Car Price Prediction Based using Machine Learning Algorithms

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Under Guidance

of

Internal Guide

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Acknowledgement

Knowledge in itself is a continuous process. At this moment of our substantial enhancement, We rarely find words to express our gratitude towards those who were constantly involved with us.

The completion of any inter disciplinary project depends upon coordination, cooperation and combined efforts of several resources of knowledge, creativity, skill, energy and time. The work being accomplished now, we feel our sincerest urge to recall and knowledge through these lines, trying our best to give full credit wherever it deserves.

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With Sincere Regards,

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PROJECT PROFILE

Project Name:	Car Price Prediction Based using Machine Learning Algorithm
Type of Application:	Machine Learning
Project Description:	A machine learning project to predict car price using features like model ,brand, odometer reading(km), fuel type ,Number of Owners ,Engine Capacity, year for informed-decision making.
Team Size:	3 students.
Front End:	HTML, CSS, JavaScript, Bootstrap
Back End:	Python , Flask as web Framework , SQLite3
Dataset used:	Realistic_Car_data from Kaggle
Tools used:	VS Code, Google Colab

INTRODUCTION TO TOOLS

❖ Introduction to Tools

➢ FrontEnd:

- The front-end of a website or web app is what users see and interact with. It includes the design, layout, buttons, menus, and everything you can click or view. The main technologies used to build the front-end are HTML, CSS, and JavaScript.

  - **HTML (HyperText Markup Language) :**

    HTML is like the building blocks of a web page. It gives structure to the content—like headings, paragraphs, images, and links.

  - **CSS (Cascading Style Sheets):**

    CSS is used to make the website look good. It controls colors, fonts, spacing, and layout. Some CSS tools, like Tailwind CSS, give you ready-made classes to make designing faster and easier.

  - **JavaScript:**

    JavaScript makes websites interactive and more user-friendly. It allows you to do things like show or hide content, handle button clicks, respond to user actions, and update parts of the page without reloading it.

  - **Bootstrap:**

    Bootstrap is a widely used front-end framework that helps developers create stylish and responsive websites easily. It includes ready-made templates for buttons, forms, layouts, and more. Bootstrap also offers built-in JavaScript components like modals, carousels, and dropdowns to add interactivity without writing a lot of custom code.

➢ Back End:

- The back-end of a website or web app is the part that works behind the scenes. It handles things like storing data, processing user input, and connecting to databases.

  - **Python:**

    Python is a popular programming language that is easy to read and write. It's used in many areas like web development, data analysis, artificial intelligence, and more. Python has lots of built-in features and external libraries that help developers build powerful applications quickly and easily.

  - **Flask:**

    Flask is a simple web framework for Python. It helps you build websites and web apps easily. With Flask, you can create routes (URLs), handle user requests, and connect to databases. It's lightweight, flexible, and great for both beginners and experienced developers who want full control over their apps.

  - **SQLite3:**

    SQLite3 is a database that comes with Python. It stores data in a single file and is very easy to use. You don't need to install anything extra to use it. It's perfect for small to medium-sized apps, and is often used during development or for apps that don't need a complex database.

SYSTEM STUDY

❖ System Study:

➢ Existing System: -

- The current car price prediction market still relies on outdated methods like manual assessments and expert opinions, which are often inconsistent and error-prone. These traditional approaches fail to evaluate dynamic factors such as mileage, condition, and market trends effectively. They also lack scalability and real-time data processing, making them inefficient in handling large datasets. As a result, inaccurate pricing leads to market imbalances and financial losses for both buyers and sellers.

➢ Proposed System : -

- To overcome these challenges, the Machine Learning-based Car Price Prediction System leverages advanced algorithms to provide accurate, scalable, and real-time price predictions. The proposed system utilizes a data-driven approach, integrating key features such as:

  - **Model Type** (e.g., sedan, SUV, hatchback)
  - **Brand Type** (e.g., BMW, Toyota, Honda)
  - **Year** (Car make year)
  - **Engine Capacity** (In Liters)
  - **Odometer Reading (km)** (vehicle usage and wear)
  - **Fuel Type** (e.g., petrol, diesel, electric)
  - **Number of Owners**

- By employing machine learning techniques such as Regression Models, Decision Trees, Random Forest the system enhances prediction accuracy while ensuring adaptability to real-time data. This solution minimizes human error, improves efficiency, and enables informed decision-making for buyers, sellers, and dealers in the automotive market.

  - **Admin Module**
    - View registered users and search user history
    - Access and search user prediction history
    - Export user and prediction data in CSV, Excel, or PDF formats
    - Visualization charts

  - **User Features**
    - User can predict data easily by just enter few number of inputs
    - After prediction user can give feedback
    - Download prediction results with input details PDF formats

➢ Scope of the Proposed System:-

- **Role: Customer**

  ➢ Price Prediction
  - Input car details such as Model Type, Brand, Year, Odometer Reading, Fuel Type, Mileage, and Number of Owners to receive an estimated car price.
  - Access real-time, data-driven price predictions to make informed buying or selling decisions.

  ➢ Download Results
  - Option to download prediction results with all input parameters PDF format.

- **Role: Admin**

  ➢ User and Prediction Data Management

  - View registered users and their prediction history.
  - Search within user and prediction data using filters (e.g., name, car model).
  - Export user data and prediction history in CSV, Excel, or PDF formats.
  - View charts for visualization.

  ➢ Data Management

  - Upload and manage datasets for training/testing the machine learning model.
  - Update key attributes like Brand, Model Type, Fuel Type, Mileage, and other pricing factors to ensure accurate predictions.

  ➢ System Monitoring

  - Monitor and evaluate the performance of the prediction model.
  - Ensure data quality, resolve inconsistencies, and maintain overall system accuracy.

➢ Aims and Objective of Proposed System: -

- The primary aim of the Car Price Prediction System is to develop a machine learning-based solution that provides accurate and real-time car price estimations based on key vehicle attributes. This system is designed to enhance transparency, reduce human error, and facilitate informed decision-making for both buyers and sellers in the automotive industry. By integrating advanced machine learning techniques and real-time market analysis, the system ensures a transparent, data-driven, and highly efficient approach to vehicle price estimation.

➢ Objectives: -

- Build an Accurate Prediction Model
  - Develop a robust machine learning model that utilizes historical and real-time data to provide accurate car price predictions.
- Utilize Key Vehicle Attributes
  - Incorporate critical input parameters such as Model Type, Brand, Year, Mileage, Fuel Type, Odometer Reading, and Number of Owners for improved prediction accuracy.
- Customer-Oriented Functionality
  - Provide a user-friendly interface for customers to input car details and receive instant price estimates.
  - Allow customers to download prediction results PDF for personal use.
- Admin-Oriented Functionality
  - Enable administrators to view and manage registered users and search prediction history with relevant filters.
  - Allow admins to download user and prediction data in CSV, Excel, or PDF formats for reporting and analysis.
- Efficient Data Management
  - Provide tools for administrators to upload, update, and manage datasets used for training and testing the ML model, including car-related attributes such as brand, model type, mileage, and fuel type.
- System Monitoring and Maintenance
  - Equip administrators with the ability to monitor model performance, maintain data integrity, handle inconsistencies, and ensure continuous system reliability.
- Support Informed Decision-Making
  - Help buyers, sellers, and dealers make better decisions by offering transparent, objective, and data-driven insights into vehicle pricing.

