

PROJECT REPORT

PROJECT TITLE : Car Resale value Prediction

TEAM ID : PNT2022TMID14437

TEAM MEMBERS : Srivathsan T

Surya M

Sudarshan S

Vijayakrishna G

1. INTRODUCTION

1.1 Project overview

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

1.2 Purpose

In 2019, the Indian used automobile resale industry was valued at \$24.2 billion USD. There is a critical need to close this gap between sellers and buyers due to the enormous demand for used automobiles and the shortage of professionals who can evaluate the proper valuation. The goal of this research is to create a system that can impartially forecast a car's resale value based on little information such as the number of miles travelled and the year of purchase. The process of determining the current used automobile pricing in a certain location is known as used car value. By selecting the brand, model, year, trim, and the number of kilometers travelled, a user of OBV may quickly determine the used car's price. The value of a used automobile is based on a number of variables, including its state right now, when it was bought, etc. Used automobile valuation will never have a precise price; instead, it will always fall within a reasonable price range.

2. LITERATURE SURVEY

2.1 Existing problem

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

2.2 References

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

2.3 Problem Statement Definition

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

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

Brainstorm

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

 10 minutes

TIP



You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

Srivathsan T

Need to sell the car	is the car accident free	Does the car have an ongoing Fc
is it a flooded car	Does the car have a native registration	What is the driven Km of the car
Explore and find the suitable techniques	Explore and find the suitable data set	Analyse the outcome and visualize it

Surya M

Analyse the problem statement	Study ANN model and get a good idea	Check for other similar problem statements
Import the suitable dataset	To implement the model	Train the model
To check different ways to added layers	Analyse the different case of layers	Check the implementation

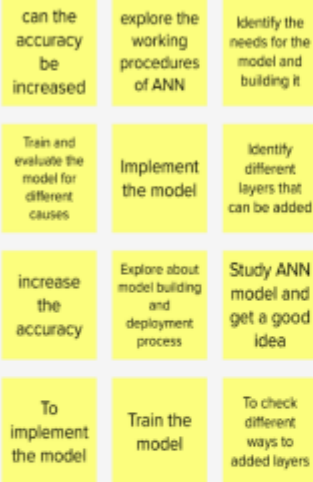
Vijayakrishna G

To find appropriate dataset and understand it	Explore different use case for solutions	Identify the needs for the model and building it
Train and evaluate the model for different cases	Implement the model	Check for increase in accuracy
Visualize the process done by the model in user friendly way	Analyse other options and ways	Implement it for final result to show off in better way

Sudarshan S

Understand the problem	check for similar datasets	Identify preprocessing techniques
Analyse the UI	Explore deployment process	Can the accuracy be increased
Understand the visualization	explore the working procedures of ANN	Discuss with car mechanics to get an idea

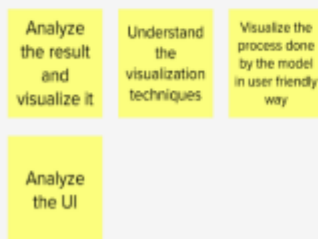
Working with model



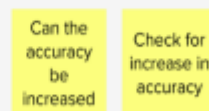
Dataset



Visualization



Accuracy





3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	<p>In this era used cars has gained more value and there is a need to predict the exact price for the second-hand cars. For predicting the resale values multiple factors must be considered like damages in the cars, model of the car, colors, fuel type, and number of miles driven. Predictions must be as accurate as possible to gain the support from the users. Best and reasonable amount for the cars must be predicted by considering all the possible factors.</p> <p>Huge data sets must be analyzed and our model should be trained on that, so that the accuracy rate of the predictions could be improved. Various data science algorithms are available and the best optimal one could be applied. The main motto is to provide reasonable resale value.</p>
2.	Idea / Solution description	<p>To predict reasonable value for the reselling cars, we use linear Regression Algorithm. Linear Regression is a machine learning algorithm based on supervised learning. It performs a regression task and predicts price.</p>
3.	Novelty / Uniqueness	<p>We use linear regression that predicts well and works well on unlabelled data. Hence it makes our Predictor unique from the others.</p>
4.	Social Impact / Customer Satisfaction	<p>Predicts correct price for reselling cars considering many factors and satisfies the customers who are trying to resell their cars.</p>
5.	Business Model (Revenue Model)	<p>Premium options will be developed for users while he/she uses the page more than twice. Annual festive offers will be given and on that basis revenue can be generated.</p>
6.	Scalability of the Solution	<p>Price of the reselling cars will be predicted based on the parameters . Multiple parameters will be considered during prediction. Reasonable deducts will be done considering the customers. Hence the solution is highly scalable.</p>

