CAR RESALE VALUE PREDICTION

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Content

CAR RESALE VALUE PREDICTION

1. Introduction

1.1 Project Overview

The Car Valuation Tool is a free tool designed to help you get the estimated resale value of your car within seconds. Our automobile valuation algorithm is real-time updated, so it keeps up with the most recent modifications and market trends. However, the amounts displayed during the online assessment are only estimates and might alter when the retailer inspects your automobile. You don't even need to register to have your automobile valued; all you need to do is provide some basic information about it, such as its make, model, amount of miles driven, city of residence, and contact information.

1.2 Purpose

In 2019, the Indian used automobile resale industry was valued at $24.2 billion USD.

There is a critical need to close this gap between sellers and buyers due to the enormous demand for used automobiles and the shortage of professionals who can evaluate the proper valuation. The goal of this research is to create a system that can impartially forecast a car's resale value based on little information such as the number of miles travelled and the year of purchase.The process of determining the current used automobile pricing in a certain location is known as used car value. By selecting the brand, model, year, trim, and the number of kilometers travelled, a user of OBV may quickly determine the used car's price. The value of a used automobile is based on a number of variables, including its state right now, when it was bought, etc. Used automobile valuation will never have a precise price; instead, it will always fall within a reasonable price range.

2. Literature Survey

2.1 Existing Problem

Car Resale value prediction is one of the best to sell our in this market for an best and better price. Rather than giving our car to an less price , the customer those who uses the car will be benifitted and the seller will also be benefitted. The goal of this research is to create a system that can impartially forecast a car's resale value based on little information such as the number of miles travelled and the year of purchase. You don't even need to register to have your automobile valued; all you need to do is provide some basic information about it, such as its make, model, amount of miles driven, city of residence, and contact information

2.2 References

1.Car Value Prediction Using Machine Learning - MMGYD Yash - 2022

A fair car value prediction has made so easy for the buyers to get a car home, as it just requires few efforts and brains of field experts. Also the manufacturer brings new car with higher price in the industry with some additional costs of government tax. So, customers think more before buying a brand new car keeping in mind that would it be worth to invest. Generally, buyers don't have any idea about what any car be worth for and they hesitate seeing the market price list. Customers not being capable to buy a new car financially due to the higher market price, there is a need of used car value prediction globally which effectively determines the worthiness of a car which can be bought without much thinking. Looking at this problem, we will develop a model which will help the buyers to overcome their fear to buy a car. Considering number of attributes and various features of a particular car we could get a reliable prediction of a car. To train a model for predicting the price of used cars we applied machine learning techniques i.e. Regression Algorithms because it provides us continuous value as an output and not a categorized value such as Random Forest, linear regression and other algorithms for getting better accuracy. Then after processing on the data of dataset collected from Kaggle, we will be comparing the performance of different algorithms to get a chosen output. Further it would be available in GUI as a Web-application developed using Python-flask making it user friendly so that users could give input and get the price of a car according to it.

2. Linear Regression for Car Sales Prediction in Indian Automobile Industry - R Kulkarni, A Bokhare - Congress on Intelligent Systems - 2022

The automobile industry is one of the leading industries in our economy. Sudden up rise in the demand for automobile vehicle and also the growth in profits are the leading factors for this industry to become one of the major and important ones. This industry is also coming up with various financial aids and schemes for the general population which is why people buying vehicles is causing a ripple effect and maximizing their profits and the growth of industry. This industry has been a great force and a contributor to our economy. That is why this is of important significance for us to accurately predict the sales of automobile. That is why every industry or organization wants to predict the result by using their own past data and various learning algorithms of machine learning. This will help them visualize past data and help them to determine their future goals and plan accordingly and, thus, making sales prediction the current trend in the market. Current study helps to get the prediction of sales in automobile industry using machine learning techniques.

3.Vehicle resale price prediction using machine learning - B Lavanya, S Reshma, N Nikitha, M Namitha - 2021

The production of vehicles has been consistently expanding in the previous decade, with more than 70 million traveler's vehicles being delivered in the year 2016. This has brought about the trade-in vehicle market, which all alone has become a roaring industry. The new approach of online gateways has worked with the requirement for both the client and the merchant to be better educated about the patterns and examples that decide the worth of a pre-owned vehicle on the lookout. Utilizing Machine Learning Algorithms like Linear Regression, Multiple Regression. we will attempt to foster a factual model which will actually want to anticipate the cost of a pre-owned vehicle, in light of past shopper information and a given arrangement of highlights. We will likewise be contrasting the forecast precision of these models to decide the ideal one.

4. Machine Learning Techniques To Predict The Price Of Used Cars: Predictive Analytics in Retail Business - CV Narayana, CL Likhitha, S Bademiya - IEEE - 2021

It is generally known that, taking wise and challenging decisions is really a crucial task in every business. Taking improper decisions can cause huge loss and even lead to shutdown of business. To propose a novel solution for this challenge, this research work majorly focuses on one of the retail businesses i.e., used car sales business. The proposed research work shows that, the predictive analytical models will be a great add-on to business mainly for assisting the decision making process. Predictive Analytics is a process, where the businesses use statistical methods and technologies to analyze their historical data for delivering new insights and plan the future accordingly. The major objective of our paper is to build a prediction model i.e., a fair price mechanism to predict the cars selling price based on their features like the car model, the number of years that a car is old, the type of fuel it uses, the type of seller, the type of transmission and the number of kilometers that the car has driven so far. This paper will help to get an approximation about selling price of a used car based on its features and reduces the seller and consumer risk in business. The proposed model utilizes the machine learning algorithms and regression techniques of statistics like linear, decision tree and random forest regressions to achieve this task.

