PROFESSIONAL READINESS FOR INNOVATION EMPLOYABILITY AND ENTREPRENEURSHIP

PROJECT REPORT

TITLE : CAR RESALE VALUE PREDICTION

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Project Report Format

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1. INTRODUCTION

1.1 Project Overview

This system “Car Resale Value Prediction” aims to build a regression model to predict used cars' resale value based on multiple aspects, including vehicle mileage, year of manufacturing, fuel consumption, transmission, road tax, fuel type, and engine size. This model can benefit sellers, buyers, and car manufacturers in the used cars market. Upon completion, it can output a relatively accurate price prediction based on the information that user’s input. Various regression methods, including linear regression, polynomial regression, support vector regression, decision tree regression, and random forest regression, were applied in the research to achieve the highest accuracy.

This system was implemented as a web application where the user enters the details of the car to get an estimation of the car’s resale value.

1.2 Purpose

Car resale value prediction helps the user to predict the resale value of the car depending upon various features like kilometers driven, fuel type, etc. The purpose of this system is of commercial interest to sellers/financer to be able to predict the resale value of cars with better accuracy. The most essential elements for forecast are brand and model, period use of vehicle, mileage of vehicle, gear type and fuel type utilized in the vehicle just as fuel utilization per mile profoundly influences cost of a vehicle because of continuous changes in the cost of a fuel. In view of the differing highlights and factors, and furthermore with the assistance of master information the vehicle resale value forecast has been done precisely.

2. LITERATURE SURVEY

2.1 Existing problem

With difficult economic conditions, it is likely that sales of second-hand imported (reconditioned) cars and used cars will increase. In many developed countries, it is common to lease a car rather than buying it outright. After the lease period is over, the buyer has the possibility to buy the car at its residual value, i.e., its expected resale value. Thus, it is of commercial interest to sellers/financers to be able to predict the salvage value (residual value) of cars with accuracy.

2.2 References

Monburinon, N., Chertchom, P., Kaewkiriya, T., Rungpheung, S., Buya, S., & Boonpou, P. (2018). Prediction of Prices for Used Cars by Using Regression Models. 5th International Conference on Business and Industrial Research (ICBIR), (pp. 115-119). Bangkok.

Noor, K., & Jan, S. (2017). Vehicle Price Prediction System using Machine Learning Techniques. International Journal of Computer Applications, 27-31.

Pudaruth, S. (2014). Predicting the Price of Used Cars using Machine Learning. International Journal of Information & Computation Technology, 754-764.

Research, F. -M. (2020, February 25). Automotive Industry in Dubai. Retrieved 10 24, 2021, from https://www.feedbackme.com/automotive-industry-in-uae

Rizvi, R. (2019, April). Car Production is on the Rise in Dubai. Retrieved September 10, 2019, from https://propakistani.pk/2019/04/08/car-production-ison-the-rise-in-dubai/

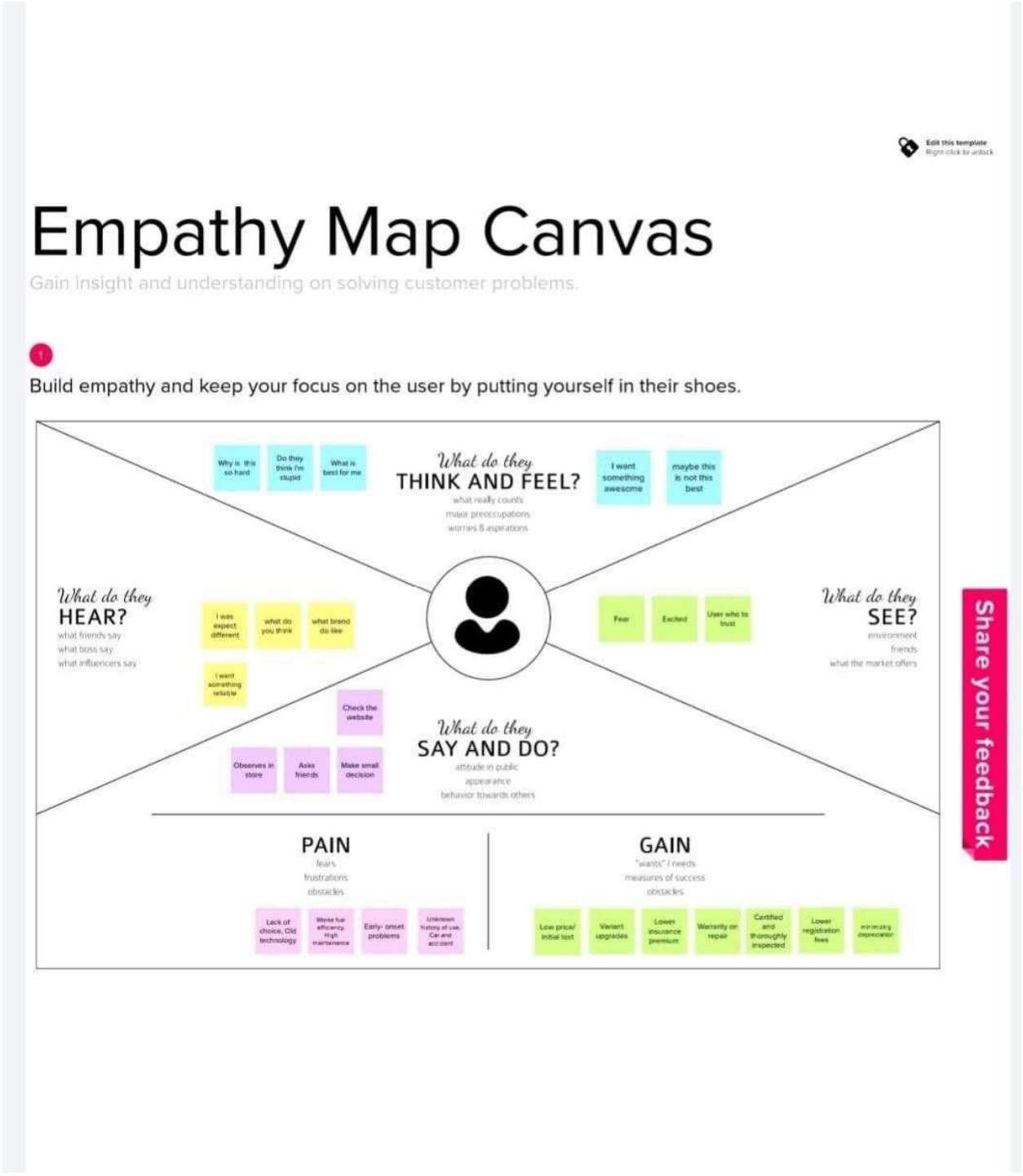
Used Vehicle Value Index. (2021, April). Retrieved from manheim: https://publish.manheim.com/en/services/consulting/used-vehicle-valueindex.html

2.3 Problem Statement Definition

It is easy for any company to price their new cars based on the manufacturing and marketing cost it involves. But when it comes to a used car it is quite difficult to define a price because it involves it is influenced by various parameters like car brand, manufactured year etc. The goal of our system is to predict the best price for a used car in the based on the previous data related to sold cars using machine learning.