3.4 Problem Solution fit

Define CS, fit into CC	<div>1. CUSTOMER SEGMENT(S)</div> <div>Who is your customer? i.e. working parents of 0-5 y.o. kids</div> <div>CS</div> <div>Commoners who are trying to resale used cars</div>	<div>6. CUSTOMER CONSTRAINTS</div> <div>What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.</div> <div>CC</div> <div>Less consumption of data</div> <div>Correct cost prediction</div> <div>Interactive webpage</div>	<div>5. AVAILABLE SOLUTIONS</div> <div>Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking</div> <div>AS</div> <div>Instead of using Linear regression algorithm, we would have opted random forest algorithm.</div>	Explore AS, differentiate
	<div>2. JOBS-TO-BE-DONE / PROBLEMS</div> <div>Which jobs to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.</div> <div>J&P</div> <div>Initially best price should be identified</div> <div>Any damage in the cars must be treated properly before reselling</div> <div>Used cars must be repainted</div>	<div>9. PROBLEM ROOT CAUSE</div> <div>What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations.</div> <div>RC</div> <div>Customers should know the best price for reselling their car</div> <div>They should not be cheated for low costs</div>	<div>7. BEHAVIOUR</div> <div>What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)</div> <div>BE</div> <div>Customer can give feedbacks</div> <div>Support can be provided to them through online</div>	
Focus on J&P, tap into BE, understand RC	<div>3. TRIGGERS</div> <div>What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about an efficient solution in the news.</div> <div>TR</div> <div>Seeing neighbors resale car in good condition at low price, wishing to resale car in a comparatively high budget</div>	<div>10. YOUR SOLUTION</div> <div>If you are working on an existing business, write down your current solution (fill in the canvas, and check how much it fits reality). If you are working on a new business proposition, then keep it blank until you fill into the canvas and come up with a solution that fits with in customer limitations, solves a problem and matches customer behaviour.</div> <div>SL</div> <div>We use supervised learning algorithm and can be solved using a regression technique, which is random forest</div> <div>it predicts output with high accuracy, even for the large dataset it runs efficiently. It can also maintain accuracy when a large proportion of data is missing.</div>	<div>8. CHANNELS OF BEHAVIOUR</div> <div>K1 ONLINE What kind of actions do customers take online? Extract online channels from #7</div> <div>K2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for the customer development.</div> <div>CH</div> <div>Through online customers can compare with multiple websites</div> <div>Customers can also check with Reselling brokers</div>	Identify strong TR & EM
Identify strong TR & EM	<div>4. EMOTIONS: BEFORE / AFTER</div> <div>How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design.</div> <div>EM</div> <div>Before reselling: Afraid and expecting</div> <div>After reselling: Happy and satisfied</div>			

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through website or application Registration through Social medias Registration through LinkedIn
FR-2	User Confirmation	Verification via Email or OTP
FR-3	User Login	Login through website or App using the respective username and password
FR-4	User Access	Access the app requirements
FR-5	User Upload	User should be able to upload the data
FR-6	User Solution	Data report should be generated and delivered to

