

PROJECT REPORT

PROJECT TITLE : Car Resale value Prediction

TEAM ID : PNT2022TMID39909

TEAM MEMBERS : Suresh Kumar P (TEAMLEAD)

Saran Pradeep E

Tamil Selvan P

Sankaralingam V

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

2.1Existing 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

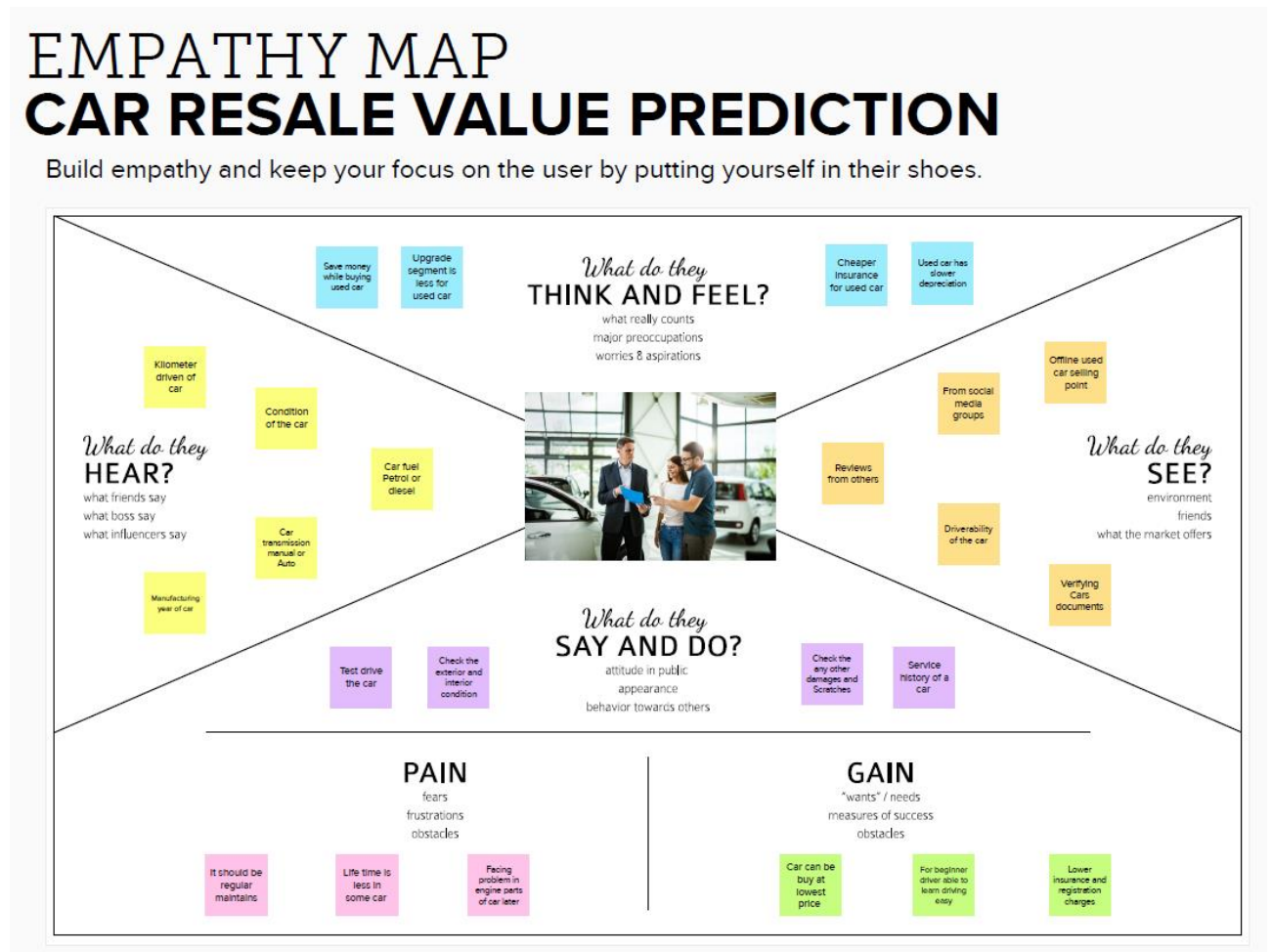
- [1] Pudaruth Sameerchand , Pudaruth Sameerchand , Predicting the price of Used Car Using Machine Learning Techniques
- [2] Enis gegic, Becir ,Isakovic, Dino Keco, ,Zerina Masetic,Jasmin Kevric Car Price Prediction Using Machine Learning
- [3] Ning sun,Hongxi Bai,Yuxia Geng,Huizhu Shi Price Evaluation model in second hand car system
- [4] Doan Van Thai, Luong Ngoc Son, Pham Vu Tien, Nguyen Nhat Anh, Nguyen Thi Ngoc Anh Prediction car prices using qualify qualitative data and knowledge-based system

2.3 Problem Statement Definition

Car Resale value prediction is used to predict the value of the used cars to an reasonable price which satisfies the customer.

3 IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstroming

1

Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

🕒 5 minutes

PROBLEM

The main aim of this project is to predict the price of used cars using different machine learning models

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The main aim of this project is to predict the price of used cars using the various method. The project should take parameters related to used car as inputs and enable the customers to make decisions by their own for buying used car.
2.	Idea / Solution description	Based parameter such as Car brand, No of owners, Kilometer Driven, Fuel type, Year are the parameter used to predict the price of the car. Those dataset required for predicting the price of the car by using regression algorithms method.
3.	Novelty / Uniqueness	Determine price of the used car based on the worthiness of the car predicted at anywhere and at any time by using various features such as year, model, km, etc. The model predicts the resale value of car with high accuracy.
4.	Social Impact / Customer Satisfaction	Many websites such as cars24.com, cardekho.com, and OLX.com, provide these buyers with a place to sell their old cars, but what should be the car's price? This model may help to overcome this problem. Based on the dataset is the results shows the highly accurate in prediction of the price. So the people know the price of the car while selling or buying the car.
5.	Business Model (Revenue Model)	Users can predict the correct valuation of the car and without human intervention like car dealers in the process to eliminate biased valuation predicted by the dealer. And also we compare price and gather the user rating of the car..
6.	Scalability of the Solution	This project proposed a scalable framework for predicting values for different type of used cars present all over India. This to make the efforts of knowing the car resale value easier for the user. It is a web page model so it can be viewed and accessed in both computer as well as mobile phones.