❖ Feasibility Study

➢ Operational feasibility (Functionality)

- In order to predict the price , user needs a desktop which consists of following features:
  - **Car Price Prediction** – Users can input vehicle details such as model type, odometer reading, fuel type, year, brand, mileage and Number of Owners to get an estimated price.
  - **Intelligent Prediction Model** – The system leverages machine learning algorithms to generate precise price estimations based on real-time data.
  - **Input Fields** – Users enter details such as car brand, model year, fuel type, and mileage to ensure accurate predictions.
  - **Predict Price Button** – Initiates the machine learning model to process the data and generate a predicted price instantly.
  - **Instant Price Output** – Displays the calculated car price in real time based on the input attributes.
  - **Downloadable Prediction Result** – Users have the option to download the prediction result along with all input details in PDF format
  - **User-Friendly Interface** – Features a clean, minimalistic UI designed for ease of use, ensuring a seamless experience for buyers.

➢ Technical feasibility (Tools)

- The Car Price Prediction System is a web-based machine learning application designed to provide accurate and real-time car price estimations. The system is developed using a combination of modern programming languages, frameworks, and tools to ensure efficiency, scalability, and seamless user interaction.

- The main technology and tools associated with this system are as follows:

  - **Front End**
    HTML, CSS, JavaScript, Bootstrap
  - **Back End**
    Python (for processing predictions & handling backendlogic)
  - **Machine Learning Model**
    Random Forest (for property price prediction)
  - **Tools Used**
    Visual Studio Code
    Google Colab
  - **Frameworks & Libraries**
    Flask
    Scikit-Learn (for ML model)

➢ Economic Feasibility (Budget)

- The Car Price Prediction System is designed to be a cost-effective solution, leveraging open-source tools and frameworks to minimize development expenses. The key economic considerations are as follows:

  - **Visual Studio Code** – A free, open-source code editor available for download, eliminating any licensing costs.
  - **Google Colab** – A free cloud-based platform that provides a Jupyter Notebook environment with GPU/TPU support, enabling efficient model development and testing without the need for high-end local hardware.
  - **No Hosting Costs** – Since the system is not deployed on a cloud or paid hosting service, there are no additional infrastructure expenses involved

SYSTEM ANALYSIS

❖ System Analysis:

❖ Requirements Specification (along with System Modules): -

✓ Customer Module & Admin Module

➢ Purpose:-

- The Car Price Prediction System is designed to provide accurate, data-driven price estimations for used vehicles using Machine Learning (ML) techniques. Traditional car valuation methods often rely on manual assessments and expert opinions, which can be inconsistent and inaccurate. The system utilizes a machine learning model to provide accurate and data-driven price predictions, enabling users to make informed buying decisions.

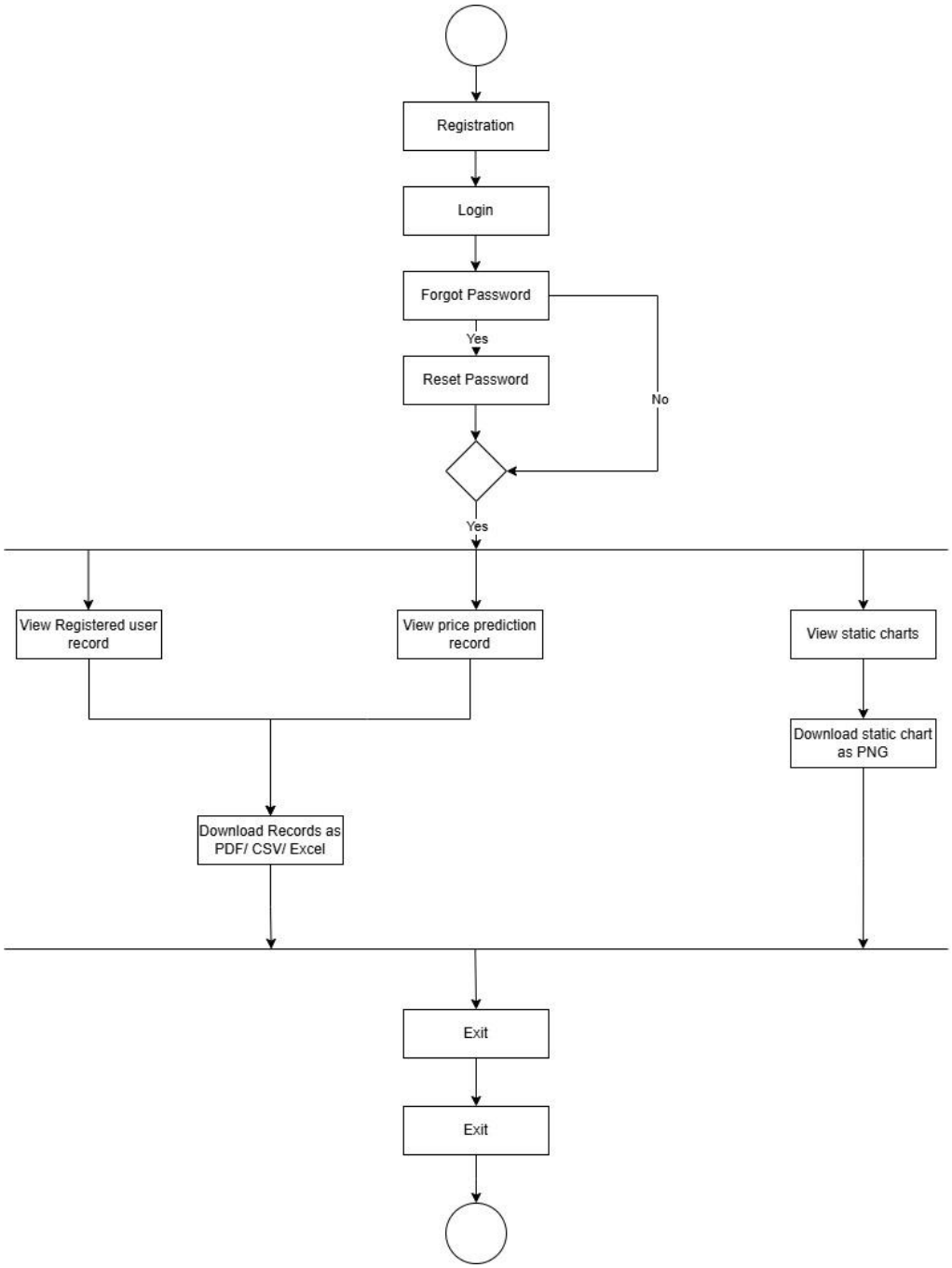
➢ Intended Audience: -

- Car Buyers: Individuals looking to purchase a used car and seeking a fair price estimate based on market trends
- Car Dealerships & Resellers: Businesses that need automated, data-driven pricing to optimize inventory valuation and sales strategies
- Financial Institutions & Insurance Companies: Organizations requiring accurate car valuation data for loan approvals, insurance policies, and risk assessment.
- Market Analysts & Researchers: Professionals analyzing automotive market trends, depreciation rates, and pricing models for research and business insights