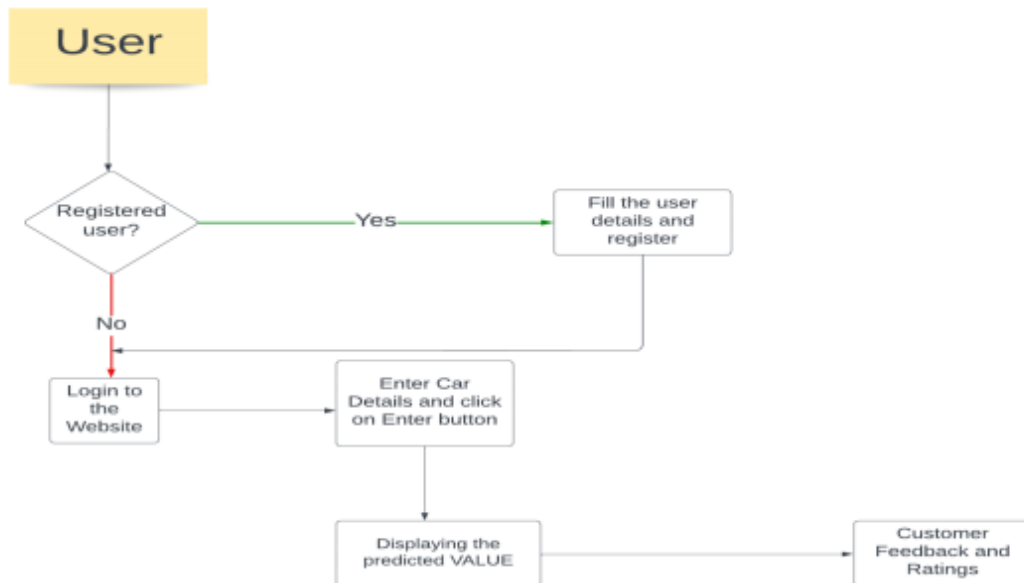
		user for every 24 hours
FR-7	User Data Sync	API interface to increase to invoice system

4.2 Non-Functional requirements

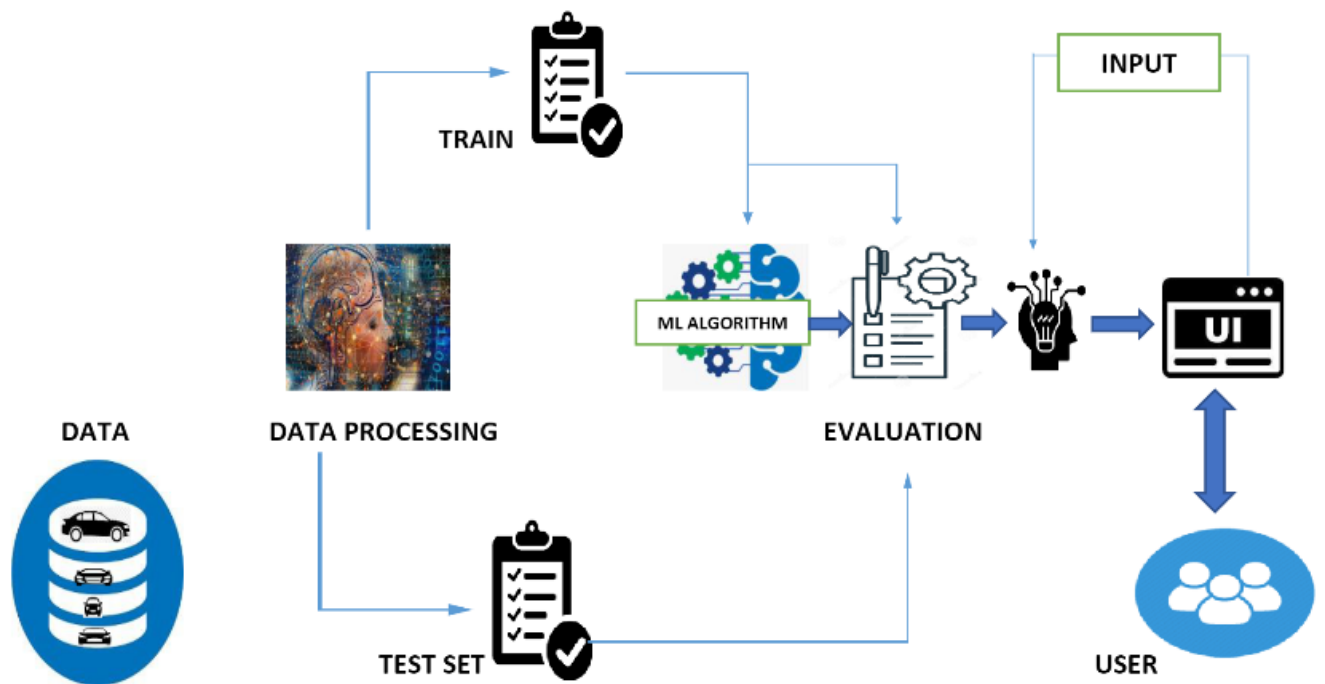
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	<p>Usability requirements includes language barriers and localization tasks.</p> <p>Usability can be assessed by</p> <p>Efficiency of use.</p>
NFR-2	Security	<p>Access permissions for the particular system</p> <p>information may only be changed by the system' s</p> <p>data administrator.</p>
NFR-3	Reliability	<p>The database update process must roll back all</p> <p>related updates when any update fails.</p>
NFR-4	Performance	<p>The front-page load time must be no more than 4</p> <p>seconds for users that access the website using anVoLTE mobile connection.</p>
NFR-5	Availability	<p>New module deployment must not impact front page, product pages, and check out pages availability and mustn't take longer than one hour.</p>
NFR-6	Scalability	<p>We can increase scalability by adding memory, servers, or disk space. On the other hand, we can</p> <p>compress data, use optimizing algorithms.</p>

