

# **PROJECT REPORT**

## **PREDICTION OF CAR RESALE VALUE**

### **1. INTRODUCTION**

Car Resale value Prediction 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. In order to predict the resale value of the car, we proposed an intelligent, flexible, and effective system that is based on using regression algorithms. Considering the main factors which would affect the resale value of a vehicle a regression model is to be built that would give the nearest resale value of the vehicle. We will be using various regression algorithms and algorithm with the best accuracy will be taken as a solution, then it will be integrated to the web-based application where the user is notified with the status of his product.

#### **1.1 Project Overview**

The system is defined in the python language that predicts the amount of resale value based on the given information. The system works on the trained dataset of the machine learning program that evaluates the precise value of the car. User can enter details only of fields like purchase price of car, kilometers driven, fuel of car, year of purchase.

#### **1.2 Purpose**

Considering the demand for private car all around the world, the demand of secondhand car market has been rising and creating a chance in business for both buyer and seller. In several countries, buying a used car is the best choice for customer because its price is reasonable and affordable by buyer. After few years of using them, it may get a profit from resell again. However, various factors influence the price of a used car such as how old of those vehicles and the condition in current scenario of them. Normally, the price of used cars in the market is not constant. Thus, car price evaluation model is required for helping in trading.

### **2. LITERATURE SURVEY**

#### **2.1 Existing problem**

Due to limited data, system only takes into account limited features for predicting the resale value of the car. Since this is an online system, current system does not take into account any physical damage to the car body or engine while predicting the resale value.

## 2.2 References

- [1] S. Pudaruth, "Predicting the Price of Used Cars using Machine Learning Techniques," *International Journal of Information & Computation Technology*, vol. 4, no. 7, pp. 753–764, 2014.
- [2] N. Kanwal and J. Sadaqat, "Vehicle Price Prediction System using Machine Learning Techniques," *International Journal of Computer Applications*, vol. 167, no. 9, pp. 27–31, 2017.
- [3] S. Peerun, N. H. Chummun, and S. Pudaruth, "Predicting the Price of Secondhand Cars using Artificial Neural Networks," *The Second International Conference on Data Mining, Internet Computing, and Big Data*, no. August, pp. 17–21, 2015.
- [4] N. Sun, H. Bai, Y. Geng, and H. Shi, "Price evaluation model in second-hand car system based on BP neural network theory," in *2017 18th IEEE/ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing (SNPD)*, jun 2017, pp. 431–436.
- [5] G. Rossum, "Python Reference Manual," Amsterdam, The Netherlands, The Netherlands, Tech. Rep., 1995. [6] A. K. Elmagarmid, P. G. Ipeirotis, and V. S. Verykios, "Duplicate Record Detection: A Survey," *IEEE Transactions on Knowledge and Data Engineering*, vol. 19, no. 1, pp. 1–16, jan 2007.

S.NO	PAPER TITLE	AUTHORS	DESCRIPTION
1.	Predicting the price of used cars using machine learning Techniques	Gegic, Enis, et al. "Car price prediction using machine learning techniques." <i>TEM Journal</i> 8.1 (2019): 113.	This paper analyses on various supervised machine learning algorithms for predicting the resale value of the cars used in Mauritius. Comparative study on KNN, regression, naïve bayes and decision tree has been made to come up with high accuracy.
2.	Prediction of Resale Value of the Car Using Linear Regression Algorithm	Das Adhikary, Dibya Ranjan, Ronit Sahu, and Sthita Pragyna Panda. "Prediction of Used Car Prices Using Machine Learning." <i>Biologically Inspired Techniques in Many Criteria Decision Making</i> . Springer, Singapore, 2022. 131-140.	In this paper, linear regression algorithm is used to estimate the car resale value. This research work achieved accuracy in predicting the resale value of the vehicle based on the most significant attributes which are selected based on the highest correlation. This gives 90% percent accuracy and the error obtained is 10%
3.	Used car price prediction using K-Nearest Neighbour Based Model	Samruddhi, K., and R. Ashok Kumar. "Used Car Price Prediction using K-Nearest Neighbor Based Model." <i>Int. J. Innov. Res. Appl. Sci. Eng. (IJIRASE)</i> 4 (2020): 629-632.	This paper uses K nearest Neighbour(KNN) algorithm to predict the resale value of the used cars. It has achieved around 85% accuracy. This model has also validated with 5 and 10 folds by using K Fold Method.
4.	Old car price prediction with machine learning	Gajera, Prashant, Akshay Gondaliya, and Jenish Kavathiya. "Old Car Price Prediction With Machine Learning." <i>Int. Res. J. Mod. Eng. Technol. Sci</i> 3 (2021): 284-290.	This paper uses various machine learning algorithms to predict the car price such as linear-regression, KNN, Random forest, XG boost and Decision Tree and linear regression. Based on comparative studies made on these algorithms, Random forest Regressor has got the most accuracy.
5.	Second Sale Car Price Prediction using Machine Learning algorithm	C. V. Narayana, N. O. G. Madhuri, A. NagaSindhu, M. Aksha and C. Naveen, "Second Sale Car Price Prediction using	The major goal is to develop a prediction model that can estimate the selling price of used cars based on key factors. Machine learning techniques such as Random Forest Regression, Feature engineering technique such as Extra Trees Regression are employed to accomplish the goal as