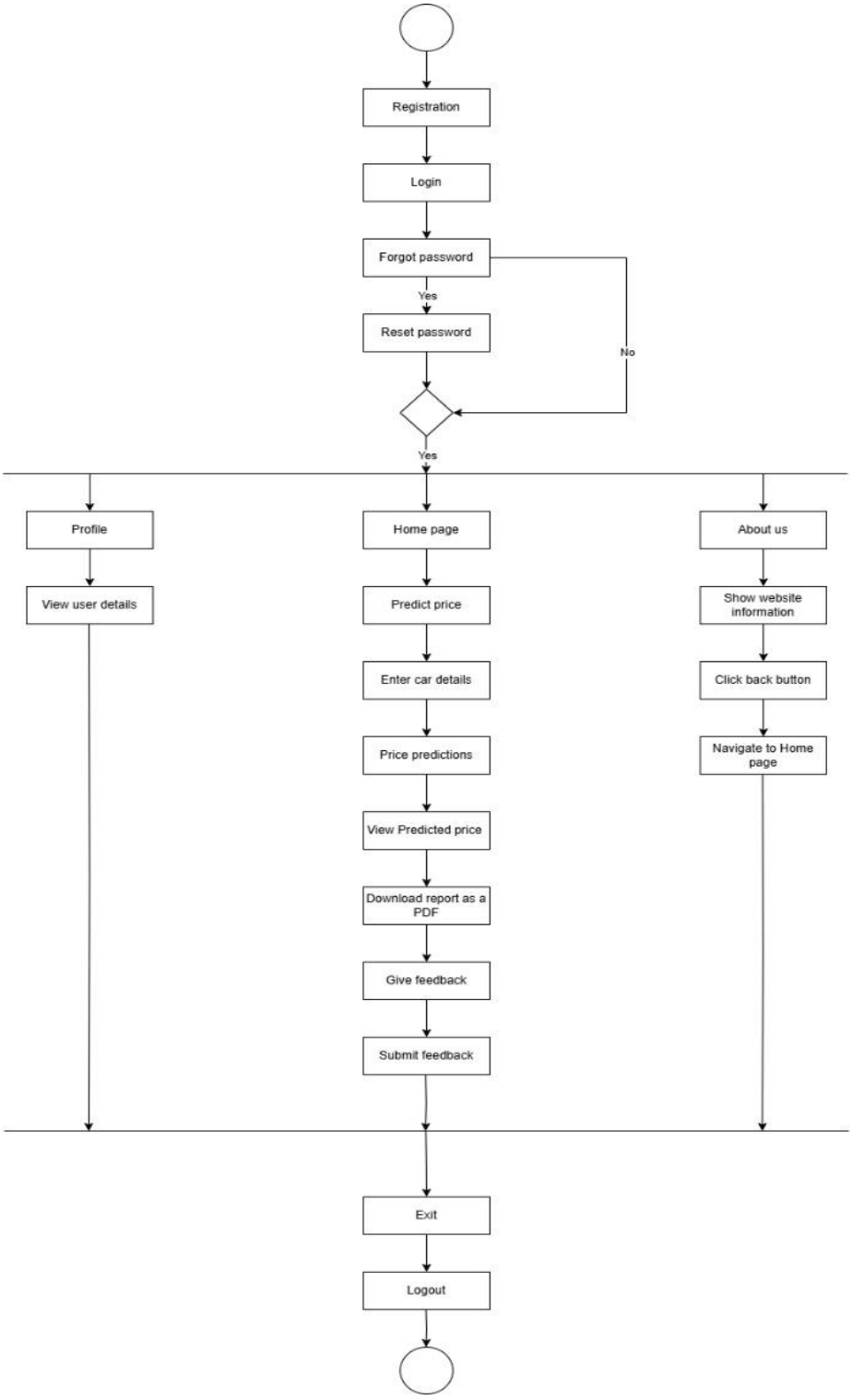
❖ Use Case Diagram

❖ Activity Diagram :

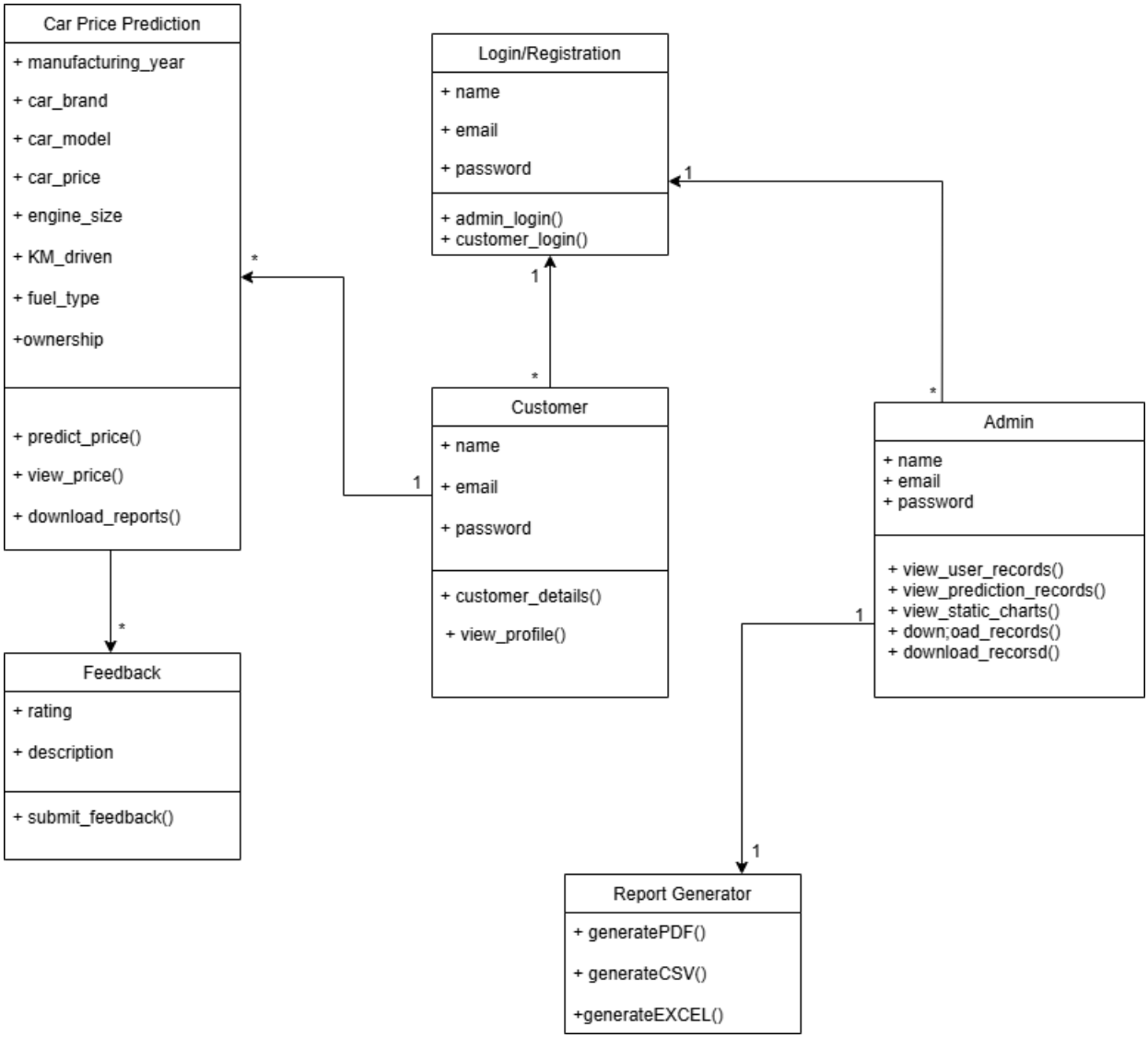
➢ User :



➢ Admin :


Registration
Login
Forgot password
Yes
No
Reset password
Yes
Profile
View user details
Home page
Predict price
Enter car details
Price predictions
View Predicted price
Download report as a PDF
Give feedback
Submit feedback
About us
Show website information
Click back button
Navigate to Home page
Exit
Logout

❖ Clas Diagram :



SYSTEM DESIGN

❖ Data Dictionary:

✓ User Table :

Column	Type	Constraint	Description
I'd	INTEGER	Primarykey(Autoincrement)	User Id
Name	TEXT	Not null	User Full Name
Username	TEXT	Unique,Not null	User Name
Password	TEXT	Not null	User Password
E-mail	TEXT	Not null	User EmailAddress
Phone	TEXT	Not null	User Phone Number
Address	TEXT	Not null	User Address
City	TEXT	Not null	User city
State	TEXT	Not null	User state
Country	TEXT	Not null	User Country
Zip	TEXT	Not null	Zip code of city

✓ Prediction Table :

