IDENTIFYING AIRLINE PASSENGER SATISTFACTION USING MACHINE LEARNING

AN INDUSTRY ORIENTED MINI REPORT

Submitted to

JAWAHARLAL NEHRU TECNOLOGICAL UNIVERSITY, HYDERABAD

In partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING

Submitted By

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CERTIFICATE OF COMPLETION
INDUSTRY ORIENTED MINI PROJECT

This is to certify that the Industry Oriented Mini Project entitled "IDENTIFYING AIRLINE PASSENGER SATISTFACTION USING MACHINE LEARNING" is being submitted by **GONE PRATHYUSHA(21UK1A0540) , ODDIRAJU HARSHITHA(21UK1A0544), BANDARI SATHVIKA(21UK1A0540),CHINDHAM VIVEK(21UK1A0561)** in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Computer Science & Engineering to Jawaharlal Nehru Technological University Hyderabad during the academic year 2024- 2025.

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ABSTRACT

This paper explores the topic of airline passenger satisfaction, a critical aspect of the aviation industry influenced by various factors including service quality, comfort, reliability, and customer service. The research aims to identify the key determinants that significantly impact passenger satisfaction levels, utilizing both qualitative and quantitative methodologies.

The qualitative approach involves a comprehensive literature review of existing studies, synthesizing findings on passenger expectations, preferences, and experiences. Through this review, common themes emerge such as seat comfort, in-flight entertainment, cabin crew behaviour, and timeliness of flights.

Additionally, quantitative analysis employs survey data collected from a diverse sample of airline passengers. Statistical methods including regression analysis are employed to assess the relative importance of different factors in influencing overall satisfaction levels. Findings reveal that while core factors like safety and punctuality are universally significant, there are notable differences in passenger priorities based on demographics and flight preferences.

The implications of these findings are discussed with respect to airline management strategies aimed at enhancing passenger satisfaction. Recommendations include targeted improvements in customer service training, technology integration for real-time passenger feedback, and personalized service offerings to cater to diverse passenger needs.

Ultimately, this study contributes to the broader discourse on airline service quality and offers insights into effective strategies for enhancing passenger satisfaction in a competitive global market.

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1.INTRODUCTION

1.1 OVERVIEW

- **Data Analysis and Insights**: ML algorithms analyze extensive datasets including customer reviews, flight data, and service interactions to extract valuable insights into passenger preferences and pain points.

- **Predictive Capabilities**: ML enables airlines to predict flight delays, customer behavior, and demand patterns, allowing for proactive management of operations and service delivery.

- **Personalization**: By leveraging ML, airlines can personalize services such as seat preferences, onboard amenities, and pricing strategies based on individual passenger profiles and historical data.

- **Customer Service Optimization**: Sentiment analysis of social media and customer feedback helps airlines to promptly address issues and improve overall service quality, enhancing customer satisfaction.

- **Operational Efficiency**: ML optimizes resource allocation, improves scheduling, and enhances decision-making processes, leading to greater operational efficiency and cost-effectiveness.

- **Competitive Advantage**: Adopting ML not only improves passenger experience but also strengthens airlines' competitiveness by adapting quickly to market changes and customer expectations.

By leveraging machine learning techniques, airlines can gain deeper insights into passenger satisfaction drivers, anticipate needs, and ultimately enhance the overall travel experience.Gather information from customer surveys, bookings, and social media to understand what passengers like or dislike. Clean up the data to remove errors and make sure it’s ready for analysis. Decide what we want to predict or improve, like how happy passengers are with their flights. Teach computers to recognize patterns in the data that show what makes passengers satisfied or dissatisfied. Continuously gather feedback and adjust our approach to keep improving passenger experiences.

1.2 PURPOSE:

- **Enhancing Customer Experience**: By understanding and predicting passenger preferences, airlines can offer personalized services, thus improving the overall travel experience and increasing customer satisfaction and loyalty.

- **Proactive Issue Resolution**: ML enables airlines to anticipate and mitigate potential issues such as flight delays, thereby reducing passenger inconvenience and improving reliability.

- **Operational Efficiency**: Through data analysis and predictive modeling, ML helps optimize resource allocation, streamline operations, and reduce costs, leading to more efficient and cost-effective service delivery.

- **Real-Time Decision Making**: ML facilitates quick, data-driven decisions in response to dynamic conditions, ensuring that airlines can adapt promptly to changes and maintain high service standards.

- **Market Competitiveness**: By leveraging advanced ML technologies, airlines can stay ahead of competitors by continuously evolving their services to meet and exceed passenger expectations.

- **Feedback Utilization**: ML allows for effective sentiment analysis of customer feedback.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

1. **Inconsistent Service Quality**: Airlines often struggle with maintaining consistent service standards across different routes and classes, leading to varying passenger experiences and perceptions.
2. **Flight Delays and Disruptions**: Instances of flight delays, cancellations, and mishandled baggage significantly impact passenger satisfaction by disrupting travel plans and causing inconvenience.
3. **Transparency in Pricing and Fees**: Hidden fees, unclear pricing structures, and unexpected charges contribute to passenger frustration and mistrust towards airlines**.**
4. **Overbooking and Seat Availability**: Overbooking practices and limited seat availability can result in denied boarding situations, further exacerbating passenger dissatisfaction.
5. **Complex Booking Systems**: Complex and fragmented booking processes, coupled with cumbersome travel management platforms, make it challenging for passengers to navigate and manage their bookings effectively.
6. **Customer Service Issues**: Inadequate customer service during irregular operations, lack of responsiveness to passenger inquiries and complaints, and poor communication worsen the passenger experience.
7. **Security and Safety Concerns**: Perceptions of inadequate security measures or safety protocols can undermine passenger confidence in an airline's ability to ensure their well-being.
8. **Environmental Impact**: Growing awareness of environmental issues raises concerns about airlines' sustainability practices and their impact on the environment, influencing passenger preferences.
9. **Technological Integration**: Lagging technological advancements in improving passenger experiences, such as outdated inflight entertainment systems or limited Wi-Fi availability, can disappoint tech-savvy passengers.

2.2 PROPOSED SOLLUTION

- **Consistent Service Standards**: Implement rigorous training programs and quality assurance measures to ensure consistent service delivery across all routes and classes.

- **Improved Operational Efficiency**: Invest in predictive analytics and operational tools to minimize flight delays, optimize scheduling, and enhance baggage handling processes.

- **Enhanced Transparency**: Provide clear and transparent pricing structures upfront, including fees and charges, to build trust and reduce customer uncertainty.

- **Optimized Seat Management**: Utilize advanced algorithms and data analytics to better manage seat inventory, reducing overbooking instances and improving seat availability.

- **Simplified Booking Processes**: Streamline booking platforms and interfaces to make the booking process more intuitive and user-friendly for passengers.

- **Enhanced Customer Service**: Invest in comprehensive customer service training, empower frontline staff with decision-making capabilities, and improve communication during disruptions.

- **Focus on Safety and Security**: Prioritize robust safety measures, communicate them effectively to passengers, and invest in technologies that enhance security without compromising efficiency.

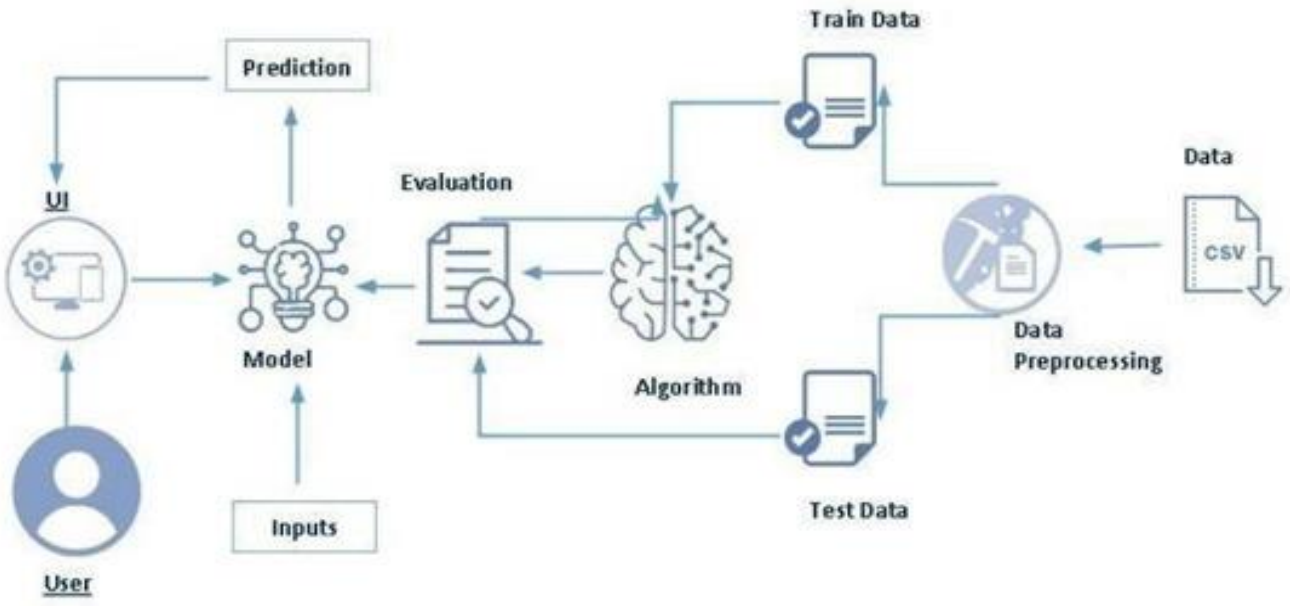
- **Environmental Responsibility**: Implement sustainable practices such as fuel-efficient operations, carbon offset programs, and eco-friendly initiatives to reduce environmental impact.

- **Technological Advancements**: Upgrade inflight entertainment systems, expand Wi-Fi availability, and leverage technology for personalized passenger experiences, such as predictive customer service and personalized recommendations.

- **Feedback Mechanisms**: Establish effective feedback channels and actively solicit passenger feedback to continuously improve services and address concerns prompt.

3 THEORITICAL ANALYSIS

3.1 BLOCK DIAGRAM



3.2. SOFTWARE DESIGNING

The following is the Software required to complete this project:

- **Requirements Gathering**: Understand the specific problems and challenges faced by airlines and passengers through stakeholder interviews, surveys, and data analysis.

- **System Analysis**: Analyze the gathered requirements to define the scope of the software solution, including functional and non-functional requirements.

- **Architecture Design**: Define the high-level architecture of the software system, considering scalability, performance, security, and integration with existing airline systems (e.g., booking, CRM, operations).

- **Database Design**: Design the database schema to efficiently store and retrieve data related to passenger profiles, bookings, flight schedules, feedback, and operational data.

- **User Interface Design**: Design intuitive and user-friendly interfaces for passengers, airline staff, and administrators, ensuring ease of navigation and accessibility across devices.

- **Algorithm Design**: Develop algorithms for predictive analytics (e.g., flight delay predictions, demand forecasting), personalization (e.g., tailored recommendations), and optimization (e.g., seat allocation, pricing strategies).

- **Integration Design**: Plan integration with external systems such as airline reservation systems, payment gateways, and third-party services (e.g., weather forecasts, traffic data).

- **Security Design**: Implement robust security measures to protect sensitive passenger information, comply with regulatory requirements (e.g., GDPR, HIPAA), and prevent unauthorized access or data breaches.

- **Testing Strategy**: Develop a comprehensive testing strategy, including unit testing, integration testing, and system testing, to ensure the software meets functional requirements and performs reliably under various scenarios.

- **Deployment and Maintenance**: Plan for deployment in phases or iterations, ensuring minimal disruption to airline operations, and establish a maintenance plan for ongoing updates, bug fixes, and enhancements.

- **User Training and Support**: Provide training to airline staff and support services to passengers to ensure smooth adoption and effective use of the software solution.

- **Feedback and Iterative Improvement**: Implement mechanisms to gather feedback from users (both passengers and airline staff) to identify areas for improvement and iterate on the software solution continuously.

4.EXPERIMENTAL INVESTIGATION

In this project, we have used Airline Passenger Satisfaction Dataset. This dataset is a csv file consisting of labelled data and having the following columns-

1. Unnamed:0 : It is a undefined column/feature.

2. **Id :** This feature describes about the individual id of a passenger.

3. **Gender :** This feature ensures whether the passenger is male or female.

4. Age : It indicates the age group of passengers.

5. Type of Travel : Purpose of travel undertaken by the passenger.

6. Class : Service class that the passenger booked for their flight.

7. Flight Distance: The total distance of the flight.

8. Inflight Wifi Services : Internet connectivity provided to passengers during a flight journey.

9. Departure/Arrival Time convenient: Rating provided by passengers regarding the convenience of the departure and arrival times of their flight.

10.Ease of online Booking: How easy and convenient it was to book flight tickets through the airline's website or mobile app.

11.Gate Location : satisfaction with the location of the departure gate within the airport terminal.

12.Food and Drink : passengers' satisfaction with the quality, variety.

13.Online Boarding: passengers' satisfaction with the ease and convenience of checking in for their flight via the airline's website or mobile app.

14.Seat Comfort: passengers' satisfaction with the comfort and ergonomics of their seating arrangements during the flight.

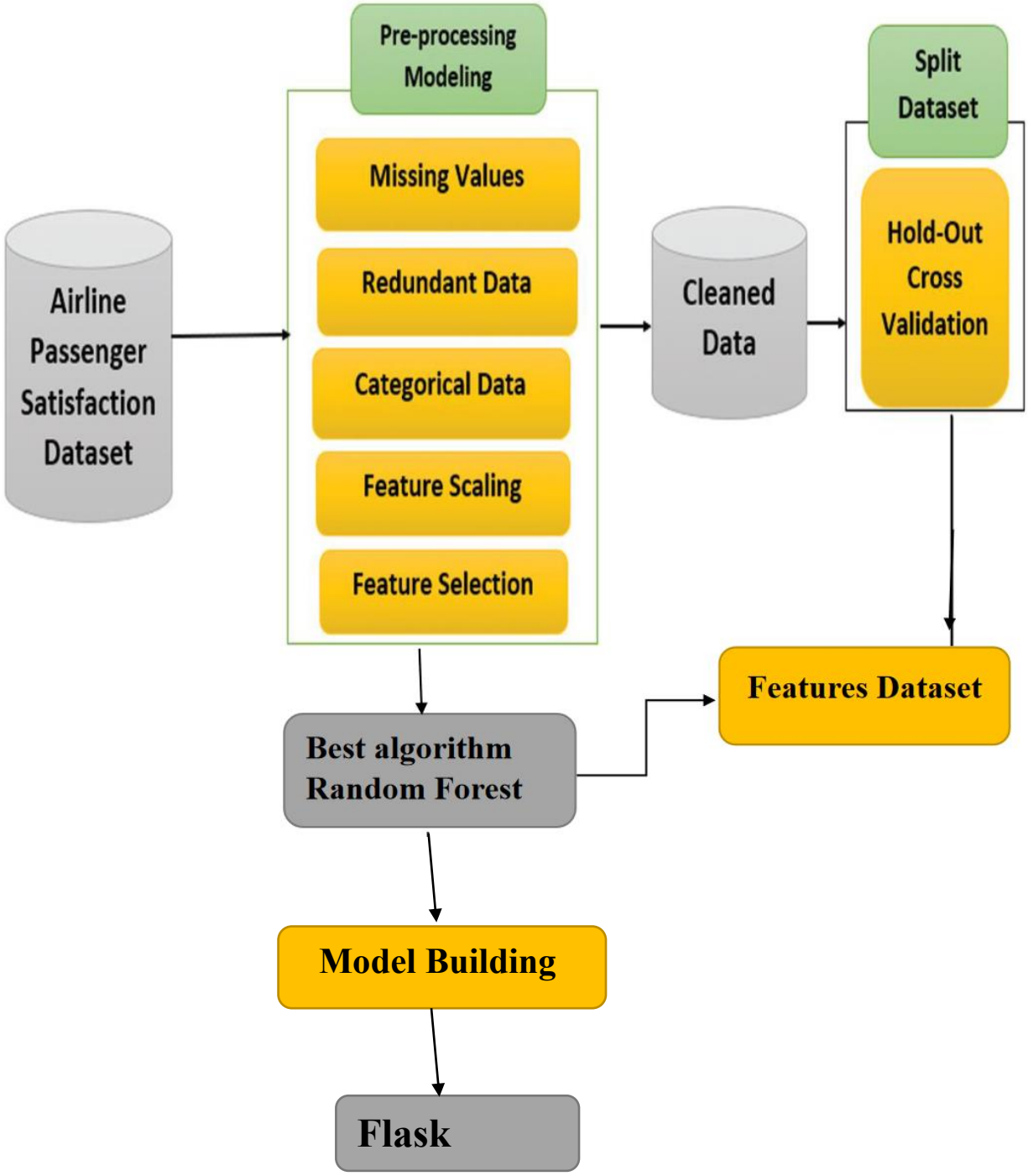
15.Inflight Entertainment: Entertainment options available to passengers during a flight, such as movies, TV shows, music.

16.Onboard Service: Quality and level of service provided to passengers by the cabin crew during a flight.
17.Leg Room service: Passengers to stretch their legs while seated onboard an aircraft.
18.Baggage Handling: Airlines manage passengers' checked baggage from check-in to its delivery at the destination airport.
19.Check in Service: The process and experience of checking in for a flight, either at the airport or online.
20.Inflight Service: The services provided to passengers during a flight on an airplane.
21.Cleanliness: Ensures passengers comfort health and safety.
22.Departure delay in minutes: The amount of time beyond the scheduled departure time.
23.Arrival delay in minutes: The amount of time by which a flight arrives later than its scheduled arrival time.
24.Satisfaction: Contribute overall comfort, experience, convenience during a flight.

For the dataset we selected, it consists of more than the columns we want to predict it . So, we have chosen the feature drop it contains the columns that we are going to predict the passenger satisfied or not with the airline services.