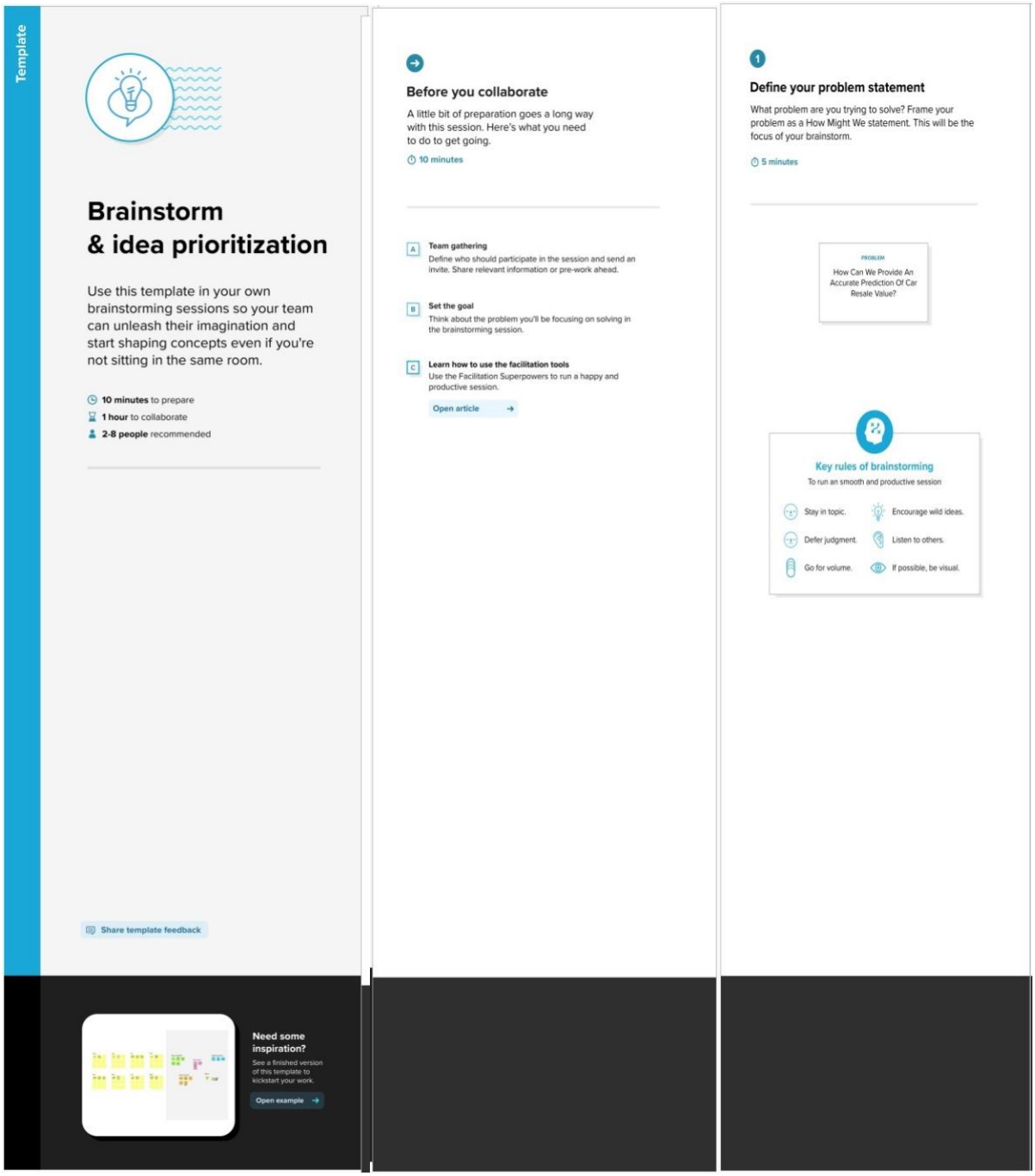
3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map Canvas