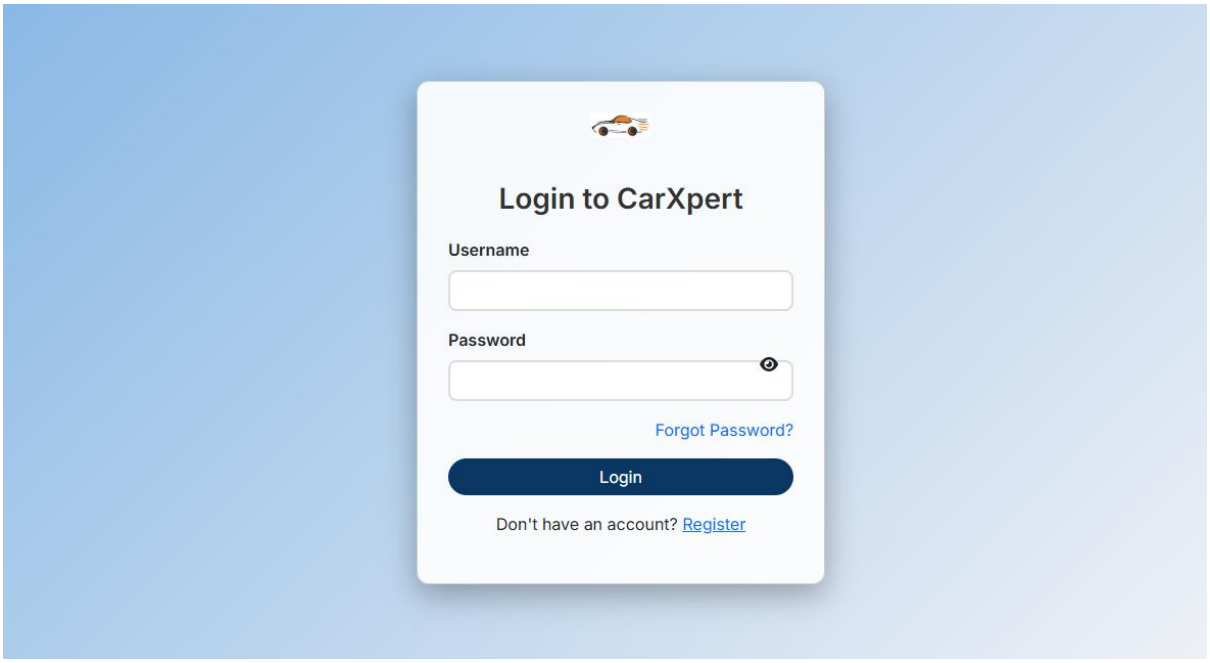
Column	Type	Constraint	Description
Id	INTEGER	Primary key(Autoincrement)	Unique Id
User_Id	INTEGER	Not null	User id
Year	INTEGER	Not null	Car make year
Odometer	REAL	Not null	Odometer reading
Engine_size	REAL	Not null	Engine size of car
Brand	TEXT	Not null	Brand of car
Model_name	TEXT	Not null	Car model name
Fuel_type	TEXT	Not null	Fuel type of car
Owner	INTEGER	Not null	Number of Owner
Predicted_price	REAL	Not null	Predicted price
Rating	INTEGER	Null (Default 0)	Feedback rating
Feedback_text	TEXT	Null	Comment
Timestamp	DATETIME	DEFAULT CURRENT_TIMESTAMP	Store time

- ✓ **Reset Token Table:-**

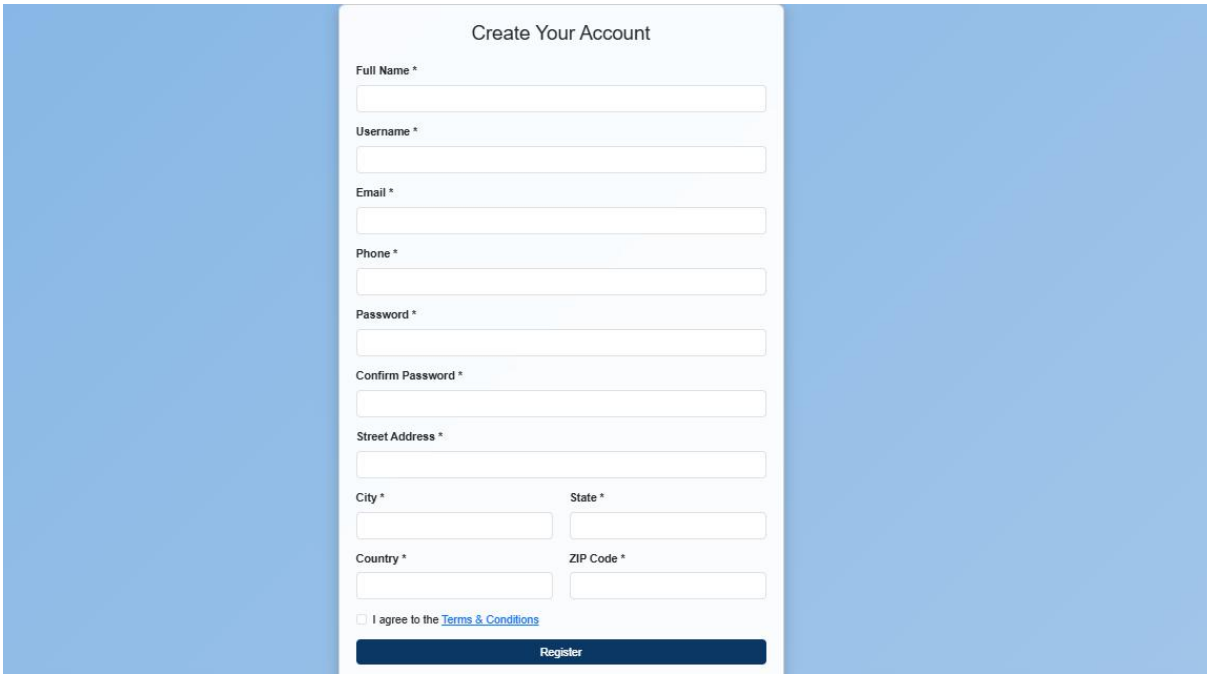
Column	**Type**	**Constraint**	**Description**
Id	INTEGER	Primary key(Autoincrement)	Unique id
Email	TEXT	Not null	User email address
Token	TEXT	Not null	Unique Secure String

❖ Screen Layouts :

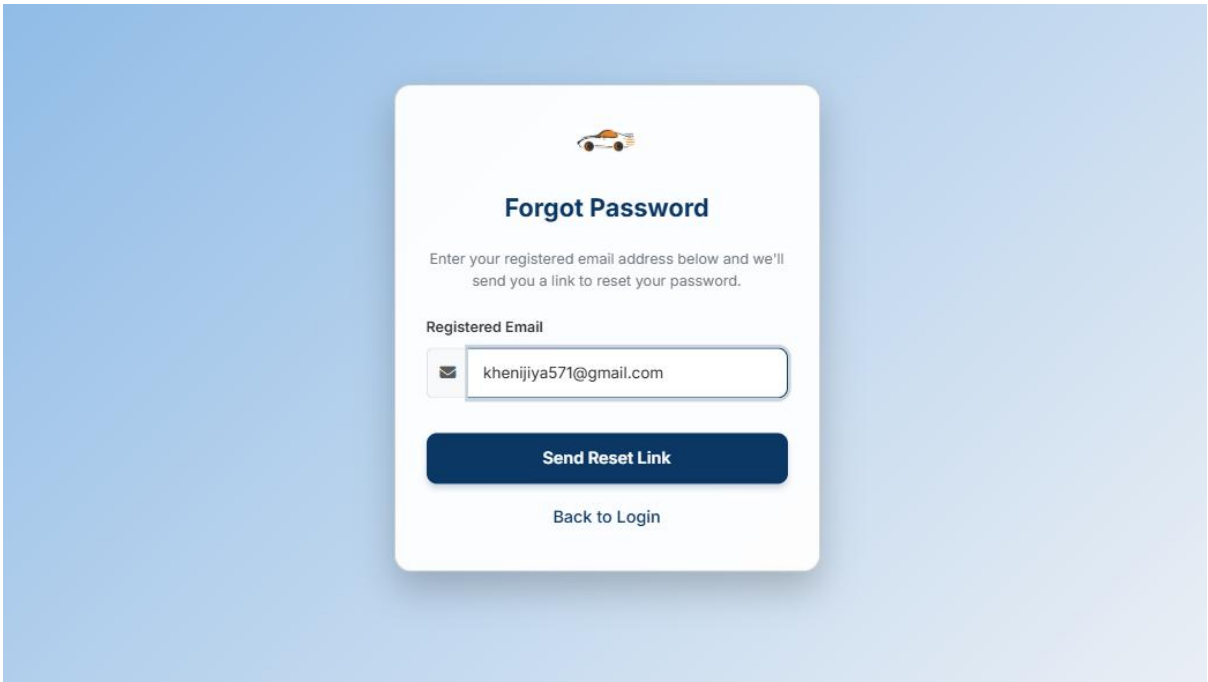
➢ Login Page :