- Feature drop means it drops the columns that we don’t want in our dataset.
- Feature_drop = [‘unnamed’ ,’id’ ,’Type of Class ’]

5. FLOW CHART


Pre-processing Modeling
Missing Values
Redundant Data
Categorical Data
Feature Scaling
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Airline Passenger Satisfaction Dataset
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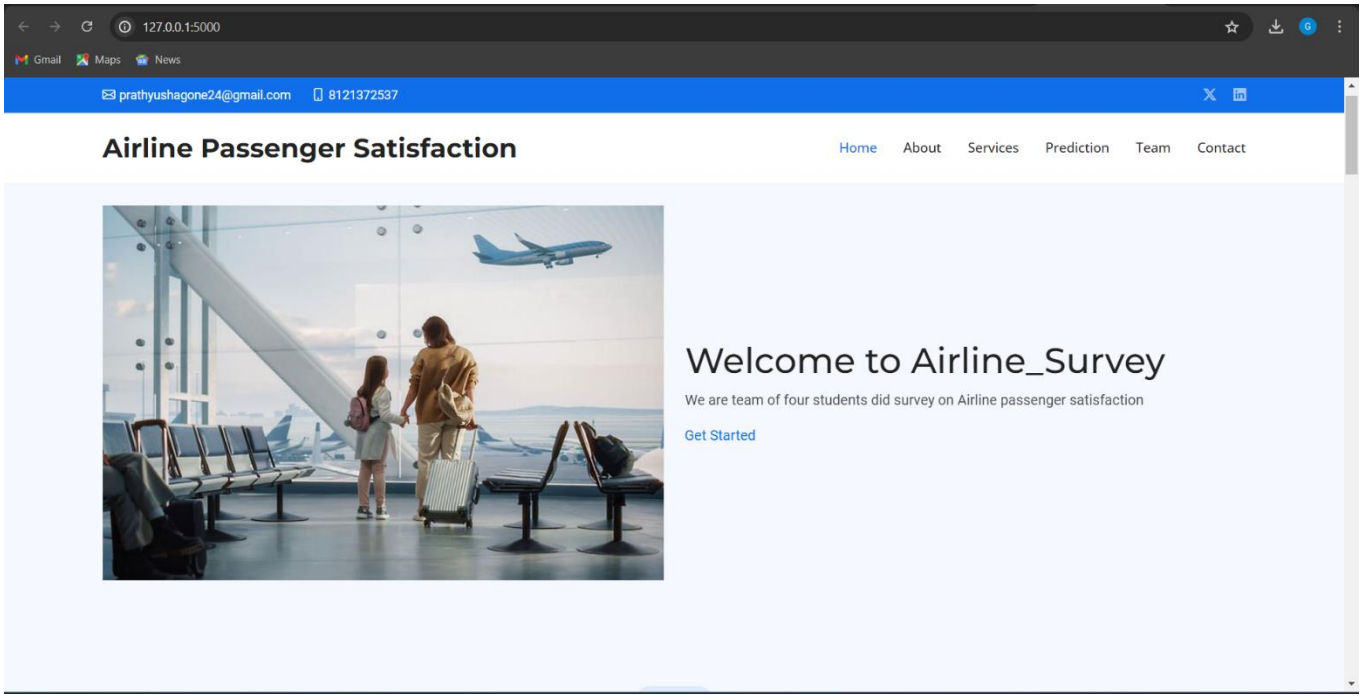
Features Dataset
Best algorithm Random Forest
Model Building
Flask

6.HOME PAGE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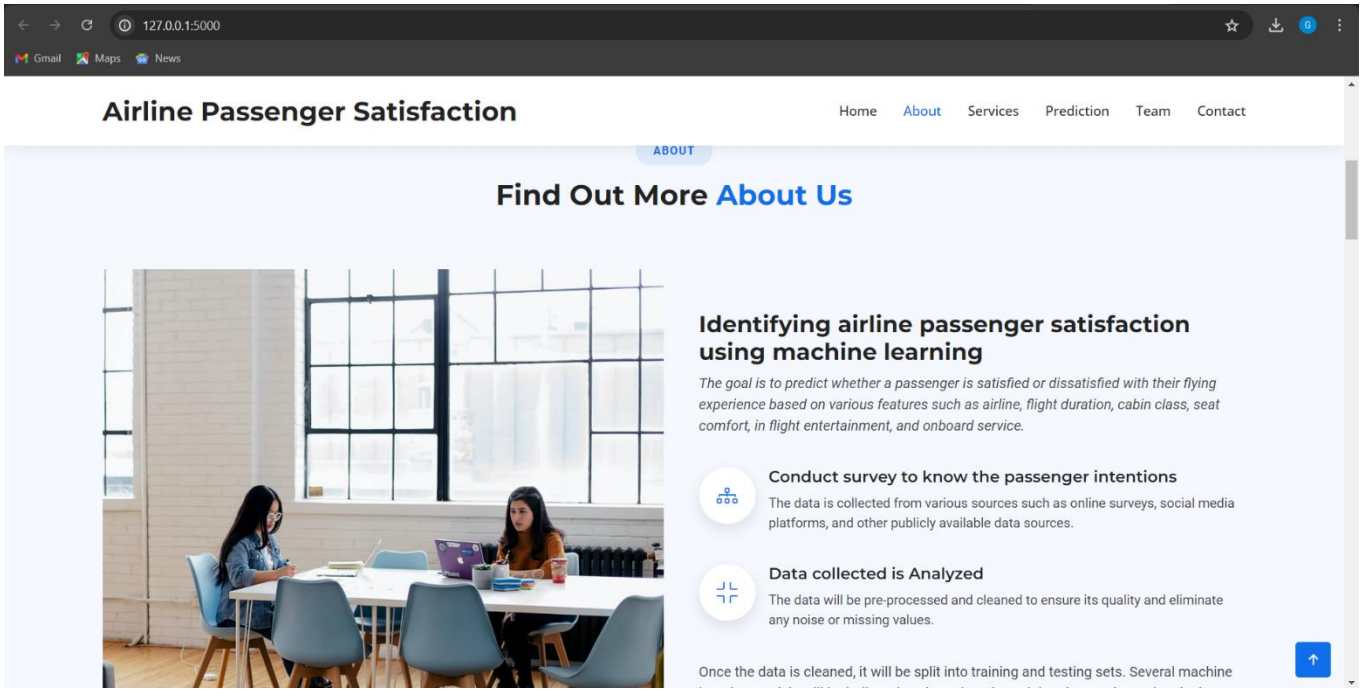
Get Started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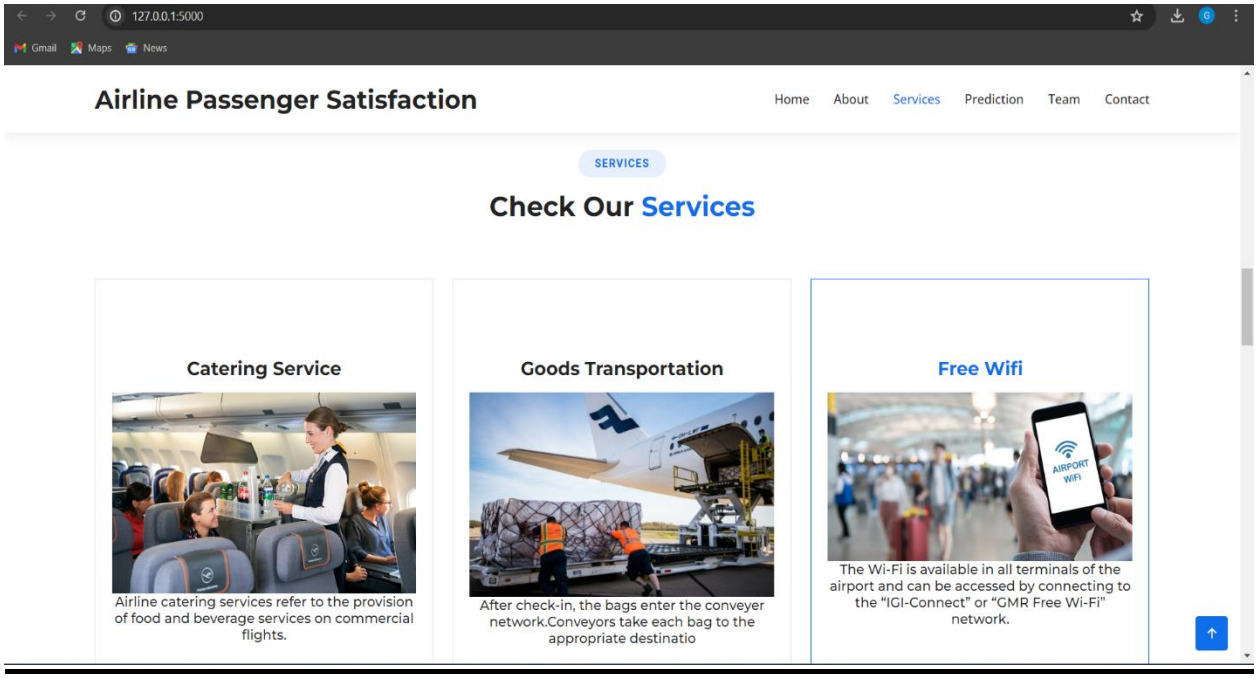
Identifying airline passenger satisfaction using machine learning
The goal is to predict whether a passenger is satisfied or dissatisfied with their flying experience based on various features such as airline, flight duration, cabin class, seat comfort, in flight entertainment, and onboard service.
Conduct survey to know the passenger intentions
The data is collected from various sources such as online surveys, social media platforms, and other publicly available data sources.
Data collected is Analyzed
The data will be pre-processed and cleaned to ensure its quality and eliminate any noise or missing values.
Once the data is cleaned, it will be split into training and testing sets. Several machine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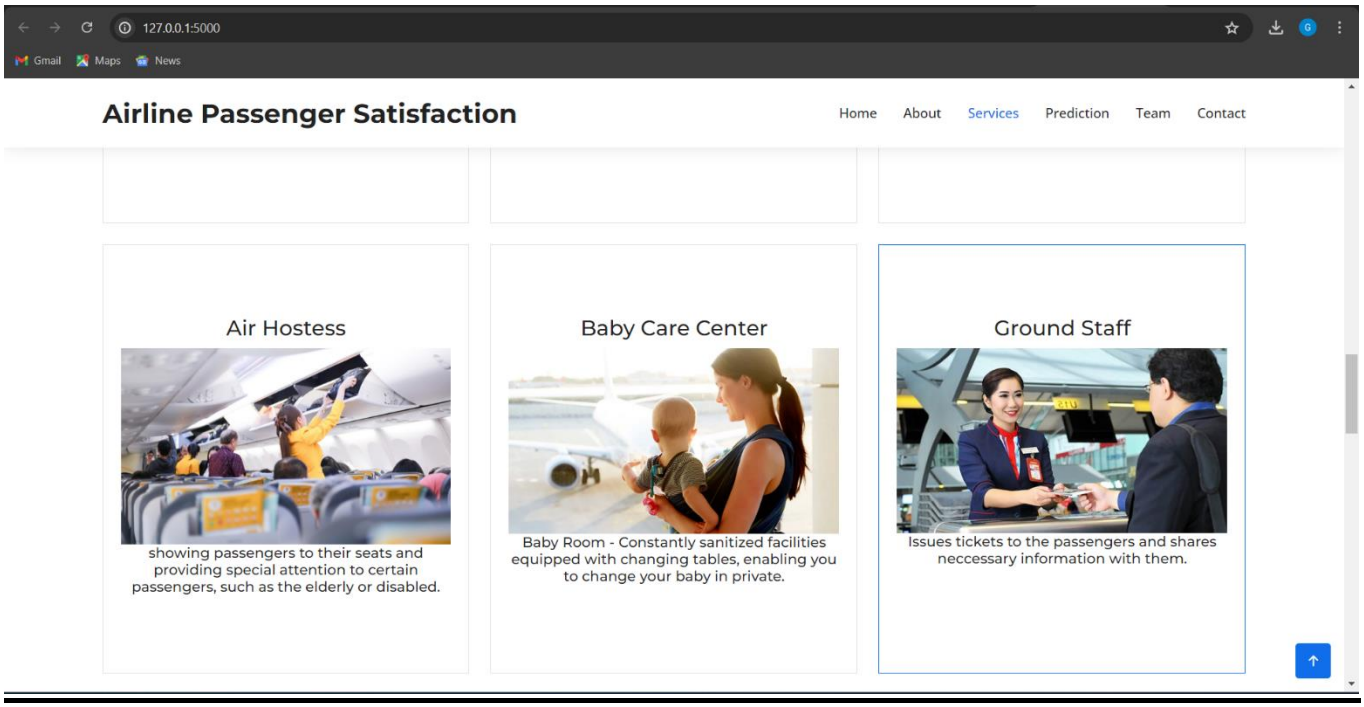
SERVICES
Check Our Services
Catering Service
Airline catering services refer to the provision of food and beverage services on commercial flights.
Goods Transportation
After check-in, the bags enter the conveyer network.Conveyors take each bag to the appropriate destinatio
Free Wifi
AIRPORT WiFi
The Wi-Fi is available in all terminals of the airport and can be accessed by connecting to the "IGI-Connect" or "GMR Free Wi-Fi" network.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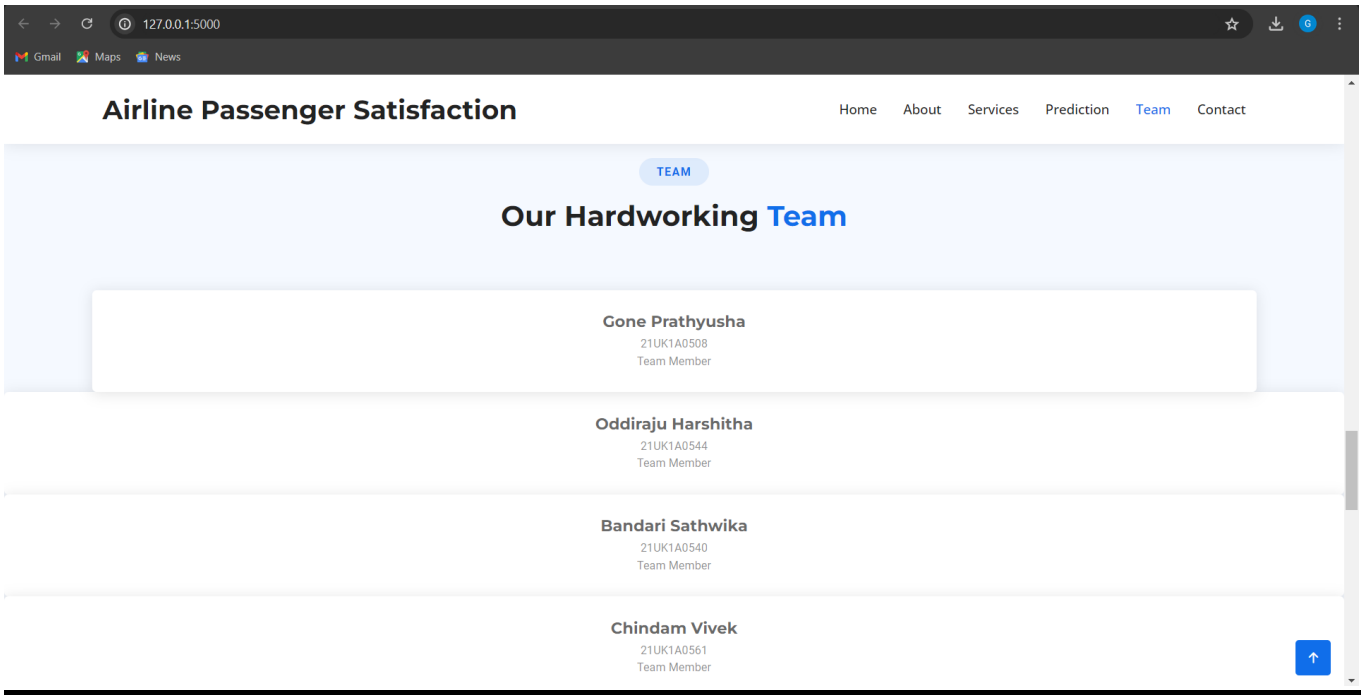
Air Hostess
showing passengers to their seats and providing special attention to certain passengers, such as the elderly or disabled.
Baby Care Center
Baby Room - Constantly sanitized facilities equipped with changing tables, enabling you to change your baby in private.
Ground Staff
Issues tickets to the passengers and shares neccessary information with them.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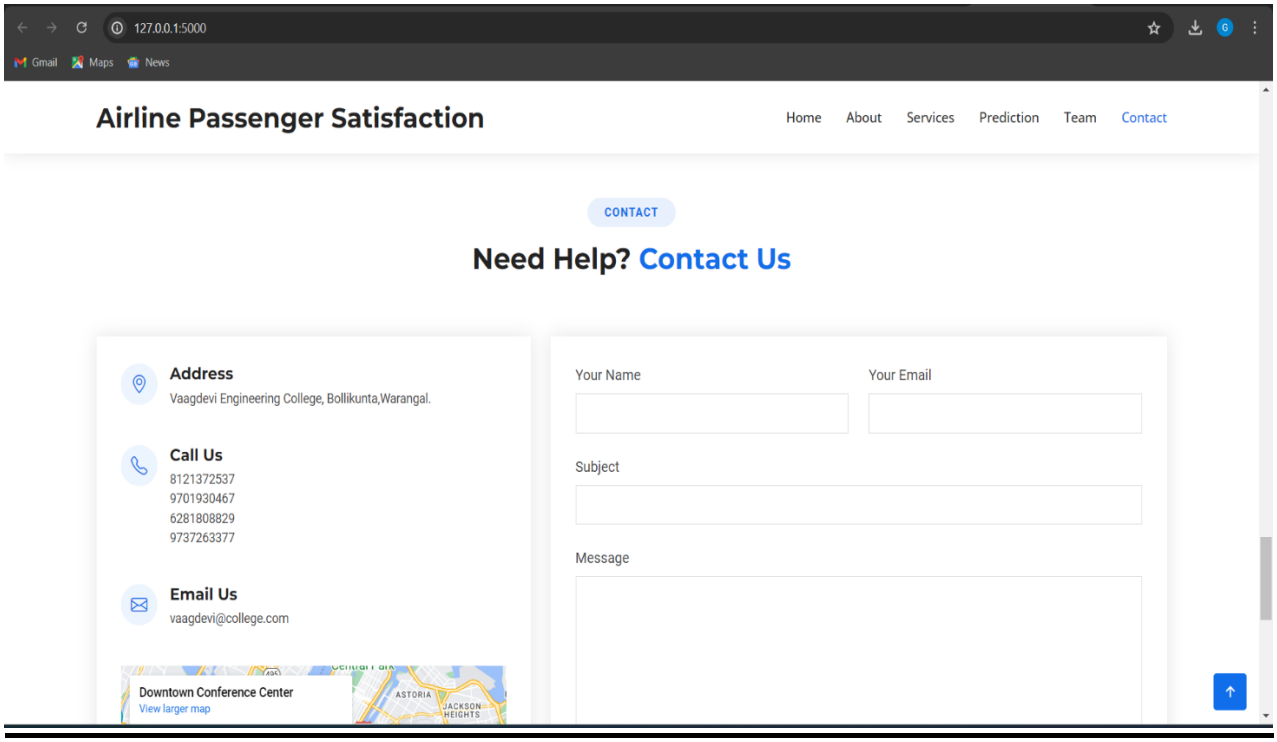
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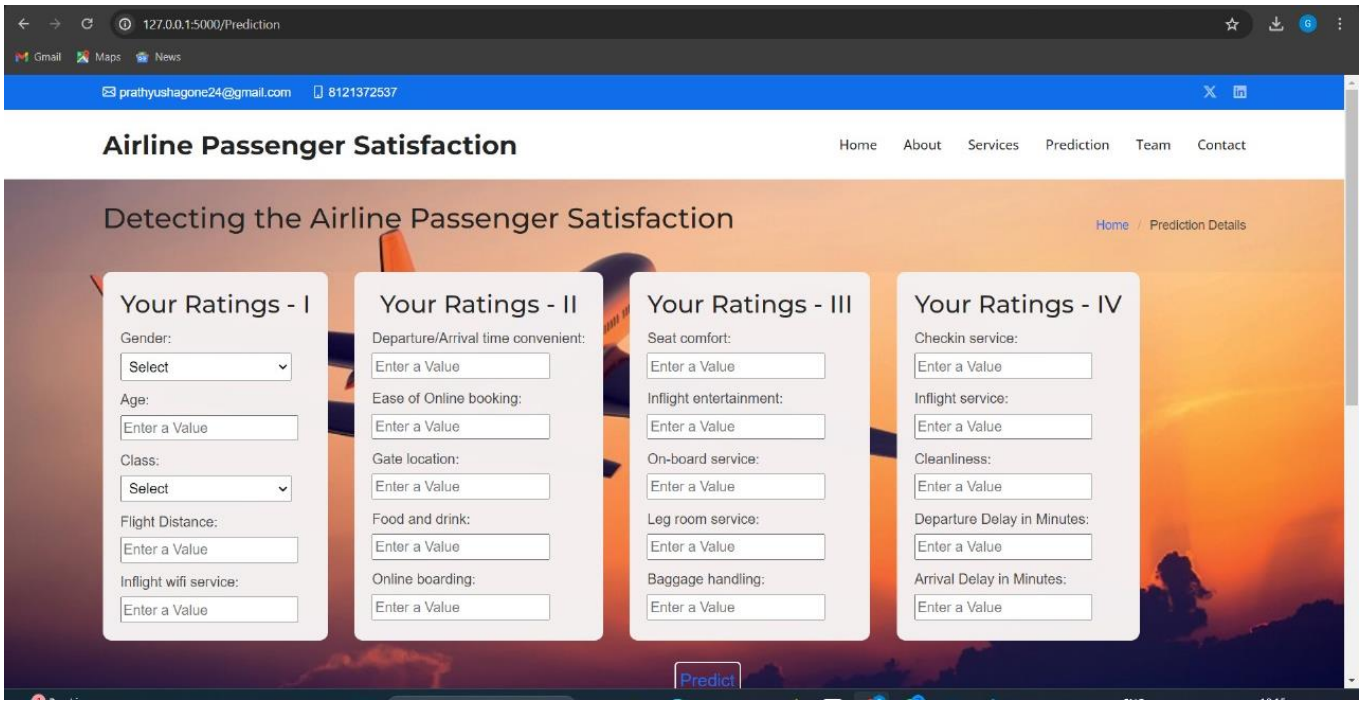
PREDICTION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Class:
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Flight Distance:
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Inflight wifi service:
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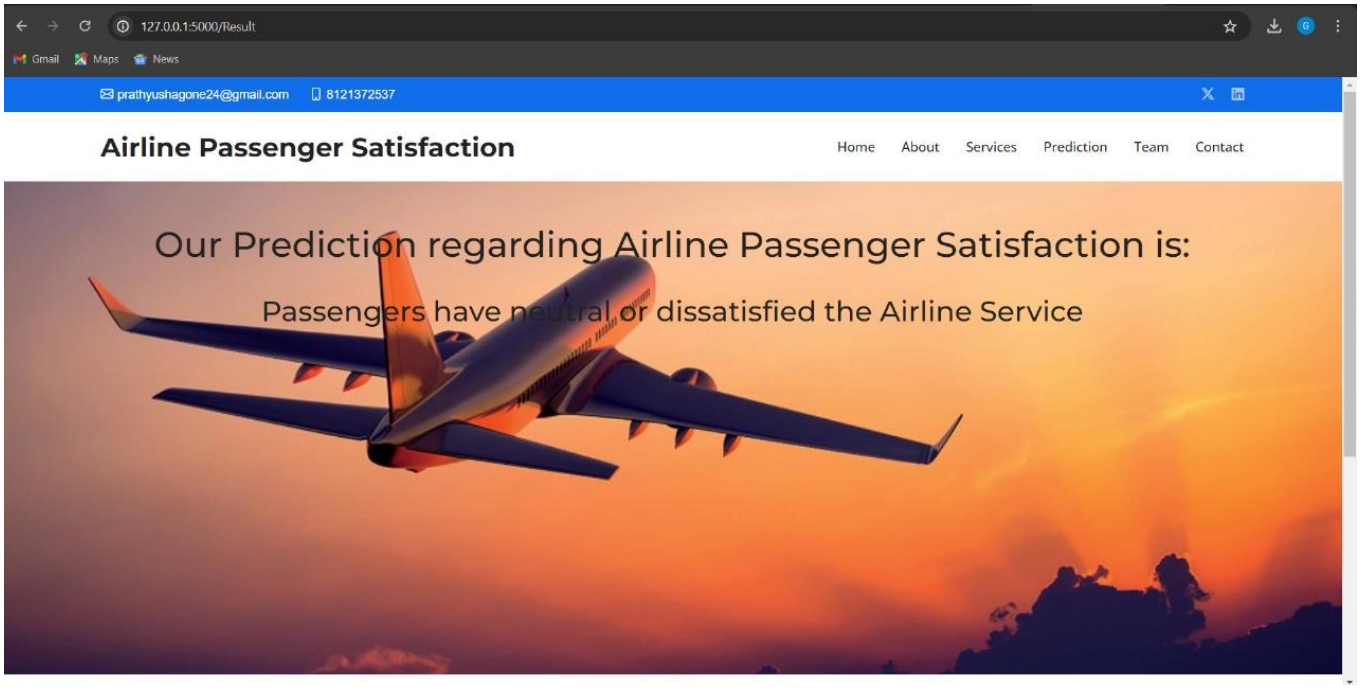
Your Ratings - II
Departure/Arrival time convenient:
Enter a Value
Ease of Online booking:
Enter a Value
Gate location:
Enter a Value
Food and drink:
Enter a Value
Online boarding:
Enter a Value
Your Ratings - III
Seat comfort:
Enter a Value
Inflight entertainment:
Enter a Value
On-board service:
Enter a Value
Leg room service:
Enter a Value
Baggage handling:
Enter a Value
Your Ratings - IV
Checkin service:
Enter a Value
Inflight service:
Enter a Value
Cleanliness:
Enter a Value
Departure Delay in Minutes:
Enter a Value
Arrival Delay in Minutes:
Enter a Value
Predict