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Web Browser	USN-1	As a user, I can visit the website by entering my email, password, and confirming my password.	I can access my website by clicking on the link	High	Sprint-1
		USN-2	I can move to home page	I can visit the website any number of time	Medium	Sprint-1
		USN-3	We can move to the prediction page by clicking "predid" button.	I can get the result quickly.	High	Sprint-2
		USN-4	Accurate value is shown in the webpage.	I can view the predicted value	High	Sprint-3
		USN-5	As a user, I can register to the application by entering email & password	Sign out is possible	High	Sprint-1
Customer(Mobile App)	Mobile App(sign up)	USN-1	As a user can register by filling user details.	Check correct format and proceed to the process.	High	Sprint-5
	(Sign in)	USN-2	As a user can login by using username and password.	Check the details and enter into the page.	Medium	Sprint-6
Customer(Mobile User)	Dashboard	USN-3	As a user, I can move to the dashboard after login	Without further delay I can move to the Home page easily	Medium	Sprint-6
		USN-4	Enter Car Details	Car details is checked and moved to the model for value prediction.	Medium	Sprint-6
		USN-5	After entering Car Details click on Predict Value.	I can get the result without any delay.	High	Sprint-6

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Dataset reading and Pre processing	USN-1	Cleaning the dataset and splitting to dependent and independent variables	2	High	Surya M Srivathsan T
Sprint-2	Building the model	USN-2	Choosing the appropriate model for building and saving the model as pickle file	1	High	Sudarshan S Vjayakrishna G
Sprint-3	Application building	USN-3	Using flask deploying the ML model	2	Medium	Surya M Srivathsan T
Sprint-4	Train the model in IBM	USN-4	Finally train the model on IBM cloud and deploy the application	2	Medium	Sudarshan S Vjayakrishna G