3.4 Problem Solution Fit

PROBLEM SOLUTION FIT

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PROJECT TITLE : CAR RESALE VALUE PREDICTION

Define CS, fit into CL	CS	1. Customers Segment:	CC	6. Customer Constraints:	AS	5. Available solution:	Explore AS, differentiate
		<ul style="list-style-type: none"> ➤ People who are like to buy the used car and sell the car. ➤ It is very used for first time buyer of the car. 		<ul style="list-style-type: none"> ➤ It is very much difficult to find selling rate of the used car. ➤ The security of this website must be noticed regarding user information. 		<p>Many Websites are available in online to find price of the used car.</p> <p>Pros:</p> <ul style="list-style-type: none"> I. It's is very simple & time saver. II. Some parameters required for predicting the price. <p>Cons:</p> <ul style="list-style-type: none"> I. Predict the price is approximately. 	
Focus on PR, tap into BE, understand RC	PR	2. Problems/Jobs-to-be-done:	RC	9. Problem Root Cause:	BE	7. Behaviour:	Focus on PR, tap into BE, understand RC
		<ul style="list-style-type: none"> ➤ Giving the necessary information for particular thing which needs for customer. ➤ Solving problems raise form the customer. 		The problem arises when the user need to buy a resale car but not sure how much does it cost, will the cost be under their budget and if so which model should be bought as the comparison of prices or prediction of car resale value is difficult in the first place.		It's simple and takes only a few seconds. Just fill in your car's details like Brand, Model, Variant, Year of registration, etc. and click on the "Check Valuation" button. And we acquire the price of the car.	

Identify strong TR & EM	TR	3. Triggers:	SL	10. Your Solutions:	CH	8. Channels of behaviour:	Extract online & offline CH of BE
		<p>Many people will search to see the car within price range before purchasing car.</p> <p>Nowdays Industries are trying car is prestige of people. And making Customer to buy the car by advertisement and attractive images in online for the purpose for buying the car.</p>		<p>Predict the car resale value from the characteristics. The best algorithm is identified and implemented. Provided a user friendly web-based application to clients.</p> <p>This system is built by using Machine learning and regression model. By using this system, we can predict the resale value of the car at any time anywhere.</p>		<p>Online:</p> <p>Customer can predict the price at anywhere throughout online. And easy to compare the price and gather the user rating.</p> <p>Offline:</p> <p>Customer should move to the dealership to dealership for the best price. And need to bargain from the sales person.</p>	
	EM	4. Emotions:					
		<p>BEFORE:</p> <p>Customer is confused and doesn't know the price before buying used car.</p> <p>AFTER:</p> <p>Determine the worthiness of the car by their own without human intervention.</p>					

4 REQUIREMENT ANALYSIS

4.1 Functional requirement

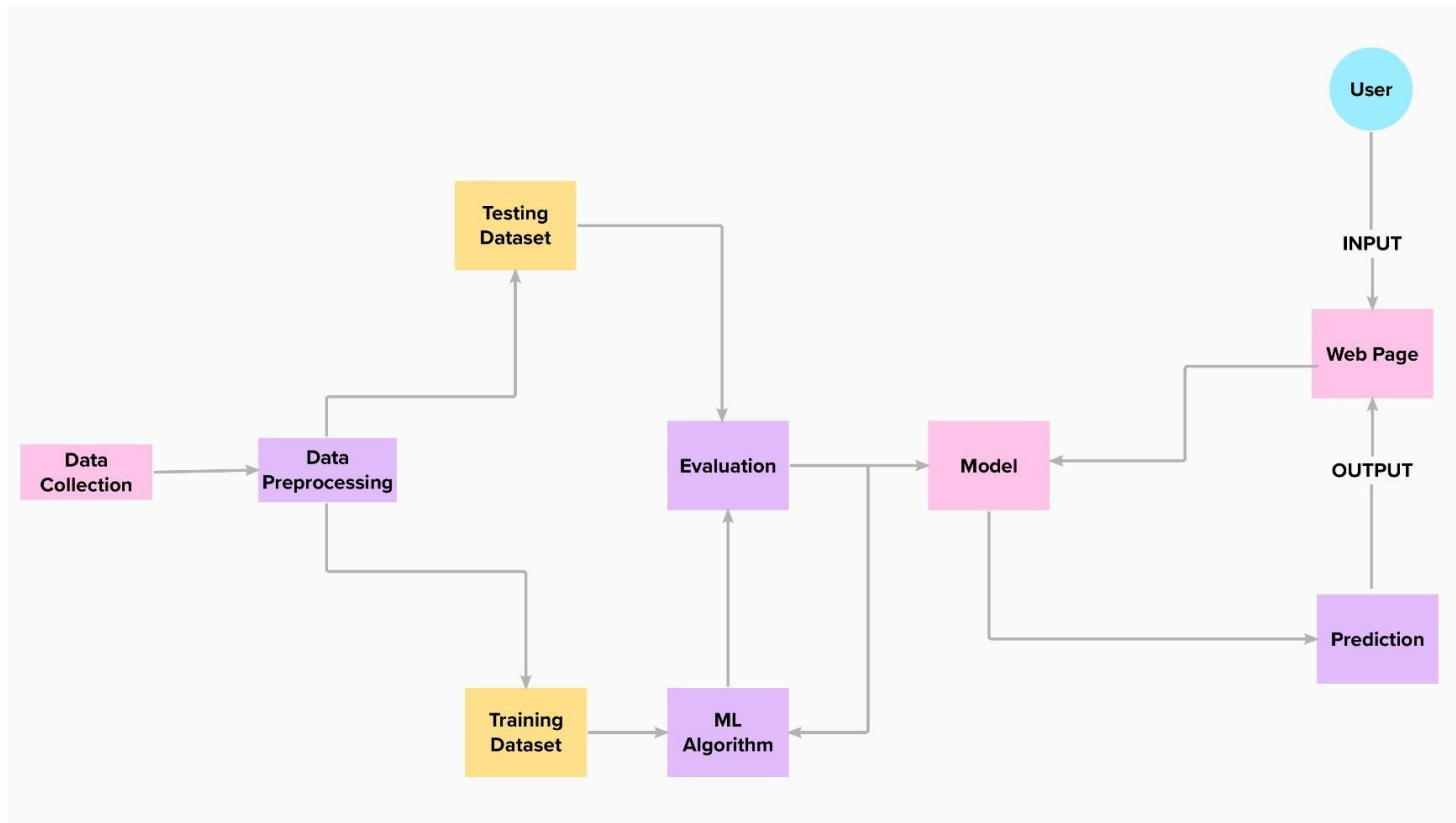
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Website
FR-2	User Confirmation	Confirmation via Website
FR-3	Car Registration	Registration through Website
FR-4	Car Information	Getting the car details through Website
FR-5	Value Prediction	Shows the resale value of the car through website

4.2 Non-Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	The model predicts the resale value of the car with more accuracy.
NFR-2	Security	Protect the user information as well as their car details.
NFR-3	Reliability	The model performs consistently well and also it begins trust to the user.
NFR-4	Performance	The model performance has high accuracy and with portable from one machine to another machine.
NFR-5	Availability	The model can be available anywhere at anytime.
NFR-6	Scalability	The model can be viewed and accessed in both computer as well as mobile phone.