RESULT: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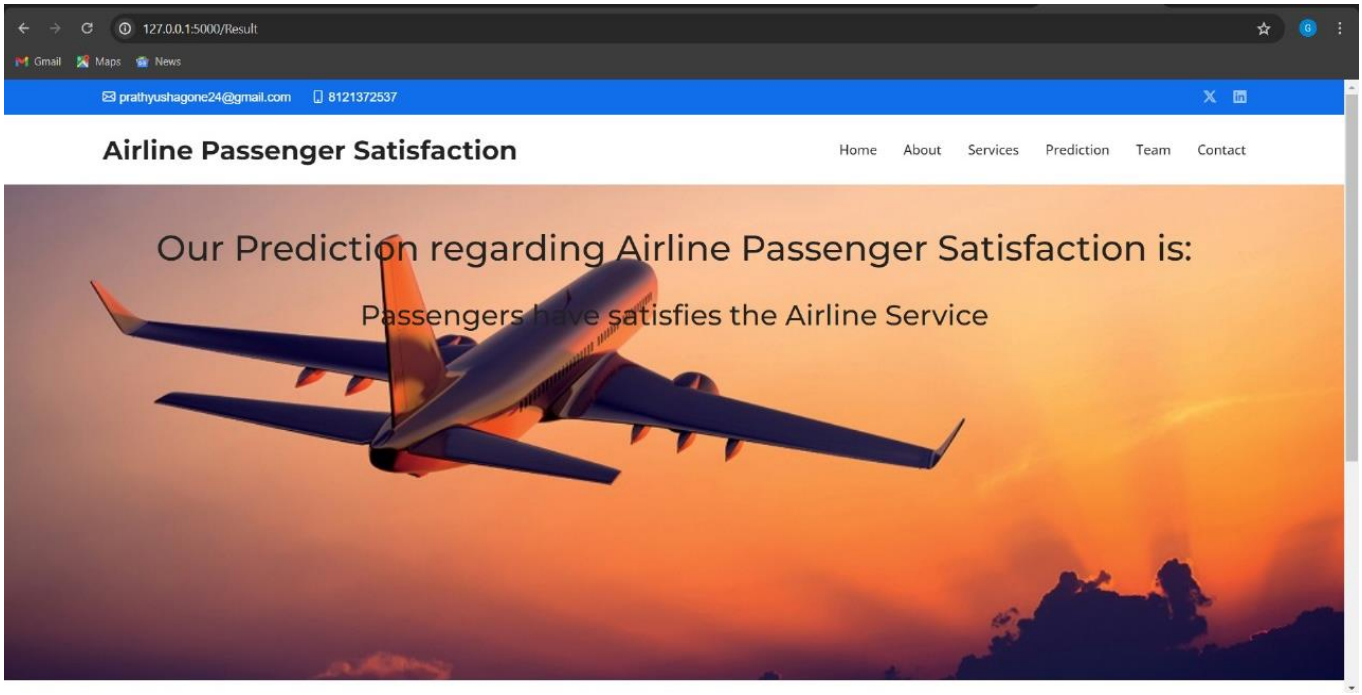
Our Prediction regarding Airline Passenger Satisfaction is:
Passengers have neutral or dissatisfied the Airline Service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Our Prediction regarding Airline Passenger Satisfaction is:
Passengers have satisfies the Airline Service

7.ADVANTAGES AND DISADVANTAGES

ADVANTAGES:

- **Enhanced Customer Experience**: Software solutions can streamline booking processes, provide personalized recommendations, and offer seamless communication channels, thereby enhancing overall passenger satisfaction.

- **Improved Service Quality**: Software can standardize service delivery across different touchpoints, ensuring consistent quality and responsiveness to passenger needs.

- **Cost Reduction**: Efficiency gains through software automation and optimization can lead to cost savings in areas such as staffing, fuel consumption, and maintenance.

- **Competitive Advantage**: Airlines that leverage innovative software solutions to enhance passenger satisfaction can differentiate themselves in a competitive market, attracting and retaining loyal customers.

DISADVANTAGES:

1. **Inconsistent Service Quality**: Variations in service levels across different flights and airlines can lead to mixed experiences for passengers.
2. **Flight Delays and Disruptions**: Instances of delays, cancellations, and mishandled baggage can cause significant inconvenience and frustration for passengers.
3. **Transparency Issues**: Lack of clarity in pricing, hidden fees, and confusing booking processes can lead to dissatisfaction and mistrust among passengers.
4. **Overbooking and Seating Issues**: Overbooking practices and limited seat availability can result in denied boarding situations and dissatisfaction among passengers.
5. **Customer Service Challenges**: Inadequate responses to passenger inquiries, complaints, and issues during travel can diminish satisfaction levels.
6. **Environmental Impact**: Concerns about the environmental impact of air travel, including carbon emissions and sustainability practices, may affect passenger perceptions.

8.APPLICATIONS

1. **Predictive Maintenance**: ML algorithms can analyze historical data from aircraft systems to predict maintenance needs and minimize unexpected delays due to mechanical issues.
2. **Personalized Recommendations**: ML models can analyze passenger preferences, past travel behavior, and demographic data to offer personalized travel recommendations, such as destination suggestions or seat preferences.
3. **Flight Delay Prediction**: ML algorithms can analyze historical flight data, weather forecasts, and airport congestion patterns to predict flight delays accurately, allowing airlines to proactively inform passengers and manage expectations.
4. **Customer Sentiment Analysis**: ML can analyze customer feedback from various channels (e.g., surveys, social media) to understand passenger sentiment and identify areas for improvement in service delivery.
5. **Dynamic Pricing**: ML models can analyze demand patterns, competitor pricing, and booking trends to optimize pricing strategies dynamically, maximizing revenue while offering competitive fares to passengers.
6. **Fraud Detection**: ML algorithms can detect fraudulent activities related to bookings, payment transactions, and loyalty programs, enhancing security and trust among passengers.
7. **Operational Optimization**: ML can optimize crew scheduling, flight routing, and resource allocation based on real-time data and operational constraints, improving efficiency and minimizing operational disruptions.
8. **Voice and Chat Assistants**: ML-powered voice recognition and natural language processing (NLP) can enable automated customer service assistants, providing passengers with instant responses and support throughout their journey.
9. **Image and Video Analysis**: ML can analyze surveillance footage and security scans to enhance safety measures and streamline airport security processes, reducing wait times and enhancing passenger experience.
10. **Customer Lifetime Value Prediction**: ML models can predict the lifetime value of individual passengers based on their behavior, preferences, and spending patterns, allowing airlines to tailor marketing efforts and loyalty programs effectively.

9.CONCLUSION

"In conclusion, airline passenger satisfaction hinges on several critical factors including customer service quality, on-time performance, comfort, and value for money. Through analyzing various aspects such as booking experience, in-flight amenities, and overall journey convenience, it becomes evident that airlines can significantly enhance satisfaction by focusing on these areas. Recommendations for improving passenger satisfaction include investing in personalized customer service, optimizing operational efficiency to minimize delays, and continually innovating to meet evolving passenger expectations. By prioritizing these aspects, airlines can foster loyalty and positive word-of-mouth, thereby enhancing their competitive edge in the industry."

10.FUTURE SCOPE

- **Predictive Analytics**: ML algorithms can analyze historical data to predict passenger preferences, booking patterns, and even potential disruptions in travel plans. This enables airlines to proactively adjust services and operations to enhance passenger satisfaction.

- **Personalized Recommendations**: ML models can recommend personalized travel packages, upgrades, and ancillary services based on individual preferences, previous travel behavior, and real-time data inputs. This personalization can significantly enhance the overall travel experience.

- **Sentiment Analysis**: ML techniques such as natural language processing (NLP) can analyze customer feedback from various sources (social media, surveys, reviews) to gauge sentiment and identify areas for improvement. Airlines can then prioritize improvements that directly impact passenger satisfaction.

- **Operational Efficiency**: ML algorithms can optimize flight scheduling, crew management, and resource allocation to minimize delays and disruptions. This improves on-time performance, a key factor influencing passenger satisfaction.

- **Enhanced Customer Service**: Chatbots powered by ML can provide real-time assistance to passengers, handling inquiries, booking changes, and resolving issues promptly. This ensures a seamless customer service experience even during peak travel times.

- **Fraud Detection and Security**: ML can enhance fraud detection in bookings and improve security screening processes at airports, ensuring a safe and secure travel environment that contributes to passenger satisfaction.

- **Dynamic Pricing Strategies**: ML algorithms can analyze demand patterns and competitor pricing to optimize fare structures dynamically. This can lead to fairer pricing models and better value propositions for passengers.