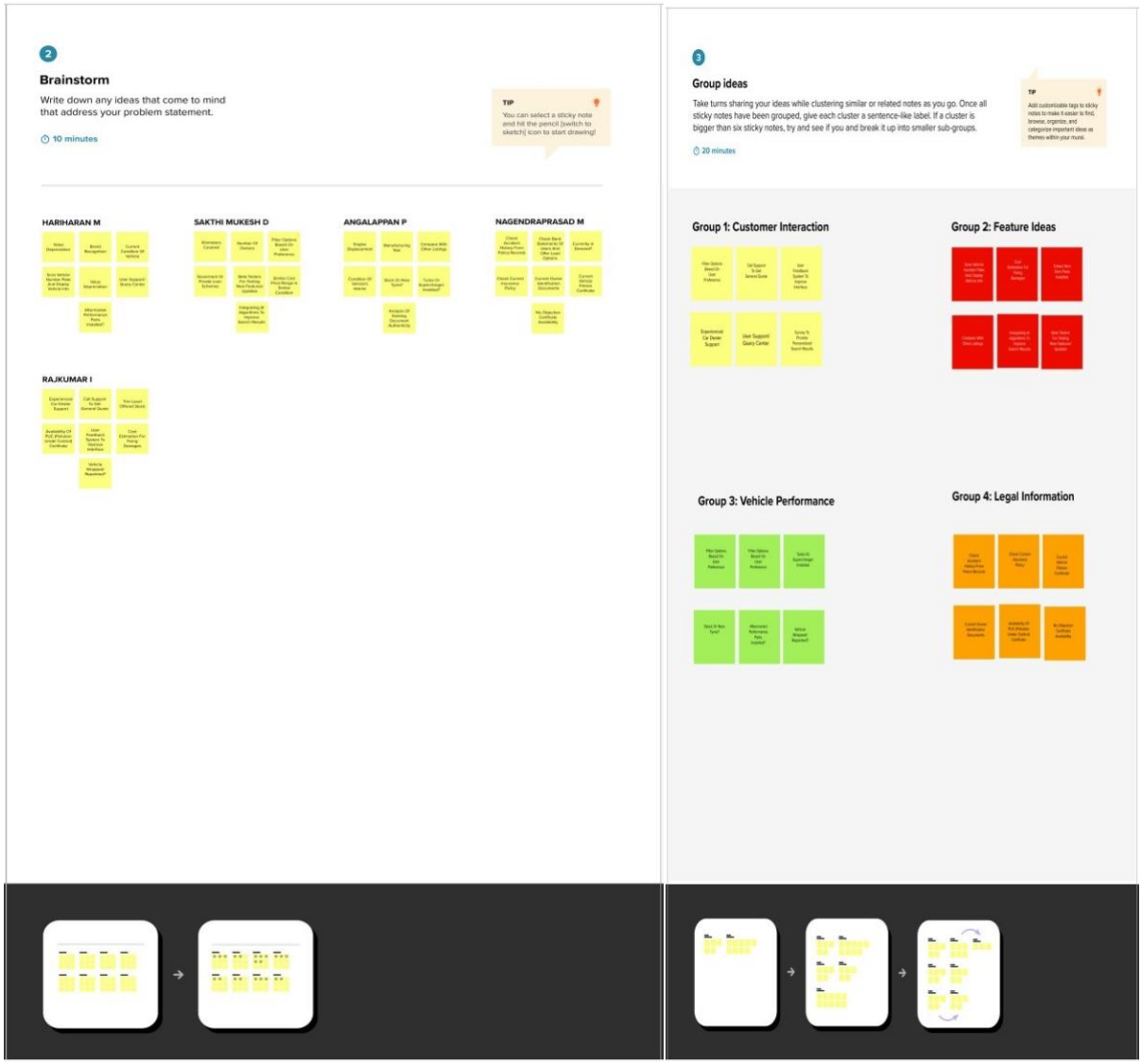


3.2 Ideation & Brainstorming

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



Step-2: Brainstorm, Idea Listing and Grouping

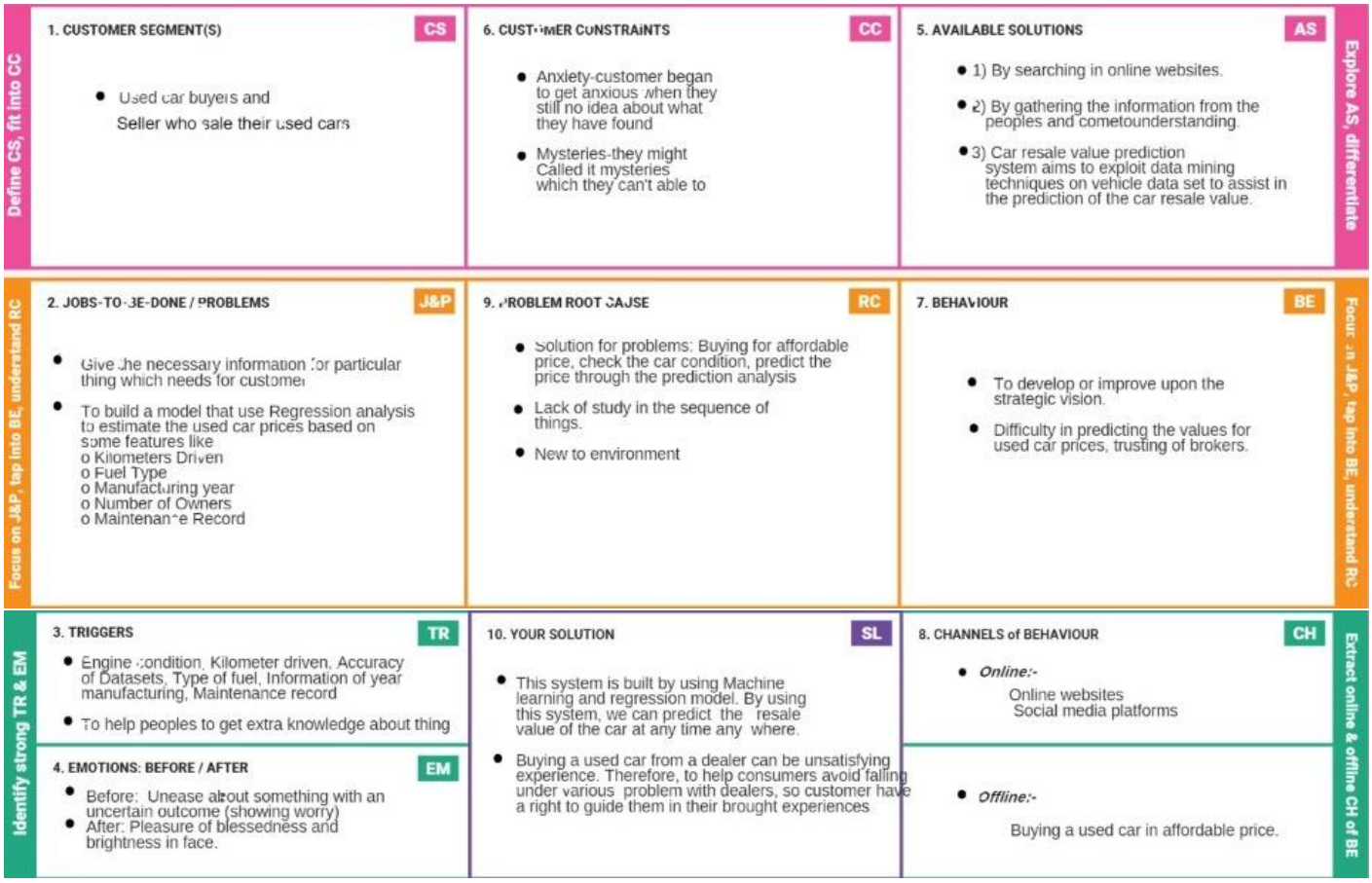


Step-3: Idea Prioritization

3.3 . Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The main aim of the project is to predict the price of the used cars using the various Machine Learning (ML) models. The project should take parameters related to used cars as input and enable the customers to make decisions by their own.
2.	Idea / Solution description	The model is to built that would give the nearest resale value of the vehicle. By using these best accuracy value will be taken as a solution and it will be integrated to the web-based application where the user is notified with the status of his product.
3.	Novelty / Uniqueness	Used cars price prediction is effectively used to determine the worthiness of the car by their own within few minutes by using various features such as year, model, mileage(km), etc.
4.	Social Impact / Customer Satisfaction	If the user wants to buy or sell a own car it helps user to predict the correct valuation by their own. A loss function is to be optimized and mainly a weak learner can make predictions for used cars easily.
5.	Business Model (Revenue Model)	It helps users to predict the correct valuation of the cars remotely with perfect valuation and without human intervention like car dealer in the process to eliminate biased valuation predicted by the dealer.
6.	Scalability of the Solution	Using stored data and machine learning approaches, this project proposed a scalable framework for predicting values for different types of used cars present all over India.

3.4 PROBLEM SOLUTION FIT



4.REQUIREMENT ANALYSYIS

4.1 FUCTIONAL REQUIREMENTS

Following are the functional requirements of proposed solution

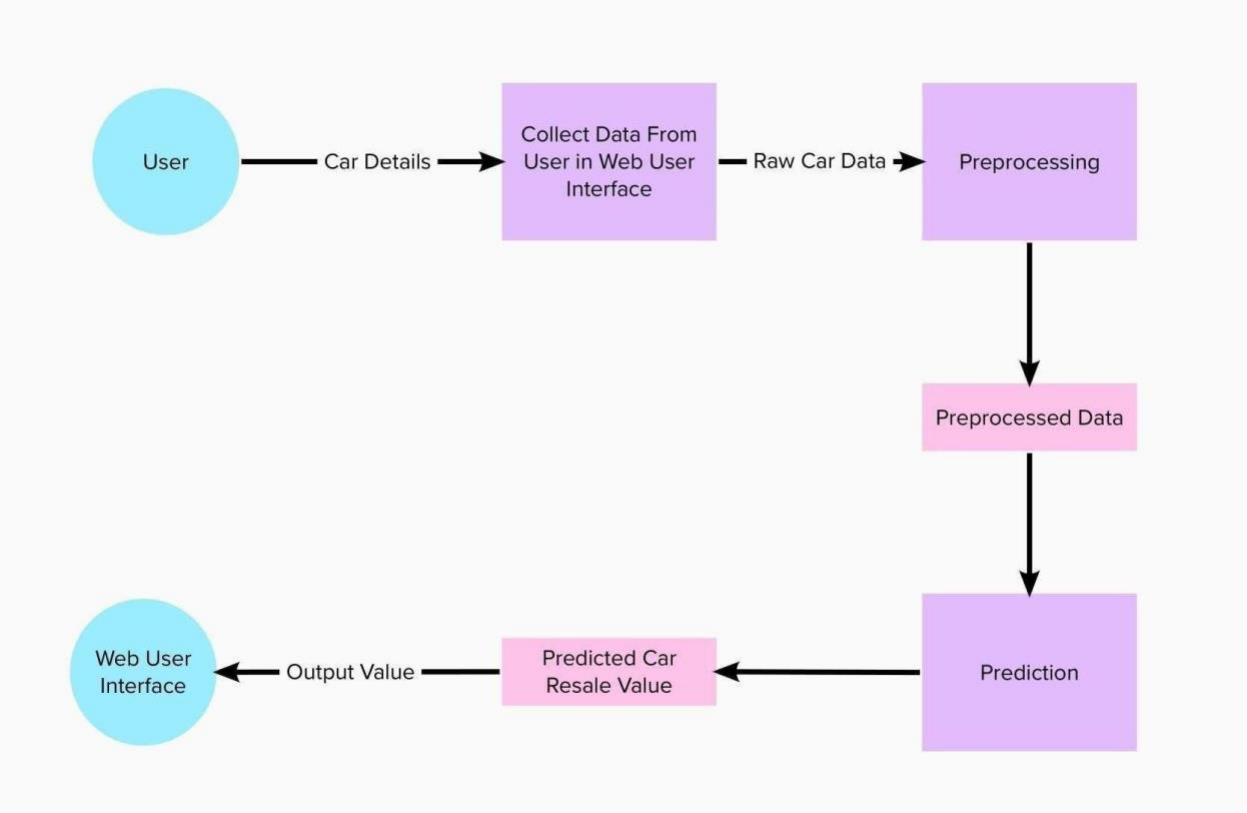
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration to the related websites	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Users Profile	Personal details, Bank account ,Is He/She interested in buying a car
FR-4	Gather information about the vehicle	Through the registered websites they collect information
FR-5	Display the functionality of the vehicle	Details: Fuel type , Manufactured year , Miles Driven , Record