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

7.1 Feature 1

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

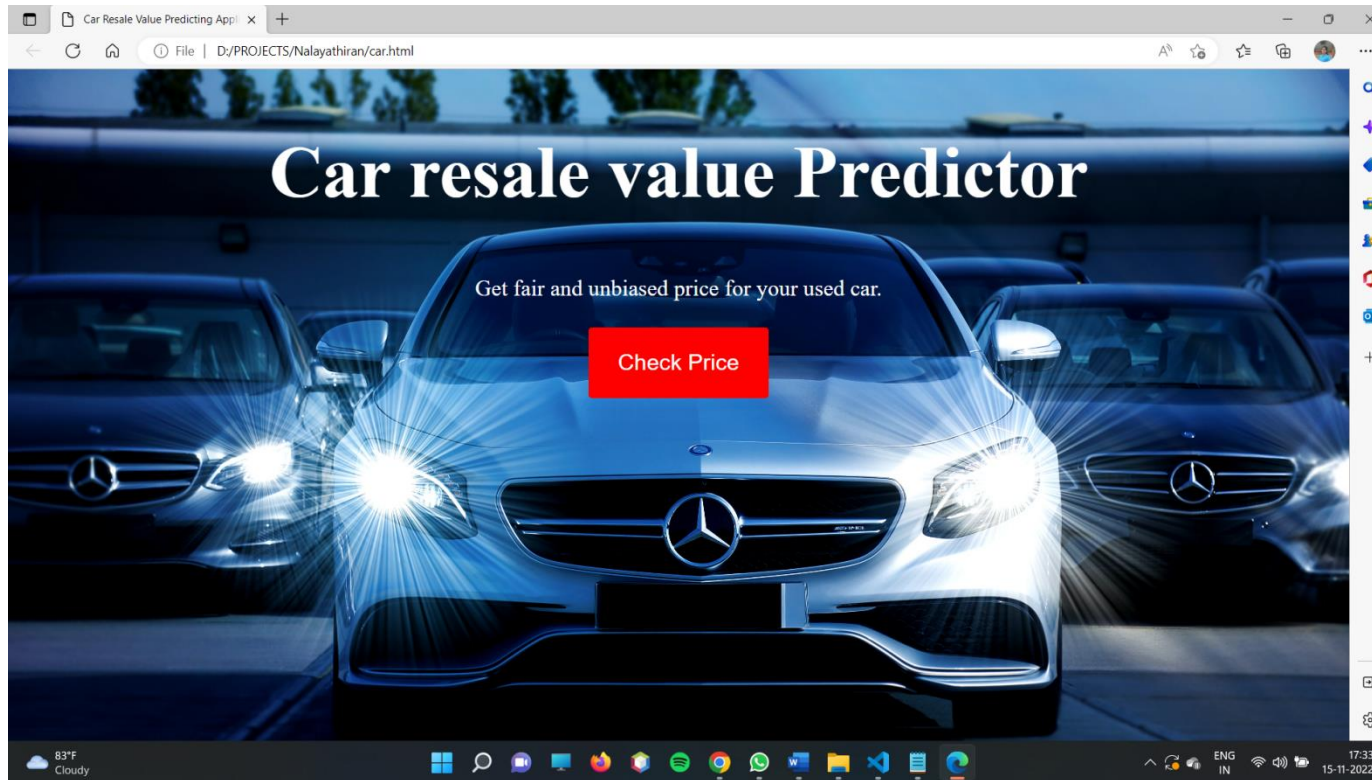
7.2 Feature 2

- Login
- Wokwi

8. TESTING

8.1 Test Cases

8.1.1 Test case 1:



Test case 2 :

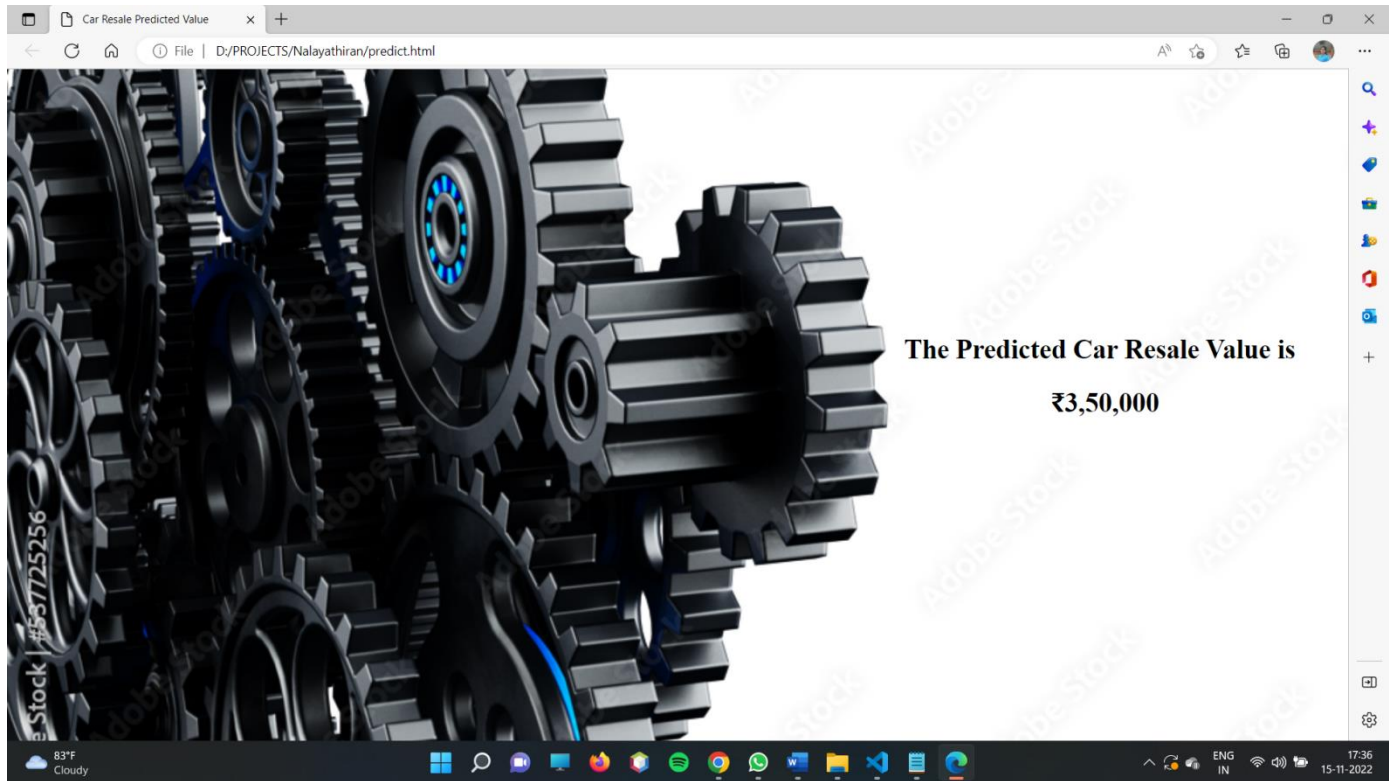
Get the Accurate Resale Value of Your Car