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    - Sharda, R., Delen, D., & Turban, E. (2019). *Business Intelligence: A Managerial Perspective on Analytics*. Pearson.
3. **Reports and Whitepapers**:
    - McKinsey & Company. (2020). *Leveraging AI and Machine Learning in Airline Operations*.
    - IATA. (2019). *Harnessing Aviation Data for Decision Making*. International Air Transport Association.
4. **Websites and Articles**:
    - Li, H., Li, W., & Wu, C. (2019). A machine learning approach to predicting airline passenger satisfaction. *Proceedings of the 28th ACM International Conference on Information and Knowledge Management*, 2113-2122.
    - AI applications for Airlines - https://www.ibm.com/industries/travel-transportation/airlines

12.APPENDIX

Model building :

1)Dataset

2)Google colab and VS code Application Building

1. HTML file (Index file, Predict file ,result file)
1. CSS file
2. Models in pickle format

SOURCE CODE:

INDEX.HTML

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

<head>
  <meta charset="utf-8">
  <meta content="width=device-width, initial-scale=1.0" name="viewport">
  <title>Airline Passenger Satisfaction</title>
  <meta content="" name="description">
  <meta content="" name="keywords">
  <link href="../static/assets/css/main.css" rel="stylesheet">
</head>
<body class="index-page">
  <header id="header" class="header sticky-top">
href="mailto:prathyushagone24@gmail.com">prathyushagone24@gmail.com</a></i>
        <i class="bi bi-phone d-flex align-items-center ms-4"><span>8121372537</span></i>
      </div>
      <div class="social-links d-none d-md-flex align-items-center">
        <a href="#" class="twitter"><i class="bi bi-twitter-x"></i></a>
        <a href="#" class="linkedin"><i class="bi bi-linkedin"></i></a>
      </div>
    </div>
  </div><!-- End Top Bar -->
    <div class="container position-relative d-flex align-items-center justify-content-between">
      <a href="index.html" class="logo d-flex align-items-center">

        <h1 class="sitename">Airline Passenger Satisfaction</h1>
      </a>
      <nav id="navmenu" class="navmenu">
        <ul>
```

```
        <i class="mobile-nav-toggle d-xl-none bi bi-list"></i>
      </nav>
    </div>
  </div>
 </header>
 <main class="main">
  <section id="hero" class="about section light-background">
   <div class="container">
    <div class="row gy-4">
     <div class="col-lg-6" data-aos="fade-up" data-aos-delay="100">
      <img src="../static/assets/img/Background.jpg" alt="" class="img-fluid">
     </div>
     <div class="col-lg-6 order-2 order-lg-1 d-flex flex-column justify-content-center" data-aos="zoom-out">
      <h1>Welcome to <span>Airline_Survey</span></h1>
      <p>We are team of four students did survey on Airline passenger satisfaction</p>
      <div class="d-flex">
      <a href="/Prediction" class="btn-get-started">Get Started</a>
      </div>
     </div>
    </div>
   </div
  </section><!-- /Hero Section -->
  <section id="about" class="about section light-background">
   <div class="container section-title" data-aos="fade-up">
    <h2>About</h2>
    <p><span>Find Out More</span> <span class="description-title">About Us</span></p>
   </div><!-- End Section Title -->
   <div class="container">
     <div class="col-lg-6" data-aos="fade-up" data-aos-delay="100">
      <img src="../static/assets/img/about.jpg" alt="" class="img-fluid">
     </div>
       <h3>Identifying airline passenger satisfaction using machine learning</h3>
       <p class="fst-italic">
        The goal is to predict whether a passenger is satisfied or dissatisfied with their flying experience based on various features such as airline, flight duration, cabin class, seat comfort, in flight entertainment, and onboard service.
       </p>
       <ul>
        <li>
         <i class="bi bi-diagram-3"></i>
         <div>
          <h4>Conduct survey to know the passenger intentions </h4>
```

The data is collected from various sources such as online surveys, social media platforms, and other publicly available data sources.

Once the data is cleaned, it will be split into training and testing sets. Several machine learning models will be built and evaluated on the training data to determine the best performing model. The models to be explored include logistic regression, decision trees, random forests, and neural networks.

After selecting the best performing model, it will be used to predict the satisfaction level of the passengers in the testing set.

</section
<section id="stats" class="stats section">

Happy Clients

<!-- End Stats Item -->

Services

<!-- End Stats Item -->

<div class="stats-item"
Hours Of Support

<!-- End Stats Item -->

Hard Workers

<!-- End Stats Item --

```
    </div>
  </section><!-- /Stats Section -->
          <h3>Catering Service</h3>
          <img src="../static/assets/img/service1.jpg"  alt="" class="img-fluid">
          <h6> Airline catering services refer to the provision of food and beverage services on commercial
flights.</h6>
        </div>
       </div><!-- End Service Item -->

       <div class="col-lg-4 col-md-6" data-aos="fade-up" data-aos-delay="200">
        <div class="service-item position-relative">
           <h3>Goods Transportation</h3>
          <img src="../static/assets/img/service2.jpg"  alt="" class="img-fluid">
          <h6>After check-in, the bags enter the conveyer network.Conveyors take each bag to the appropriate
destinatio</h6>
       </div>
       </div><!-- End Service Item -->
       <div class="col-lg-4 col-md-6" data-aos="fade-up" data-aos-delay="300">
        <div class="service-item position-relative">
          <h3>Free Wifi</h3>
           <img src="../static/assets/img/service3.jpg"  alt="" class="img-fluid">
          <h6>The Wi-Fi is available in all terminals of the airport and can be accessed by connecting to the “IGI-
Connect” or “GMR Free Wi-Fi” network.</h6>
        </div>
       </div><!-- End Service Item -->
       <div class="col-lg-4 col-md-6" data-aos="fade-up" data-aos-delay="400">
        <div class="service-item position-relative">
          <h4>Air Hostess</h4>
          <img src="../static/assets/img/service4.jpg"  alt="" class="img-fluid">
          <h6>showing passengers to their seats and providing special attention to certain passengers, such as the
elderly or disabled.</h6>
        </div>
       </div><!-- End Service Item -->
      <div class="col-lg-4 col-md-6" data-aos="fade-up" data-aos-delay="500">
        <div class="service-item position-relative">
          <h4>Baby Care Center</h4>
          <img src="../static/assets/img/service5.jpg"  alt="" class="img-fluid">
          <h6> Baby Room - Constantly sanitized facilities equipped with changing tables, enabling you to change
your baby in private.</h6>
        </div>
       </div><!-- End Service Item -->
       <div class="col-lg-4 col-md-6" data-aos="fade-up" data-aos-delay="600">
```

```
        <div class="service-item position-relative">
          <h4>Ground Staff</h4>
          <img src="../static/assets/img/service6.jpg"  alt="" class="img-fluid">
          <h6>Issues tickets to the passengers and shares neccessary information with them.</h6>
        </div>
       </div><!-- End Service Item -->
     </div>
   </div>
  <section id="contact" class="contact section">
            <h3>Address</h3>
            <p>Vaagdevi Engineering College, Bollikunta,Warangal.</p>
           </div>
          </div><!-- End Info Item -->
          <div class="info-item d-flex" data-aos="fade-up" data-aos-delay="300">
           <i class="bi bi-telephone flex-shrink-0"></i>
           <div>
            <h3>Call Us</h3>
            <p>8121372537</p>
            <p>9701930467</p>
            <p>6281808829</p>
            <p>9737263377</p>
           </div>
          </div><!-- End Info Item -->
   <div class="info-item d-flex" data-aos="fade-up" data-aos-delay="400">
           <i class="bi bi-envelope flex-shrink-0"></i>
           <div>
            <h3>Email Us</h3>
            <p>vaagdevi@college.com</p>
           </div>
          </div><!-- End Info Item -->
        </div>
       </div
       <div class="col-lg-7">
        <form action="C:\Users\ABC\Downloads\Airlines\Flask\static\forms\contact.php" method="post"
class="php-email-form" data-aos="fade-up" data-aos-delay="200">
          <div class="row gy-4">
           <div class="col-md-6">
            <label for="name-field" class="pb-2">Your Name</label>
            <input type="text" name="name" id="name-field" class="form-control" required="">
           </div>
           <div class="col-md-6">
            <label for="email-field" class="pb-2">Your Email</label>
```

```
            <input type="email" class="form-control" name="email" id="email-field" required="">
           </div>
           <div class="col-md-12">
            <label for="subject-field" class="pb-2">Subject</label>
            <input type="text" class="form-control" name="subject" id="subject-field" required="">
           </div>

           <div class="col-md-12">
            <label for="message-field" class="pb-2">Message</label>
            <textarea class="form-control" name="message" rows="10" id="message-field"
required=""></textarea>
           </div>          <div class="col-md-12 text-center">
            <div class="loading">Loading</div>
            <div class="error-message"></div>
            <div class="sent-message">Your message has been sent. Thank you!</div>
            <button type="submit">Send Message</button>
           </div>
          </div>
         </form>
        </div><!-- End Contact Form -->
       </div>
      </div>
    </section><!-- /Contact Section -->
  </main>
  <footer id="footer" class="footer"
  <div class="container footer-top">
     <div class="row gy-4">
      <div class="col-lg-4 col-md-6 footer-about">
       <a href="C:\Users\ABC\Downloads\Airlines\Flask\templetes\index.html" class="d-flex align-items-center">
        <span class="sitename">Detecting Airline Passenger Satisfaction</span>
       </a>
       <div class="footer-contact pt-3">
        <p>Vaagdevi Engineering College</p>
        <p>Bollikunta, Warangal-506002</p>
        <p class="mt-3"><strong>Phone:</strong> <span>8121372537</span></p>
        <p><strong>Email:</strong> <span>vaagdevi@college.com</span></p>
       </div>
      </div>
      <div class="col-lg-2 col-md-3 footer-links"
      </div>
    <div class="container copyright text-center mt-4">
```

```
    <p>© <span>Copyright</span> <strong class="px-1 sitename">Airline Passenger Satisfaction</strong>
<span>All Rights Reserved</span></p
      Designed by <p>Our Team Members</p>
    </div>
   </div
 </footer>
 <!-- Scroll Top -->
```

PREDICT.HTML

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

<head>
  <meta charset="utf-8">
  <meta content="width=device-width, initial-scale=1.0" name="viewport">
  <title>Airlineline Passenger Satisfaction</title>
  <meta content="" name="description">
  <meta content="" name="keywords"

  <!-- Main CSS File -->
  <link href="../static/assets/css/main.css" rel="stylesheet">
</head>
<body >
  <header id="header" class="header sticky-top">

    <div class="topbar d-flex align-items-center">
      <div class="container d-flex justify-content-center justify-content-md-between">
        <div class="contact-info d-flex align-items-center">
          <i class="bi bi-envelope d-flex align-items-center"><a
href="prathyushagone24@gmail.com">prathyushagone24@gmail.com</a></i>
          <i class="bi bi-phone d-flex align-items-center ms-4"><span>8121372537</span></i>
        </div>
        <div class="social-links d-none d-md-flex align-items-center">
          <a href="#" class="twitter"><i class="bi bi-twitter-x"></i></a>
          <a href="#" class="linkedin"><i class="bi bi-linkedin"></i></a>
        </div>
      </div>
    </div><!-- End Top Bar -->

    <div class="branding d-flex align-items-cente">
```

```
    <div class="container position-relative d-flex align-items-center justify-content-between">
      <a href="/index" class="logo d-flex align-items-center">
        <!-- Uncomment the line below if you also wish to use an image logo -->
        <!-- <img src="assets/img/logo.png" alt=""> -->
        <h1 class="sitename">Airline Passenger Satisfaction</h1>
      </a>
 </header>
 <main class="main"></main>
<!-- Page Title -->
  <div class="page-title" data-aos="fade">
    <div class="container d-lg-flex justify-content-between align-items-center">
      <h2 class="mb-2 mb-lg-0"><p>Detecting the Airline Passenger Satisfaction</p></h2>
      <nav class="breadcrumbs">
        <ol>
          <li><a href="/index">Home</a></li>
          <li  class="current">Prediction Details</li>
        </ol>
      </nav>
    </div>
  </div><!-- End Page Title -->
  <style>
  <div class="form-container">
      <div class="form-box">
        <form method="POST" action="/Result" id="form">
          <h3>Your Ratings - I</h3>

          <label for="Gender">Gender:</label>
          <select id="Gender" name="Gender">
             <option value="Female">Female</option>
             <option value="Male">Male</option>
          </select>

          <label for="Age">Age:</label>
          <input type="number" name="Age" placeholder="Enter a Value" required>

          <label for="Class">Class:</label>
          <select id="Class" name="Class">
             <option value="Bussiness">Bussiness</option>
             <option value="Eco">Eco</option>
             <option value="Eco Plus">Eco Plus</option>
          </select>
          <label for="Flight Distance">Flight Distance:</label>
          <input type="number" name="Flight Distance" placeholder="Enter a Value" required>
```

```
        <label for="Inflight wifi service">Inflight wifi service:</label>
        <input type="number" name="Inflight wifi service" placeholder="Enter a Value" required>
      </div>

      <div class="form-box">
        <h3>Your Ratings - II</h3>

        <label for="Departure/Arrival time convenient">Departure/Arrival time convenient:</label>
        <input type="number" name="Departure/Arrival time convenient" placeholder="Enter a Value"
required>
        <label for="Ease of Online booking">Ease of Online booking: </label>
        <input type="number" name="Ease of Online booking" placeholder="Enter a Value" required>

        <label for="Gate location">Gate location:</label>
        <input type="number" name="Gate location" placeholder="Enter a Value" required>

        <label for="Food and drink">Food and drink:</label>
        <input type="number" name="Food and drink" placeholder="Enter a Value" required>

        <label for="Online boarding">Online boarding:</label>
        <input type="number" name="Online boarding" placeholder="Enter a Value" required>
      </div>
      <div class="form-box">
        <h3>Your Ratings - III</h3>

        <label for="Seat comfort">Seat comfort: </label>
        <input type="number" name="Seat comfort" placeholder="Enter a Value" required>

        <label for="Inflight entertainment">Inflight entertainment:</label>
        <input type="number" name="Inflight entertainment" placeholder="Enter a Value" required>

      <label for="On-board service">On-board service:</label>
      <input type="number" name="On-board service" placeholder="Enter a Value" required>

      <label for="Leg room service">Leg room service:</label>
      <input type="number" name="Leg room service" placeholder="Enter a Value" required>

      <label for="Baggage_handling">Baggage handling:</label>
      <input type="number" name="Baggage_handling" placeholder="Enter a Value" required
    </div>
      <div class="form-box">
        <h3>Your Ratings - IV</h3>
```

```
          <label for="Checkin service">Checkin service:</label>
        <input type="number" name="Checkin service" placeholder="Enter a Value" required>

        <label for="Inflight service">Inflight service: </label>
        <input type="number" name="Inflight service" placeholder="Enter a Value" required>

        <label for="Cleanliness">Cleanliness: </label>
        <input type="number" name="Cleanliness" placeholder="Enter a Value" required>

        <label for="Departure Delay in Minutes">Departure Delay in Minutes:</label>
        <input type="number" name="Departure Delay in Minutes" placeholder="Enter a Value"
required>

        <label for="Arrival Delay in Minutes">Arrival Delay in Minutes:</label>
        <input type="number" name="Arrival Delay in Minutes" placeholder="Enter a Value" required>

         <button id="predbut"><a href="/Result"><center>Predict</center></a></button>
  </div
  </form
  </main>
</body>

</html>
```

RESULT.HTML

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

<head>
  <meta charset="utf-8">
  <meta content="width=device-width, initial-scale=1.0" name="viewport">
  <title>Airline Passenger Satisfaction</title>
  <meta content="" name="description">
  <meta content="" name="keywords">
  <!-- Main CSS File -->
  <link href="../static/assets/css/main.css" rel="stylesheet">

</head>
```

```
<body class="service-details-page">

  <header id="header" class="header sticky-top">
href="prathyushagone24@gmail.com">prathyushagone24@gmail.com</a></i>
        <i class="bi bi-phone d-flex align-items-center ms-4"><span>8121372537</span></i>
      </div>
      <div class="social-links d-none d-md-flex align-items-center">
        <a href="#" class="twitter"><i class="bi bi-twitter-x"></i></a>

        <a href="#" class="linkedin"><i class="bi bi-linkedin"></i></a>
      </div>
    </div>
  </div><!-- End Top Bar --

        <i class="mobile-nav-toggle d-xl-none bi bi-list"></i>
      </nav>

    </div>

  </div>

 </header
 <main class="body">
    <div class="row gy-4">
      <div class="col-lg-4 col-md-6 footer-about">
        <a href="/index" class="d-flex align-items-center">
          <span class="sitename">Airline Passenger Satisfaction</span>
        </a>
        <div class="footer-contact pt-3">
          <p>Vaagdevi Engineering College</p>
          <p>Bollikunta,Warangal-506002</p>
          <p class="mt-3"><strong>Phone:</strong> <span>8121372537</span></p>
          <p><strong>Email:</strong> <span>vaagdevi@college.com</span></p>