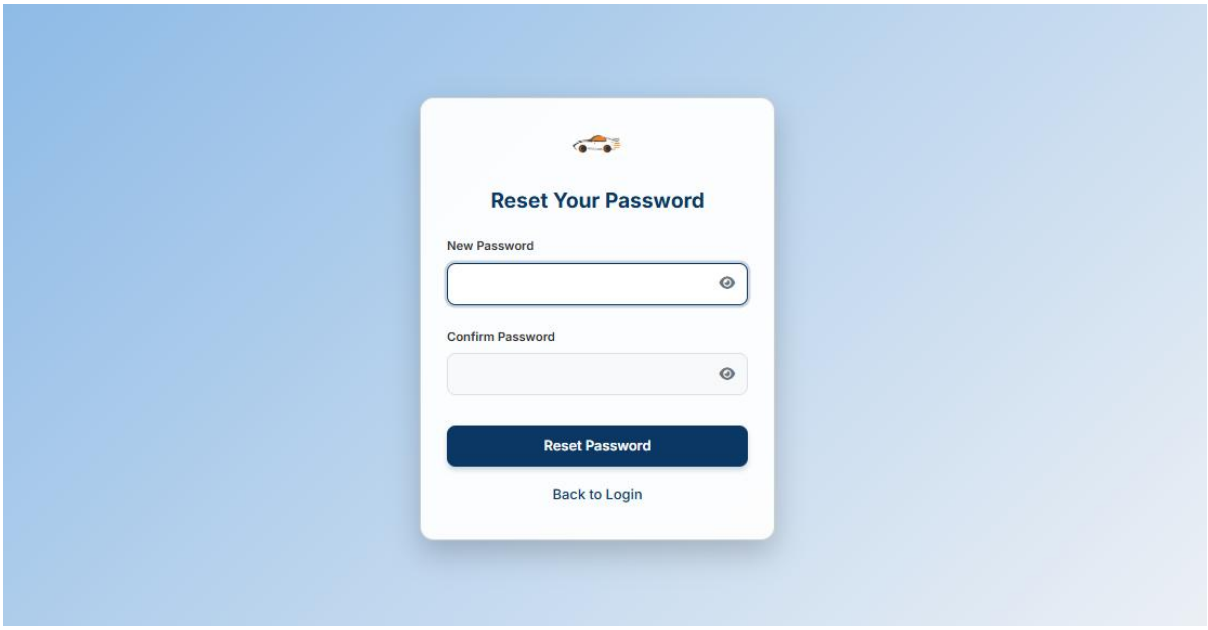
➢ Registration Page :



