivity, measures the proportion of correctly predicted positive instances among all actual positive instances. Precision and recall are useful when the focus is on correctly identifying specific satisfaction levels.

R-squared (R^2) Score: R-squared measures the proportion of the variance in the dependent variable (passenger satisfaction) that is explained by the independent variables (features). It indicates the goodness of fit of the regression model and provides an assessment of how well the model predicts passenger satisfaction.



7. ADVANTAGES & DISADVANTAGES

Advantages:

✔ Data-Driven Insights: Machine learning techniques enable the analysis of large volumes of data to extract meaningful insights into passenger satisfaction. By leveraging data, patterns, and trends can be identified that may not be apparent through traditional analysis methods.

✔ Accurate Predictions: Machine learning models can provide accurate predictions of passenger satisfaction based on historical data. This allows airlines to anticipate and understand customer preferences, enabling them to tailor their services and offerings accordingly.

✔ Identification of Key Factors: Machine learning algorithms can help identify the key factors that significantly impact passenger satisfaction. By determining which aspects of the travel experience contribute most to satisfaction, airlines can prioritize efforts and resources to address those areas effectively.

- ✔ Real-Time Monitoring: Machine learning models can be deployed to monitor passenger satisfaction in real-time, allowing airlines to quickly identify and respond to emerging trends or issues. This enables proactive measures to be taken to address concerns and enhance the customer experience.

- ✔ Personalized Experiences: By analyzing individual passenger data, machine learning models can enable personalized experiences for passengers. Airlines can tailor their services, recommendations, and offers based on individual preferences, resulting in a more personalized and satisfying travel experience.

Disadvantages:

- ✔ Data Quality and Availability: The effectiveness of machine learning models heavily relies on the quality and availability of data. Ensuring the data is accurate, comprehensive, and representative of the target population can be a challenge. Limited or biased data can result in models that do not generalize well or provide accurate predictions.

- ✔ Complex Model Development: Developing machine learning models requires expertise in data preprocessing, feature selection, algorithm selection, model training, and evaluation. It can be time-consuming and resource-intensive to develop and fine-tune models, especially when dealing with large datasets.

- ✔ Interpretability and Explainability: Some machine learning algorithms, such as deep learning models, can be complex and lack interpretability. It can be challenging to understand the reasoning behind the model's predictions, which may be important in certain contexts, such as regulatory compliance or customer trust.

8.CONCLUSION

Identifying airline passenger satisfaction using machine learning techniques offers valuable insights and opportunities for airlines to enhance the

overall travel experience. By analyzing large volumes of data and developing predictive models, airlines can gain a deeper understanding of customer preferences, identify key factors influencing satisfaction, and make data-driven decisions to improve their services.

Through the project, several advantages have been highlighted. Machine learning enables the extraction of data-driven insights, accurate predictions of passenger satisfaction, and real-time monitoring of satisfaction levels. It facilitates the identification of key factors that significantly impact satisfaction, allowing airlines to focus on areas that matter most to their customers. Additionally, machine learning models can provide personalized experiences, tailoring services and offerings to individual preferences.

9.FUTURE SCOPE

Enhanced Personalization:

As technology advances and more data becomes available, the scope for personalized experiences can be further expanded. By integrating additional data sources such as social media activity, customer feedback, and historical travel patterns, airlines can create highly tailored experiences for individual passengers. This can involve personalized recommendations, customized offers, and proactive resolution of customer concerns.

Sentiment Analysis:

While machine learning models can predict overall passenger satisfaction, incorporating sentiment analysis techniques can provide a more nuanced understanding of customer emotions and sentiments throughout the travel journey. Sentiment analysis can capture real-time feedback from social media, reviews, and customer interactions to identify specific pain points, satisfaction drivers, and emerging trends.

Continual Model Improvement:

Machine learning models can be refined and improved over time by incorporating feedback, monitoring performance metrics, and adapting to changing passenger preferences. Ongoing model retraining and evaluation ensure that the models remain accurate and effective in predicting passenger satisfaction in evolving travel landscapes.

Integration of Augmented Reality (AR) and Virtual Reality (VR):

AR and VR technologies can provide immersive experiences that

enhance passenger satisfaction. Airlines can leverage these technologies to offer virtual cabin tours, personalized entertainment options, and interactive in-flight experiences, creating a memorable journey for passengers.