4.2 NON-FUNCTIONAL REQUIREMENTS

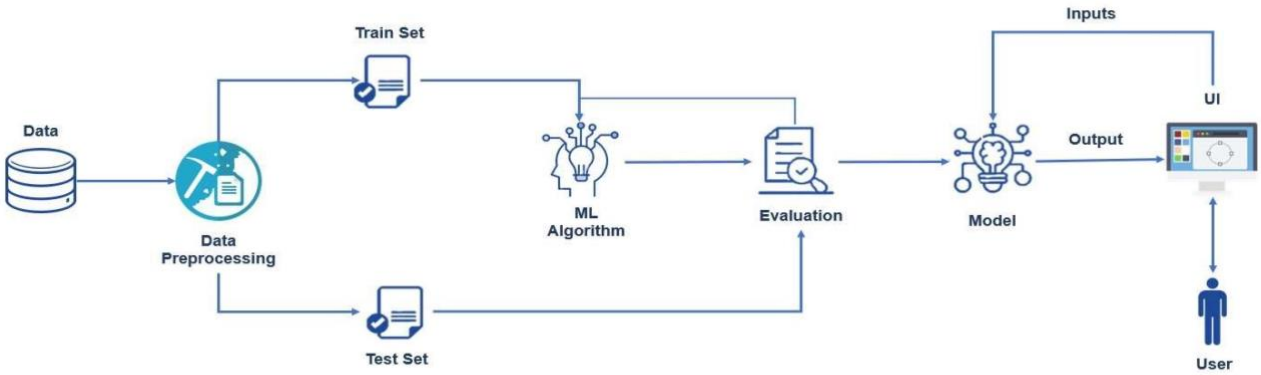
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration to the related websites	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Users Profile	Personal details, Bank account ,Is He/She interested in buying a car
FR-4	Gather information about the vehicle	Through the registered websites they collect information
FR-5	Display the functionality of the vehicle	Details: Fuel type , Manufactured year , Miles Driven , Record

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Pric
Customer (Mobile User)	Data Entry	USN-1	As a user, I can enter the car details in the application.	I can enter the car details	Med
	Obtain output	USN-2	As a user, I will receive car resale value in the application.	I can receive my car resale value	High
Customer (Web User)	Data Entry	USN-1	As a user, I can enter the car details in the application.	I can enter the car details	Med
	Obtain output	USN-2	As a user, I will receive car resale value in the application.	I can receive my car resale value	High
Administrator	Landing page	USN-3	As an admin , I will update the dataset and retrain the model if needed for accurate results .	I can check if the update is reflected or not	High

6. PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning & Estimation

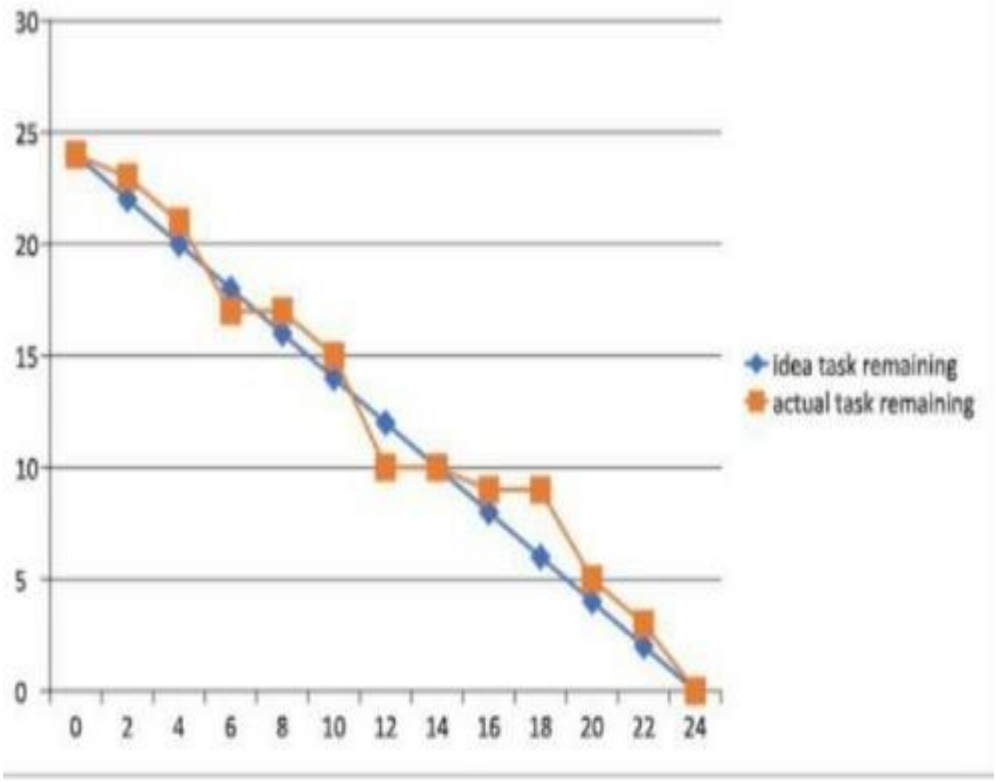
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data visualization and data preprocessing	USN-1	The main goal of data visualization is to make it easier to identify patterns,trends and outlier in large data setts	10	High	Dhivya,dinesh
Sprint-2	Implementing machine learning	USN-2	We use various kinds of algorithms to allow machines to learn the relationships within the data provided	10	High	Priyankka,pritha
sprint-3	App building	USN-3	Using flask deploying the ML model	10	High	dinesh
Sprint4	Evaluate predictor	USN-4	Evaluate the dataset details with the model which has already builded	20	Medium	priyankka

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)
Sprint1	20	6 Days	24 Oct 2022	29 Oct 2022	10	29 Oct 2022
Sprint2	20	6 Days	31 Oct 2022	05 Nov 2022	10	05 Nov 2022
Sprint3	20	6 Days	07 Nov 2022	12 Nov 2022	10	12 Nov 2022
Sprint4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Report

Burndown Chart



7.CODING AND SOLUTION

7.1 Home Page

Displays the home page of the application. Code:

1) Index.html

```
<!DOCTYPE html>
<nav lang="en" dir="ltr">
  <head>
    <style>
      body
{ background-color:#D3D3D3;
      }

     div {text-align: center;}
 </style>
    <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">
      <div class="text-box">
        <h1 style="font-size: 40px;color: purple">Car resale value Predictor</h1><br>
        <p style="font-size: 25px"> Welcome! To predict your used car price click the below
button!</p>
        <br>
```

```
        <a href="form.html">
          <form action="form.html">
            <input type="submit"value="check price">
          </form>
          </a>

        <br>
        <img src="https://imageio.forbes.com/specials-
images/imageserve/5d35eacaf1176b0008974b54/2020-Chevrolet-Corvette-
Stingray/0x0.jpg?format=jpg&crop=4560,2565,x790,y784,safe&width=960" alt="Car" width="350"
height="200">

      </div>
    </section>
  </nav>
    </body>
    </body>
  </body>
</html>
```

2) **style.css**

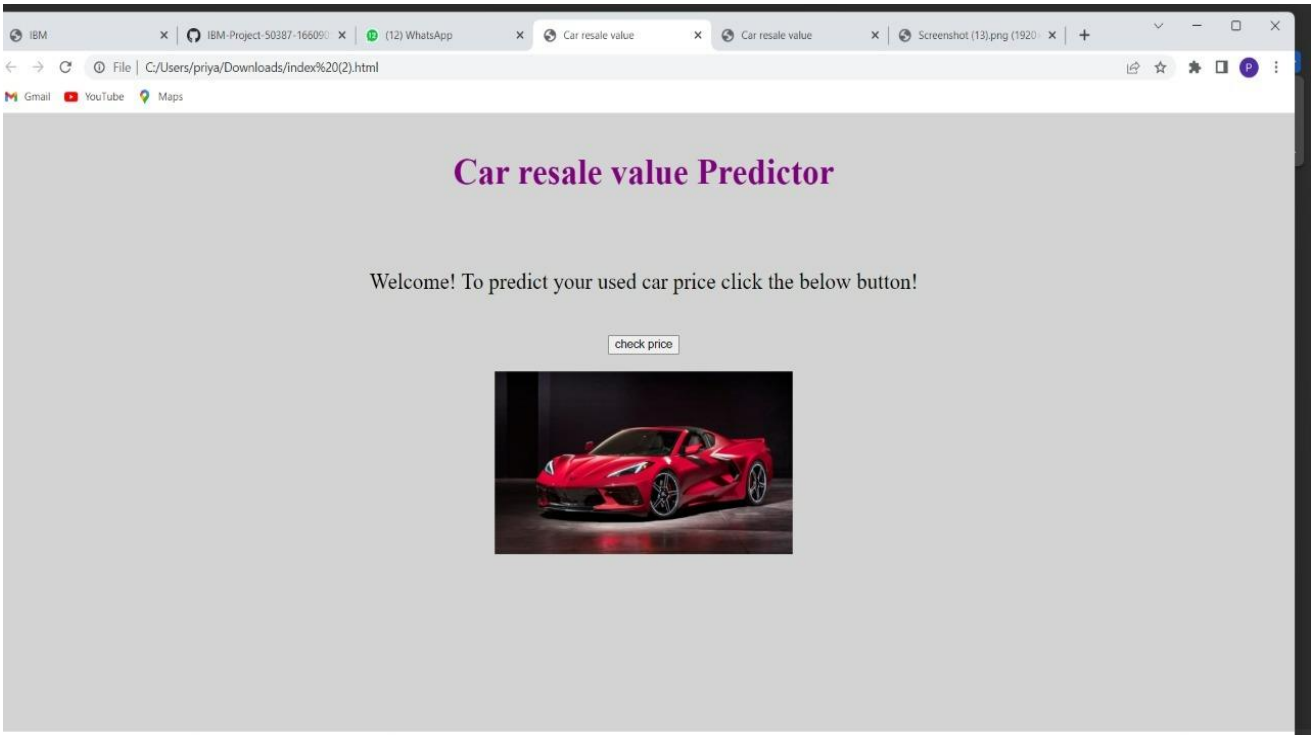
```
*{
  margin: 0;
  padding: 0;
}

body{
  font-family :'Franklin Gothic Medium';
  margin: 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.jpg);
  background-position: center;
  background-size: cover;
  position :absolute;
}
.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;
}

.text-box a.visit-btn{
  text-align: center;
  padding: 10px 20px;
  font-weight: 700;
  white-space: inherit;
  vertical-align: middle;
  border: 2px solid transparent;
  display: inline-block;
  margin: 10px 10px 0 0;
  border-radius: 50px;
  overflow: hidden;
  background-color: #FFE4C4;
  border: 0;
  line-height: 50px;
  box-shadow: 0 3px 6px 0 rgba(0,0,0,0.16);
  font-size: 20px;
  text-decoration:none;
  position: relative;
}
.text-box a.visit-btn:hover{
  background-image: linear-gradient(to left,#FFE4C4,#a147e4);
  background-position: left center;
}
```

.



7.2 Data Entry Page

Allows user to enter the details about the car for which the resale value is to be predicted.

Code:

1. **form.html**

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

```
</head>
<body style="background-color:Lightblue;">
    <section class="form">
    <form action="/predict" method="GET">
    <table border="0" align="center">
    <tbody>
        <h1>Get the Accurate Resale Value of Your Car</h1>
    <tr>
    <td><label for="year" padding:10px>Registration year : </label></td>
    <td><input id="year" maxlength="50" name="regyear" type="text" />
    <br>
    <br>
    </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="sl">Sl </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="sandero">Sandero </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">Gl </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><center>

<a href="predict.html" style="font-size:30px;">submit</a>

</center>
</form>
```

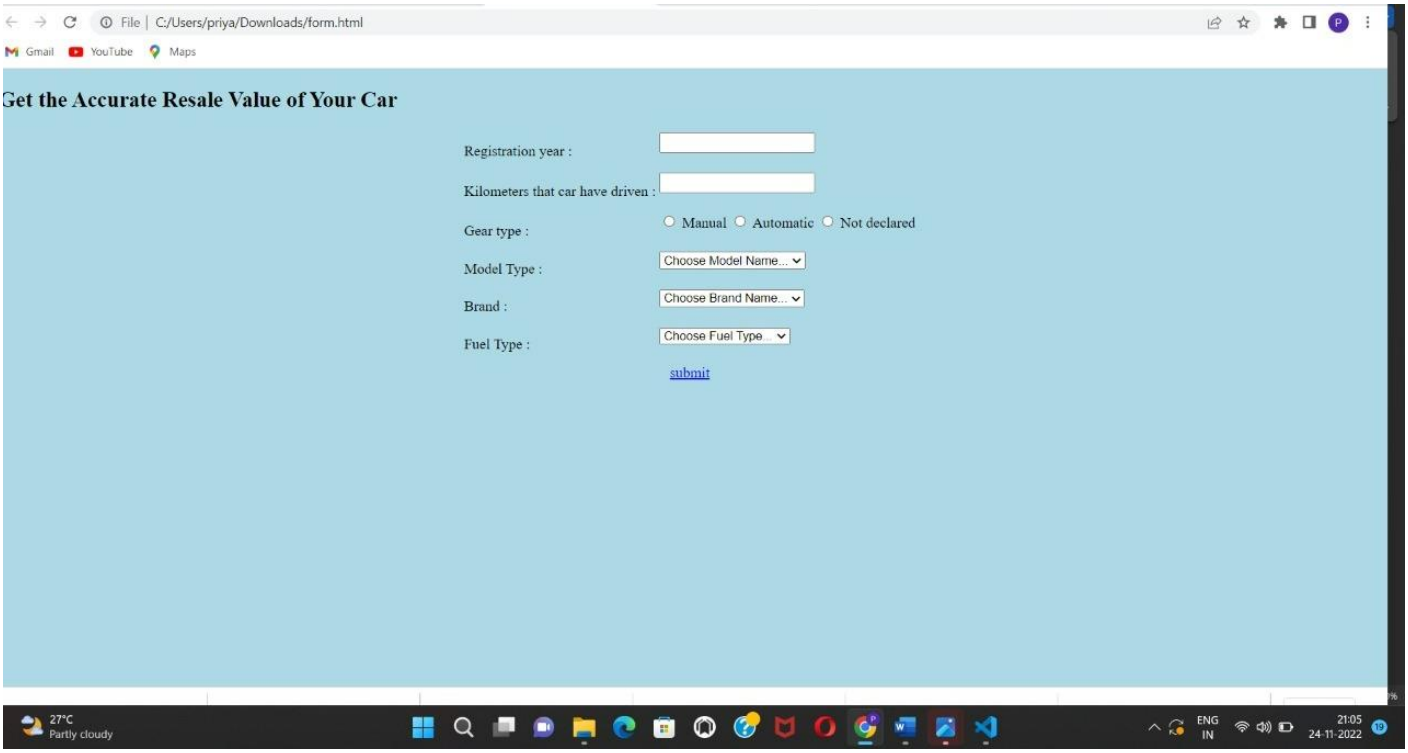
```
  </section>

</body>
</html>
```

2. form.css

```
.header{
    width: 100%;
    text-align: center;
    padding-top: 20px;
    font-size:20px;
    font-family :'Franklin Gothic Medium';
    background-color:#43FFB6;
    border:0%;
    top:0px;
    bottom:0px;
    right:0px;
    left:0px;
    overflow-y:auto;
  }
  body{
      margin: 0;
      font-family :'Franklin Gothic Medium';
  }
  .form{
  background-image: linear-
gradient(rgba(25,30,30,0.7),rgba(25,30,30,0.7)),url(../Images/car2.jpg);
    background-position: center;
    background-size: cover;
    position: relative;
    text-align: center;
    padding:20px;
    display: flex;
    flex-direction: column;
    align-items: center;
    font-size:22px;
  }
  input[type=text] {
    width: 100%;
    padding: 12px 20px;
    margin: 8px 0;
```

```
  display: inline-block;
  border: 1px solid #ccc;
  border-radius: 4px;
  box-sizing: border-box;
}
select {
  width: 100%;
  padding: 16px 20px;
  border: none;
  border-radius: 4px;
  background-color: #f1f1f1;
}
input[type=submit] {
  font-family :'Franklin Gothic Medium';
  font-weight: 700;
  width: 40%;
  background-color: #4CAF50;
  color: black;
  font-size: 20px;
  padding: 20px 20px;
  margin: 8px 0;
  border: none;
  border-radius: 4px;
  cursor: pointer;
}
input[type=submit]:hover {
  background-color: #37853b;
}
*{
color:black;
}
```



7.3 Output Display Page

The predicted resale car value is displayed in this page. Code

1. predict.html

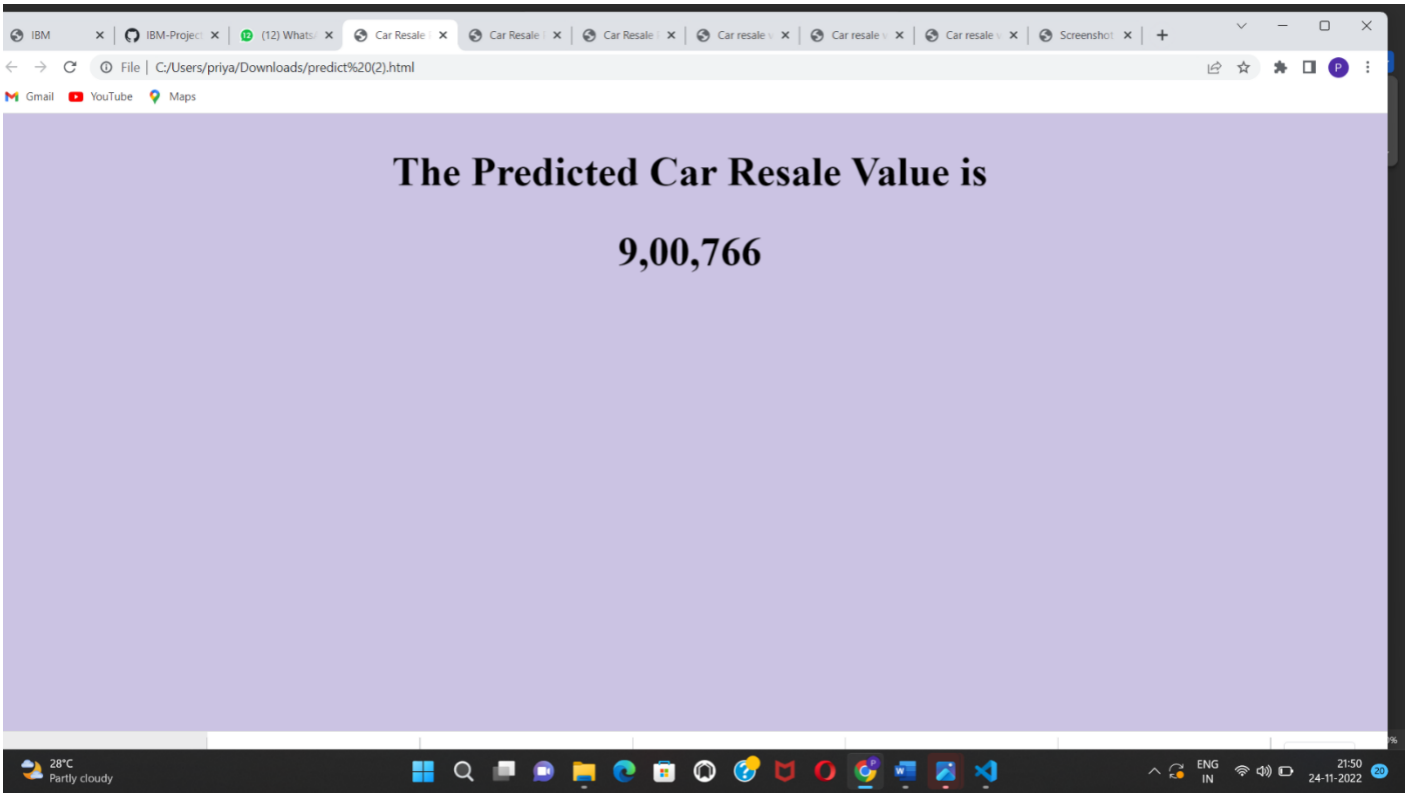
```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta http-equiv="X-UA-Compatible" content="IE=edge">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <link rel="stylesheet" href="../static/css/predict.css">
    <title>Car Resale Predicted Value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