5 PROJECT DESIGN

5.1 Data Flow Diagram



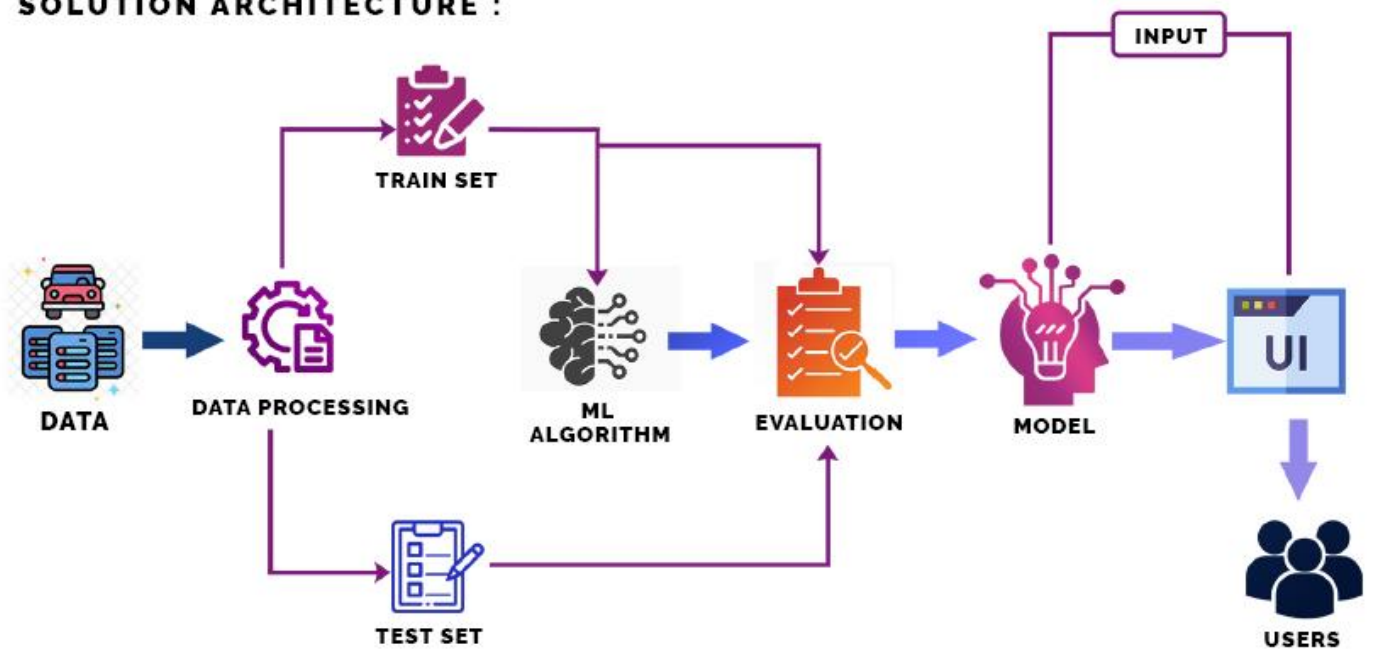
5.2 Solution & Technical Architecture

CAR RESALE VALUE PREDICTION

PROBLEM SOLUTION ARCHITECTURE

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SOLUTION ARCHITECTURE :



User Stories

User Type	Functional requirement	User story number	User story/task	Acceptance criteria	Priority	Release
Customer (Mobile user, Web user, Care executive, Administrator)	Registration	USN-1	As a user, I can register for the application by entering my mail, password, and confirming my password	I can access my account/ dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Dashboard	USN-3	As a user, I can register for the application through internet	I can register & access the dashboard with Internet login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can confirm the registration in Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login with my id and password	High	Sprint-1

6 PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	We have to create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW	Arunprasad C Vasudevan V
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location through the software	1	MEDIUM	Arunprasad C Vasudevan V
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM	Manikandan K Ragul K
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Kaviyarasan M Vasudevan V
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Arunprasad C Manikandan K

6.2 Sprint Delivery Schedule

Sprint	Functional Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Home Page	USN-1	Description about car resale process	2	Low	Suresh Kumar.P, Sankaralingam.V
Sprint-3	Registration/Login	USN-2	As a user, I can register for the application by entering my username, email, phone number, and password and verify it. As a user, I can log in to the web application by entering my Username & password.	5	Medium	Suresh Kumar.P, Sankaralingam.V
Sprint-3	Form Page	USN-3	As a user, I submit my car details.	5	Medium	Suresh Kumar.P, Sankaralingam.V
Sprint-3	Result	USN-4	The predicted resale price for the given car model will be displayed.	9	High	Suresh Kumar.P, Sankaralingam.V
Sprint-1	Data collection and Data preprocessing	USN-5	Collect the required data and read the data.	6	High	Suresh Kumar.P, Saran Pradeep.E
Sprint-1	Data collection and Data preprocessing	USN-6	Clean and analyse the data to avoid duplications	9	High	Suresh Kumar.P, Saran Pradeep.E

Sprint-1	Data collection and Data preprocessing	USN-7	Split the data into Dependent and Independent variables	6	High	Suresh Kumar.P, Saran Pradeep.E
Sprint-2	Model Building	USN-8	Build the model using a Random Forest regression to classify the data.	9	High	Suresh Kumar.P, Tamil Selvan.P
Sprint-2	Model Building	USN-9	Check the metrics	7	High	Suresh Kumar.P, Tamil Selvan.P
Sprint-2	Model Building	USN-10	Save the model	5	High	Suresh Kumar.P, Tamil Selvan.P
Sprint-4	Deploy the model	USN-11	Deployment of ML model using IBM Watson Studio, object storage.	13	High	Suresh Kumar.P, Saran Pradeep.E
Sprint-4	Integrate the webapp with the IBM model	USN-12	Use flask for the integration purpose.	8	Medium	Suresh Kumar.P, Saran Pradeep.E

7 CODING & SOLUTIONING

7.1 Feature 1

- IoT device
- IBM Watson Platform
- Node red
- Cloudant DB
- Web UI
- MIT App Inventor
- Python code