10.APPENDIX

Booking Process: This category focuses on the ease and clarity of the flight booking procedures, including the availability of various fare options and the user-friendliness of our website or mobile app.

Check-In and Boarding: Here, we assess the efficiency of check-in procedures, queue management, and the overall boarding process, including the support provided to passengers with special needs.

Cabin Comfort and Cleanliness: This category evaluates the comfort of our seats, cleanliness of the cabin environment, availability of amenities, and the effectiveness of temperature control.

Source Code GitHub&amp

```
from flask import Flask, \
   render_template as render,\
      redirect,url_for as url,request,flash
          import requests

app=Flask(__name__)
app.secret_key="vijay2003"
pred=0

@app.route('/')
def Home():
   return render("Home.html")
```

```
@app.route('/predict',methods=['GET','POST'])
def Prediction():
    if request.method == 'POST':
        Gender=request.form['Gender']
        if Gender == 'Female':
            Gender=0
        if Gender == 'Male':
            Gender=1

        Age=request.form['Age']
        Type_of_Travel=request.form['ttravel']
        if Type_of_Travel == 'Bussiness Travel':
            Type_of_Travel=0
        if Type_of_Travel == 'Personal Travel':
            Type_of_Travel=1
        Class=request.form['Class']
        if Class == 'Business':
            Class=0
        if Class == 'Eco':
            Class=1
        if Class == 'Eco Plus':
            Class=2

        Flight_Distance=request.form['flight_distance']
        Inflight_wifi_service=request.form['iws']
        Departure_ArrivalTime=request.form['dadtc']
        Ease_of_OnlineBooking=request.form['eob']
        Gate_location=request.form['gl']
```

```
Food_and_Drink=request.form['fd']
Online_Boarding=request.form['ob']
Seat_comfort=request.form['sc']
Infight_entertainment=request.form['ie']
On_board_service=request.form['obs']
Leg_room_services=request.form['lrs']
Baggage_handling=request.form['bh']
Checkin_service=request.form['cs']
Inflight_service=request.form['is']
Cleanliness=request.form['cl']
Departure_Delay_in_minutes=request.form['ddm']
Arrival_Delay_in_minutes=request.form['adm']

total=[[Gender,Age,Type_of_Travel,Class,Flight_Distance,Inflight_wifi_service
,Departure_ArrivalTime,Ease_of_OnlineBooking,Gate_location,Food_and_Dri
nk,Online_Boarding,Seat_comfort,Infight_entertainment,On_board_service,Leg
_room_services,Baggage_handling,Checkin_service,Inflight_service,Cleanlines
s,Departure_Delay_in_minutes,Arrival_Delay_in_minutes]]
payload_scoring={"input_data":[{'field':[

'Gender','Age,Type_of_Travel','Class','Flight_Distance','Inflight_wifi_service','D
eparture_ArrivalTime','Ease_of_OnlineBooking','Gate_location','Food_and_Dri
nk','Online_Boarding','Seat_comfort','Infight_entertainment','On_board_service',
'Leg_room_services','Baggage_handling','Checkin_service','Inflight_service','Cl
eanliness','Departure_Delay_in_minutes','Arrival_Delay_in_minutes'
]}]}

response_scoring=requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/DEPLOYMENT-ID-HERE?version=2023-
05-15&space_id=SPACE-ID-HERE',json=payload_scoring)
```

```
        print("Scoring Response")
        prediction=response_scoring.json()
        print(prediction)
        pred=prediction['prdeictions'][0]['values'][0][0]

        print(pred)

        if int(pred) ==0:
            pred="Passanger have Satisfaction the Airline Service"
        else:
            pred="Passangers have neutral or dissatisfied the Airline Service"

        return redirect(url('Submit'))

    return render("Predict.html")



@app.route('/submit')
def Submit():
    return render('Submit.html',pred={pred})
if__name__== "__main__":
    app.run(debug=True)
```

Project Video Demo Link

https://drive.google.com/file/d/1GsIsqRD6Chq8-8fXO9P6Pk2sx0Dv8XOp/view?usp=drivesdk