5. Application of Machine Learning Techniques to Predict the Price of Pre-Owned Cars in Bangladesh - FR Amik, A Lanard, A Ismat, S Momen - Information - 2021

Pre-owned cars (i.e., cars with one or more previous retail owners) are extremely popular in Bangladesh. Customers who plan to purchase a pre-owned car often struggle to find a car within a budget as well as to predict the price of a particular pre-owned car. Currently, Bangladesh lacks online services that can provide assistance to customers purchasing pre-owned cars. A good prediction of prices of pre-owned cars can help customers greatly in making an informed decision about buying a pre-owned car. In this article, we look into this problem and develop a forecasting system (using machine learning techniques) that helps a potential buyer to estimate the price of a pre-owned car he is interested in. A dataset is collected and pre-processed. Exploratory data analysis has been performed. Following that, various machine learning regression algorithms, including linear regression, LASSO (Least Absolute Shrinkage and Selection Operator) regression, decision tree, random forest, and extreme gradient boosting have been applied. After evaluating the performance of each method, the best-performing model

(XGBoost) was chosen. This model is capable of properly predicting prices more than 91% of the time. Finally, the model has been deployed as a web application in a local machine so that this can be later made available to end users.

6. Car Resale Price Predictor - A Singh, B Kalia - 2021

Car Resale is a problem that is faced by almost everyone who thinks about sale of his used car , there can be different ways to rate a car but mostly people trust brokers and there is no mathematical way to predict this based on the previously sold cars. There are certain apps where you can sale your used products but there is no efficient method to suggest what should be actual price to resale the car. The designed system deals with using previous data from various sources to predict price of the car and will use different machine learning algorithms that will create a regression model and will help in predicting price of car. This Project will also be deployed with help of flask so it can be used in real time with a user interface as well, this will be a good project for daily use of people who face a dilemma of choosing right price for their vehicle before selling it again, to built the model we will be using different ML models like SVM , LR , Trees etc.

7. Prediction of resale value of the car using linear regression algorithm - S Kiran - Int. J. Innov. Sci. Res. Technology - 2020

The expected estimate for resale value of a car is most significant in the field of present research and technology. Most significant attributes are considered for predicting the resale value of the car. The significant relationships among various attributes are found by establishing the correlations. In this research the price of the car is considered as dependent variable for target prediction .The data used for prediction was taken from web. The suitability of linear regression algorithm is identified and implemented in this research work for accurately predicting the resale value of the vehicle based on most significant attributes that are been selected on the basis of highest correlation. The outcome of the research shows that the accuracy of the model built is up to 90 percent and error obtained is 10 percent.

8.Used Car Price Prediction using K-Nearest Neighbor Based Model-K.Samruddhi ¸ Dr. R.Ashok Kumar - 2020

Predicting the price of used cars is one of the significant and interesting areas of analysis. As an increased demand in the second-hand car market, the business for both buyers and sellers has increased. For reliable and accurate prediction it requires expert knowledge about the field because of the price of the cars dependent on many important factors. This paper proposed a supervised machine learning model using KNN (K Nearest Neighbor) regression algorithm to analyze the price of used cars. We trained our model with data of used cars which is collected from the Kaggle website. Through this experiment, the data was examined with different trained and test ratios. As a result, the accuracy of the proposed model is around 85% and is fitted as the optimized model.

9.Car Price Prediction using Machine Learning Techniques-Enis Gegic, Becir Isakovic, Dino Keco, Zerina Masetic, Jasmin Kevric -2019

A car price prediction has been a high interest research area, as it requires noticeable effort and knowledge of the field expert. Considerable number of distinct attributes are examined for the reliable and accurate prediction. To build a model for predicting the price of used cars in Bosnia and Herzegovina, we applied three machine learning techniques (Artificial Neural Network, Support Vector Machine and Random Forest). However, the mentioned techniques were applied to work as an ensemble. The data used for the prediction was collected from the web portal autopijaca.ba using web scraper that was written in PHP programming language. Respective performances of different algorithms were then compared to find one that best suits the available data set. The final prediction model was integrated into Java application. Furthermore, the model was evaluated using test data and the accuracy of 87.38% was obtained.

10. Automobile Resale System Using Machine Learning - M Dholiya, S Tanna, A Balakrishnan,Ratnesh Dubey, Rajesh Singh-International Research Journal of Engineering and Technology (IRJET) - 2019

Cars are being sold more than ever. Many researches have been done in recent years on predicting used car price with data mining. An accurate used car price evaluation works as a catalyst in the healthy development of used car market. Therefore, arises a need for a model that can assign a price for a vehicle by evaluating its features taking prices of other cars into consideration. Customers can be widely exploited by fixing unrealistic prices for the used cars and

many fall into this trap. Therefore, raises an absolute necessity of a used car price prediction system to effectively determine the worthiness of the car depending on a variety of features. This price prediction model bridges this gap, giving the buyers and sellers an approximate value of the car using the multiple linear regression to predict the price .

2.3 Problem Statement Definition

Determining whether the listed price of a used car is a challenging task, due to the many factors that drive a used vehicle's price on the market. The focus of this project is developing machine learning models that can accurately predict the price of a used car based on its features, in order to make informed purchases. We implement and evaluate various learning methods on a dataset consisting of the sale prices of different makes and models.

Depending on various parameters we will determine the price of the car. Regression Algorithms are used because they provide us with continuous value as an output and not a categorized value because of which it will be possible to predict the actual price a car rather than the price range of a car. User Interface has also been developed which acquires input from any user and displays the price of a car according to user's inputs.

3. Ideation and Proposed Solution

3.1 Empathy Map Canvas
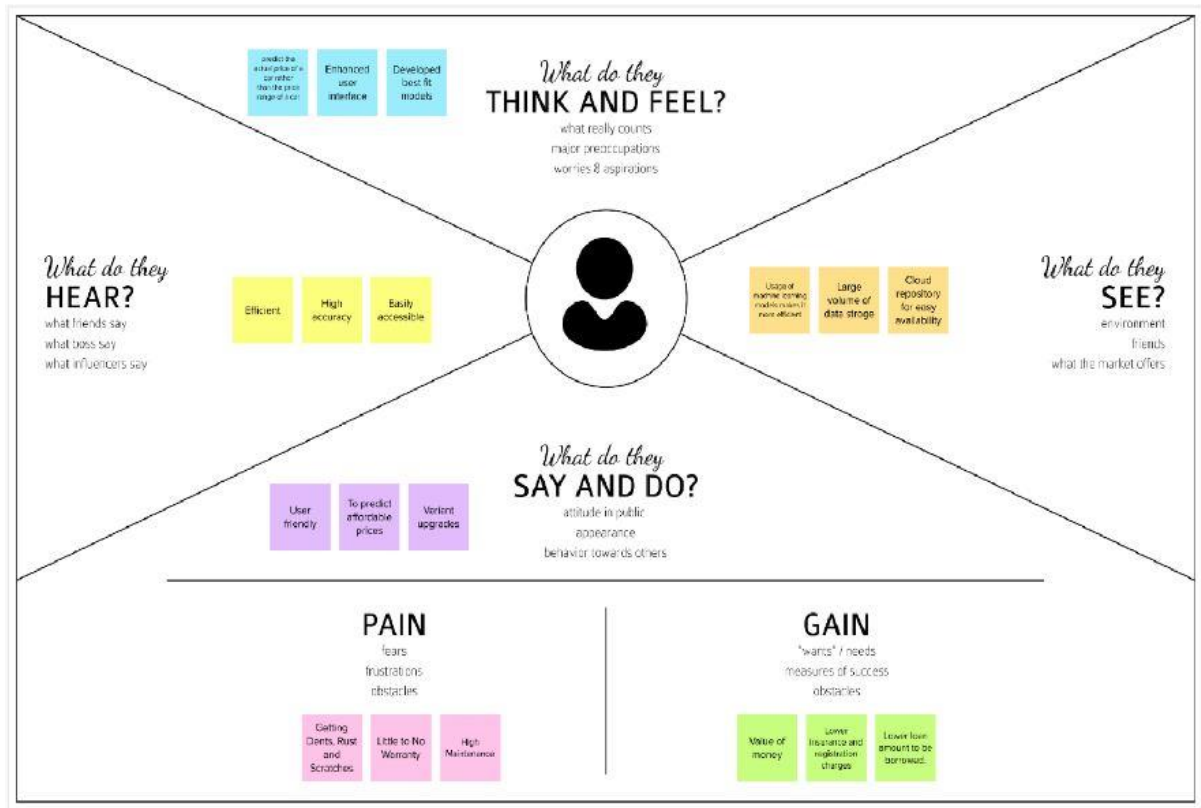
3.2 Ideation and Brainstorming

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

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕐 10 minutes

Joy Parithi

Balamurugan

Jabeth Akshay

Aravind

Step-3: Idea Prioritization

3

Group Ideas

Take turns sharing your ideas while clustering similar or related notes as you go.
In the last 10 minutes, 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

Valuation factor

Kilometers traveled and Odometer	Exterior and Interior condition	Vehicle make and Model	Mechanical condition
Maintenance service history	Accident history		

Less commonly known factors affecting the price

Old vehicle	New models and discontinuations	Seasonal effect

To increase the resale value

Quality photos	If selling online, include detailed descriptions	Clean very well, external and internally	Choose listing sites carefully

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕐 20 minutes

Year of Manufacture

Condition of the car

Mileage and maintanence

♡

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

⚐

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)
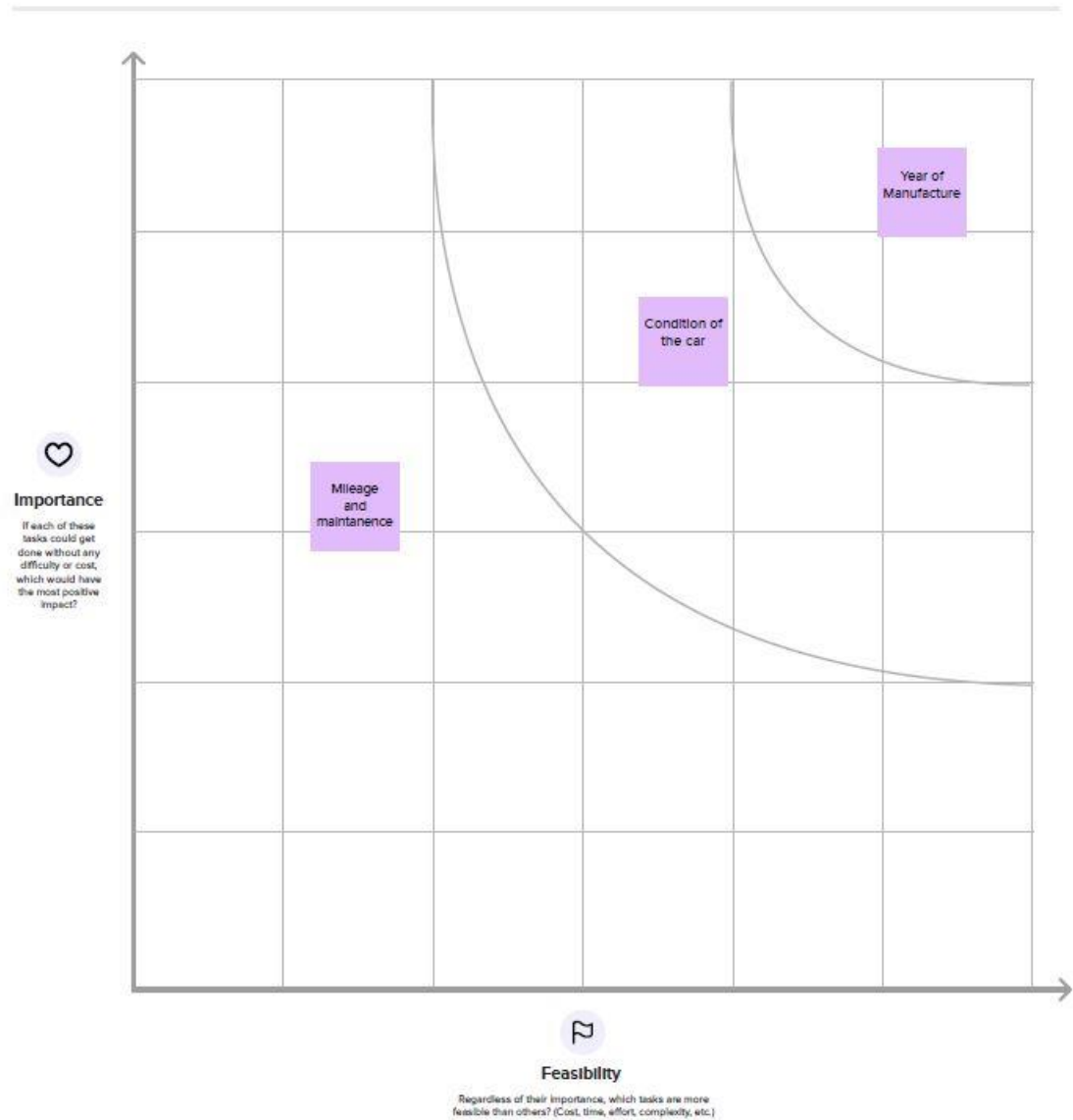
3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Accurately predicting the price of used car based on its features, in order to make informed purchases.
2.	Idea / Solution description	In order to predict the resale value of the car, we proposed an intelligent, flexible, and effective system that is based on using regression algorithms. Considering the main factors which would affect the resale value of a vehicle a regression model is to be built that would give the nearest resale value of the vehicle. We will be using various regression algorithms and algorithm with the best accuracy will be taken as a solution, then it will be integrated to the web-based application where the user is notified with the status of his/her product.
3.	Novelty / Uniqueness	Using data mining and machine learning approaches, this project proposed a scalable framework for used cars price prediction. An efficient machine learning model is built by training, testing, and evaluating five machine learning regressors. The results of our tests were quantified in terms of the R2 score of our predictions. R2 score is a statistical measure of how close the data are to the fitted regression line.
4.	Social Impact / Customer Satisfaction	People can predict the price of the used cars at a better accuracy. They can provide their preferred features into consideration with the help of user-friendly interface.
5.	Business Model (Revenue Model)	It is cost free as it is a Software as a Service Platform. People need not spend money to detect the car resale value.
6.	Scalability of the Solution	Better execution in accuracy, sensitivity, and specificity as well as in system design flexibility.

3.4. Problem Solution Fit

Define CS, fit into

1. CUSTOMER SEGMENT(S) — CS

Who is your customer?

Used car sellers

6. CUSTOMER — CC

What constraints prevent your customers from taking action or limit their choices of solutions? e.g. spending power, budget, no cash, network connection, available devices

- To determine the worthiness of the car by their own within few minutes
- A loss function is to be optimized by spending Money for dealers, brokers to buy or sell a car.

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? e.g. pen and paper is an alternative to digital notetaking

- In the past User cannot find the value of used car buy their own without prior knowledge about cars.
- A person who don't know much about the car can also make predictions for used cars easily.

Explore AS,

Focus on J&P, tap into BE, understand

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

To build supervised machine learning Model using regression algorithms for forecasting the value of a vehicle based on multiple attributes such as
- Condition of Engine
- Year of Registration
- Kilometers
- Number of Owner

9. PROBLEM ROOT CAUSE — RC

What's the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.

- The price predicted by the dealers or brokers for used car is not trustful
- Users can predict the correct valuation of the car remotely without human intervention like car dealers.
- User can eliminate the valuation predicted by the dealer

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

- The History of Your car's condition and documents produced by them will be Suspicious.
- The model is to be built would give the nearest value of the vehicle by eliminating anonymous value predicted by using humans.

Focus on J&P, tap into BE, understand

Identify strong TR & EM

3. TRIGGERS — TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

Users can predict the correct valuation of the car by their own like Olxcars, cars24 and other car resale value prediction websites by using model, year, owner, etc..

4. EMOTIONS: BEFORE / AFTER — EM

How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design

Before:
- User will be in fear about the biased value predicted by the humans based on the condition of the car.

After:
- User can determine the worthiness of the car by their own without human intervention.

10. YOUR SOLUTION — SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then leave it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

- The main aim of this project is to predict the price of used cars using the Machine Learning (ML) algorithms and collection data's about different cars.

The project should take parameters related to used car as inputs and enable the customers to make decisions by their own.

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

- Customer should predict the worth of the car by using different parameters given by ...

- User should confirm the details provided about the vehicle in RTO online.
- User can decide by seeing the exterior and interior condition of the car.
- User can test the performance of the car and to buy it up in a affordable price based on its conditions.

Extract online & offline CH of BE

Requirement Analysis

4.1 Functional Requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail
FR-2	User Confirmation	Confirmation via Email
FR-3	User login	Login using credentials
FR-4	Car's data	Fill the required data
FR-5	Prediction	Analyse the car's price

4.2 Non-Functional Requirement

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to predict car's price
NFR-2	**Reliability**	Prediction of accurate car's resale value.
NFR-3	**Performance**	Reducing overall load time.
NFR-4	**Availability**	Can be accessed anytime and anywhere. Available for everyone.
NFR-5	**Scalability**	Multiple users can access the website at same time

Project Design

5.1 Data Flow Diagram
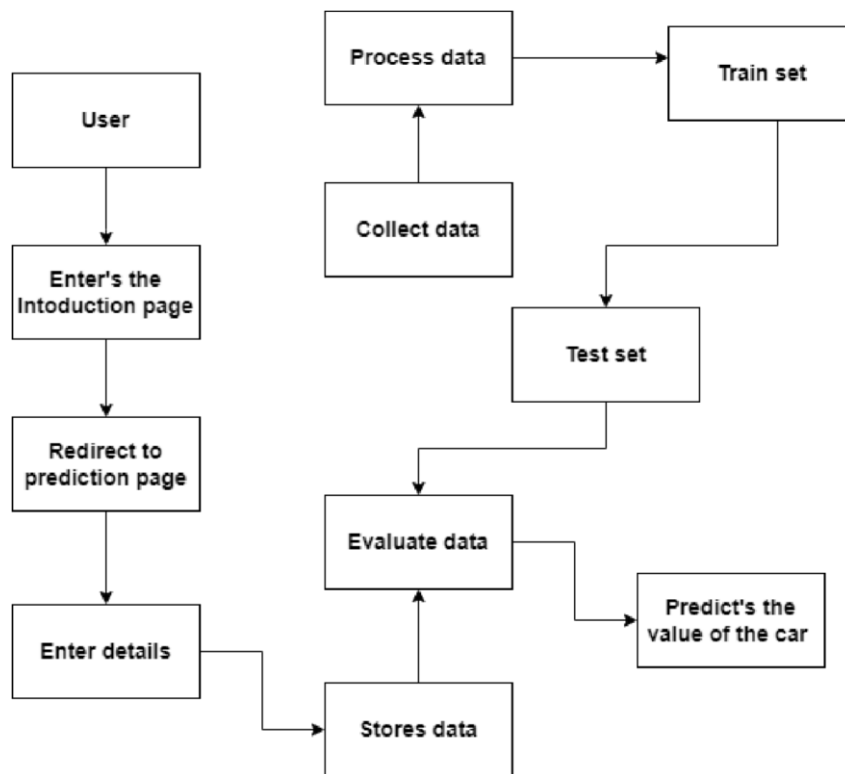
5.2 Solution and Technical Architecture
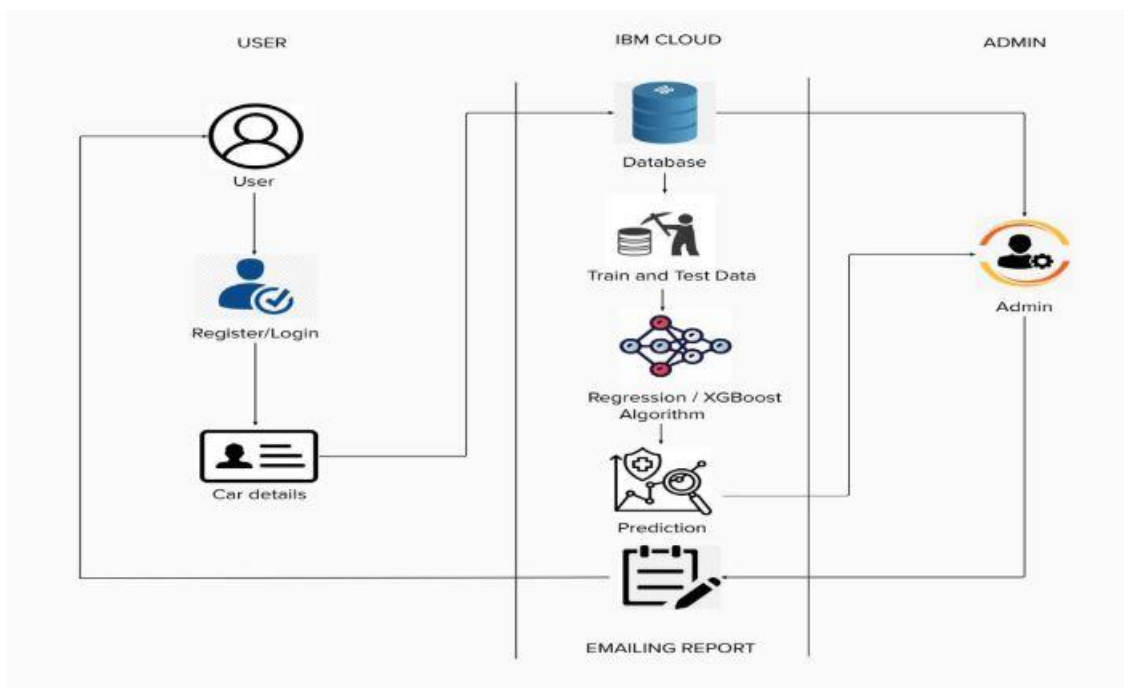
5.3. User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (web 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	Sprint-1
	Login	USN-2	As a user, I can log into the application by entering email & password	I can access my account / Dashboard when logged in	High	Sprint-1
Customer (web user)	Dashboard	USN-3	User can view his/her profile and their previous activities.	I can view my profile details.	Medium	Sprint-2
		USN-4	User can view the accuracy of the prediction of the price of used cars.	I can view the accuracy Of car resale value in the dashboard.	High	Sprint-2
Customer Care Executive	Helpdesk	USN-5	As a customer care executive, he/she can view the customer queries.	I can post my queries in the dashboard	Medium	Sprint-3
		USN-6	As a customer care executive, he/she can answer the customer queries.	I can get support from helpdesk	High	Sprint-3
Administrator	User Profile	USN-7	As an admin, he/she can update the details of users.	I can view my updated details.	High	Sprint-4
		USN-8	As an admin, he/she can add or delete users.	I can access my account / Dashboard when logged in	High	Sprint-4
		USN-9	As an admin, he/she can manage the user details.	I can view the organized data of myself.	High	Sprint-4

6.Project Planning and Scheduling

6.1 Script Planning and Execution

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Balamurugan Joy Parithi
Sprint-2		USN-2	As a user, I will receive confirmation email once I have registered for the application	2	Low	Aravindh Jabeth Akshay
Sprint-1		USN-3	As a user, I can register for the application through Gmail	2	Medium	Aravindh S Jabeth Akshay
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	2	High	Balamurugan Joy Parithi
Sprint-2	Dashboard	USN-5	Profile - view & update your profile	2	High	Balamurugan Joy Parithi
Sprint-2		USN-6	Home – Predict the price of the car	2	High	Balamurugan Joy Parithi
Sprint-3		USN-7	The user will have to fill in the below 16 fields for the system to predict a car resale value name seller offerTypes abtest vehicleType yearOfRegisrtation gearbox powerPS model kilometer monthOfRegistration fuelType brand notRepairedDamage nrOfPictures postalCode	2	High	Balamurugan Joy Parithi Aravind Jabeth Akshay
Sprint-3		USN-8	User can view the accuracy of Car resale value.	1	Medium	Aravind Jabeth Akshay

Sprint		USN		Story Points	Priority	
Sprint-3	System Requirement	USN-9	I. Hardware Requirement i. Laptop or PC ∟ I5 processor system or ☐higher ☐4 GB RAM or higher 128 GB ROM or higher	2	High	Aravind Jabeth Akshay
Sprint-3		USN-10	II. Software Requirement iii. Laptop or PC • Windows 10 or higher	1	Medium	Aravind Jabeth Akshay
Sprint-4	Administrator	USN-11	As an administrator, he/she can view the customer queries.	1	High	Balamurugan Joy Parithi
Sprint-4		USN-12	As a customer care executive, he/she can answer the customer queries.	2	High	Balamurugan Joy Parithi
Sprint-4		USN-13	As an admin, he/she can add or delete users.	1	High	Balamurugan Joy Parithi
Sprint-4		USN-14	Customer Feedback – customers can send feedback to the Admin	2	Medium	Balamurugan Joy Parithi

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	11 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 ov 2022

6.3. REPORT FROM JIRA

	OCT							NOV							NOV							NOV						
	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

CVP-1 Data set collect about the resale cars

CVP-2 To import required libraries

CVP-3 Read the Datasets

CVP-4 clean the Datasets

CVP-5 Split the data into dependent and independent variables

CVP-6 Apply using the regression models

CVP-7 To build flask app using python

CVP-8 To build UI and HTML page

CVP-9 Execute and test the model

CVP-10 To use machine learning model

CVP-11 Integrate the flask app

7. CODING & SOLUTIONING

7.1. Feature 1

Home Page

Car Resale value prediction app is a responsive web application which predicts the price of the reused cars. The home page contains information about the application. It also contains the tab to upload the input of the user.

```html
<!DOCTYPE html>
<html lang="en">
<head xmlns="http://www.w3.org/1999/xhtml">
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link
href="https://cdn.jsdelivr.net/npm/bootstrap@5.0.2/dist/css/bootstrap.min.css"
rel="stylesheet"
      integrity="sha384-
EVSTQN3/azprG1Anm3QDgpJLIm9Nao0Yz1ztcQTwFspd3yD65VohhpuuCOmLASjC
" crossorigin="anonymous">
  <title>Car Resale Values Prediction </title>
  <link rel="stylesheet" href="/static/css/style.css">
  <link rel="stylesheet" type="text/css"
      href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.11.2/css/all.css">
  <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
  <script
src="https://cdn.jsdelivr.net/npm/popper.js@1.16.0/dist/umd/popper.min.js"
      integrity="sha384-
Q6E9RHvbIyZFJoft+2mJbHaEWldlvI9IOYy5n3zV9zzTtmI3UksdQRVvoxMfooAo"
```

```html
        crossorigin="anonymous"></script>


    <!-- Bootstrap CSS -->

    <link rel="stylesheet"
href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/css/bootstrap.min.css
"

        integrity="sha384-
9alt2nRpC12Uk9gS9baDl411NQApFmC26EwAOH8WgZl5MYYxFfc+NcPb1dKGj7Sk"
crossorigin="anonymous">

    <script
src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@2.0.0/dist/tf.min.js"></scrip
t>


</head>

<body >

  <div class="card bg-dark text-black">

    <img src="https://4kwallpapers.com/images/walls/thumbs_2t/1147.jpg"
class="card-img" alt="..."  >

        <div class="card-img-overlay">


            <div class="container" style="opacity:80%">

            <div class="row">

            <div class="card mt-50" style="width: 100%; height: 100%">

                <div class="card-header" style="text-align: center">

                    <h1>Hi,Let's check the price of your resale car!!</h1>

                </div>

                <div class="card-body" style="justify-content:center;">

                    <div class="col-12" style="text-align: center">

                        <h5>Hola! Give the valid info : </h5>
```

```html
        </div>
        <br>
        <form method="post" accept-charset="utf-8" name="Modelform" >
          <div class="col-12" style="text-align: center">
            <label><b>Select the company:</b> </label><br>
            <select class="selectpicker form-control" id="company" name="company" required="1"
                    onchange="load_car_models(this.id,'car_models')">
              {% for Brands in companies %}
              <option value="{{ Brands }}">{{ Brands }}</option>
              {% endfor %}
            </select>
          </div>
          <div class="col-12" style="text-align: center">
            <label><b>Select the model:</b> </label><br>
            <select class="selectpicker form-control" id="car_models" name="car_models" required="1">
            </select>
          </div>
          <div class="col-12" style="text-align: center">
            <label><b>Select Year of Purchase:</b> </label><br>
            <select class="selectpicker form-control" id="year" name="year" required="1">
              {% for year in years %}
              <option value="{{ year }}">{{ year }}</option>
              {% endfor %}
            </select>
          </div>
```

```html
            <div class="col-12" style="text-align: center">
                <label><b>Select the Fuel Type:</b> </label><br>
                <select class="selectpicker form-control" id="fuel_type"
name="fuel_type" required="1">
                    {% for fuel in fuel_types %}
                    <option value="{{ fuel }}">{{ fuel }}</option>
                    {% endfor %}
                </select>
            </div>
            <div class="col-12" style="text-align: center">
                <label><b>Enter the Number of Kilometres that the car has
travelled:</b> </label><br>
                <input type="text" class="form-control" id="kilo_driven"
name="kilo_driven"
                    placeholder="Enter the kilometres driven ">
            </div>
            <div class="col-12" style="text-align: center">
                <button  class="btn btn-primary form-control mt-4"
onclick="send_data()">Predict Price</button>
            </div>
        </form>

        <div class="row">
          <div class="col-12" style="text-align: center">
            <h4><span id="prediction"></span></h4>
          </div>
        </div>
      </div>
```

```html
            </div>

          </div>

          </div>

      </div>

  </div>

   <script>


   function load_car_models(company_id,car_model_id)

   {

      var company=document.getElementById(company_id);

      var car_model= document.getElementById(car_model_id);

      console.log(company.value);

      car_model.value="";

      car_model.innerHTML="";

      {% for company in companies %}

        if( company.value == "{{ company }}")

        {

          {% for model in car_models %}

            {% if company in model %}


              var newOption= document.createElement("option");

              newOption.value="{{ model }}";

              newOption.innerHTML="{{ model }}";

              car_model.options.add(newOption);

            {% endif %}

          {% endfor %}

        }
```

```
        {% endfor %}
    }


    function form_handler(event) {
        event.preventDefault(); // Don't submit the form normally
    }
    function send_data()
    {
        document.querySelector('form').addEventListener("submit",form_handler);


        var fd=new FormData(document.querySelector('form'));


        var xhr= new XMLHttpRequest({mozSystem: true});


        xhr.open('POST','/predict',true);
        document.getElementById('prediction').innerHTML="Wait! Predicting
Price.....";
        xhr.onreadystatechange = function(){
            if(xhr.readyState == XMLHttpRequest.DONE){
                document.getElementById('prediction').innerHTML="Prediction:
₹"+xhr.responseText;


            }
        };


        xhr.onload= function(){};


        xhr.send(fd);
```

```html
    }
    </script>
    <!-- jQuery first, then Popper.js, then Bootstrap JS -->
    <script src="https://code.jquery.com/jquery-3.5.1.slim.min.js"
      integrity="sha384-
DfXdz2htPH0lsSSs5nCTpuj/zy4C+OGpamoFVy38MVBnE+IbbVYUew+OrCXaRkfj"
      crossorigin="anonymous"></script>
    <script
src="https://cdn.jsdelivr.net/npm/popper.js@1.16.0/dist/umd/popper.min.js"
      integrity="sha384-
Q6E9RHvbIyZFJoft+2mJbHaEWldlvI9IOYy5n3zV9zzTtmI3UksdQRVvoxMfooAo"
      crossorigin="anonymous"></script>
    <script
src="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/js/bootstrap.min.js"
      integrity="sha384-
OgVRvuATP1z7JjHLkuOU7Xw704+h835Lr+6QL9UvYjZE3Ipu6Tp75j7Bh/kR0JKI"
      crossorigin="anonymous"></script>
</body>
</html>
```

7.2. Feature 2

Prediction page:

The user will add the data asked in the prediction page and press the predict button. Then the page will redirect to a new page and provide information about the price of the reused car.

app.py

```python
import pickle

import numpy as np

import pandas as pd

from flask import Flask, render_template, request


app = Flask(__name__)


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

car = pd.read_csv('Cleaned_datasets.csv')



@app.route('/')

def index():

    companies = sorted(car['Brands'].unique())

    car_models = sorted(car['Car_names'].unique())

    year = sorted(car['year'].unique(), reverse=True)

    fuel_type = car['fuel_type'].unique()


    companies.insert(0, 'Select Company')
```

```python
    return render_template('index.html', companies=companies,
car_models=car_models, years=year, fuel_types=fuel_type)


@app.route('/predict', methods=['POST'])
def predict():
    company = request.form.get('company')

    car_model = request.form.get('car_models')
    year = request.form.get('year')
    fuel_type = request.form.get('fuel_type')
    driven = request.form.get('kilo_driven')

    prediction = model.predict(pd.DataFrame(columns=['name', 'company', 'year',
'kms_driven', 'fuel_type'],
                              data=np.array([car_model, company, year, driven,
fuel_type]).reshape(1, 5)))
    print(prediction)

    return str(np.round(prediction[0], 2))


if __name__ == '__main__':
    app.run()
```

8. Testing

8.1. User Acceptance testing

				Date	03-Nov-22							
				Team ID	PNT2022TMID00425							
				Project Name	Project - Car Resale Value Prediction							
				Maximum Marks	4 marks							

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
HomePage_TC_001	UI	Home Page	Verify all the UI elements in Home page rendered properly		1.Enter URL and click go 2.Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Joy Parithi
HomePage_TC_002	Functional	Home Page	Verifiy the Data Entry page can be reachable.		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button.	-	User should navigate to Data Entry Page	Working as expected	Pass		N		Bakamurugan
DataEntryPage_TC_001	UI	Data Entry Page	Verify all the UI elements in Data Entry page rendered properly		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Aravind
DataEntryPage_TC_002	Functional	Data Entry Page	Verify user is able to enter all values		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered	2012 12 12 Manual Yes Golf Volkswagen Petrol Coupe	User should be able to enter all values in data entry page	Working as expected	Pass		N		Jabeth Akshay
DataEntryPage_TC_003	Functional	Data Entry Page	Verifiy the Output Display page can be reachable.		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press the submit Button		User should navigate to Output Display Page	Working as expected	Pass		N		Balamurugan
OutputDisplayPage_TC_001	UI	Output Display Page	Verify all the UI elements in Output Display page rendered properly		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press the submit Button 7. Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Aravind
OutputDisplayPage_TC_002	Functional	Output Display Page	Verify user is able to get predicted result		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press the submit Button 7. Verify all the UI elements displayed or not 8. Verify if the predicted value is displayed or not	-	Predited Car Resale Value is displayed on the page	Working as expected	Pass		N		Joy Parithi

Test case 1

Test case 2

Hi,Let's check the price of your resale car!!

Hola! Give the valid info :

Select the company:

Hyundai

Select the model:

Hyundai Accent

Select Year of Purchase:

2019

Select the Fuel Type:

Petrol
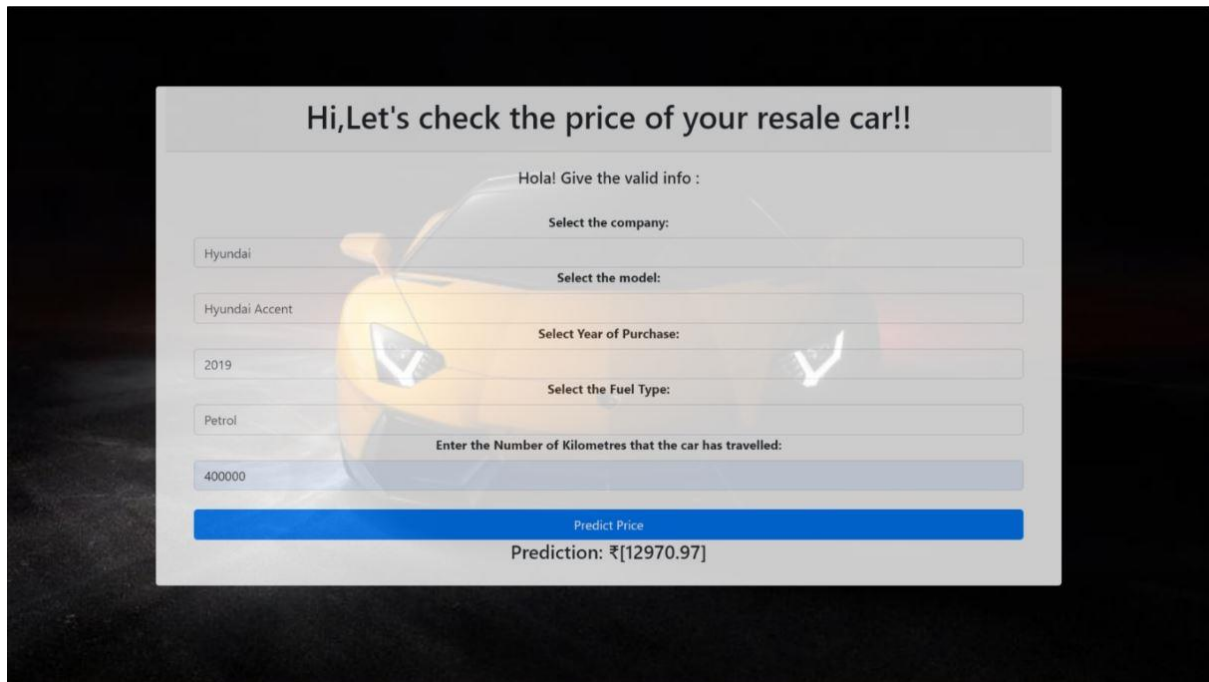
Enter the Number of Kilometres that the car has travelled:

400000

Predict Price

Prediction: ₹[12970.97]

9. Result

9.1 Performance Metrics

The Performance is the Accuracy of the model trained.
The training accuracy of the model is 92%.
The testing accuracy of the model is 89%.

10. Advantages Disadvantages

Advantages:

- This will reduced installation cost.
- It will monitor 24/7.
- Very useful to sale the car for reasonable price
- Good at learning complex and non-linear relationships
- Highly explainable and easy to interpret
- Robust to outliers
- No feature scaling is required

Disadvantages:

- Car Resale value can not be used by the person who doesn't have access to the internet.
- Very hard to use for targeted range of people

11. Conclusion

We have successfully developed an application using python flask, HTML, CSS. The increased prices of new cars and the financial incapability of the customers to buy them, Used Car sales are on a global increase. Therefore, there is an urgent need for a Used Car Price Prediction system which effectively determines the worthiness of the car using a variety of features. The proposed system will help to determine the accurate price of used car price prediction. This paper compares 3 different algorithms for machine learning : Linear Regression, Lasso Regression and Ridge Regression.

12. Future Scope

In future this machine learning model may bind with various website which can provide real time data for price prediction. Also we may add large historical data of car price which can help to improve accuracy of the machine learning model. We can build an android app as user interface for interacting with user. For better performance, we plan to judiciously design deep learning network structures, use adaptive learning rates and train on clusters of data rather than the whole dataset.

13.APPENDIX

GITHUB & PROJECT DEMO LINK
(https://github.com/IBM-EPBL/ IBM-Project-9645-1659063905)
DEMO LINK
(https://youtu.be/wt54mbla0PA)