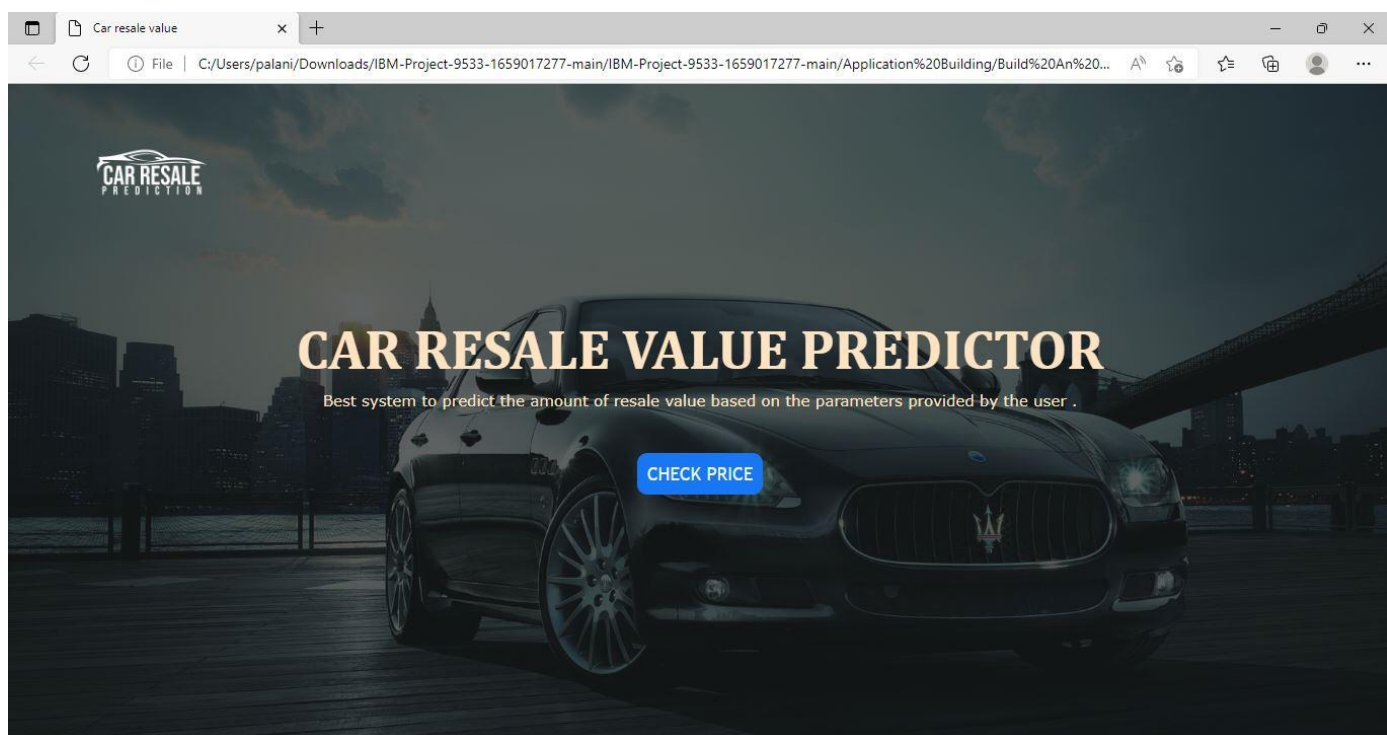
7.2 Feature 2

- Login
- Wokwi

8 TESTING AND RESULTS

8.1 Test Cases

Test case 1:



Test case 2:

GET THE ACCURATE RESALE VALUE OF YOUR CAR

Registration year :

Registration Month :

Power of car in PS:

Kilometers that car have driven :

Gear type : ☐ Manual ☐ Automatic ☐ Not declared

Your car is repaired or damaged : ☐ Yes ☐ No ☐ Not declared

Model Type :

Brand :

GET THE ACCURATE RESALE VALUE OF YOUR CAR

Registration Month :

Power of car in PS:

Kilometers that car have driven :

Gear type : ☐ Manual ☐ Automatic ☐ Not declared

Your car is repaired or damaged : ☐ Yes ☐ No ☐ Not declared

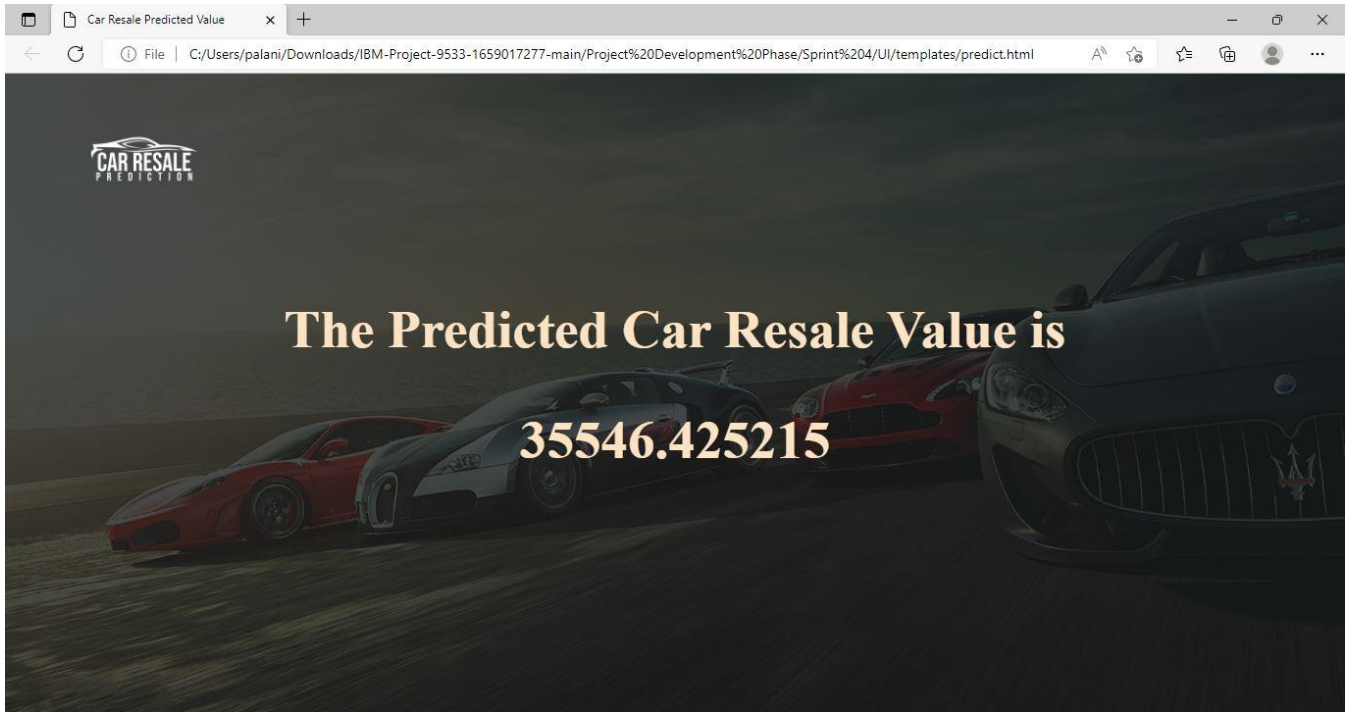
Model Type :

Brand :

Fuel Type :

Vehicle type:

9 Result



10.