      Designed by <p>Our Team Members</p>
    </div>
  </div>

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

APP.PY

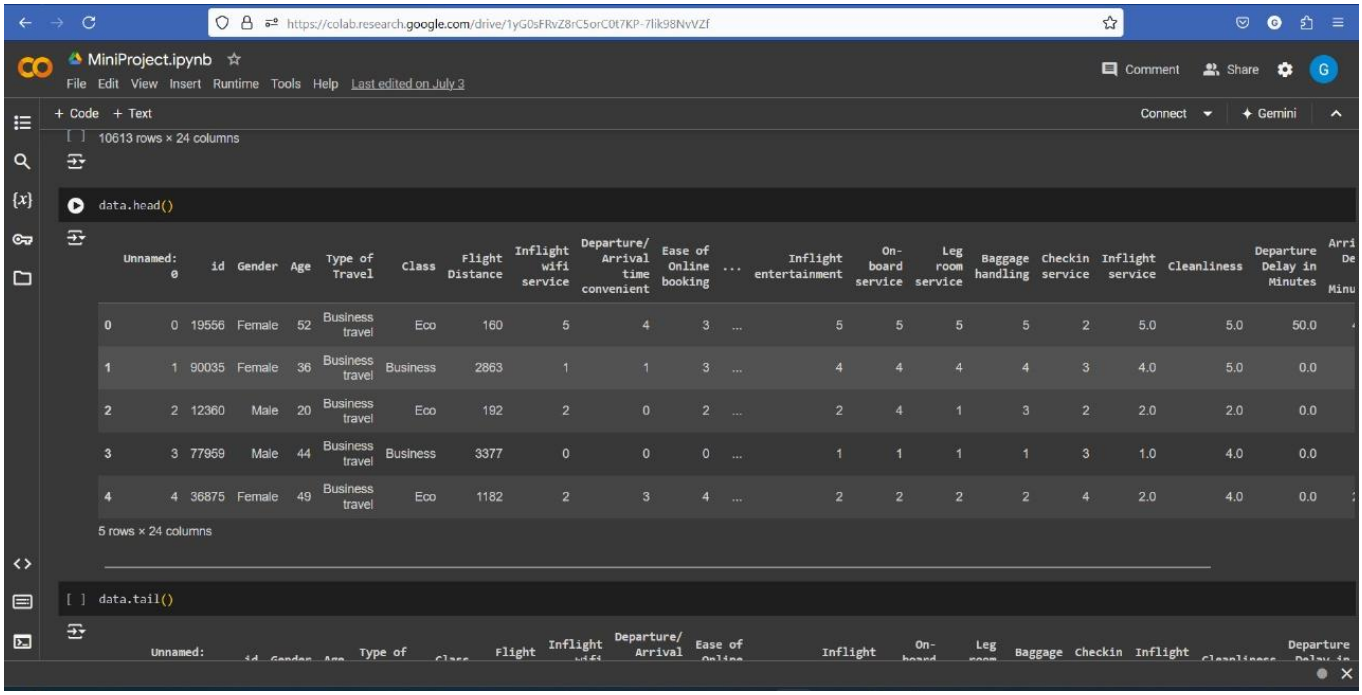
```
import pickle
import numpy as np
import pandas as pd
from flask import Flask,render_template,request

model = pickle.load(open('model.pkl','rb'))

app=Flask(_name_)

@app.route('/')
def home():
    return render_template('index.html')

@app.route('/Prediction')
def predict():
    return render_template('Prediction.html')

@app.route('/Result',methods=["GET","POST"])
def result():
    if request.method=="POST":
        Gender=request.form["Gender"]
        if Gender=="Female":
            Gender=0
        if Gender=="Male":
            Gender=1
        Age=request.form["Age"]
        Class=request.form["Class"]
        if Class=="Bussiness":
            Class=0
        if Class=="Eco":
            Class=1
        if Class=="Eco Plus":
            Class=2
        Flight_Distance = request.form['Flight Distance']
        Inflight_wifi_service = request.form['Inflight wifi service']
        Departure_Arrival_time_convenient = request.form['Departure/Arrival time convenient']
        Ease_of_Online_booking = request.form['Ease of Online booking']
        Gate_location = request.form['Gate location']
```

```
        Food_and_drink = request.form['Food and drink']
        Online_boarding = request.form['Online boarding']
        Seat_comfort = request.form['Seat comfort']
        Inflight_entertainment = request.form['Inflight entertainment']
        On_board_service = request.form['On-board service']
        Leg_room_service = request.form['Leg room service']
        Baggage_handling= request.form['Baggage_handling']
        Checkin_service = request.form['Checkin service']
        Inflight_service = request.form['Inflight service']
        Cleanliness = request.form['Cleanliness']
        Departure_Delay_in_Minutes = request.form['Departure Delay in Minutes']
        Arrival_Delay_in_Minutes = request.form['Arrival Delay in Minutes']
        total = [[Gender, Age,  Class, Flight_Distance, Inflight_wifi_service,
Departure_Arrival_time_convenient, Ease_of_Online_booking, Gate_location, Food_and_drink,
Online_boarding, Seat_comfort, Inflight_entertainment, On_board_service, Leg_room_service,
Baggage_handling, Checkin_service, Inflight_service, Cleanliness, Departure_Delay_in_Minutes,
Arrival_Delay_in_Minutes]]

        print(total)
        prediction = model.predict(total)
        print(prediction)
        pred = prediction[0]
        print(pred)

        if int(pred) == 0:
            pred = "Passengers have satisfies the Airline Service"
        else:
            pred = "Passengers have neutral or dissatisfied the Airline Service"
        print("hello",pred)
        return render_template('Result.html', prediction_text=pred)


if _name=="main_":
  app.run(debug=True)
```

CODE SNIPPETS

MODEL BUILDING

IMPORT LIBRARIES AND READ DATASET



MiniProject.ipynb

10613 rows × 24 columns

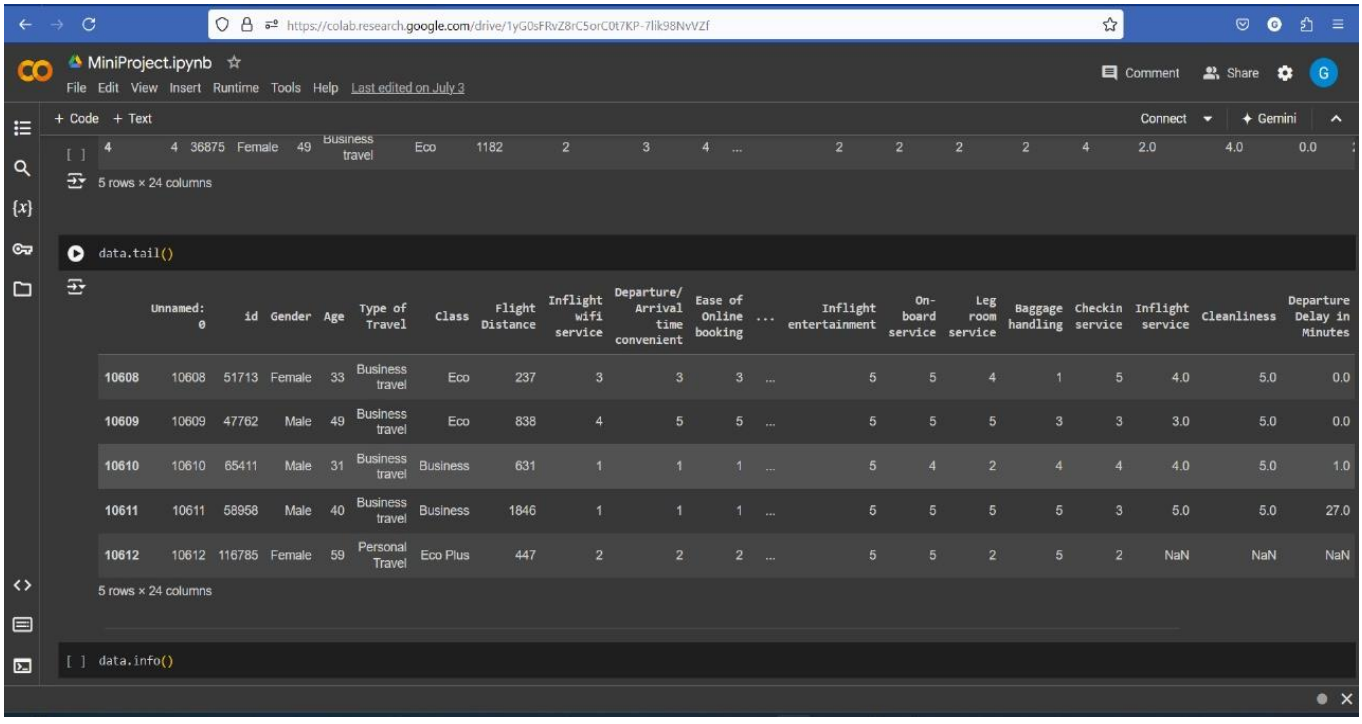
```
data.head()
```

	Unnamed: 0	id	Gender	Age	Type of Travel	Class	Flight Distance	Inflight wifi service	Departure/ Arrival time convenient	Ease of Online booking	...	Inflight entertainment	On-board service	Leg room service	Baggage handling	Checkin service	Inflight service	Cleanliness	Departure Delay in Minutes	Arri De Minu
0	0	19556	Female	52	Business travel	Eco	160	5	4	3	...	5	5	5	5	2	5.0	5.0	50.0	
1	1	90035	Female	36	Business travel	Business	2863	1	1	3	...	4	4	4	4	3	4.0	5.0	0.0	
2	2	12360	Male	20	Business travel	Eco	192	2	0	2	...	2	4	1	3	2	2.0	2.0	0.0	
3	3	77959	Male	44	Business travel	Business	3377	0	0	0	...	1	1	1	1	3	1.0	4.0	0.0	
4	4	36875	Female	49	Business travel	Eco	1182	2	3	4	...	2	2	2	2	4	2.0	4.0	0.0	

5 rows × 24 columns

```
data.tail()
```

PRINT HEAD AND TAIL OF THE DATASET



MiniProject.ipynb

5 rows × 24 columns

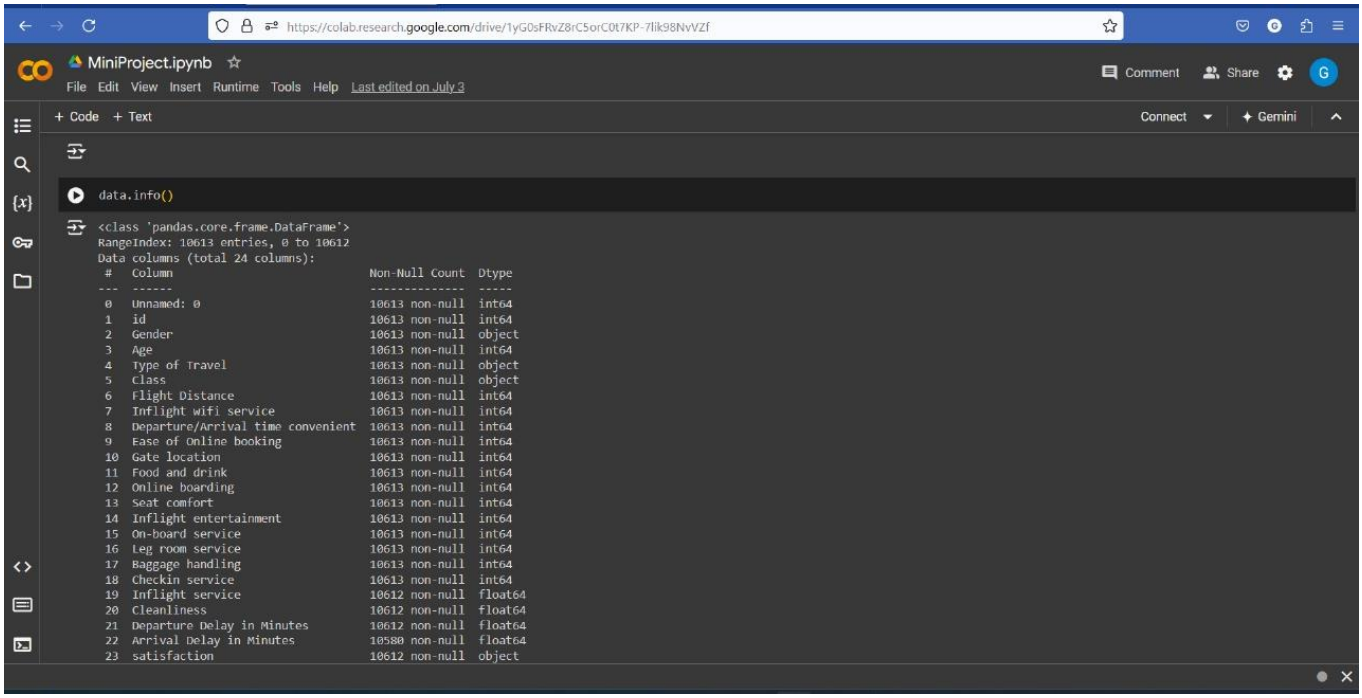
```
data.tail()
```

	Unnamed: 0	id	Gender	Age	Type of Travel	Class	Flight Distance	Inflight wifi service	Departure/ Arrival time convenient	Ease of Online booking	...	Inflight entertainment	On-board service	Leg room service	Baggage handling	Checkin service	Inflight service	Cleanliness	Departure Delay in Minutes
10608	10608	51713	Female	33	Business travel	Eco	237	3	3	3	...	5	5	4	1	5	4.0	5.0	0.0
10609	10609	47762	Male	49	Business travel	Eco	838	4	5	5	...	5	5	5	3	3	3.0	5.0	0.0
10610	10610	65411	Male	31	Business travel	Business	631	1	1	1	...	5	4	2	4	4	4.0	5.0	1.0
10611	10611	58958	Male	40	Business travel	Business	1846	1	1	1	...	5	5	5	5	3	5.0	5.0	27.0
10612	10612	116785	Female	59	Personal Travel	Eco Plus	447	2	2	2	...	5	5	2	5	2	NaN	NaN	NaN

5 rows × 24 columns

```
data.info()
```

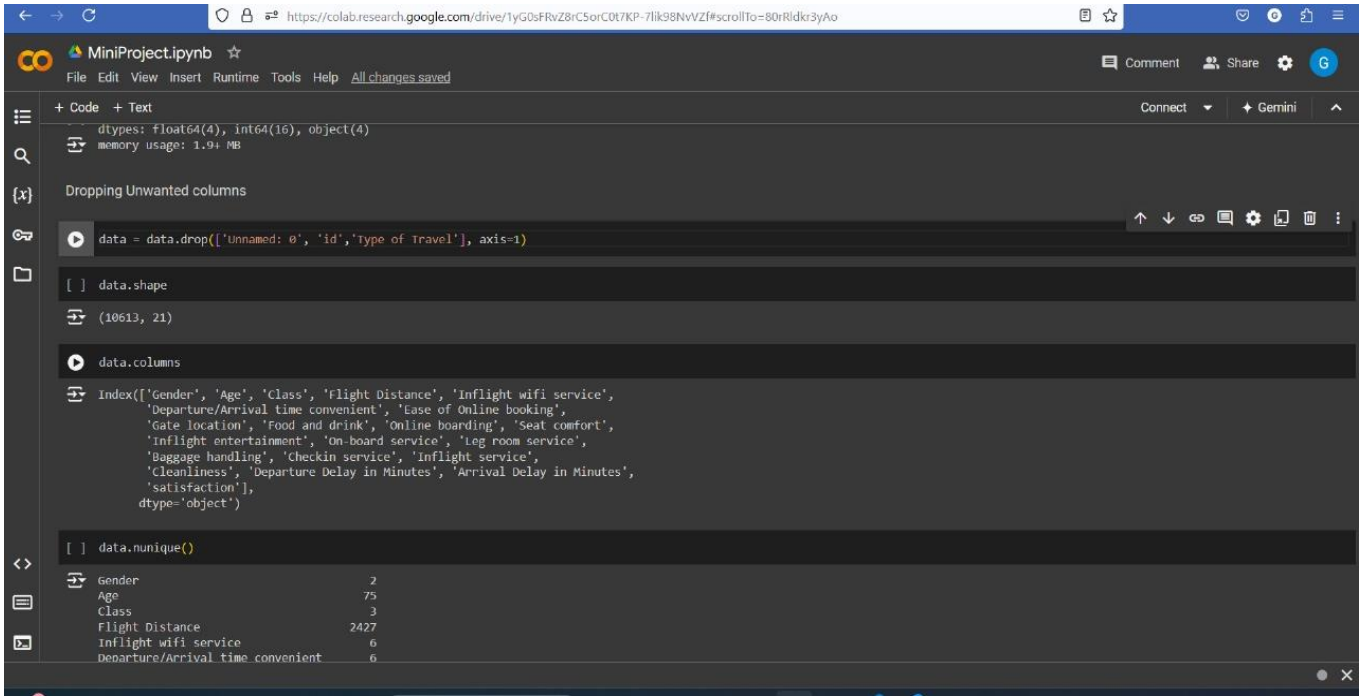
INFO



```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10613 entries, 0 to 10612
Data columns (total 24 columns):
 #   Column                            Non-Null Count  Dtype
---  ------                            --------------  -----
 0   Unnamed: 0                        10613 non-null  int64
 1   id                                10613 non-null  int64
 2   Gender                            10613 non-null  object
 3   Age                               10613 non-null  int64
 4   Type of Travel                    10613 non-null  object
 5   Class                             10613 non-null  object
 6   Flight Distance                   10613 non-null  int64
 7   Inflight wifi service             10613 non-null  int64
 8   Departure/Arrival time convenient 10613 non-null  int64
 9   Ease of Online booking            10613 non-null  int64
 10  Gate location                     10613 non-null  int64
 11  Food and drink                    10613 non-null  int64
 12  Online boarding                   10613 non-null  int64
 13  Seat comfort                      10613 non-null  int64
 14  Inflight entertainment            10613 non-null  int64
 15  On-board service                  10613 non-null  int64
 16  Leg room service                  10613 non-null  int64
 17  Baggage handling                  10613 non-null  int64
 18  Checkin service                   10613 non-null  int64
 19  Inflight service                  10612 non-null  float64
 20  Cleanliness                       10612 non-null  float64
 21  Departure Delay in Minutes        10612 non-null  float64
 22  Arrival Delay in Minutes          10580 non-null  float64
 23  satisfaction                      10612 non-null  object
```

DROP UNWANTED COLUMNS



```
dtypes: float64(4), int64(16), object(4)
memory usage: 1.9+ MB
```

Dropping Unwanted columns

```
data = data.drop(['Unnamed: 0', 'id','Type of Travel'], axis=1)
```

```
data.shape
```

```
(10613, 21)
```