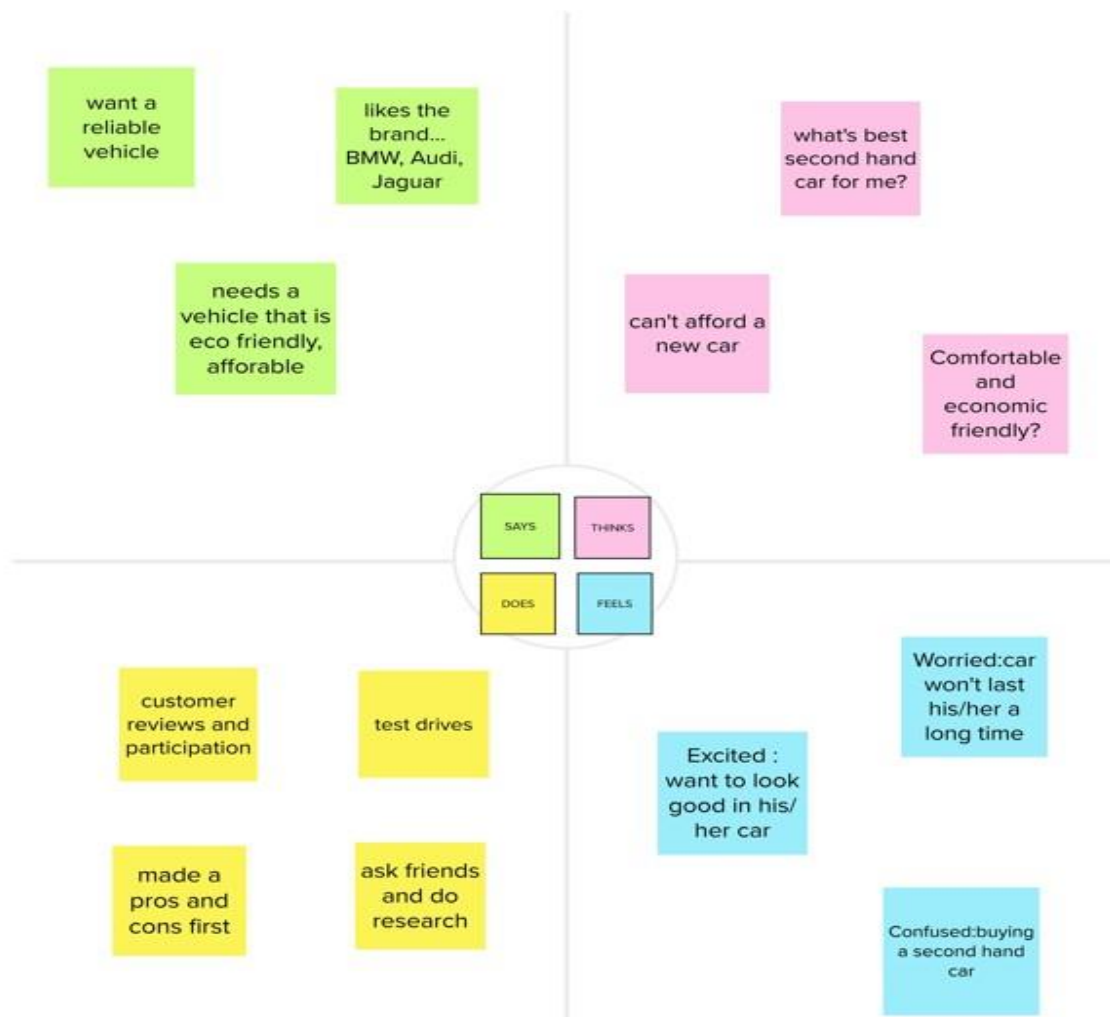
		Machine Learning Algorithm," 2022 7th International Conference on Communication and Electronics Systems (ICCES), 2022, pp. 1171-1177, doi: 10.1109/ICCES54183.2022.9835872.	Random Forest Regression is modeled for prediction analysis and Extra Trees Regression fits the number of decision trees. The results are so encouraging with our approach.
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### 2.3 Problem Statement Definition