10.1 ADVANTAGES

- This will reduced installation cost.
- It will monitor 24/7.
- Very useful to sale the car for reasonable price

10.2 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

Price prediction analyses a good or service based on its attributes, demand, and current market trends using an algorithm. The pricing is then adjusted by the programme at a level that it believes would both draw people and optimise sales. The method is known as price forecasting or predictive pricing in some quarters.

12 FUTURE SCOPE

When compared to February 2020, average prices were up 42.5% in September 2022. While it's possible that used vehicle prices have peaked, new car prices are expected to be high through the end of 2022. Prices are anticipated to drop for both new and used automobiles in 2023, by 2.5% to 5% for new cars and 10% to 20% for used cars.

13 APPENDIX

Source Code

HTML FILES:

Car HTML :

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Car resale value </title>
    <link rel="stylesheet" href="../static/css/style.css">
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">
  </head>
  <body>
    <section class="header">
      <nav>
        <a href="/"></a>
      </nav>
      <div class="text-box">
        <h1>CAR RESALE VALUE PREDICTOR</h1>
```

```

        <p>Best system to predict the amount of resale value based on the
parameters provided by the user .</p>
        <a href="./predict_page" class="visit-btn ">CHECK PRICE</a>
    </div>
</section>

</body>
</html>

```

Car.CSS :

```

*{
    margin: 0;
    padding: 0;
}

.header{
    min-height: 100vh;
    width: 100%;
    background-image: linear-
gradient(rgba(25,30,30,0.7),rgba(25,30,30,0.7)),url(../Images/car1.png);
    background-position: center;
    background-size: cover;
    position: relative;
}

nav{
    display: flex;
    padding: 2% 6%;
    justify-content: space-between;
    align-items: center;
}

.nav-links{
    flex: 1;
    text-align: right;
}

.nav-links ul li{
    list-style: none;
    display: inline-block;
    padding: 8px 12px;
    position: relative;
}

.nav-links ul li a{
    color: white;
    text-decoration: none;
    font-size: 13px;
}

.text-box{
    text-align: center;
}

```

```

position: relative;
color: #FFE4C4;
top:50%;
}
.text-box h1{
margin-top: 50px;
font-size: 55px;
font-family: Cambria, Cochin, Georgia, Times, 'Times New Roman', serif;
}
.text-box p{
margin: 10px 0 40px;
font-size: 15px;
font-family: Verdana, Geneva, Tahoma, sans-serif;
}
.visit-btn{
background-color: #1877f2;
color: aliceblue;
border: none;
border-radius: 10px;
font-size: 18px;
font-family: 'Trebuchet MS', 'Lucida Sans Unicode', 'Lucida Grande', 'Lucida
Sans', Arial, sans-serif;
line-height: 48px;
padding: 10px;
width: 602px;
text-decoration:none;
}

```

Value.HTML :

```

<!DOCTYPE html>
<html lang="en" dir="ltr">
<head>
<link rel="stylesheet" href="../../static/css/value.css">
<title>Car resale value</title>

</head>
<body>
  <section class="form">
    <form action="http://localhost:5000/predict" method="GET">
      <table border="0" align="center">
        <tbody>
          <tr>
            <td><h1>GET THE ACCURATE RESALE VALUE OF YOUR CAR</h1>
          </td>
        </tbody>
        <tr>
          <td><label for="year" padding:10px>Registration year : </label></td>
          <td><input id="year" maxlength="50" name="regyear" type="text" />
          <br>
          <br>
        </tr>
      </table>
    </form>
  </section>

```

```

</td>
</tr>

<tr>
<td><label for="month">Registration Month : </label></td>
<td><input id="month" maxlength="50" name="regmonth" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="power">Power of car in PS: </label></td>
<td><input id="power" maxlength="50" name="powerps" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="kilometer">Kilometers that car have driven : </label></td>
<td><input id="kilometer" maxlength="50" name="kms" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="geartype">Gear type : </label></td>
<td><input type="radio" name="geartype" value="manual"/> Manual
<input type="radio" name="geartype" value="automatic"/> Automatic
<input type="radio" name="geartype" value="not-declared"/> Not declared
<br>
<br>
</td>
</tr>

<tr>
<td><label for="damage">Your car is repaired or damaged : </label></td>
<td><input type="radio" name="damage" value="yes"/> Yes
<input type="radio" name="damage" value="no"/> No
<input type="radio" name="damage" value="not-declared"/> Not declared
<br>
<br>
</td>
</tr>

<tr>

```

```
<td><label for="model">Model Type : </label></td>
<td>
<select name="model" id="model">
<option value="" disabled selected hidden>Choose Model Name...</option>
<option value="golf">Golf </option>
<option value="grand">Grand </option>
<option value="fabia">Fabia </option>
<option value="3er">3er </option>
<option value="2_reihe">2 Reihe </option>
<option value="andere">Andere </option>
<option value="c_max">C Max </option>
<option value="3_reihe">3 Reihe </option>
<option value="passat">Passat </option>
<option value="navara">Navara </option>
<option value="ka">Ka </option>
<option value="polo">Polo </option>
<option value="twingo">Twingo </option>
<option value="a_klasse">A klasse </option>
<option value="scirocco">Scirocco </option>
<option value="5er">5er </option>
<option value="meriva">Meriva </option>
<option value="arosa">Arosa </option>
<option value="c4">C4 </option>
<option value="civic">Civic </option>
<option value="transporter">Transporter </option>
<option value="punto">Punto </option>
<option value="e_klasse">E Klasse </option>
<option value="clio">Clio </option>
<option value="kadett">Kadett </option>
<option value="kangoo">Kangoo </option>
<option value="corsa">Corsa </option>
<option value="one">One </option>
<option value="fortwo">Fortwo </option>
<option value="1er">1er </option>
<option value="b_klasse">B Klasse </option>
<option value="signum">Signum </option>
<option value="astra">Astra </option>
<option value="a8">A8 </option>
<option value="jetta">Jetta </option>
<option value="fiesta">Fiesta </option>
<option value="c_klasse">C Klasse </option>
<option value="micra">Micra </option>
<option value="vito">Vito </option>
<option value="sprinter">Sprinter </option>
<option value="156">156 </option>
<option value="escort">Escort </option>
<option value="forester">Forester </option>
<option value="xc_reihe">Xc Reihe </option>
```