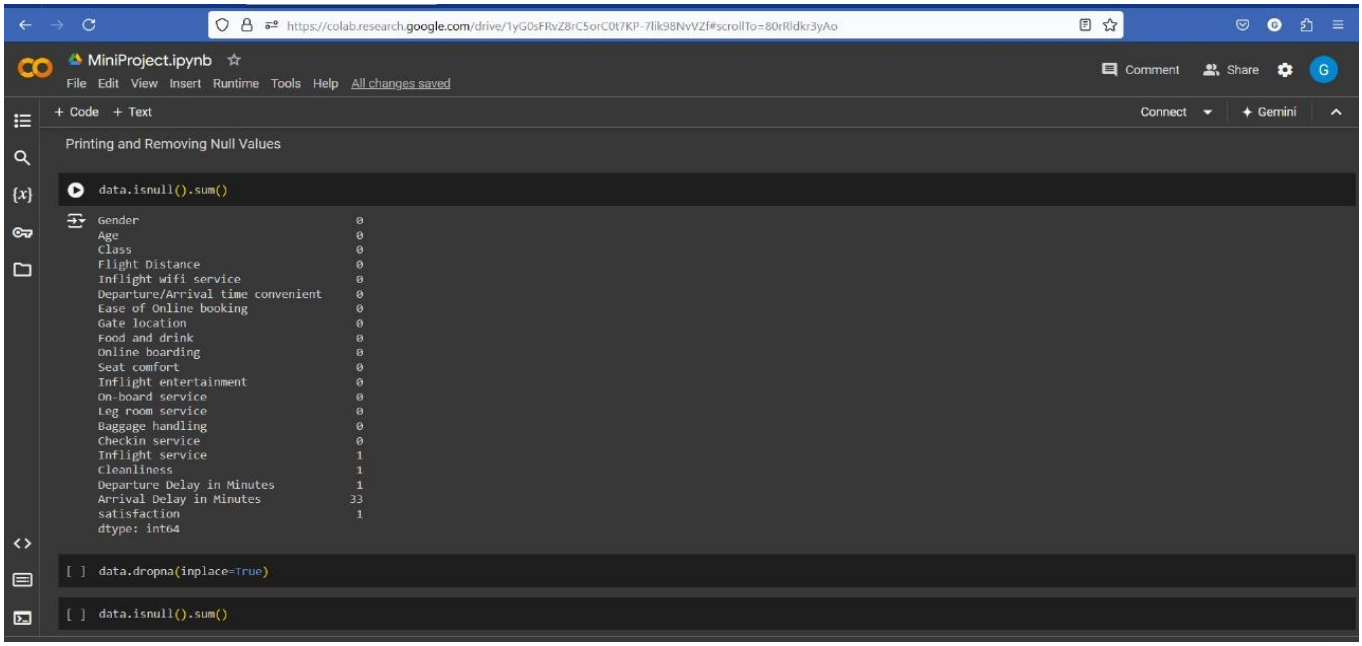
```
data.columns
```

```
Index(['Gender', 'Age', 'Class', 'Flight Distance', 'Inflight wifi service',
       'Departure/Arrival time convenient', 'Ease of Online booking',
       'Gate location', 'Food and drink', 'Online boarding', 'Seat comfort',
       'Inflight entertainment', 'On-board service', 'Leg room service',
       'Baggage handling', 'Checkin service', 'Inflight service',
       'Cleanliness', 'Departure Delay in Minutes', 'Arrival Delay in Minutes',
       'satisfaction'],
      dtype='object')
```

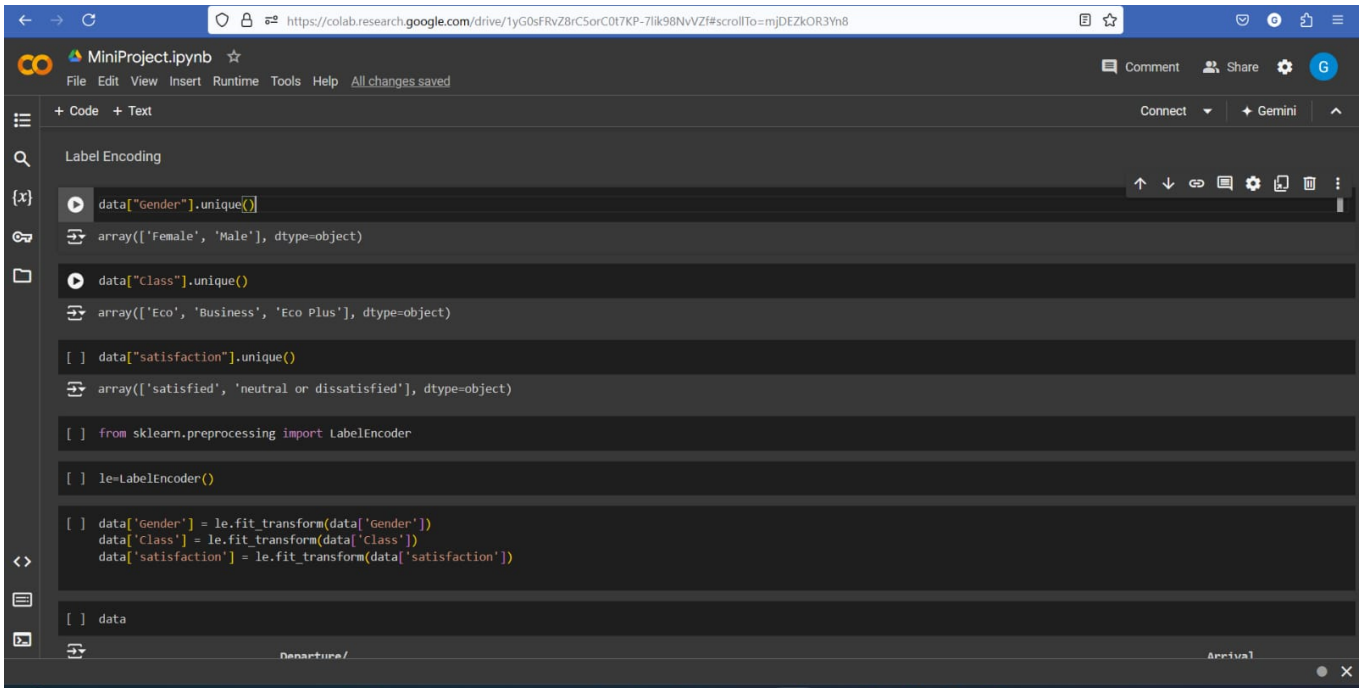
```
data.nunique()
```

```
Gender                              2
Age                                75
Class                               3
Flight Distance                 2427
Inflight wifi service               6
Departure/Arrival time convenient   6
```

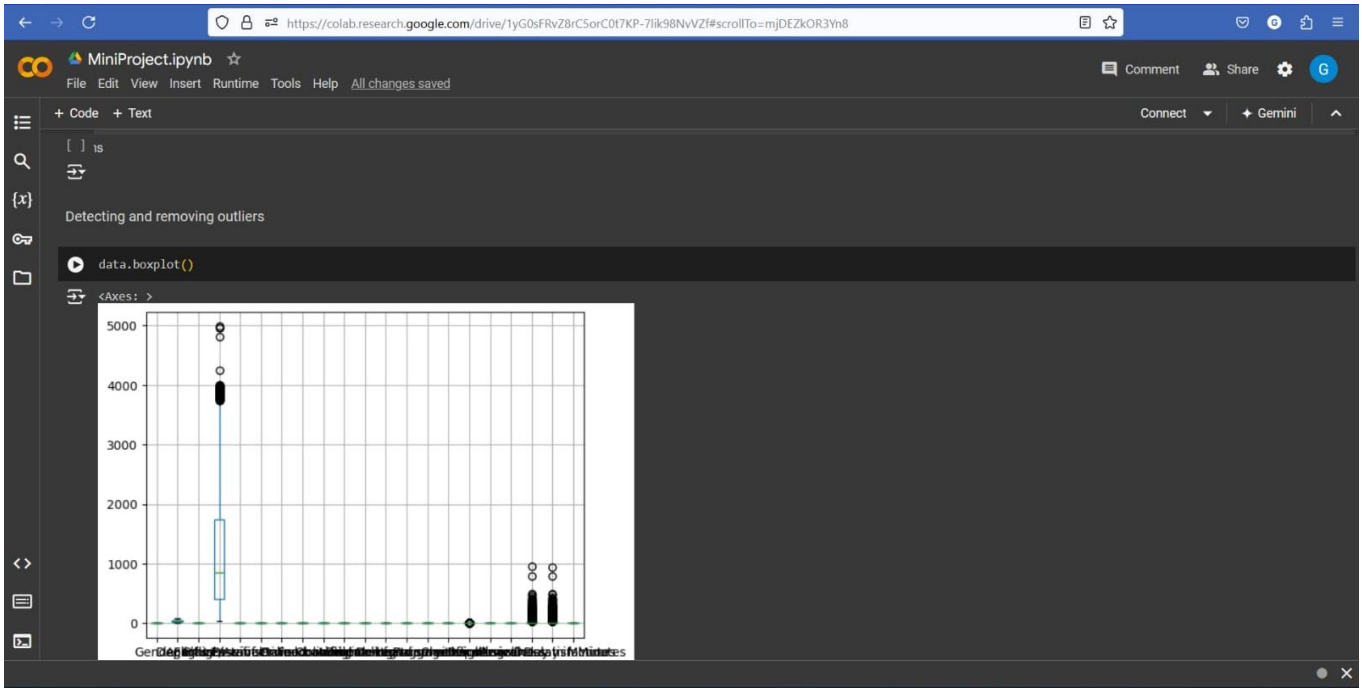
DROP NULL VALUES



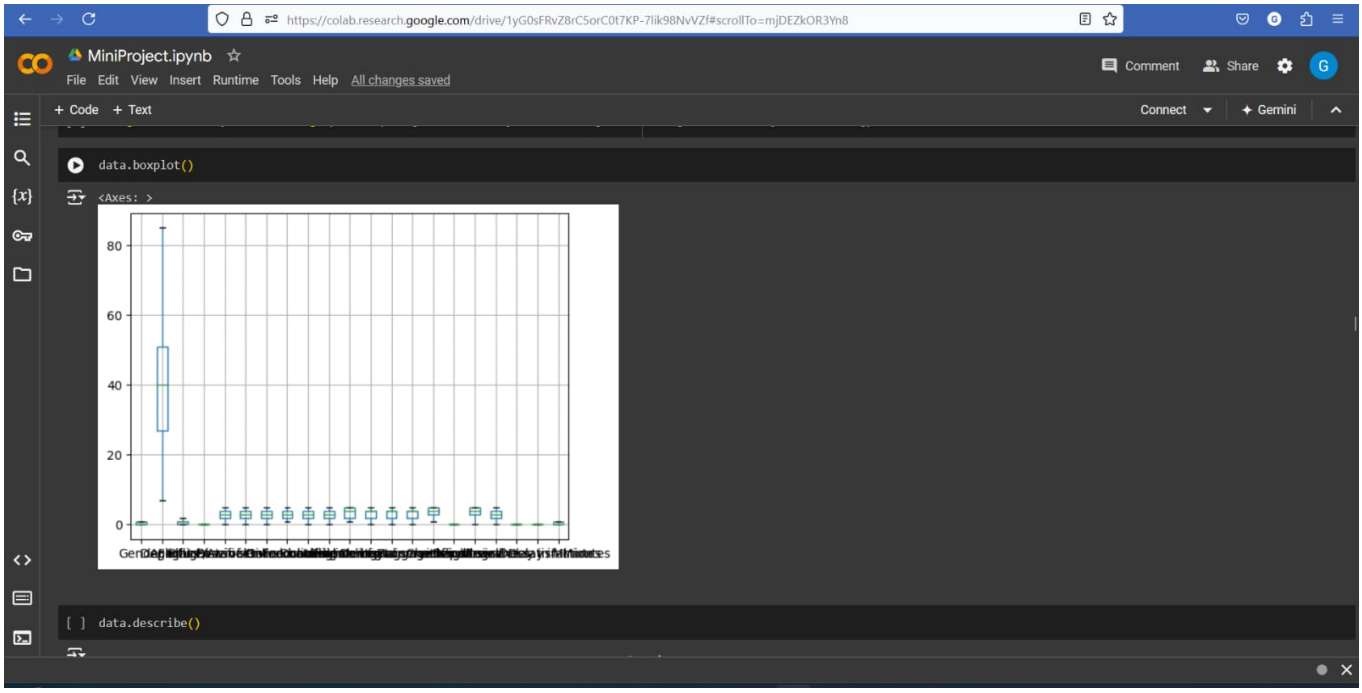
LABEL ENCODING



DETECTING OUTLIERS

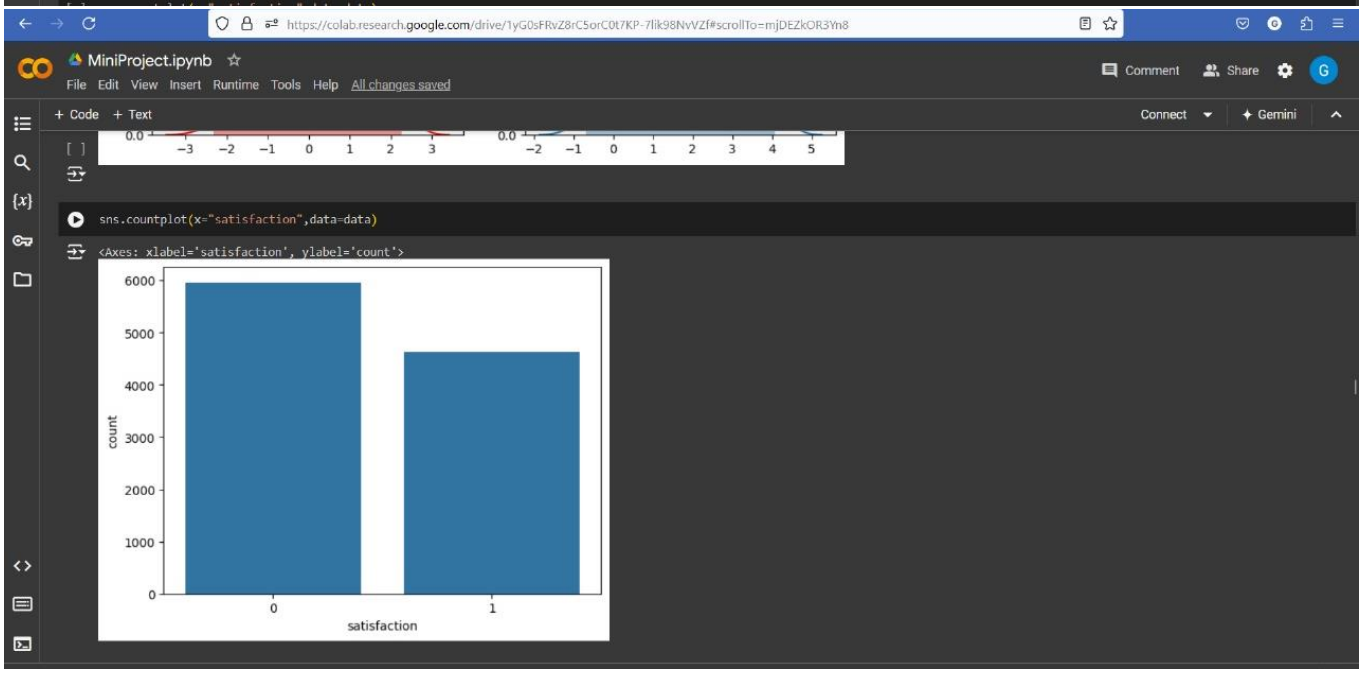


REMOVED OUTLIERS



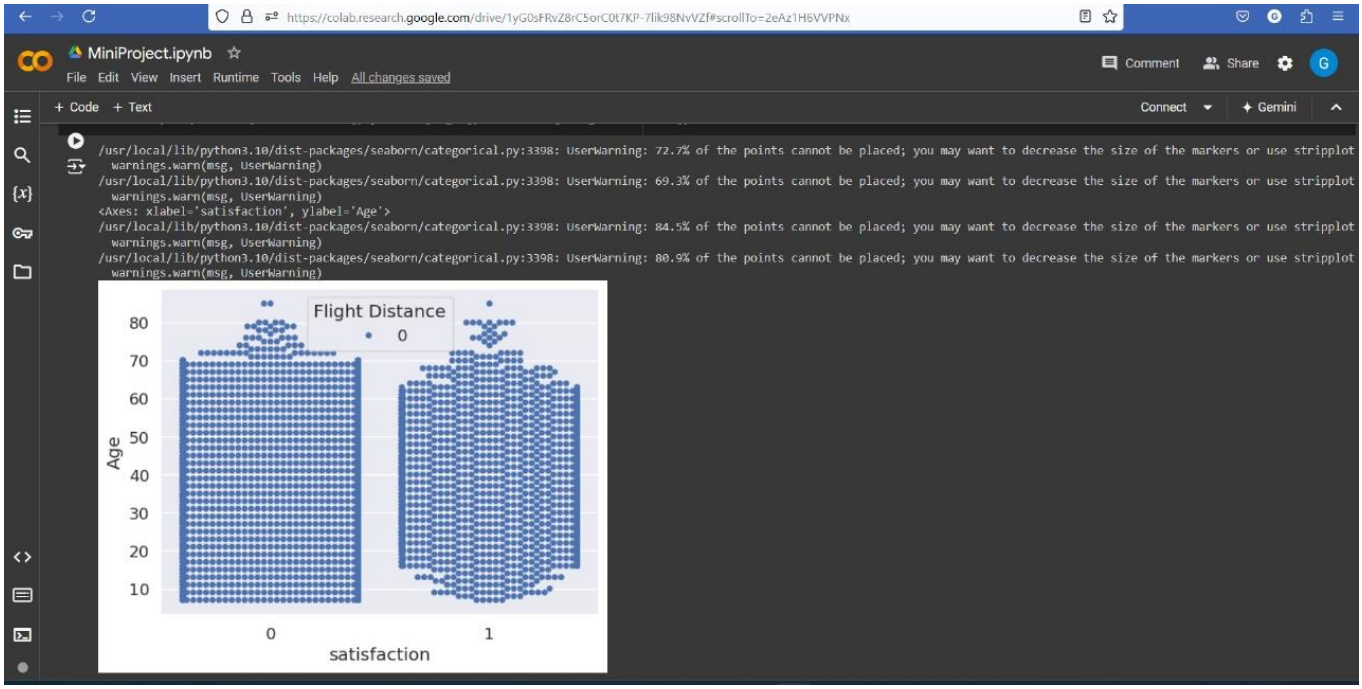
VISUALIZATION:

UNIVARIATE ANALYSIS

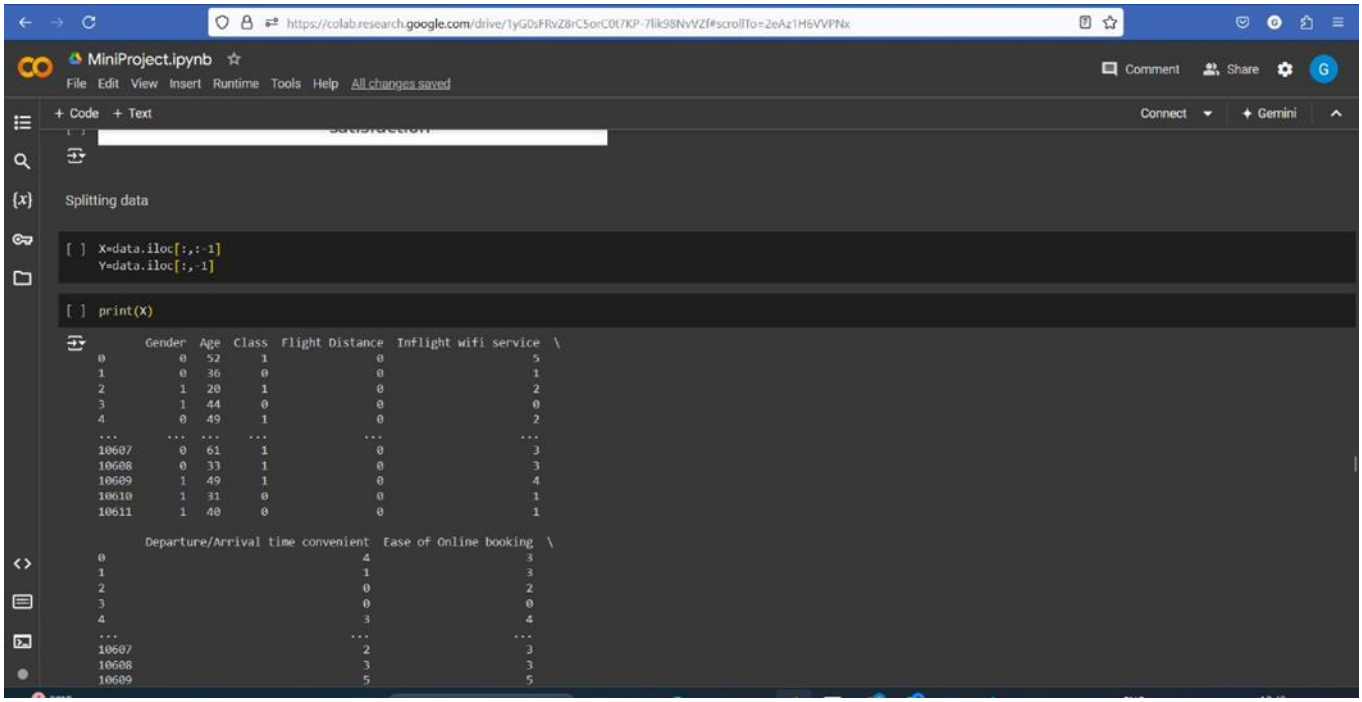


BIVARIATE ANALYSIS

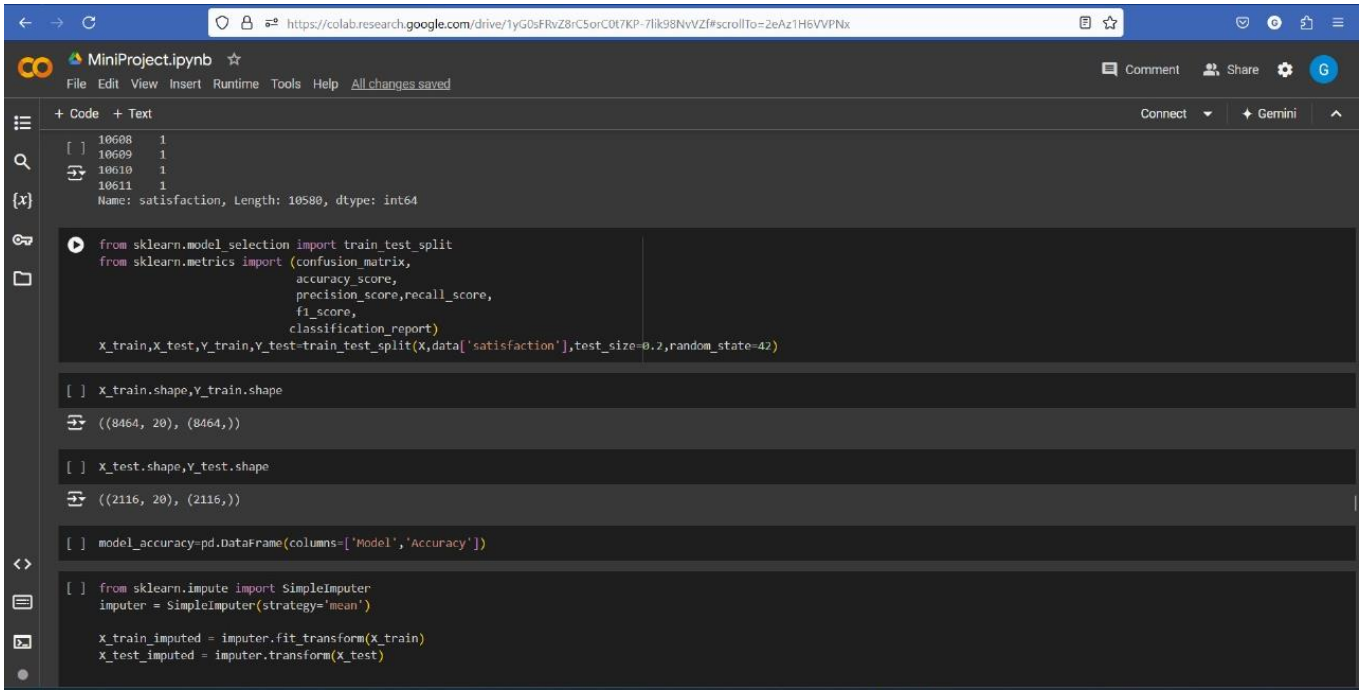
MULTI VARIATE ANALYSIS



SPLITTING OF DATA

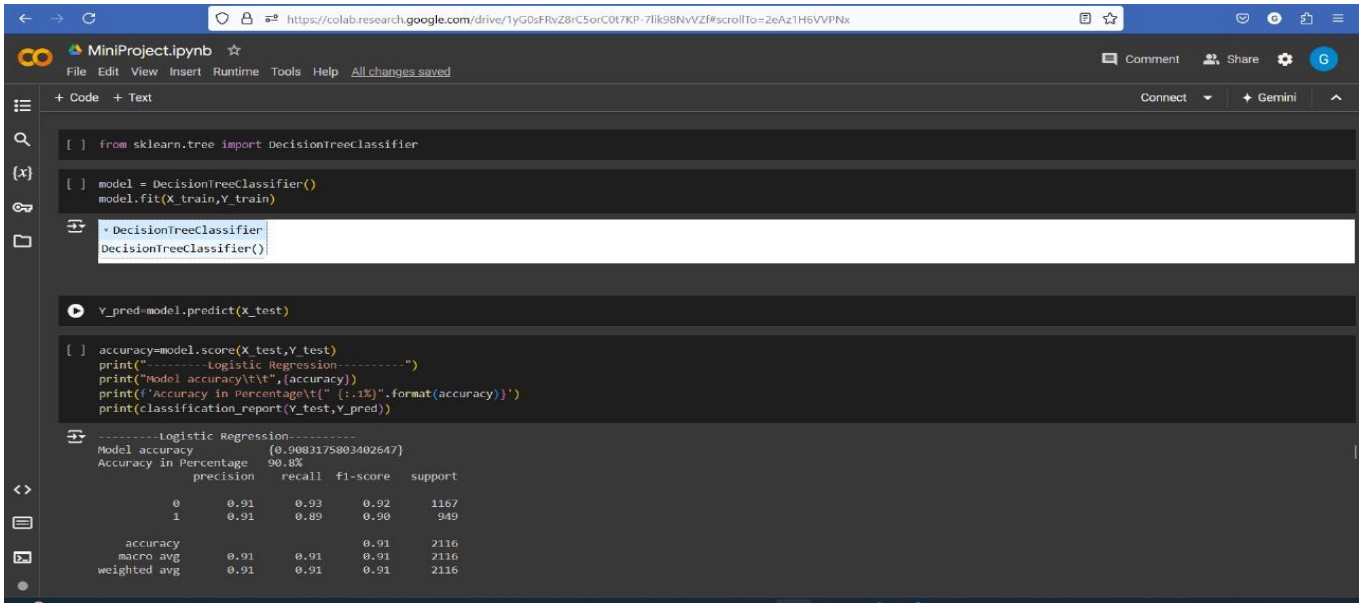


IMPORTING TRAINING AND TESTING LIBRARIES

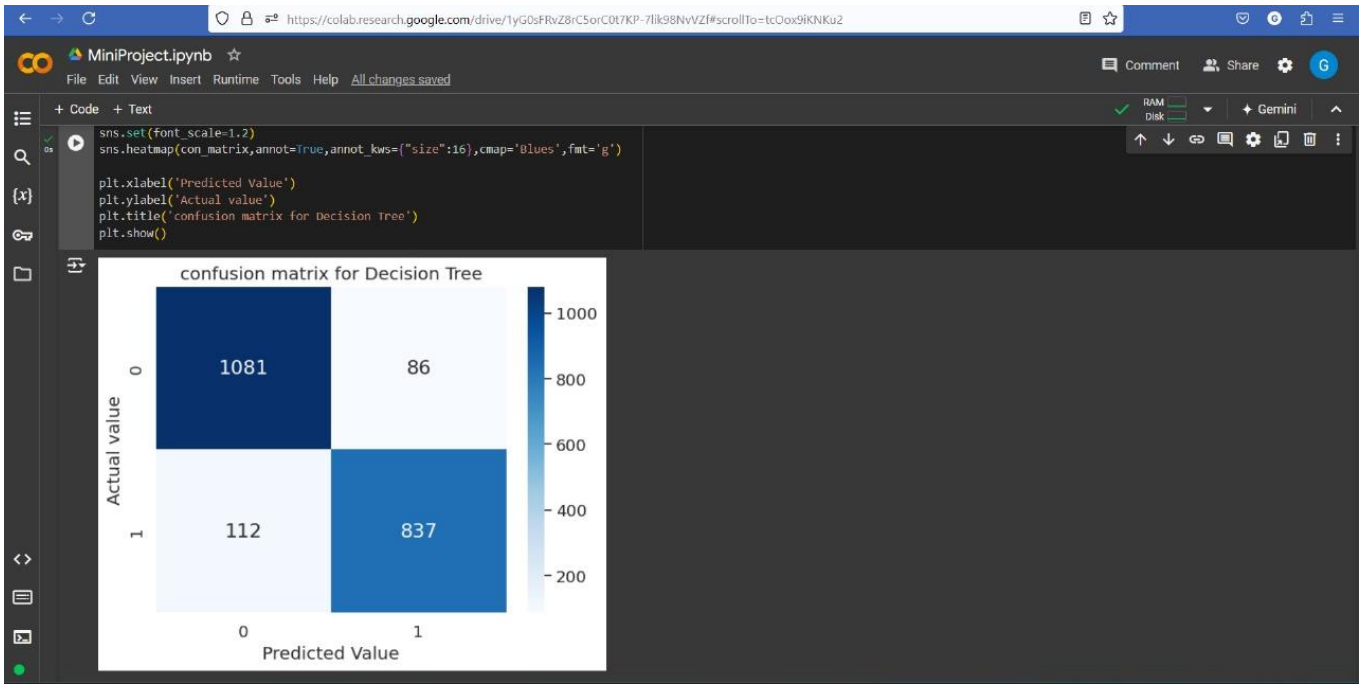


TRAINING THE MODELS IN MULTIPLE ALGORITHMS

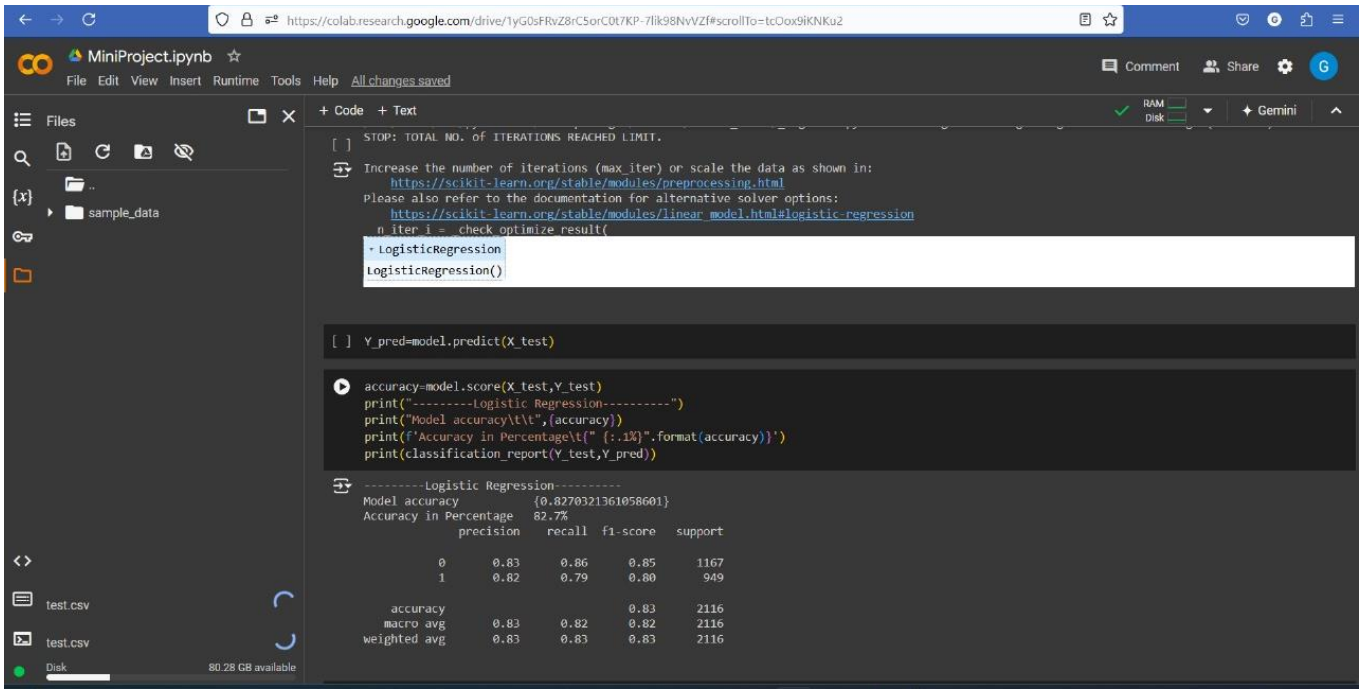
DECISION TREE ALGORITHM



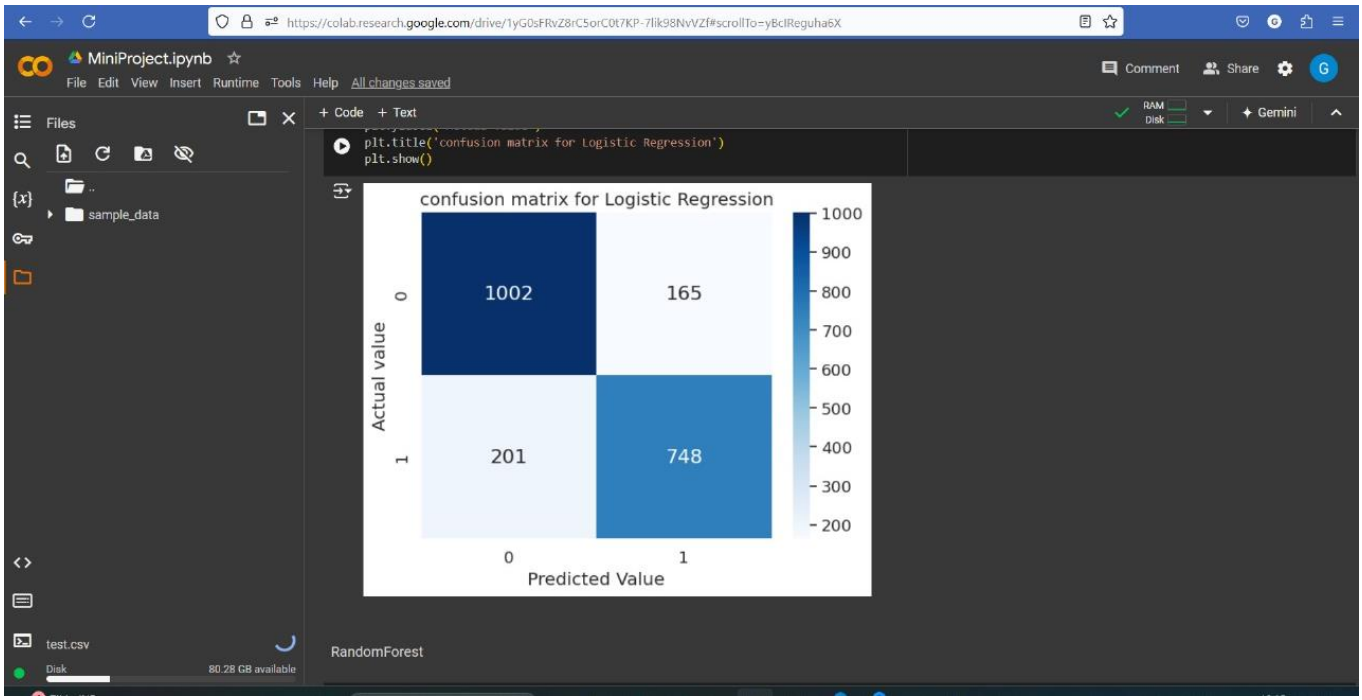
DECISION TREE CONFUSION MATRIX