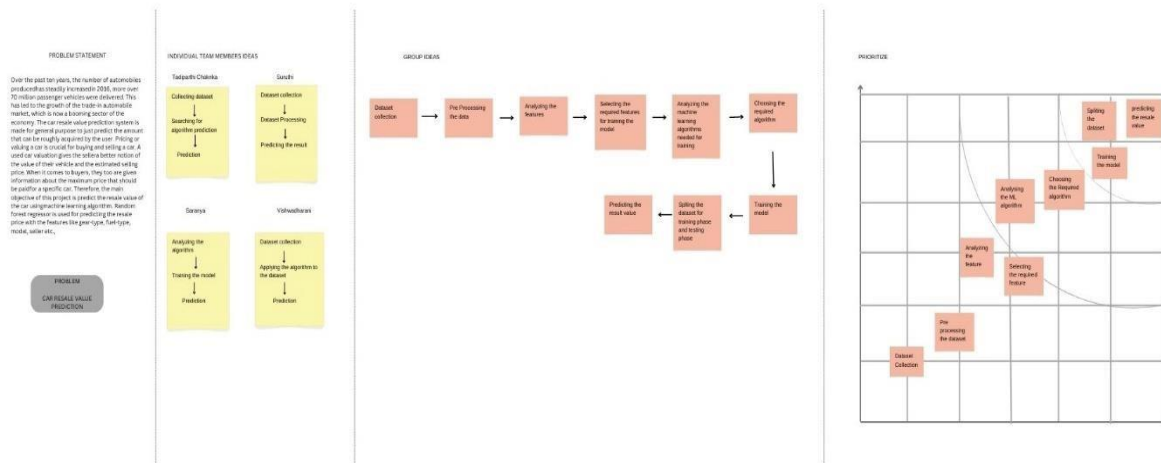
- The main aim of this project is to predict the price of a used cars using various ML algorithms and models.
- To predict the selling price of used car based on the given car's feature.

## 3. IDEATION & PROPOSED SOLUTION

### 3.1 Empathy Map Canvas



## 3.2 Ideation & Brainstorming



## 3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<ul style="list-style-type: none"> <li>The main aim of this project is to predict the price of a used cars using various ML algorithms/models.</li> <li>To predict the selling price of a used car based on the given car's features.</li> </ul>
2.	Idea / Solution description	<ul style="list-style-type: none"> <li>Car resale value prediction is the system to predict the amount of resale value based on the parameters provided by the user.</li> <li>Various models will be built and based on the accuracy obtained, the best model is chosen and it will be integrated to the web-based application.</li> </ul>
3.	Novelty / Uniqueness	<ul style="list-style-type: none"> <li>The price prediction of a used car is determined effectively within few minutes using various features such as year, mileage, model etc.</li> <li>The model's accuracy is to be increased.</li> </ul>
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"> <li>Experience of a customer is likely to obtain a positive and significant impact with the customer satisfaction and loyalty.</li> <li>If a user wants to buy a used car or wants to sell a car, this method helps them in predicting the correct price or evaluation on their own.</li> </ul>
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"> <li>It helps in predicting the correct valuation of a car remotely without human intervention like car dealers in the process to eliminate biased valuation predicted by the car dealer.</li> </ul>
6.	Scalability of the Solution	<ul style="list-style-type: none"> <li>Using the dataset(Stored data) and machine learning approaches, this proposed project is a scalable framework for predicting the price values for different types of used cars present all over India.</li> </ul>