```
<option value="scenic">Scenic </option>
<option value="a4">A4 </option>
<option value="a1">A1 </option>
<option value="insignia">Insignia </option>
<option value="combo">Combo </option>
<option value="focus">Focus </option>
<option value="tt">Tt </option>
<option value="a6">A6 </option>
<option value="jazz">Jazz </option>
<option value="omega">Omega </option>
<option value="slk">Slk </option>
<option value="7er">7er </option>
<option value="80">80 </option>
<option value="147">147 </option>
<option value="glk">Glk </option>
<option value="100">100 </option>
<option value="z_reihe">Z Reihe </option>
<option value="sportage">Sportage </option>
<option value="sorento">Sorento </option>
<option value="v40">V40 </option>
<option value="5er">5er </option>
<option value="ibiza">Ibiza </option>
<option value="3er">3er </option>
<option value="mustang">Mustang </option>
<option value="eos">Eos </option>
<option value="touran">Touran </option>
<option value="getz">Getz </option>
<option value="a3">A3 </option>
<option value="almera">Almera </option>
<option value="megane">Megane </option>
<option value="7er">7er </option>
<option value="1er">1er </option>
<option value="lupo">Lupo </option>
<option value="r19">R19 </option>
<option value="zafira">Zafira </option>
<option value="caddy">Caddy </option>
<option value="2_reihe">2 Reihe </option>
<option value="mondeo">Mondeo </option>
<option value="cordoba">Cordoba </option>
<option value="colt">Colt </option>
<option value="impreza">Impreza </option>
<option value="vectra">Vectra </option>
<option value="berlingo">Berlingo </option>
<option value="80">80 </option>
<option value="m_klasse">M Klasse </option>
<option value="tiguan">Tiguan </option>
<option value="i_reihe">I Reihe </option>
<option value="espace">Espace </option>
```

```
<option value="sharan">Sharan </option>
<option value="6_reihe">6 Reihe </option>
<option value="panda">Panda </option>
<option value="up">Up </option>
<option value="seicento">Seicento </option>
<option value="ceed">Ceed </option>
<option value="5_reihe">5 Reihe </option>
<option value="yeti">Yeti </option>
<option value="octavia">Octavia </option>
<option value="mii">Mii </option>
<option value="rx_reihe">Rx Reihe </option>
<option value="6er">6er </option>
<option value="modus">Modus </option>
<option value="fox">Fox </option>
<option value="matiz">Matiz </option>
<option value="beetle">Beetle </option>
<option value="c1">C1 </option>
<option value="rio">Rio </option>
<option value="touareg">Touareg </option>
<option value="logan">Logan </option>
<option value="spider">Spider </option>
<option value="cuore">Cuore </option>
<option value="s_max">S Max </option>
<option value="a2">A2 </option>
<option value="x_reihe">X Reihe </option>
<option value="a5">A5 </option>
<option value="galaxy">Galaxy </option>
<option value="c3">C3 </option>
<option value="viano">Viano </option>
<option value="s_klasse">S Klasse </option>
<option value="1_reihe">1 Reihe </option>
<option value="avensis">Avensis </option>
<option value="s1">S1 </option>
<option value="roomster">Roomster </option>
<option value="q5">Q5 </option>
<option value="kaefer">Kaefer </option>
<option value="santa">Santa </option>
<option value="cooper">Cooper </option>
<option value="leon">Leon </option>
<option value="4_reihe">4 Reihe </option>
<option value="500">500 </option>
<option value="laguna">Laguna </option>
<option value="ptcruiser">Ptcruiser </option>
<option value="clk">Clk </option>
<option value="primera">Primera </option>
<option value="exeo">Exeo </option>
<option value="159">159 </option>
<option value="transit">Transit </option>
```

```
<option value="juke">Juke </option>
<option value="qashqai">Qashqai </option>
<option value="carisma">Carisma </option>
<option value="accord">Accord </option>
<option value="corolla">Corolla </option>
<option value="lanos">Lanos </option>
<option value="phaeton">Phaeton </option>
<option value="boxster">Boxster </option>
<option value="verso">Verso </option>
<option value="swift">Swift </option>
<option value="rav">Rav </option>
<option value="kuga">Kuga </option>
<option value="picanto">Picanto </option>
<option value="kalos">Kalos </option>
<option value="superb">Superb </option>
<option value="stilo">Stilo </option>
<option value="alhambra">Alhambra </option>
<option value="911">911 </option>
<option value="mx_reihe">Mx Reihe </option>
<option value="m_reihe">M Reihe </option>
<option value="roadster">Roadster </option>
<option value="ypsilon">Ypsilon </option>
<option value="cayenne">Cayenne </option>
<option value="galant">Galant </option>
<option value="justy">Justy </option>
<option value="90">90 </option>
<option value="sirion">Sirion </option>
<option value="crossfire">Crossfire </option>
<option value="6_reihe">6 Reihe </option>
<option value="agila">Agila </option>
<option value="duster">Duster </option>
<option value="cr_reihe">Cr Reihe </option>
<option value="v50">V50 </option>
<option value="discovery">Discovery </option>
<option value="c_reihe">C Reihe </option>
<option value="v_klasse">V Klasse </option>
<option value="yaris">Yaris </option>
<option value="c5">C5 </option>
<option value="aygo">Aygo </option>
<option value="cc">Cc </option>
<option value="carnival">Carnival </option>
<option value="fusion">Fusion </option>
<option value="bora">Bora </option>
<option value="forfour">Forfour </option>
<option value="100">100 </option>
<option value="cl">Cl </option>
<option value="tigra">Tigra </option>
<option value="156">156 </option>
```