- **Forgot Password Functionality Page :**

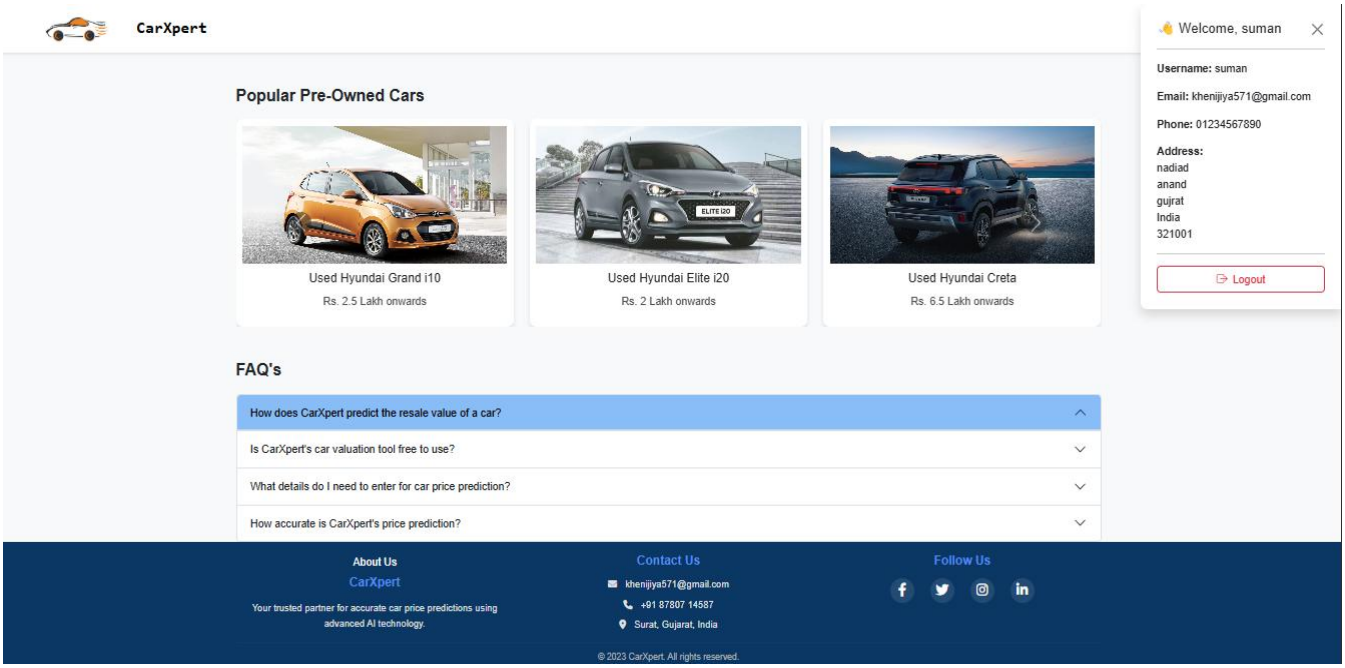


- **Reset Password page :**

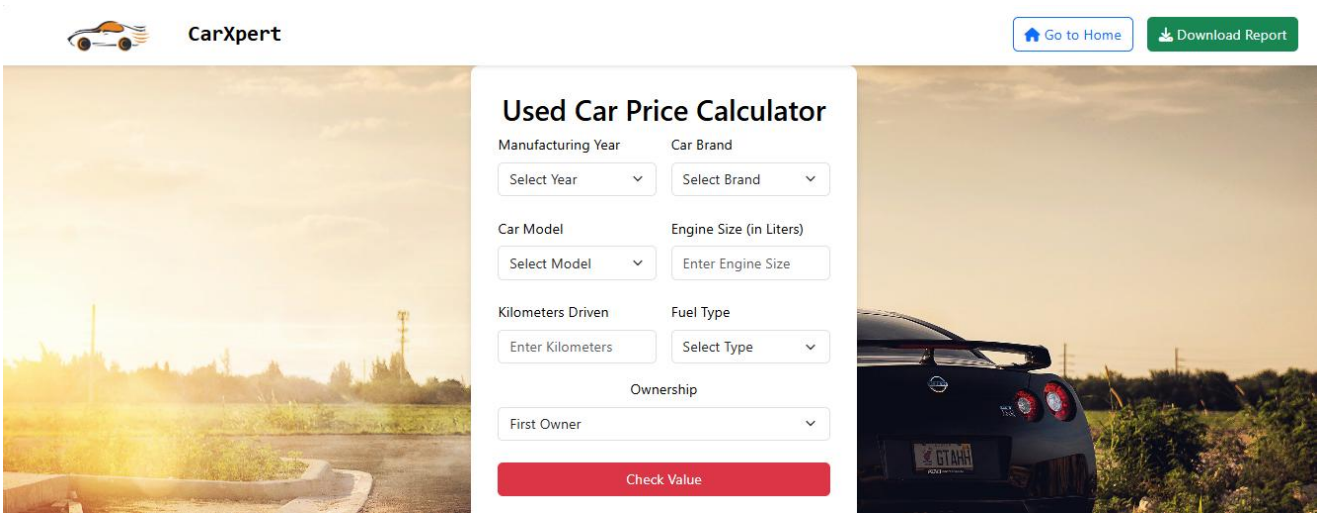


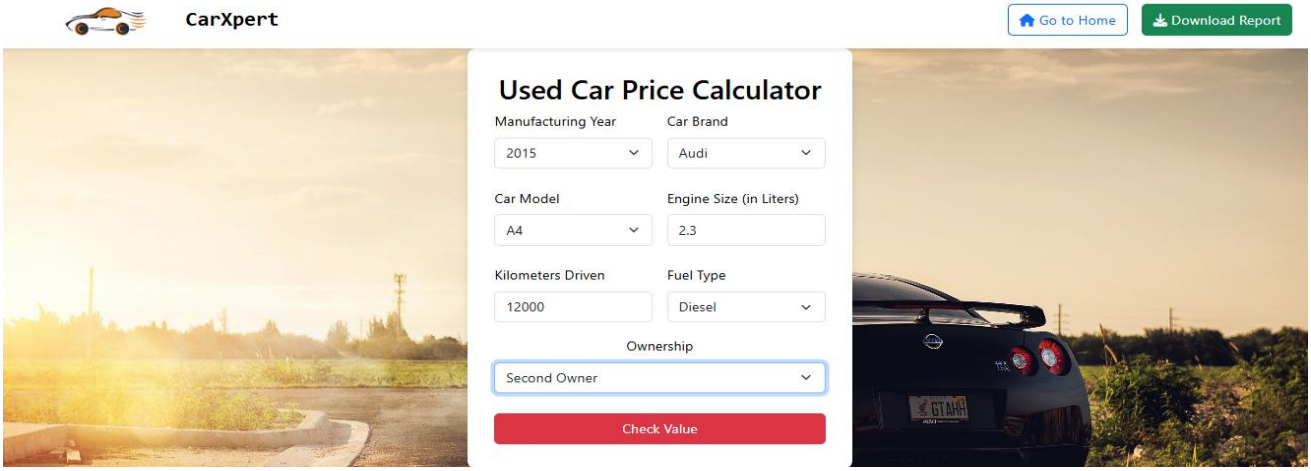
➢ User Side :

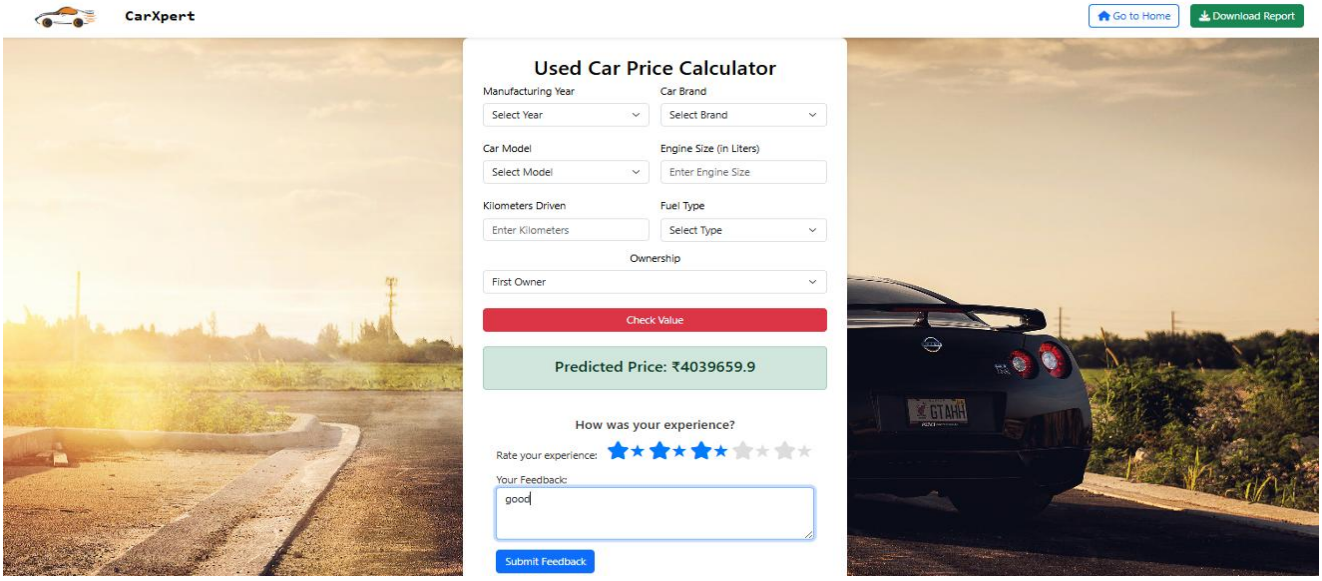
➢ Dashboard :



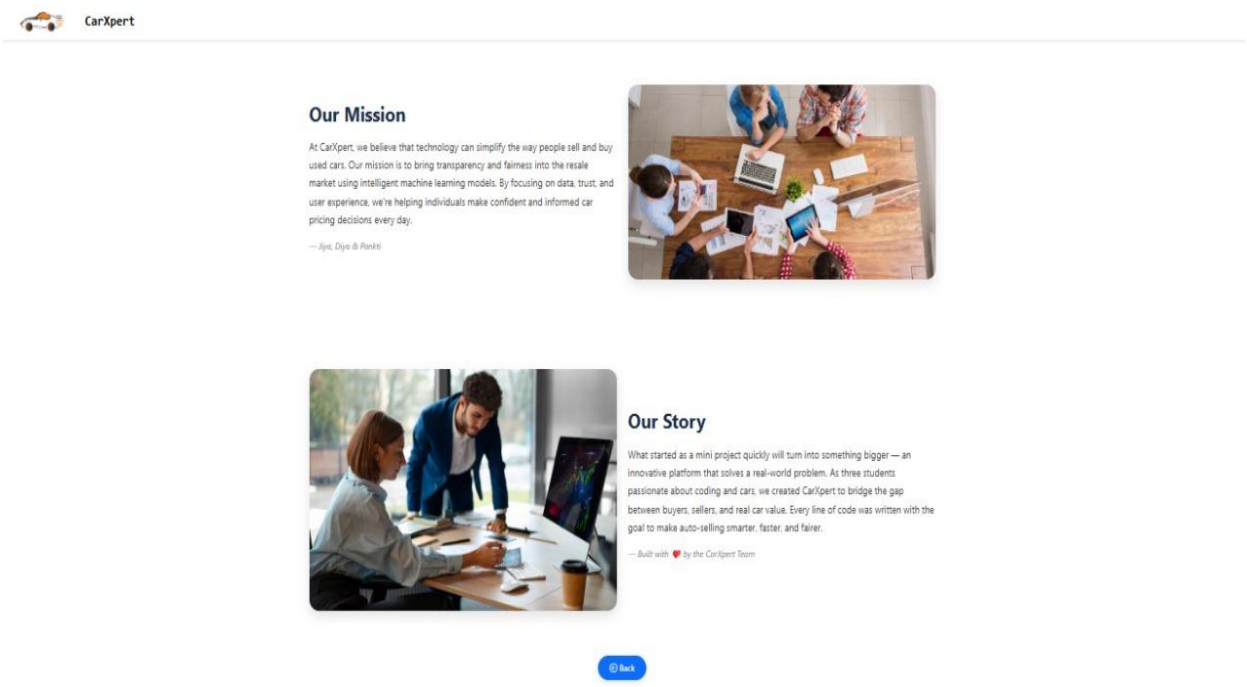
➢ Predict Price Page :