Registration Number	DL11AD3344
Registration Year	2018
Registration Month	November
Kilometers Driven	80000
Gear Type	<input checked="" type="radio"/> Manual <input type="radio"/> Automatic
Model Type	Polo
Brand	Volkswagen
Fuel Type	Petrol

Submit

9. RESULTS

9.1 Performance Metrics



10. ADVANTAGES & DISADVANTAGES

Advantages

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

Disadvantages

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

11. CONCLUSION

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

12. FUTURE SCOPE

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

13. APPENDIX

Source Code

STYLE

```
<!DOCTYPE html>
<html lang="en" dir="ltr">
  <head>
    <meta charset="utf-8">
    <title>Car Resale Value Predicting Application</title>
    <link rel="icon" type="image/x-icon" href="../static/Images/favicon.ico">
    <link rel="stylesheet" href="../static/css/style.css">
    <link rel="stylesheet" href="https://cdn.jsdelivr.net/npm/font-awesome/4.7.0/css/font-awesome.min.css">
    <style>
      h1 {
        font-size: 65px;
        top: 40px;
      }
    </style>
  </head>
</html>
```

```
p {
  font-size: 20px;
}
.button {
  display: inline-block;
  border-radius: 3px;
  background-color: red;
  border: none;
  color: white;
  text-align: center;
  font-size: 20px;
  padding: 20px;
  width: 160px;
  transition: all 0.5s;
  cursor: pointer;
  margin: 3px;
}
.button span {
  cursor: pointer;
  display: inline-block;
  position: relative;
  transition: 0.5s;
}

.button span:after {
  content: '\00bb';
  position: absolute;
  opacity: 0;
  top: 0;
  right: -20px;
  transition: 0.5s;
}

.button:hover span {
  padding-right: 20px;
}

.button:hover span:after {
  opacity: 1;
  right: 0;
}
```

```

}

body {
  background-image: url('car4.jpg');
  background-repeat: no-repeat;
  background-attachment: fixed;
  background-size: cover;
}
</style>
</head>
<center>
<body>
  <section class="header">
    <nav>

    </nav>
    <div class="text-box">
      <center><h1 style="color:white;">Car resale value
Predictor</h1><center>
      <center><p style="color:White;">Get fair and unbiased price for your
used car.</p><center>
      <button class="button" style="vertical-align:middle"><span>Check Price
</span></button>

    </div>
  </section>

</body>
</center>
</html>

```

PREDICT

```

<!DOCTYPE html>
<html lang="en">
<head>

```


[illegible]

```
        <h1 style="color:Black;"><br>The Predicted Car Resale Value is </h1>
        <h2 style="color:black;">₹3,50,000</h2>
    </div>
</section>
```

```
</right>
</body>
</html>
```

VALUE

```
<!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>
<style>
body {
    background-image: url('car10.png');
    background-repeat: no-repeat;
    background-attachment: fixed;
    background-size: cover;

}
h1{
text-align: right;
margin-right: 39px;
}
h2{
text-align: right;

margin-right: 160px
}
</style>
</head>
<body>
<right>
```

```
<section class="header">
  <br>
  <br>
  <br>
  <br>
  <br>
  <br>
  <br>

<br>
  <br>
  <br>

  <div class="text-box">

    <h1 style="color:Black;"><br>The Predicted Car Resale Value is </h1>
    <h2 style="color:black;">₹3,50,000</h2>
  </div>
</section>

</right>
</body>
</html>
```

GitHub & Project Demo Link

<https://github.com/IBM-EPBL/IBM-Project-11120-1659266975>