```
<option value="300c">300c </option>
<option value="100">100 </option>
<option value="147">147 </option>
<option value="q3">Q3 </option>
<option value="spark">Spark </option>
<option value="v70">V70 </option>
<option value="x_type">X Type </option>
<option value="5_reihe">5 Reihe </option>
<option value="ducato">Ducato </option>
<option value="s_type">S Type </option>
<option value="x_trail">X Trail </option>
<option value="toledo">Toledo </option>
<option value="altea">Altea </option>
<option value="7er">7er </option>
<option value="voyager">Voyager </option>
<option value="calibra">Calibra </option>
<option value="bravo">Bravo </option>
<option value="range_rover">Range Rover </option>
<option value="antara">Antara </option>
<option value="tucson">Tucson </option>
<option value="q7">Q7 </option>
<option value="citigo">Citigo </option>
<option value="jimny">Jimny </option>
<option value="cx_reihe">Cx Reihe </option>
<option value="wrangler">Wrangler </option>
<option value="lybra">Lybra </option>
<option value="range_rover_sport">Range Rover Sport </option>
<option value="lancer">Lancer </option>
<option value="159">159 </option>
<option value="freelander">Freelander </option>
<option value="captiva">Captiva </option>
<option value="c2">C2 </option>
<option value="500">500 </option>
<option value="range_rover_evoque">Range Rover Evoque </option>
<option value="sander0">Sander0 </option>
<option value="note">Note </option>
<option value="900">900 </option>
<option value="147">147 </option>
<option value="defender">Defender </option>
<option value="cherokee">Cherokee </option>
<option value="clubman">Clubman </option>
<option value="samara">Samara </option>
<option value="2_reihe">2 Reihe </option>
<option value="1er">1er </option>
<option value="3er">3er </option>
<option value="601">601 </option>
<option value="3_reihe">3 Reihe </option>
<option value="4_reihe">4 Reihe </option>
```

```
<option value="5er">5er </option>
<option value="6_reihe">6 Reihe </option>
<option value="legacy">Legacy </option>
<option value="pajero">Pajero </option>
<option value="auris">Auris </option>
<option value="niva">Niva </option>
<option value="5_reihe">5 Reihe </option>
<option value="s60">S60 </option>
<option value="nubira">Nubira </option>
<option value="vivaro">Vivaro </option>
<option value="g_klasse">G Klasse </option>
<option value="lodgy">Lodgy </option>
<option value="850">850 </option>
<option value="serie_2">Serie 2 </option>
<option value="6er">6er </option>
<option value="charade">Charade </option>
<option value="croma">Croma </option>
<option value="outlander">Outlander </option>
<option value="gl">G1 </option>
<option value="doblo">Doblo </option>
<option value="musa">Musa </option>
<option value="amarok">Amarok </option>
<option value="156">156 </option>
<option value="move">Move </option>
<option value="9000">9000 </option>
<option value="v60">V60 </option>
<option value="145">145 </option>
<option value="aveo">Aveo </option>
<option value="200">200 </option>
<option value="300c">300c </option>
<option value="b_max">B Max </option>
<option value="delta">Delta </option>
<option value="terios">Terios </option>
<option value="rangerover">RangeRover </option>
<option value="90">90 </option>
<option value="materia">Materia </option>
<option value="kalina">Kalina </option>
<option value="elefantino">Elefantino </option>
<option value="i3">I3 </option>
<option value="kappa">Kappa </option>
<option value="serie_3">Serie 3 </option>
<option value="48429">48429 </option>
<option value="serie_1">Serie 1 </option>
<option value="discovery_sport">Discovery Sport </option>

</select>
<br>
<br>
```

```

</td>
</tr>

<tr>
<td><label for="brand">Brand :</label></td>
<td>
<select name="brand" id="brand">
<option value="" disabled selected hidden>Choose Brand Name...</option>
<option value="volkswagen">Volkswagen </option>
<option value="audi">Audi </option>
<option value="jeep">Jeep </option>
<option value="skoda">Skoda </option>
<option value="bmw">Bmw </option>
<option value="peugeot">Peugeot </option>
<option value="ford">Ford </option>
<option value="mazda">Mazda </option>
<option value="nissan">Nissan </option>
<option value="renault">Renault </option>
<option value="mercedes_benz">Mercedes Benz </option>
<option value="opel">Opel </option>
<option value="seat">Seat </option>
<option value="citroen">Citroen </option>
<option value="honda">Honda </option>
<option value="fiat">Fiat </option>
<option value="mini">Mini </option>
<option value="smart">Smart </option>
<option value="hyundai">Hyundai </option>
<option value="sonstige_autos">Sonstige Autos </option>
<option value="alfa_romeo">Alfa Romeo </option>
<option value="subaru">Subaru </option>
<option value="volvo">Volvo </option>
<option value="mitsubishi">Mitsubishi </option>
<option value="kia">Kia </option>
<option value="suzuki">Suzuki </option>
<option value="lancia">Lancia </option>
<option value="porsche">Porsche </option>
<option value="toyota">Toyota </option>
<option value="chevrolet">Chevrolet </option>
<option value="dacia">Dacia </option>
<option value="daihatsu">Daihatsu </option>
<option value="trabant">Trabant </option>
<option value="saab">Saab </option>
<option value="chrysler">Chrysler </option>
<option value="jaguar">Jaguar </option>
<option value="daewoo">Daewoo </option>
<option value="rover">Rover </option>
<option value="land_rover">Land Rover </option>
<option value="lada">Lada </option>

```

```

</select>
<br>
<br>
</td>
</tr>

<tr>
<td><label for="fuelType">Fuel Type :</label></td>
<td>
<select name="fuelType" id="brand">
<option value="" disabled selected hidden>Choose Fuel Type...</option>
<option value="petrol"> Petrol </option>
<option value="diesel"> Diesel </option>
<option value="not-declared"> Not Declared </option>
<option value="lpg">LPG </option>
<option value="cng">CNG </option>
<option value="hybrid">Hybrid </option>
<option value="others">Others </option>
<option value="electric">Electric </option>
</select>
<br>
<br>
</td>
</tr>

<tr>
<td><label for="vehicletype">Vehicle type:</label></td>
<td>
<select name="vehicletype" id="vehicle" >
<option value="" disabled selected hidden>Choose Vehicle Type...</option>
<option value="coupe">Coupe </option>
<option value="suv">SUV </option>
<option value="kleinwagen">Kleinwagen </option>
<option value="limousine">Limousine </option>
<option value="cabrio">Cabrio </option>
<option value="bus">Bus </option>
<option value="kombi">Kombi </option>
<option value="andere">Andere </option>
<option value="volkswagen">Volkswagen </option>
</select>
<br>
<br>
</td>
</tr>
</tbody>
</table>
<input name="Submit" type="Submit" value="Submit" id="button"/>
</form>

```

```
</section>

</body>
</html>
```

Value.css :