### 3.4 Problem Solution fit

Define CS, identify QC	<b>1. CUSTOMER SEGMENT(S):</b>  Both the old used car sellers, car buyers and the mediators.	<b>6. CUSTOMER CONSTRAINTS:</b>  To determine the value for the used cars on the own. To reduce the loss met by paying to the brokers, mediators or the dealers to buy a car.	<b>5. AVAILABLE SOLUTIONS:</b>  The users cannot predict the value of the used cars by their own without having any prior knowledge about the car. A person having less knowledge about the cars may get manipulated by the human dealers and may face loss.	Explore AS, differentiate
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b>  To design a machine learning model using regression that can predict the value of the old used cars using the following criteria:  Kilometers Driven. Condition of the car and the engine. Age of the car and Number of owners for the car	<b>9. PROBLEM ROOT CAUSE</b>  Users can predict the value of the car by themselves without the help of any human dealers. The value proposed by the dealers aren't trustworthy. The biased valuation by the human dealers can be avoided.	<b>7. BEHAVIOR</b>  The history of the car and the documents produced are checked if they are suspicious. A model has to produce the nearest or the approximate resale value of the car that helps both the sellers and the buyers	
Focus on JAR, map into BE, understand RC	<b>3. TRIGGERS</b>  Users are able to predict the value by themselves without getting manipulated from the apps like OLX, Cars24, and other websites too.	<b>10. YOUR SOLUTION</b>  The primary goal of the project is to predict the value of the old used cars using machine learning algorithms. The system takes in the inputs related to the old used	<b>8. CHANNELS OF BEHAVIOR:</b>  The buyers can predict the value of the car using the parameters given by the sellers. The user must verify the details of the vehicle in	t c
	<b>4. EMOTIONS: BEFORE / AFTER:</b>  Before:- The users might have the fear of getting manipulated by the biased value of the old used cars proposed by the human dealers.  After:- The users might not have any fear of getting biased. They predict the value of the old used cars by themselves just by giving some of the inputs about the car.	cars and produces the value of the car without the help of any human dealers and any kind of manipulation.	RTO in online. Later the user can decide whether to buy or not after seeing the exterior and interior condition of the car. Finally the user can test the performance of the car and buy the car at the affordable rate for them.	

## 4. REQUIREMENT ANALYSIS

### 4.1 Functional requirement

FR No	Functional Requirements(Epic)	Sub Requirements(Story/Sub Task)
FR-1	User Registration	<ul style="list-style-type: none"> <li>Registration through form.</li> </ul>
FR-2	Car Details	<ul style="list-style-type: none"> <li>Getting the required car details as input from the user in the website.</li> </ul>
FR-3	Business rules	<ul style="list-style-type: none"> <li>Private Policy</li> <li>Terms of use</li> </ul>