```
        <div class="text-box">
          <h1>The Predicted Car Resale Value is </h1>
              <h1>{{predict}}</h1>
        </div>
    </section>


</body>
</html>
```

2. predict.css

```
.header{
    min-height: 100vh;
    width: 100%;
    background-image: linear-
gradient(rgba(25,30,30,0.7),rgba(25,30,30,0.7)),url(../Images/car3.jpg);
    background-position: center;
    background-size: cover;
    position: relative;
  }
  nav{
    display:flex;
    padding: 2% 6%;
    justify-content: space-between;
    align-items: center;
  }
  .text-box{
    text-align: center;
    position: relative;
    color:  #cfbba3;
    top:50%;
  }
  .text-box h1{
    margin-top: 50px;
    font-size: 55px;
  }
  body{
      margin: 0;
      font-family :'Franklin Gothic Medium';
  }
```



7.4 Preprocessing data and Model Selection

```
from flask import Flask, render_template, request

import requests
import pickle
import numpy as np
import sklearn
from sklearn.preprocessing import StandardScaler

# NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud
account.
API_KEY = "<your API key>"
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__)
model = pickle.load(open('random_forest_regression_model.pkl', 'rb'))
```

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

@app.route('/hai')
def Hai():
    return render_template('form.html')

@app.route('/hello',methods=['GET'])
def Home():
    return render_template('form.html')

standard_to = StandardScaler()
@app.route("/predict", methods=['POST'])
def predict():
    Fuel_Type_Diesel=0
    if request.method == 'POST':
        Year = int(request.form['Year'])
        Present_Price=float(request.form['Present_Price'])
        Kms_Driven=int(request.form['Kms_Driven'])
        Kms_Driven2=np.log(Kms_Driven)
        Owner=int(request.form['Owner'])
        Fuel_Type_Petrol=request.form['Fuel_Type_Petrol']
        if(Fuel_Type_Petrol=='Petrol'):
                Fuel_Type_Petrol=1
                Fuel_Type_Diesel=0
        else:
            Fuel_Type_Petrol=0
            Fuel_Type_Diesel=1
        Year=2020-Year
        Seller_Type_Individual=request.form['Seller_Type_Individual']
        if(Seller_Type_Individual=='Individual'):
            Seller_Type_Individual=1
        else:
            Seller_Type_Individual=0
        Transmission_Mannual=request.form['Transmission_Mannual']
        if(Transmission_Mannual=='Mannual'):
            Transmission_Mannual=1
        else:
            Transmission_Mannual=0
        prediction=model.predict([[Present_Price,Kms_Driven2,Owner,Year,Fuel_Type_Diesel,Fu
el_Type_Petrol,Seller_Type_Individual,Transmission_Mannual]])
        output=round(prediction[0],2)
        if output<0:
```

```
            return render_template('predict.html',prediction_texts="Sorry you cannot sell
this car")
        else:
            return render_template('predict.html',prediction_text="You Can Sell The Car at
{}".format(output))
    else:
        return render_template('predict.html')

if __name__=="__main__":
    app.run(debug=True)
```

8. TESTING

8.1 Test Cases Scenarios

1	Verify user is able to see home page?
2	Verify user is able to navigate to data entry page?
3	Verify user is able to see data entry page?
4	Verify user is able to enter values in the fields?
5	Verify user is able to navigate to output display page?
6	Verify user is able to view the output display page?
7	Verify user is able to view the car resale value output in the output display page?

8.2 User Acceptance Testing

1					Date	18-Nov-22							
2					Team ID	PNT2022TMID23585							
3					Project Name	Project - Car Resale Value Prediction							
4					Maximum Mark	4 marks							
5	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
6	UI	Home Page	Verify all the UI elements in Home page rendered		1.Enter URL and click go 2.Verify all the UI elements displayed or	-	All the UI elements rendered properly	Working as expected	Pass		N		Sakthi Mukesh
7	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.	-	User should navigate to Data Entry Page	Working as expected	Pass		N		Rajkumar
8	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	-	All the UI elements rendered properly	Working as expected	Pass		N		Anglappan
9	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 Volkswag en Petrol	User should be able to enter all values in data entry page	Working as expected	Pass		N		Hariharan
10	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	-	User should navigate to Output Display Page	Working as expected	Pass		N		Prasad
11	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	-	All the UI elements rendered properly	Working as expected	Pass		N		Sakthi Mukesh
12	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	-	Predited Car Resale Value is displayed on the page	Working as expected	Pass		N		Hariharan

8.3.1 Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	2	3	1	1	7
Duplicate	1	0	3	0	4
External	2	0	0	1	3
Fixed	2	2	1	2	7
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	2	2	1	5
Totals	7	7	9	6	29

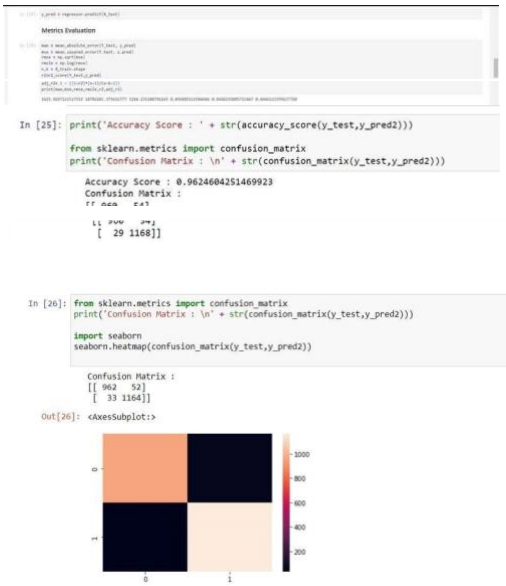
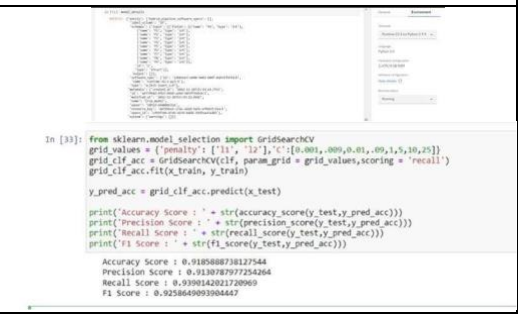
8.3.2 Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Home Page	5	0	0	5
Data Entry Page	15	0	0	15
Output Page	4	0	0	4
Hyper Parameter Tuning	3	0	0	3
Final Model Building	2	0	0	2
Flask Application	10	0	0	10
Train Model on IBM	3	0	0	3
Final Report Output	4	0	0	4

9. RESULTS

9.1 Performance Metrics

S.No.	Parameter	Values	Screenshot
1.	Metrics	Regression Model: MAE -1625.969 , MSE – 10786201.379, RMSE -3284.235 , R2 score – 0.8446 Classification Model: Confusion Matrix - , Accuray Score- & Classification Report -	
2.	Tune the Model	Hyperparameter Tuning - Validation Method -	

10. ADVANTAGES AND DISADVANTAGES

Advantages :

- Application is easy to use
- User Friendly
- No Cost
- No need to commission any agent to get car resale value estimate

Disadvantages :

- User needs to fill every asked detail of the car
- Doesn’t work for cars from different distributions
- Not always accurate

11. CONCLUSION

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 Car Resale Value Prediction system which effectively determines the worthiness of the car in terms of cost. The proposed system is a web application that will help users to determine the accurate price of used cars.