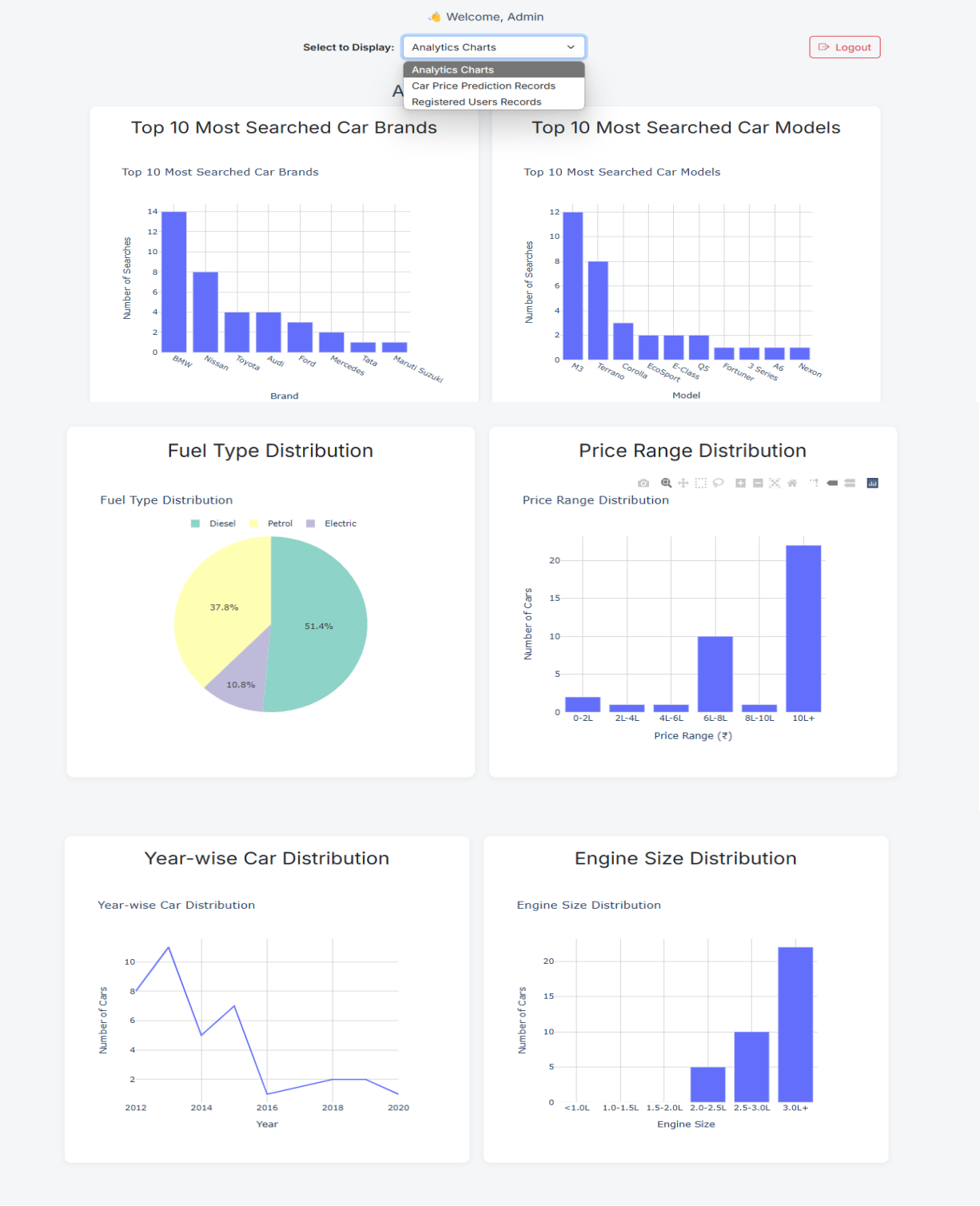


➢ About us Page :