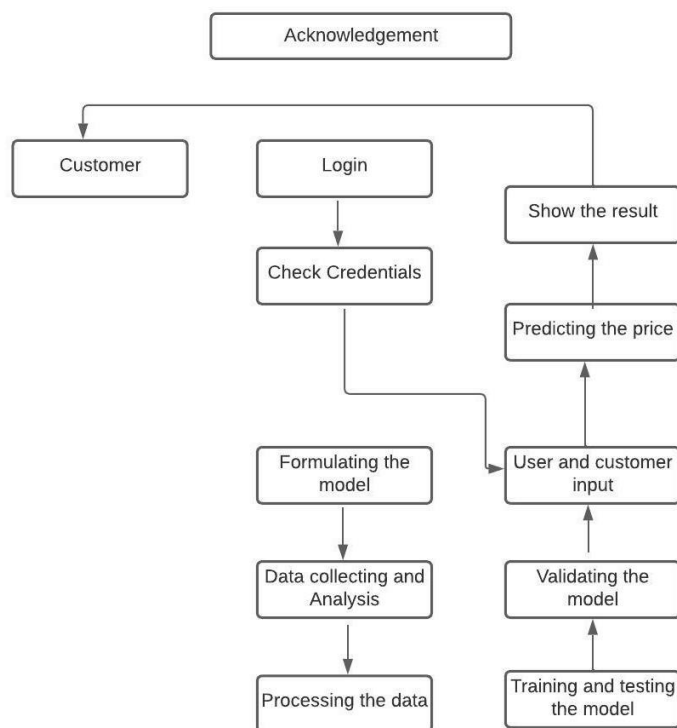


## 4.2 Non-Functional requirements

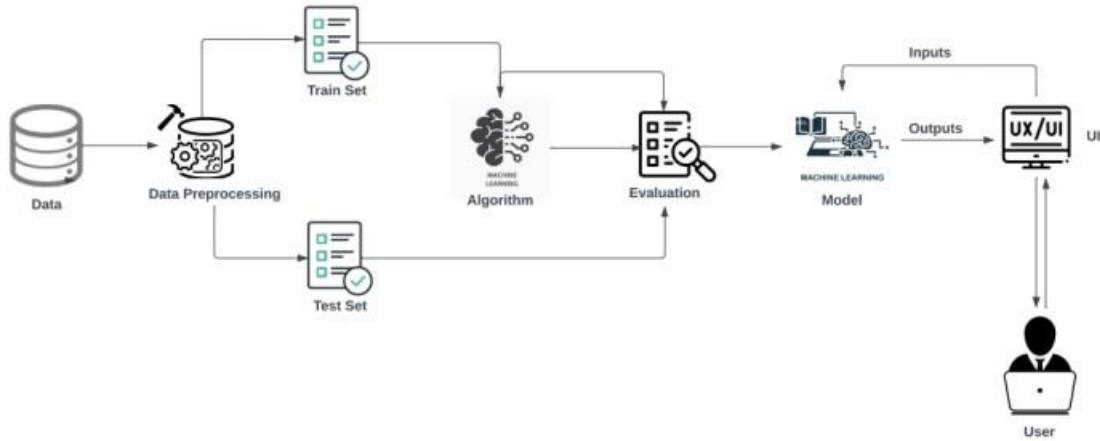
NFR No	Non-functional Requirement	Description
NFR-1	Security	<ul style="list-style-type: none"> <li>No information is disclosed to the unauthorized person.</li> <li>And the access permission is given only to the authorized person and only the authorized person can make changes in the particular system.</li> </ul>
NFR-2	Usability	<ul style="list-style-type: none"> <li>This website is easy to use.</li> <li>People from anywhere around the world can use it.</li> <li>Detailed instructions will be given and for any queries they can use the Q&amp;A column provided.</li> </ul>
NFR-3	Performance	<ul style="list-style-type: none"> <li>After collecting the required</li> </ul>
		inputs from the user fast calculation is made to produce the approximate value of the used car.
NFR-4	Durability	<ul style="list-style-type: none"> <li>Updating the database without any failure or even if it gets failed, the making process will save the data in a secured way.</li> </ul>
NFR-5	Availability	<ul style="list-style-type: none"> <li>Users will get a satisfactory approximate value of the used cars.</li> <li>The system is available for any users all around the world.</li> </ul>

## 5. PROJECT DESIGN

### 5.1 Data Flow Diagrams



## 5.2 Solution & Technical Architecture



## 5.3 User Stories

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can enter into the website with the help of the Google chrome browser in Windows	2	High	4
Sprint-1	Registration	USN-2	As a user, I can enter into the website through browser in Android	1	High	4
Sprint-1	Registration	USN-3	As a user, I can enter into the website through browser in ios	2	Medium	4
Sprint-1	Login	USN-4	As a user, I can find the car resale value prediction page in the website	1	High	4
Sprint-2	Home Page	USN-5	As a user, I need to select the parameters like Year, Showroom price, Kilometres driven, fuel type etc and click on the submit button	2	High	4
Sprint-3	Home Page	USN-6	As a user, I can see the accurate price for car resale after entering the details.	2	High	4
Sprint-4	Home Page	USN-7	As a user, If I done a mistake while providing the details , I can reset the details and click the submit button.	1	Low	4