12. FUTURE SCOPE

In future, large historical data of car price can be used to train the model, and which can help improve the estimation of the machine learning model. Moreover, we can build an application for mobile phone platforms like android, iOS for interacting with users. For better performance, we plan to judiciously design deep learning neural networks.

13. APPENDIX

Source Code

User Interface

index.html

```
<!DOCTYPE html>
<nav lang="en" dir="ltr">
  <head>
    <style>
      body
{ background-color:#D3D3D3;
      }

     div {text-align: center;}
 </style>
    <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">
      <div class="text-box">
        <h1 style="font-size: 40px;color: purple">Car resale value Predictor</h1><br>
        <p style="font-size: 25px"> Welcome! To predict your used car price click the below
button!</p>
        <br>


        <a href="form.html">
          <form action="form.html">
            <input type="submit"value="check price">
          </form>
          </a>
```

```
        <br>
        <img src="https://imageio.forbes.com/specials-
images/imageserve/5d35eacaf1176b0008974b54/2020-Chevrolet-Corvette-
Stingray/0x0.jpg?format=jpg&crop=4560,2565,x790,y784,safe&width=960" alt="Car" width="350"
height="200">

      </div>
    </section>
  </nav>
    </body>
    </body>
  </body>
</html>
```

Index.css

```
*{
  margin: 0;
  padding: 0;
}

body{
  font-family :'Franklin Gothic Medium';
  margin: 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.jpg);
  background-position: center;
  background-size: cover;
  position :absolute;
}
.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;


.text-box a.visit-btn{
  text-align: center;
  padding: 10px 20px;
  font-weight: 700;
  white-space: inherit;
  vertical-align: middle;
  border: 2px solid transparent;
  display: inline-block;
  margin: 10px 10px 0 0;
  border-radius: 50px;
  overflow: hidden;
  background-color: #FFE4C4;
  border: 0;
  line-height: 50px;
  box-shadow: 0 3px 6px 0 rgba(0,0,0,0.16);
  font-size: 20px;
  text-decoration:none;
  position: relative;
}
.text-box a.visit-btn:hover{
  background-image: linear-gradient(to left,#FFE4C4,#a147e4);
  background-position: left center;
}
```

Form.html

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


</head>
<body style="background-color:Lightblue;">
    <section class="form">
    <form action="/predict" method="GET">
    <table border="0" align="center">
    <tbody>
        <h1>Get the Accurate Resale Value of Your Car</h1>
    <tr>
```

```
<td><label for="year" padding:10px>Registration year : </label></td>
<td><input id="year" maxlength="50" name="regyear" type="text" />
<br>
<br>
</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="sl">Sl </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="sandero">Sandero </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">Gl </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><center>

    <a href="predict.html" style="font-size:30px;">submit</a>

    </center>
    </form>




  </section>

</body>
</html>
```

Form.css

```
.header{
    width: 100%;
    text-align: center;
    padding-top: 20px;
    font-size:20px;
    font-family :'Franklin Gothic Medium';
    background-color:#43FFB6;
    border:0%;
    top:0px;
    bottom:0px;
    right:0px;
    left:0px;
    overflow-y:auto;
  }
  body{
      margin: 0;
      font-family :'Franklin Gothic Medium';
  }
  .form{
  background-image: linear-
gradient(rgba(25,30,30,0.7),rgba(25,30,30,0.7)),url(../Images/car2.jpg);
    background-position: center;
    background-size: cover;
    position: relative;
    text-align: center;
    padding:20px;
    display: flex;
    flex-direction: column;
    align-items: center;
    font-size:22px;
  }
  input[type=text] {
    width: 100%;
    padding: 12px 20px;
    margin: 8px 0;
    display: inline-block;
    border: 1px solid #ccc;
    border-radius: 4px;
    box-sizing: border-box;
  }
  select {
    width: 100%;
```

```
    padding: 16px 20px;
    border: none;
    border-radius: 4px;
    background-color: #f1f1f1;
  }
  input[type=submit] {
    font-family :'Franklin Gothic Medium';
    font-weight: 700;
    width: 40%;
    background-color: #4CAF50;
    color: black;
    font-size: 20px;
    padding: 20px 20px;
    margin: 8px 0;
    border: none;
    border-radius: 4px;
    cursor: pointer;
  }
  input[type=submit]:hover {
    background-color: #37853b;
  }
  *{
  color:black;
  }
```

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></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(25,30,30,0.7),rgba(25,30,30,0.7)),url(../Images/car3.jpg);
    background-position: center;
    background-size: cover;
    position: relative;
  }
  nav{
    display:flex;
    padding: 2% 6%;
    justify-content: space-between;
    align-items: center;
  }
  .text-box{
    text-align: center;
    position: relative;
    color:  #cfbba3;
    top:50%;
  }
  .text-box h1{
    margin-top: 50px;
    font-size: 55px;
  }
  body{
      margin: 0;
      font-family :'Franklin Gothic Medium';
  }
```

app.py

```
from flask import Flask, render_template, request

import requests
import pickle
import numpy as np
```

```
import sklearn
from sklearn.preprocessing import StandardScaler

# NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud
account.
API_KEY = "<your API key>"
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__)
model = pickle.load(open('random_forest_regression_model.pkl', 'rb'))
@app.route('/')
def index():
    return render_template('index.html')

@app.route('/hai')
def Hai():
    return render_template('form.html')

@app.route('/hello',methods=['GET'])
def Home():
    return render_template('form.html')

standard_to = StandardScaler()
@app.route("/predict", methods=['POST'])
def predict():
    Fuel_Type_Diesel=0
    if request.method == 'POST':
        Year = int(request.form['Year'])
        Present_Price=float(request.form['Present_Price'])
        Kms_Driven=int(request.form['Kms_Driven'])
        Kms_Driven2=np.log(Kms_Driven)
        Owner=int(request.form['Owner'])
        Fuel_Type_Petrol=request.form['Fuel_Type_Petrol']
        if(Fuel_Type_Petrol=='Petrol'):
                Fuel_Type_Petrol=1
                Fuel_Type_Diesel=0
        else:
            Fuel_Type_Petrol=0
            Fuel_Type_Diesel=1
        Year=2020-Year
```

```
        Seller_Type_Individual=request.form['Seller_Type_Individual']
        if(Seller_Type_Individual=='Individual'):
            Seller_Type_Individual=1
        else:
            Seller_Type_Individual=0
        Transmission_Mannual=request.form['Transmission_Mannual']
        if(Transmission_Mannual=='Mannual'):
            Transmission_Mannual=1
        else:
            Transmission_Mannual=0
        prediction=model.predict([[Present_Price,Kms_Driven2,Owner,Year,Fuel_Type_Diesel,Fu
el_Type_Petrol,Seller_Type_Individual,Transmission_Mannual]])
        output=round(prediction[0],2)
        if output<0:
            return render_template('predict.html',prediction_texts="Sorry you cannot sell
this car")
        else:
            return render_template('predict.html',prediction_text="You Can Sell The Car at
{}".format(output))
    else:
        return render_template('predict.html')

if __name__=="__main__":
    app.run(debug=True)
```

GitHub & Project Demo Link:

https://github.com/IBM-EPBL/IBM-Project-50387-1660905826

https://drive.google.com/drive/folders/1Edn4vPh5jl4NvNThkfU-Qn9dC8tMoBBJ?usp=share_link