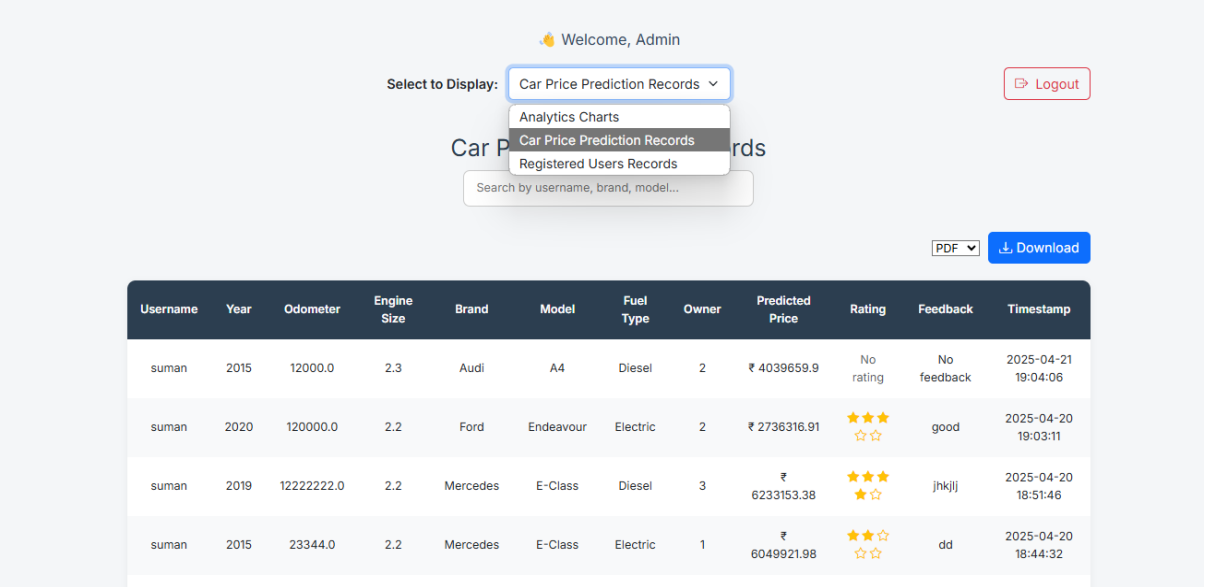


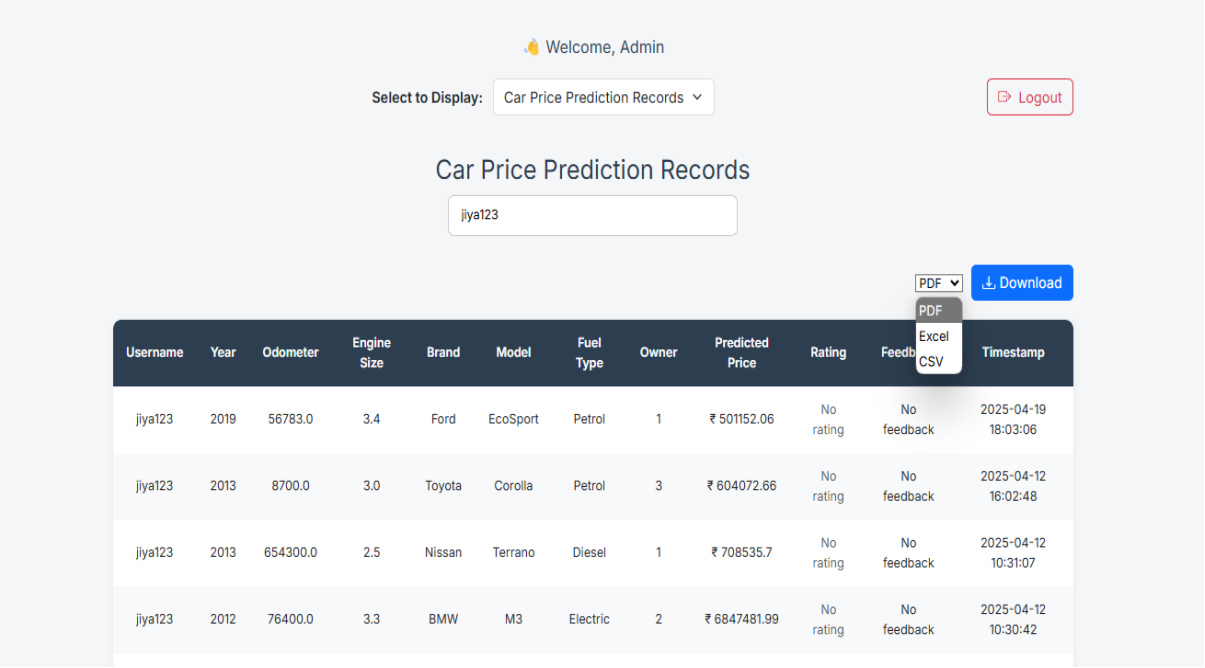
➢ Admin Side :

➢ Admin Dashboard : Analytics Charts

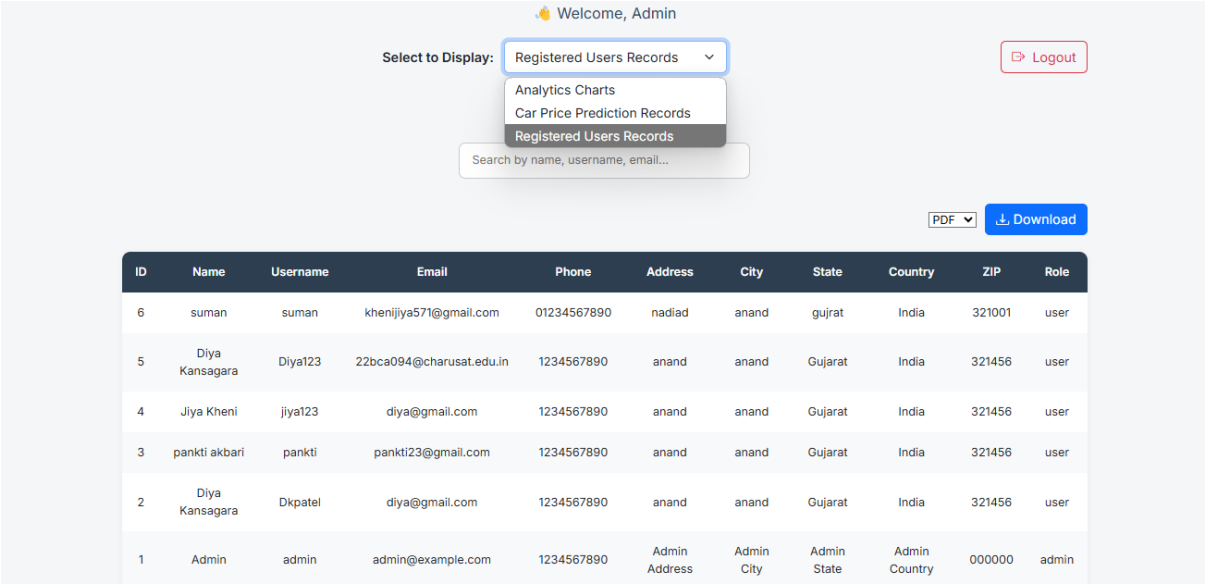


➢ Admin Dashboard : Car Price Prediction Records





➢ Admin Dashboard : Registered Users Records



ID	Name	Username	Email	Phone	Address	City	State	Country	ZIP	Role
6	suman	suman	khenijiya571@gmail.com	01234567890	nadiad	anand	gujrat	India	321001	user
5	Diya Kansagara	Diya123	22bca094@charusat.edu.in	1234567890	anand	anand	Gujarat	India	321456	user
4	Jiya Kheni	jiya123	diya@gmail.com	1234567890	anand	anand	Gujarat	India	321456	user
3	pankti akbari	pankti	pankti23@gmail.com	1234567890	anand	anand	Gujarat	India	321456	user
2	Diya Kansagara	Dkpatel	diya@gmail.com	1234567890	anand	anand	Gujarat	India	321456	user
1	Admin	admin	admin@example.com	1234567890	Admin Address	Admin City	Admin State	Admin Country	000000	admin

SYSTEM TESTING

❖ BlackBoxTestStratigies:-

➢ Test cases -

✓ User Side:-

Sr.no	Scenario	Purpose	Input	Expected Output	Status
1	Login Valid	Test valid login	Valid credentials	Redirect to dashboard	OK
2	Login Invalid	Test invalid login	Invalid credentials	error message	Fail
3	Forgot Password	Test the "Forgot Password" feature	Enter registered email address	Password reset link sent to email	OK
4	User Registration	Test registration	Fill name, email, password etc.	Success message	OK
5	Homepage Loads	Ensure homepage loads	Open URL	Homepage displays	OK
6	Predict Car Price	Test car prediction	Fill form	Correct price	OK
7	Empty Fields	Test empty form	Leave fields empty	Validation error	OK
8	Download PDF	Test PDF download	Submit details Click Download	PDF downloaded	OK

✓ Admin Side:-

Sr.no	Scenario	Purpose	Input	Expected Output	Status
1	Admin Login	Test valid admin login Test valid admin login	Valid admin credentials	Redirect to admin dashboard	OK
2	Admin Login Invalid	Test invalid admin login	Invalid credentials	Error message	Fail
3	Toggle Views (Records & Charts)	Verify all toggle views (Predictions, Users, Charts)	Select from dropdown	Respective table or chart displayed	OK
4	Search Car Predictions	Search car prediction records	Enter search term in the search box	Filtered predictions displayed	OK
5	Search Registered Users	Search registered user records	Enter search term in the search box	Filtered user records displayed	OK
6	Download Car Predictions and Registered Users	Download records in PDF, CSV, and Excel	Select format (PDF/CSV/Excel) Click "Download"	Records downloaded in selected format	OK
7	Download Chart	Download chart as PNG	Click on right corner of chart download	Chart downloaded as PNG	OK

FUTURE ENHANCEMENT

➢ Future Enhancement:-

- **Real-Time Price Tracking:** Implement price alerts for buyers when prices drop, and for sellers when market prices change.
- **Mobile Application:** Develop an app for buyers and sellers to access predictions on-the-go.
- **Car Listing & Deal Section:** Sellers can list vehicles for sale, and buyers can browse available cars.
- **Contact Feature:** Enable buyers to contact sellers directly (and vice versa) through a secure in-app messaging or inquiry system.
- **Deal Tracker:** Users can manage active deals, track responses, and finalize car purchases or sales.
- **Blockchain:** Ensure data transparency and security, building trust for both buyers and sellers in pricing and transactions.

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- ✓ https://www.stackoverflow.com
- ✓ https://developer.mozilla.org

THANK YOU