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 Sprint Planning & Estimation

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

## 7. CODING & SOLUTIONING (Explain the features added in the project along with code)

### 7.1 Feature 1

```
<!DOCTYPE html>
<nav lang="en" dir="ltr">
  <head>
    <style>
      :root {

        --typewriterSpeed: 6s;
      }

      body
      {
        margin:0;

        background-color:rgb(248, 185, 255);
      }
      h1
      {
        position:relative;
        font-size:4rem;
        position:relative;
      }
      a{
        text-decoration: none;
      }
      .bg{

        margin:50px 170px;
      }
      button{
        margin-left: 650px;
        background-color: rgb(144, 147, 238);
      }
      button:hover{

        background-color: rgb(0, 255, 17);
      }
      h1::before,
      h1::after
      {
        content:"";
        position:absolute;
```



```
    top:0;
    bottom:0;
    left:0;
    right:0;
}

h1::before
{
    background:rgb(222, 105, 252);
    animation:typewriter 6s steps(28) 2s forwards;
}
h1::after
{
    width:0.125em;
    background:black;
    animation:
        typewriter 6s steps(28) 2s forwards,
        blink 730ms steps(28) infinite,
        blinks 12s steps(28) forwards;
}
@keyframes blinks
{
    to{
        background-color:peachpuff;
    }
}
@keyframes typewriter
{
    to{left:100%;}
}
@keyframes blink
{
    to{
        background-color:transparent;
    }
}

.subtitle
{
    display:grid;
    place-content:center;
    border-radius: 25%;
    text-align:center;
    color:hsl(0 0% 0%/0.7);
    font-size:2rem;
    font-weight:400;
}
```

```

    opacity:0;
    transform: translateY(3rem);
    animation: fade 2s ease 8s forwards;
}

@keyframes fade {
  to {
    opacity: 1;
    transform: translateY(0);
  }
}

    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 class="bg">CAR RESALE VALUE PREDICTION</h1>
            <p class="subtitle">welcome to our webpage</a></p>
            <br>
            <button class="subtitle "><a href="./predict_page" style="font-size:30px;
border-radius: 10; " >Check price</a></button>
            <img src='https://www.freewebheaders.com/wp-content/gallery/cars/silver-
porsche-car-on-purple-background-header.jpg' style="width:100%"alt='ak' />

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

```

## 7.2 Feature 2

## index.html

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
<head>
<link rel="stylesheet" href="../static/css/value.css">
<title>Car resale value</title>
<style>
    body
    {
        background-image: url("https://wallpaperaccess.com/full/2590225.jpg");

    }
    fieldset
{
    width:45%;
    position:absolute;
    top:20%;
    left:25%;
    padding-top: 30px;
    padding-left: 40px;
    font-size: 20px;
    background-color: rgba(245, 245, 245, 0.495);
    border-radius: 5%;
}
    td{
        padding: 10px;
        font-size: 25px;
    }
    #button{
        padding: 8px 20px;
        font-size: 20px;
        background-color:green ;
        color: white;
        border-radius: 13px;
        border-color: green;
    }
    #button:hover{
        background-color:rgb(22, 216, 22);
        color: black;
    }

</style>

</head>
<body>
    <fieldset>
        <legend><h1>Accurate Resale Value of Your Car</h1></legend>
        <section class="form">
```

```
<form action="/predict" method="GET">
<table border="0" align="center">
<tbody>

<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
```

```

☐ No
☐ 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">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="c1">C1 </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><center>
<input name="Submit" type="Submit" value="Submit" id="button"/></center>
</form>

```