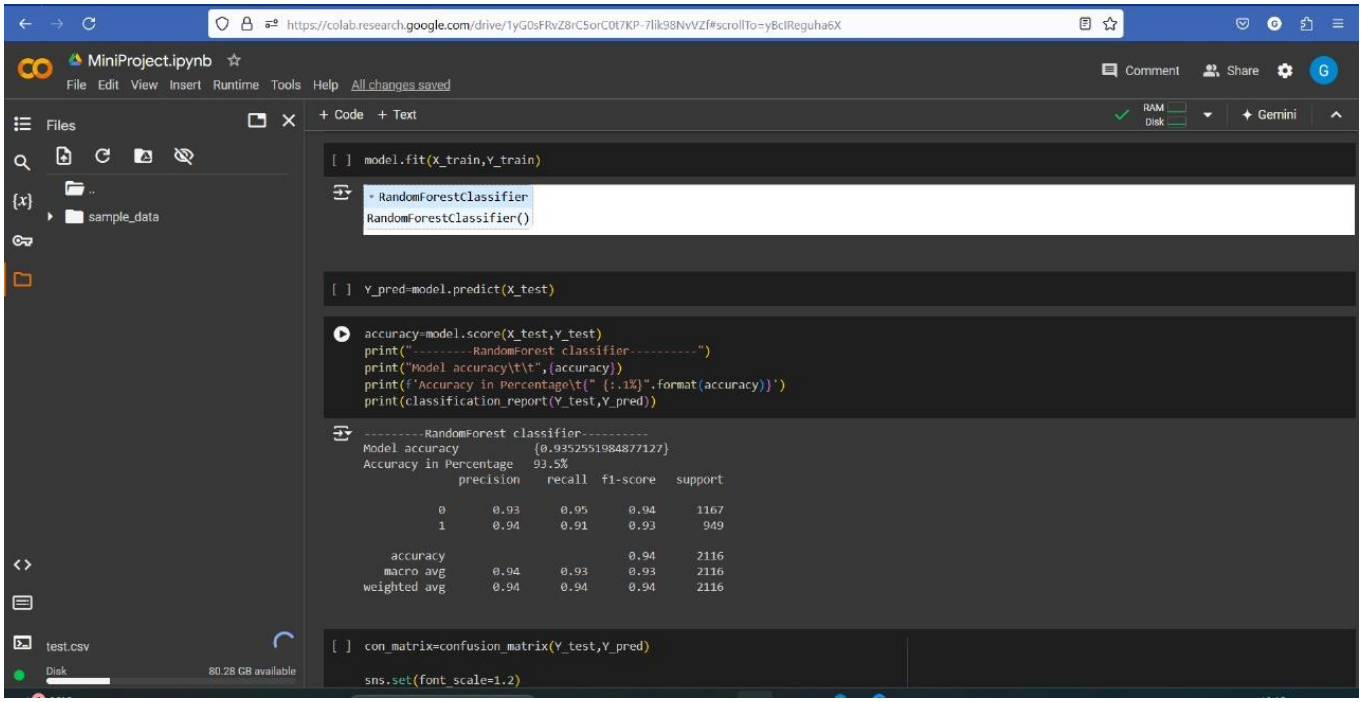
LOGISTIC REGRESSION



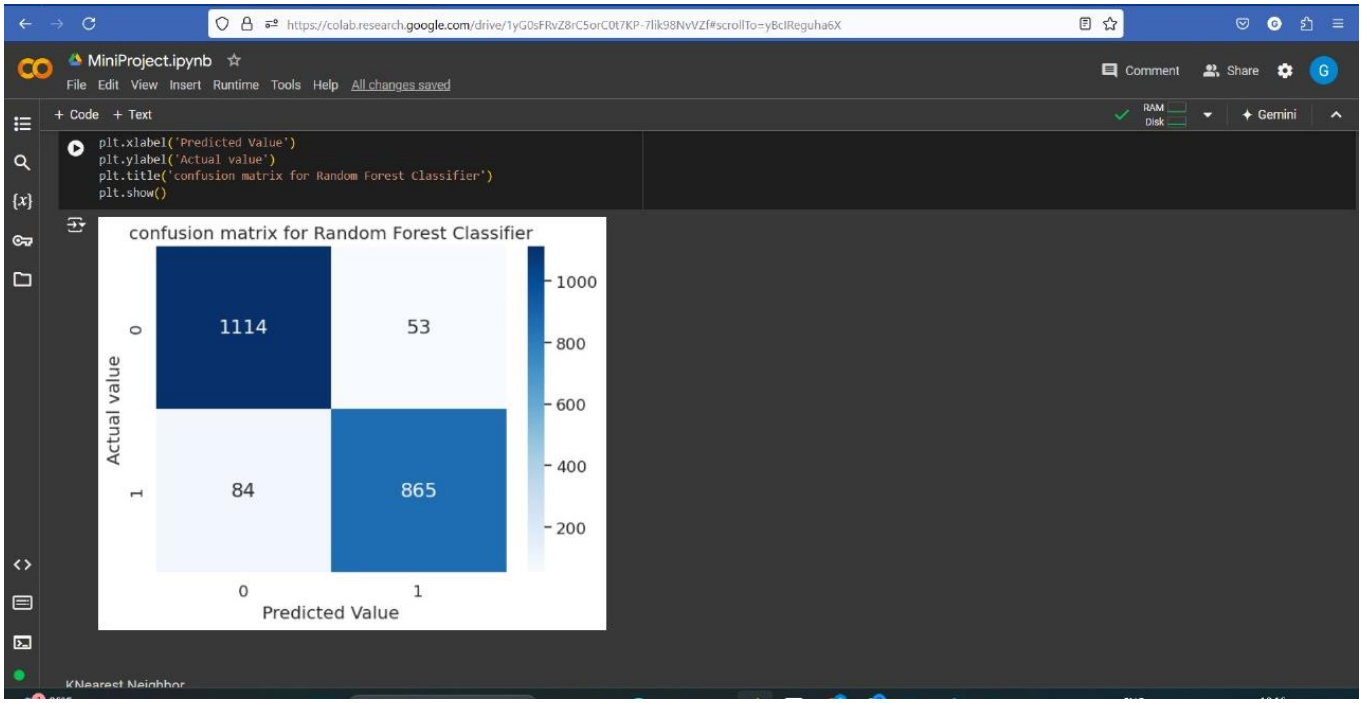
LOGISTIC REGRESSION CONFUSION MATRIX



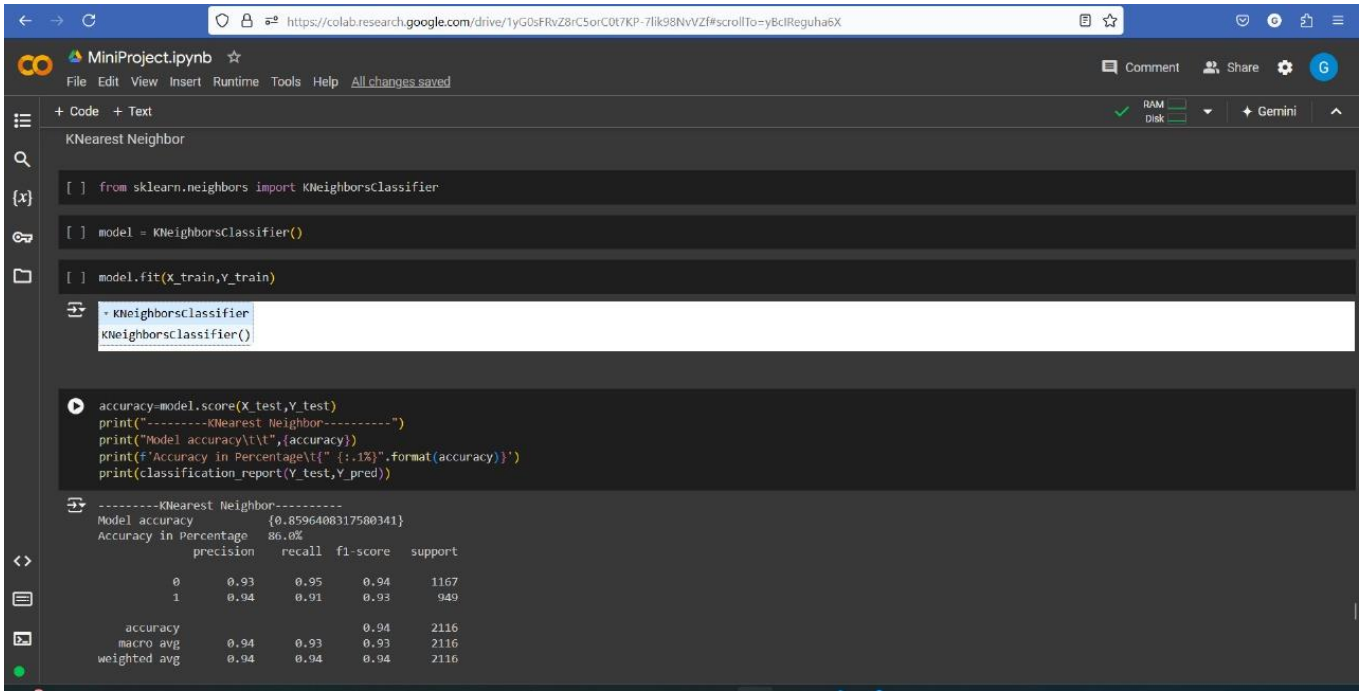
RANDOM FOREST:



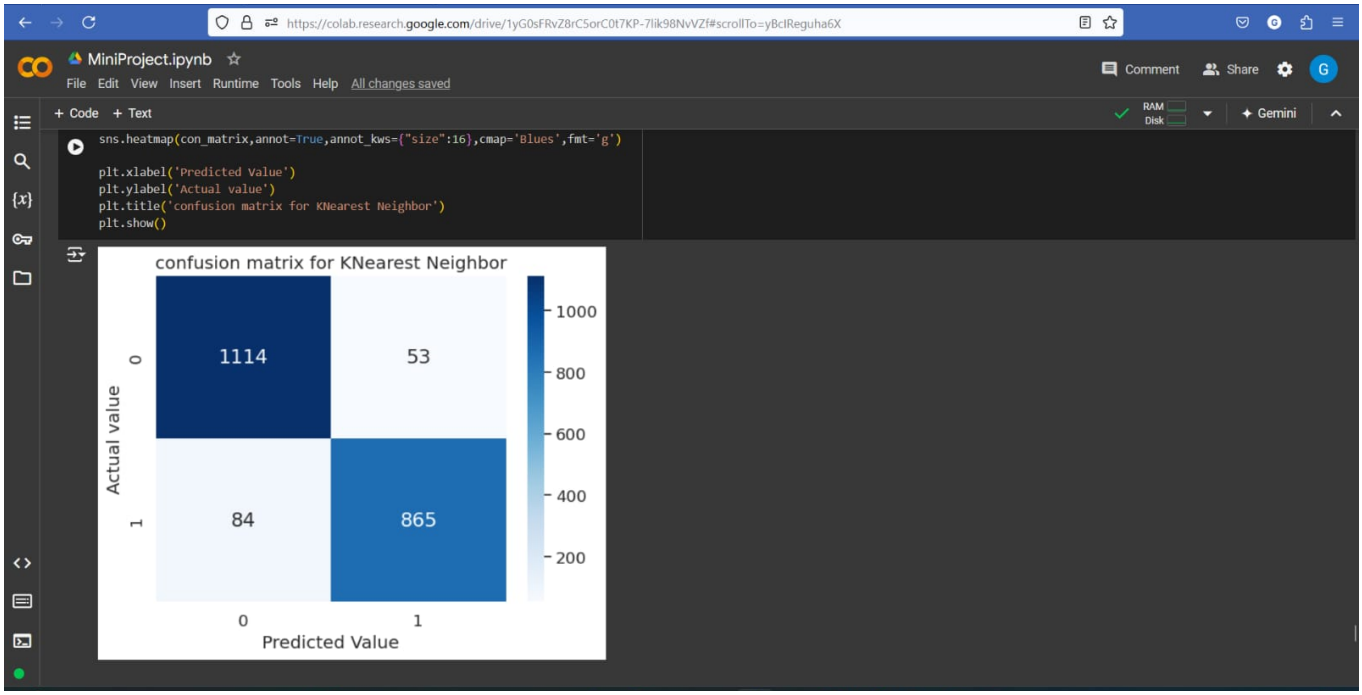
RANDOM FOREST CUSTOM MATRIX



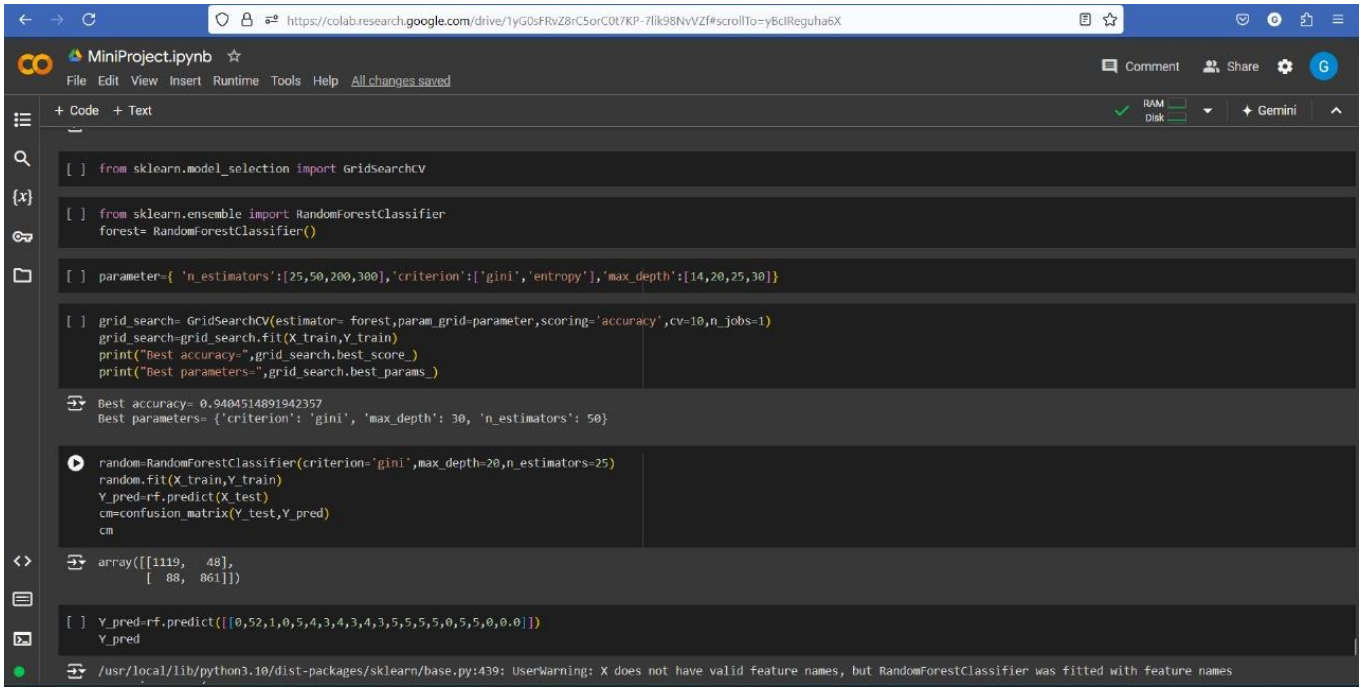
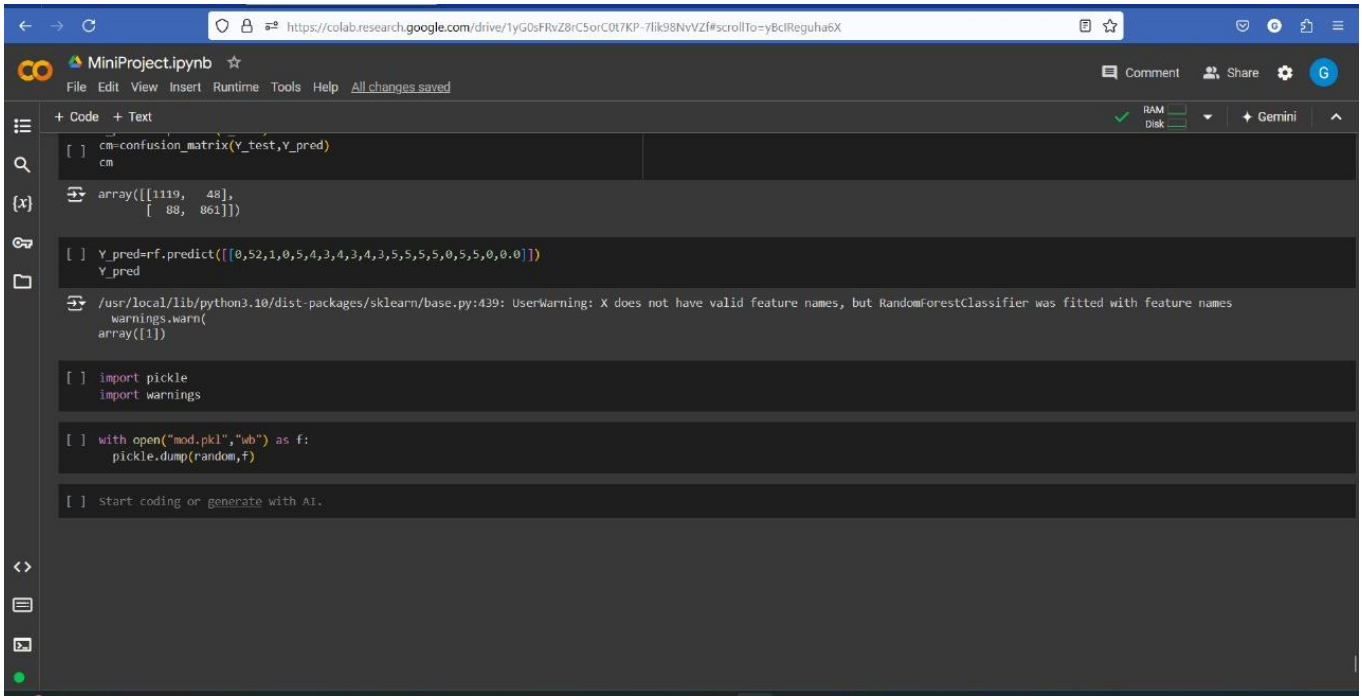
KNN ALGORITHM



KNN CONFUSION MATRIX



SAVING THE BEST MODEL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