```
.header{
  width: 100%;
  text-align: center;
  //padding-top: 20px;
  font-size:20px;
  font-family: "Lucida Console";
  background-color:#43FFB6;
  border:0%;
  top:0px;
  bottom:0px;
  right:0px;
  left:0px;
  overflow-y:auto;
}

body{
  margin: 0;
}

.form{
background-image: linear-gradient(rgba(23, 25, 26, 0.836),rgba(29, 34, 34, 0.836)),url(../Images/car4.jpg);
  background-position: center;
  background-size: cover;
  position: relative;
}

.form{
text-align: center;
font-family: Cambria, Cochin, Georgia, Times, 'Times New Roman', serif;
padding:20px;
text-top:10px;
display: flex;
flex-direction: column;
align-items: center;
}

.form{
font-size:22px;
}

textarea {
  width: 100%;
  height: 150px;
  padding: 12px 20px;
```



```
    box-sizing: border-box;
    border: 2px solid #ccc;
    border-radius: 4px;
    background-color: #f8f8f8;
    color: black;
    resize: none;
}
input[type=text] {
    transition: width 0.4s ease-in-out;
}

input[type=text] {
    width: 70%;
    height: 10%;
    color: black;
    padding: 10px 10px;
    margin: 5px 0;
}
select option{
    color: #000;
}
#model{
    width: 80%;
    color: #000;
}
#brand{
width:80%;
color: #000;
}
#vehicle{
width:80%;
color: #000;
}
*{
color:rgb(255, 255, 255);
}

#button{
    background-color: #1877f2;
    color: aliceblue;
    border: none;
    border-radius: 10px;
    font-size: 18px;
    font-family: 'Trebuchet MS', 'Lucida Sans Unicode', 'Lucida Grande', 'Lucida
Sans', Arial, sans-serif;
    line-height: 35px;
    padding: 10px;
    width: 132px;
```

```
}
```

Predict.html :

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <link rel="stylesheet" href="../static/css/predict.css">
  <title>Car Resale Predicted Value</title>
</head>
<body>
  <section class="header">
    <nav>
      <a href="/"></a>
    </nav>
    <div class="text-box">
      <h1>The Predicted Car Resale Value is </h1>
      <h1>{{predict}}</h1>
    </div>
  </section>
</body>
</html>
```

Predict.css :

```
.header{
  min-height: 100vh;
  width: 100%;
  background-image: linear-gradient(rgba(25, 30, 30, 0.801),rgba(25, 30, 30,
0.788)),url(../Images/car6.png);
  background-position: center;
  background-size: cover;
  position: relative;
}

.text-box{
  text-align: center;
  position: relative;
  color: #FFE4C4;
  top:50%;
}

.text-box h1{
  margin-top: 50px;
```

```

    font-size: 55px;
}

.text-box p{
    margin: 10px 0 40px;
    font-size: 15px;
}

body{
    margin: 0;
}

nav{
    display: flex;
    padding: 2% 6%;
    justify-content: space-between;
    align-items: center;
}

```

Integrate_flask.py :

```

# Import Libraries
import pandas as pd
import numpy as np
from flask import Flask, render_template, Response, request
import pickle
from sklearn.preprocessing import LabelEncoder
import requests

# NOTE: you must manually set API_KEY below using information retrieved from
your IBM Cloud account.
API_KEY = "Qo9j8ni7qMJ8j1C8VFDRFHbuGRAhYwCt1kVqnYg1AGkE"
token_response = requests.post('https://iam.cloud.ibm.com/identity/token',
data={"apikey":API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-
type:apikey'})
mltoken = token_response.json()["access_token"]
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' +
mltoken}

app = Flask(__name__)#initiate flask app

def load_model(file='../Result/resale_model.sav'):#load the saved model
    return pickle.load(open(file, 'rb'))

@app.route('/')
def index():#main page
    return render_template('car.html')

```

```

@app.route('/predict_page')
def predict_page():#predicting page
    return render_template('value.html')

@app.route('/predict', methods=['GET','POST'])
def predict():
    reg_year = int(request.args.get('regyear'))
    powerps = float(request.args.get('powerps'))
    kms= float(request.args.get('kms'))
    reg_month = int(request.args.get('regmonth'))

    gearbox = request.args.get('geartype')
    damage = request.args.get('damage')
    model = request.args.get('model')
    brand = request.args.get('brand')
    fuel_type = request.args.get('fuelType')
    veh_type = request.args.get('vehicletype')

    new_row = {'yearOfReg':reg_year, 'powerPS':powerps, 'kilometer':kms,
               'monthOfRegistration':reg_month, 'gearbox':gearbox,
               'notRepairedDamage':damage,
               'model':model, 'brand':brand, 'fuelType':fuel_type,
               'vehicletype':veh_type}

    print(new_row)

    new_df = pd.DataFrame(columns=['vehicletype','yearOfReg','gearbox',
                                   'powerPS','model','kilometer','monthOfRegistration','fuelType',
                                   'brand','notRepairedDamage'])
    new_df = new_df.append(new_row, ignore_index=True)
    labels =
    ['gearbox','notRepairedDamage','model','brand','fuelType','vehicletype']
    mapper = {}

    for i in labels:
        mapper[i] = LabelEncoder()
        mapper[i].classes = np.load('../Result/'+str('classes'+i+'.numpy'),
allow_pickle=True)
        transform = mapper[i].fit_transform(new_df[i])
        new_df.loc[:,i+'_'+labels] = pd.Series(transform, index=new_df.index)

    labeled = new_df[['yearOfReg','powerPS','kilometer','monthOfRegistration']
+ [x+'_'+labels for x in labels]]

    X = labeled.values.tolist()
    print('\n\n', X)
    #predict = reg_model.predict(X)

```

```

    # NOTE: manually define and pass the array(s) of values to be scored in
the next line
    payload_scoring = {"input_data": [{"fields": [['yearOfReg', 'powerPS',
'kilometer', 'monthOfRegistration','gearbox_labels',
'notRepairedDamage_labels', 'model_labels','brand_labels', 'fuelType_labels',
'vehicletype_labels']], "values": X}]}

    response_scoring = requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/7f67cbcd-6222-413b-9901-
b2a72807ac82/predictions?version=2022-10-30', json=payload_scoring,
headers={'Authorization': 'Bearer ' + mltoken})
    predictions = response_scoring.json()
    print(response_scoring.json())
    predict = predictions['predictions'][0]['values'][0][0]
    print("Final prediction :",predict)

    return render_template('predict.html',predict=predict)

if __name__=='__main__':
    reg_model = load_model()#load the saved model
    app.run(host='localhost', debug=True, threaded=False)

```

GitHub Link :

<https://github.com/IBM-EPBL/IBM-Project-50728-1660922894>

Demo Video :

<https://youtu.be/AEHT9TWvGEM>