```
</fieldset>
  </section>

</body>
</html>
```

value.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>
<style>
  .text-box{
    text-align: center;
    background-color: rgba(0, 128, 0, 0.366);

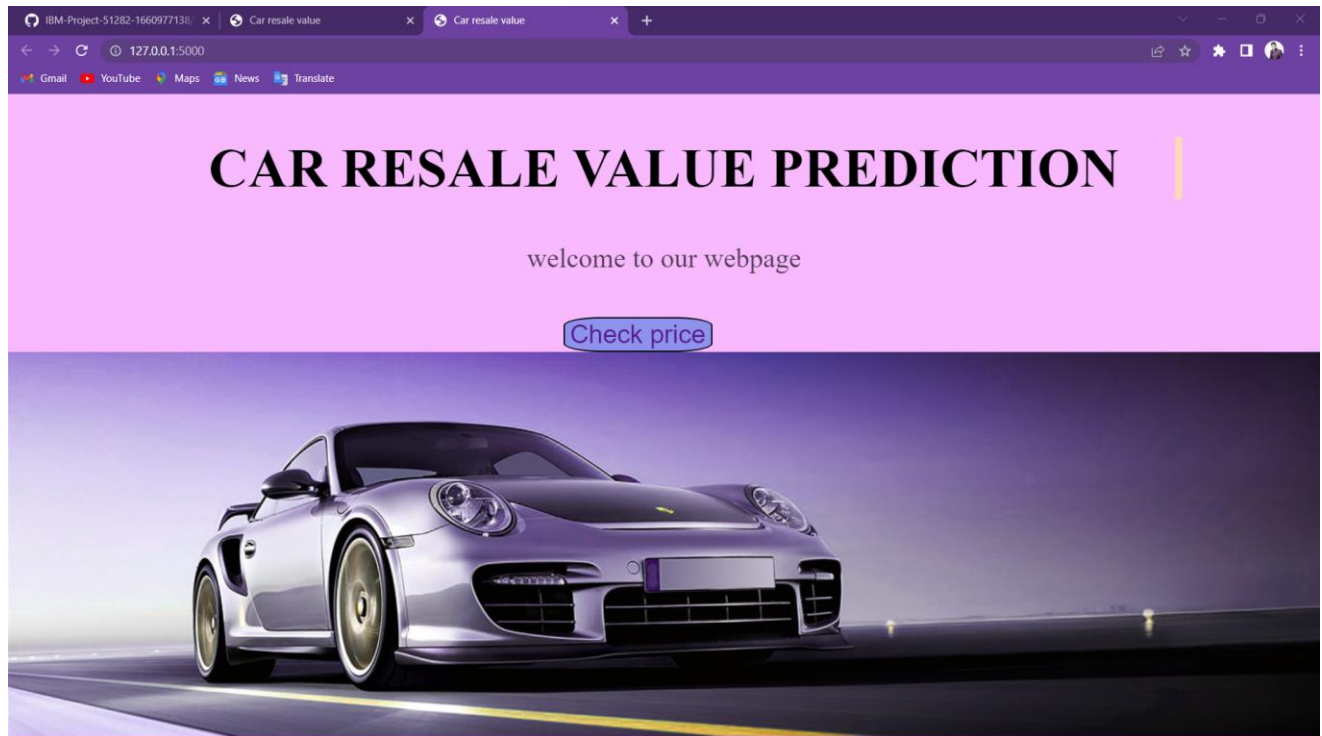
  }
</style>

<body>
  <section class="header">
    

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

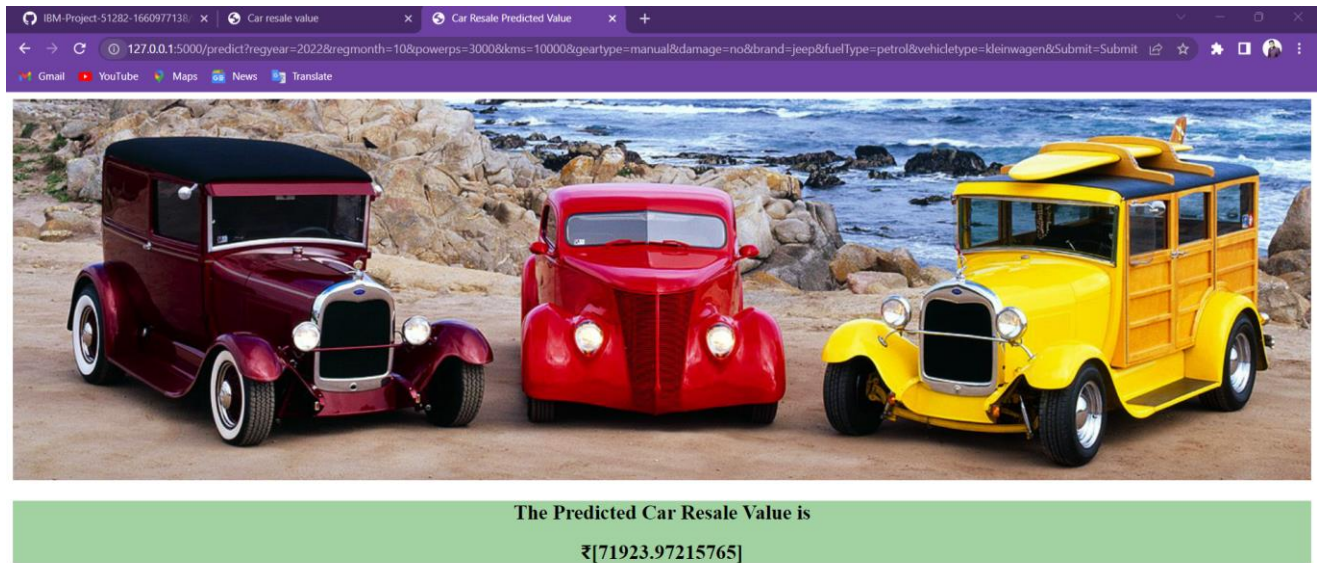
</html>
```

OUTPUT:

A screenshot of a web browser window showing a prediction form. The browser's address bar shows the URL '127.0.0.1:5000/predict\_page'. The form is titled 'Accurate Resale Value of Your Car' and is overlaid on a background image of a car. The form contains the following fields and options:

- 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

PREDICTED RESULT:



## 8. TESTING

### 8.1 Test Cases

- **Missing values**

The trained ML model requires 4 feature inputs for predicting the output. Failing which, the model throws invalid Input error. All the fields in the html form have been marked required using CSS and thus user must input all fields. Output: User must input all the fields, failing which, form shows warning message "this field needs to be filled". Thus, there can be no errors in model prediction.

- **Invalid Input**

The trained ML model requires only numerical input for all 4 features. Thus, if user uses symbols such as comma while input, model may throw error. To overcome the same, preprocessing script is deployed in backend which removes all unwanted characters like comma, whitespaces etc. so that model gets required input.

#### **Output:**

Due to python preprocessing script, model will get the desired input and thus will give accurate prediction.

## 9. RESULTS

### 9.1 Performance Metrics

```
#predicting the values to test set  
y_pred = regressor.predict(X_test)  
  
#printing the accuracy for test set  
print(r2_score(Y_test,y_pred))
```

## 10. ADVANTAGES & DISADVANTAGES

### Advantages:

- Good at learning complex and non- linear relationships
- Highly explainable and easy to interpret
- Robust to outliers
- No feature scaling is required

### Disadvantages:

- Consumes more time
- Requires high computational power

## 11. CONCLUSION

Data used in this project is autos.csv file scraped from e-commerce site and then data preparation processed by using python programming language. We tested data by using multiple linear regression, random forest regression, and gradient boosted regression trees on that particular dataset. Each model was evaluated by using the same testing data. The results are then compared by using mean absolute error as a criterion. We concluded that random forest regression trees as recommended to develop the price evaluation model because high accuracy was achieved. More appropriate data engineering can be utilized to create the better training data.

## 12. FUTURE SCOPE

Currently, only few features are used to predict resale value of the car. This can be extended to more features. One can also implement CNN to determine

physical condition of the car from images like identifying dents, scratches etc. and thus predicting more relevant resale value of a car.

### **13. APPENDIX**

GitHub and demo vide link in:

