PROJECT REPORT

Team ID	PNT2022TMID41243
Project Name	Car Resale Value Prediction

1. INTRODUCTION

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

We will compare the performance of various machine learning algorithms like Linear Regression, Ridge Regression, Lasso Regression, Elastic Net, Decision Tree Regression and choose the best out of it. Depending on various parameters we will determine the price of the car. Linear Regression Algorithms are used because they provide us with continuous value as an output and not a categorized value because of which it will be possible to predict the actual price a car rather than the price range of a car. User Interface has also been developed which acquires input from any user and displays the Price of a car according to user's inputs.

1.1 Project Overview

The price of a new car in the industry is fixed by the manufacturer with some additional costs incurred by the Government in the form of taxes. So, customers buying a new car can be assured of the money they invest to be worthy. But, due to the increased prices of new cars and the financial incapability of the customers to buy them, Used Car sales are on a global increase. Therefore, there is an urgent need for a Used Car Price Prediction system which effectively determines the worthiness of the car using a variety of features. Existing System includes a process where a seller decides a price randomly and buyer has no idea about the car and it's value in the present day scenario. In fact, seller also has no idea about the car's existing value or the price he should be selling the car at. To overcome this problem we have developed a model which will be highly effective. Regression Algorithms are used because they provide us with continuous value as an output and not a categorized value.

1.2 Purpose

The main idea of making a car resale value prediction system is to get hands-on practice for python using Data Science. Car resale value prediction is the system to predict the amount of resale value based on the parameters provided by the user. User enters the details of the car into the form given and accordingly the car resale value is predicted

2. LITERATURE SURVEY

The first paper is Predicting the price of Used Car Using Machine Learning Techniques. In this paper, they investigate the application of supervised machine learning techniques to predict the price of used cars in Mauritius. The predictions are based on historical data collected from daily newspapers. Different techniques like multiple linear regression analysis, k-nearest neighbors, naïve bays and decision trees have been used to make the predictions. The Second paper is Car Price Prediction Using Machine Learning Techniques. A Considerable number of distinct attributes are examined for the reliable and accurate prediction. To build a model for predicting the price of used cars in Bosnia and Herzegovina, they have applied three machine learning techniques (Artificial Neural Network, Support Vector Machine and Random Forest). The third paper is Price Evaluation model in second hand car system based on BP neural networks. In this paper, the price evaluation model based on big data analysis is proposed, which takes advantage of widely circulated vehicle data and a many vehicle transaction data to analyze the price data for each type of vehicle by using the optimized BP neural network algorithm. It aims to establish a second-hand car price evaluation model to get the price that best matches the car.

2.1 Existing problem

- ➢ Due to lot of data accessing, there might be lack of security
- ➢ Dataset is limited
- ➢ Sometimes there might be invalid or wrong prediction value will be displayed
- ➢ Prediction matrices have been difficult and unable to understand

2.2 References

[1] Sameerchand Pudaruth, “Predicting the Price of Used Cars using Machine Learning Techniques”;(IJICT 2014)

[2] Enis gegic, Becir Isakovic, Dino Keco, Zerina Masetic, Jasmin Kevric, ”Car Price Prediction Using Machine Learning”; (TEM Journal 2019)

[3] Ning sun, Hongxi Bai, Yuxia Geng, Huizhu Shi, “Price Evaluation Model In Second Hand Car System Based On BP Neural Network Theory”; (Hohai University Changzhou, China)

[4] Nitis Monburinon, Prajak Chertchom, Thongchai Kaewkiriya, Suwat Rungpheung, Sabir Buya, Pitchayakit Boonpou, “Prediction of Prices for Used Car by using Regression Models” (ICBIR 2018)

[5] 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” (Hanoi National University)

[6] Shonda Kuiper (2008) Introduction to Multiple Regression: How Much Is Your Car Worth?, Journal of Statistics Education, 16:3, DOI: 10.1080/10691898.2008.11889579

[7] Geurts P. (2009) Bias vs Variance Decomposition for Regression and Classification. In: Maimon O., Rokach L. (eds) Data Mining and Knowledge Discovery Handbook. Springer, Boston, MA

[8] Robert T. (1996) Regression Shrinkage and Selection Via the Lasso. In: Journal of the Royal Statistical Society: Series B (Methodological) Volume 58, Issue 1

2.3 Problem Statement Definition

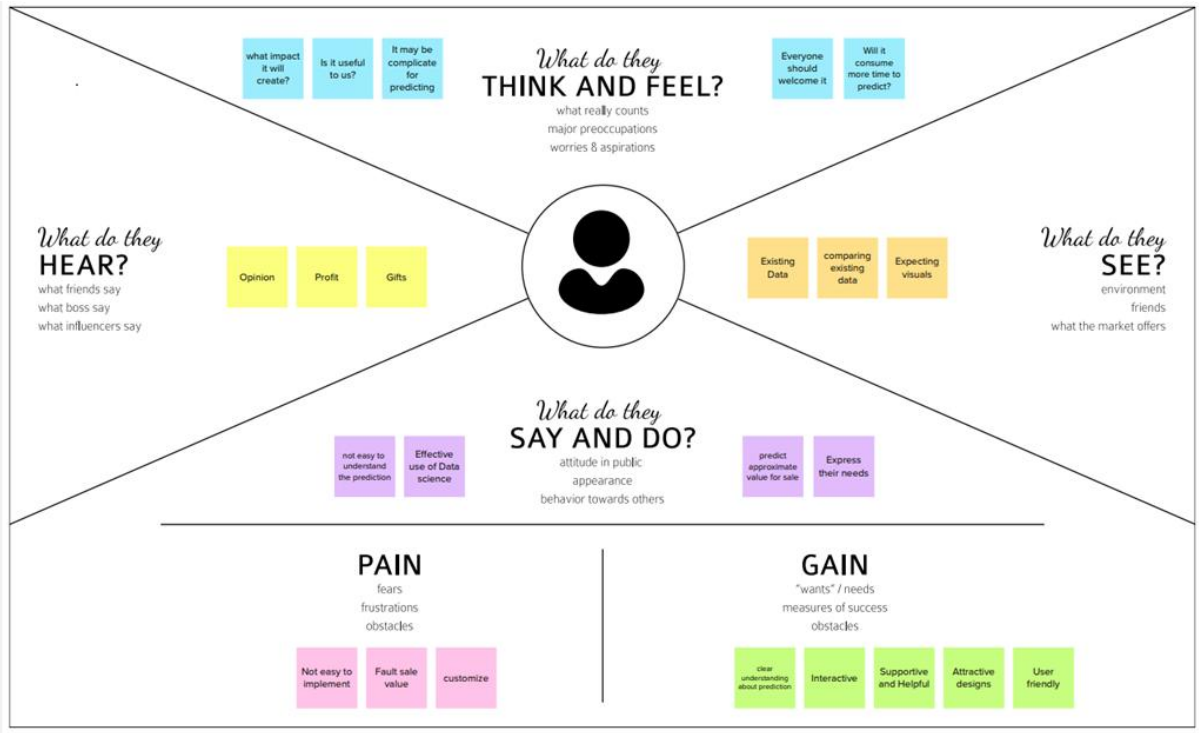
Mr. A. Vikram is 43 year old, who is travelling to his office through his Car for past 11 years. Also he uses his car to travel to visit his clients in various places. In the last 3 months, he serviced his car twice. But still his car condition is not Good and he Feeling uncomfortable while driving.

- Vikram wants to sell his car with good rate.
- He had lost more money for servicing his car.
- This problem is usually faced by many people.
- Vikram wants to know the solution for the problem.

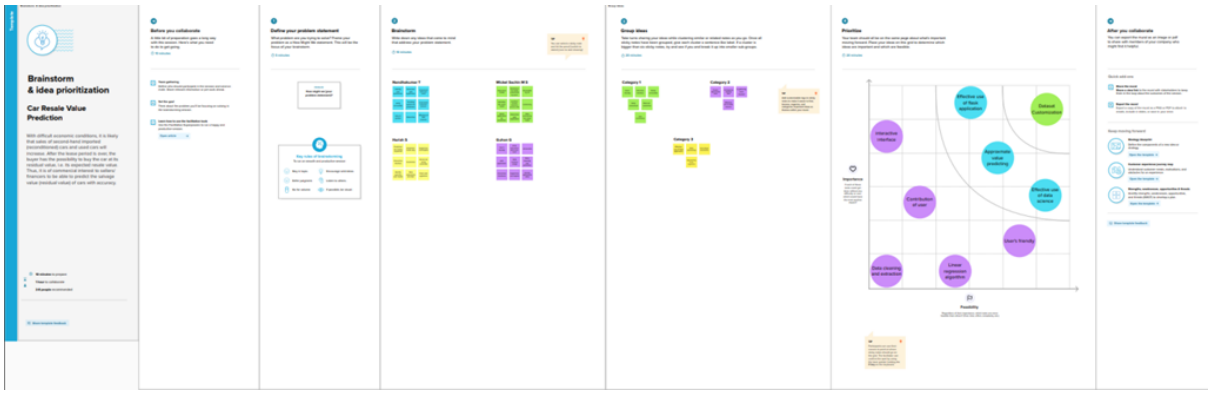
Who does the problem affect?	Person who sells his car.
What are the boundaries of the problem?	Person who sells his car due to poor performance.
What is the issue?	Person who doesn't know how much the car will be resaled according to its performance and usage.
When does the issue occurs?	During the selling of his Car to any Agents.
Where does the issue occurs?	The issue occurs in the used car selling and buying Showrooms.
Why is it important to fix the problem?	It is required to understand the analysis and at which value his car will be bought by agent.
What solution to solve this issue?	An automated system is introduced to Analyze the Car usage and predict the best value to sell the car
What methodology used to solve this issue?	Multiple linear regressions and KNN algorithms are used to predict the resale value of the car

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

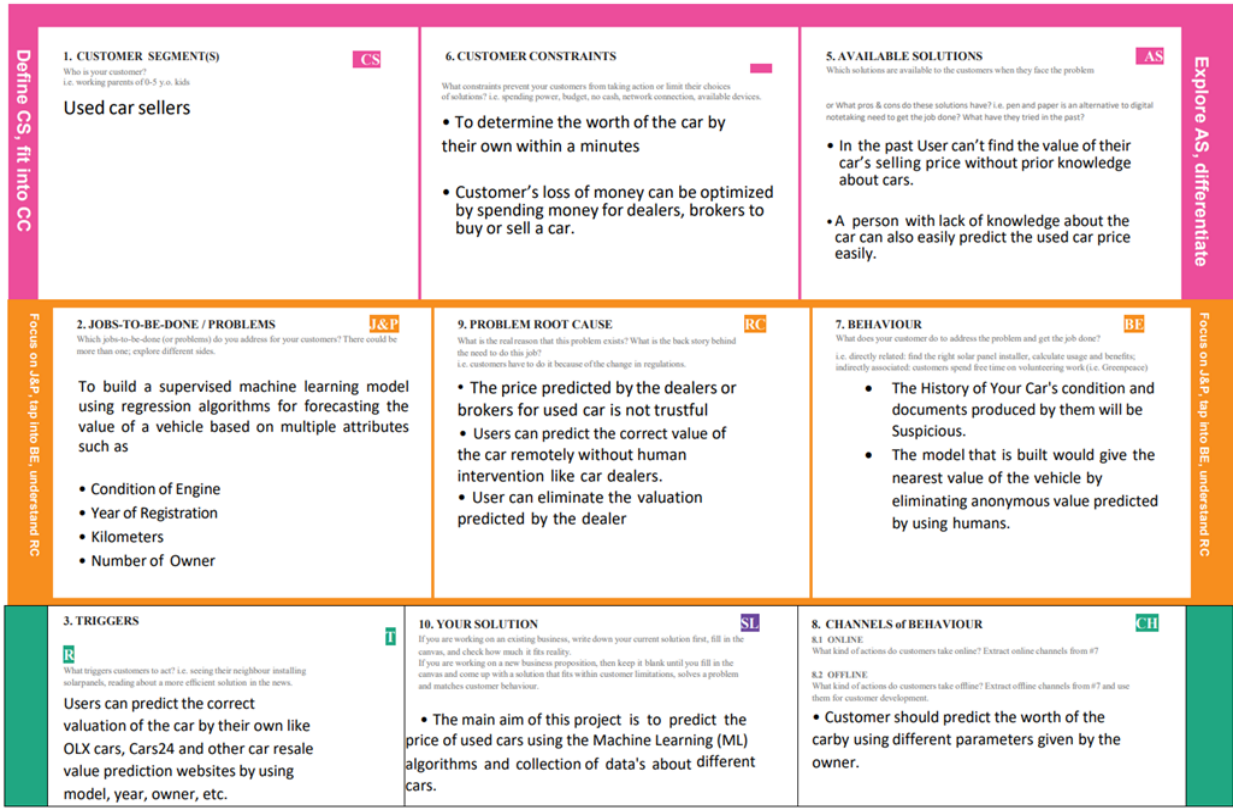


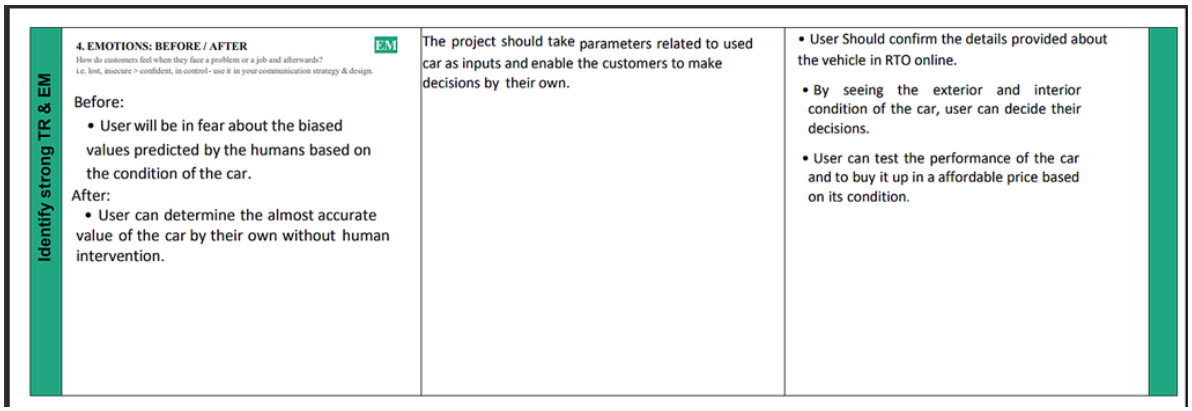
3.3 Proposed Solution

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	To develop a webpage to predict the Resale value of a car
2.	Idea / Solution description	To train the system with the dataset using a regression model
3.	Novelty / Uniqueness	By using the regression model to predict the value in a small amount of time to predict its value
4.	Social Impact/ Customer Satisfaction	The customer can get an idea about the resale value of their car, then he can have an idea whether to sell their vehicle or not based on their financial condition.
5.	Business Model (Revenue Model)	The web based application has a friendly UI for the customer to enter their vehicles detail and the system predicts the value within few seconds
6.	Scalability of the Solution	The solution given by the trained system is efficient and is almost accurate value of the vehicle.

3.4 Problem Solution fit

Project Title: Car Resale Value Prediction | **Project Design Phase-I - Solution Fit Template** | **Team ID:** PNT2022TMID41243





4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form.
FR-2	User Confirmation	Confirmation via Email.
FR-3	User Login	Login via Email. Login via password.
FR-4	Car registration	Registering the car details.
FR-5	Value Prediction	Predicting the car resale value.

4.2 Non-functional Requirements

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Predicting the resale value.
NFR-2	**Security**	Providing security to the website.
NFR-3	**Reliability**	Providing high reliability by predicting values for different types of cars.
NFR-4	**Performance**	Providing high performance by using some machine learning techniques.
NFR-5	**Availability**	It is used for all types of cars.
NFR-6	**Scalability**	Predicting values for different types of cars.

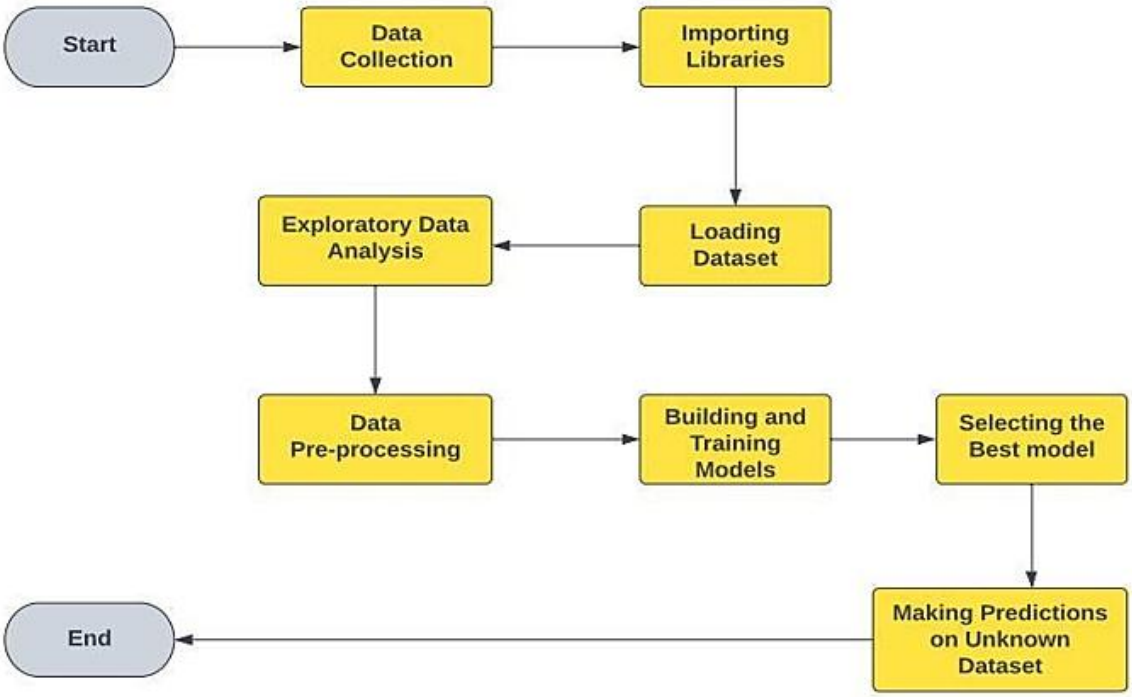
5. PROJECT DESIGN

5.1 Data Flow Diagrams

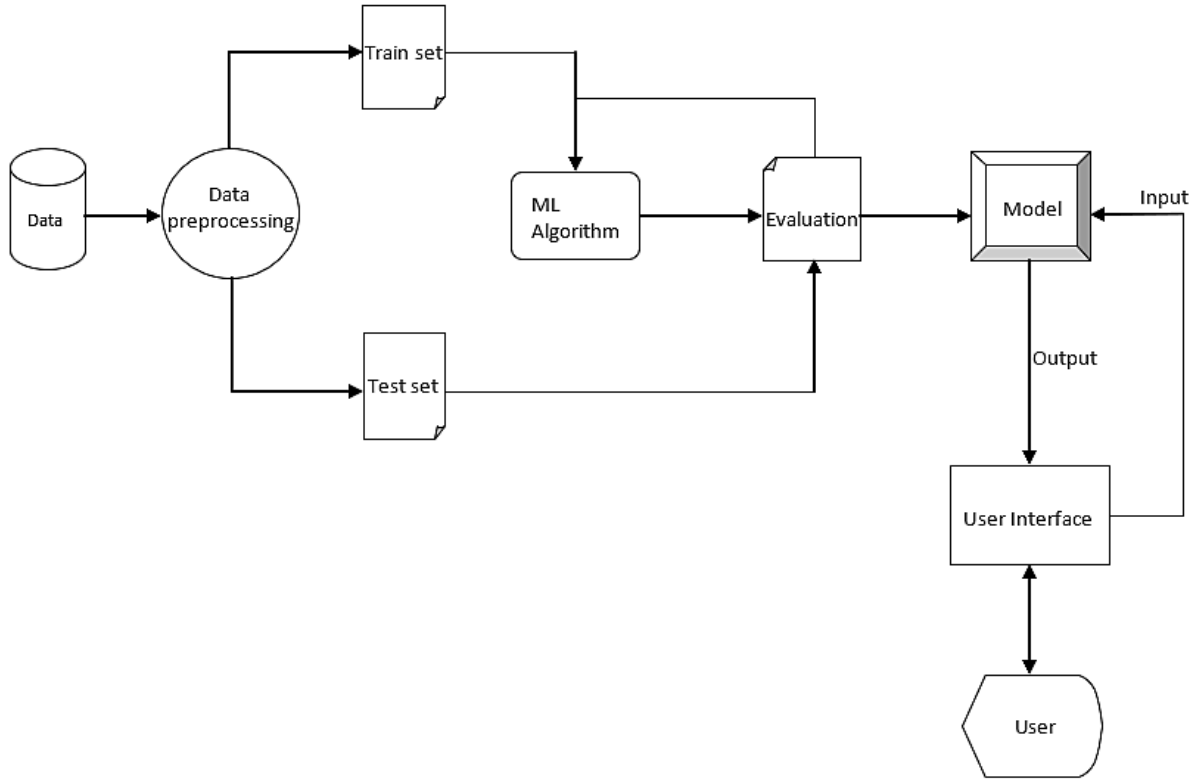
Data Flow Diagram:

A Data flow diagram is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system. What changes the information and where data is stored.

5.2 Solution & Technical Architecture



Solution Architecture Diagram



5.3 User Stories

User Type	Functional Requirements	User story Number	User Story/Task	Acceptance criteria	Priority	Relese
	Collecting dataset	USN-1	As a user, I need to gather the data in the form of CSV/XLS and clean the data		low	Sprint-1
	Data preparation	USN-2	As a user, I need t filter it for Dat visualization.		Medium	Sprint-1
	Data visualization	USN-3	As a user, I need to filter it for Data visualization		Medium	Sprint-1
	Dashboard	USN-4	Access dashboard in website	Dashboard	medium	Sprint-2
	Report and story	USN-5	As a user, I can view the list of categorized products and their details as a report and story.	Report and Story		Sprint-2
Customer (web user)	Interface	USN-6	As a user, I need to enter the details in the website to view the prediction value.	I can access the website.	High	Sprint-3
Administrator		USN-10	It can be easily accessible and responsible.	I can access it easily through applicatiion	High	sprint-4

6. PROJECT PLANNING & SCHEDULING

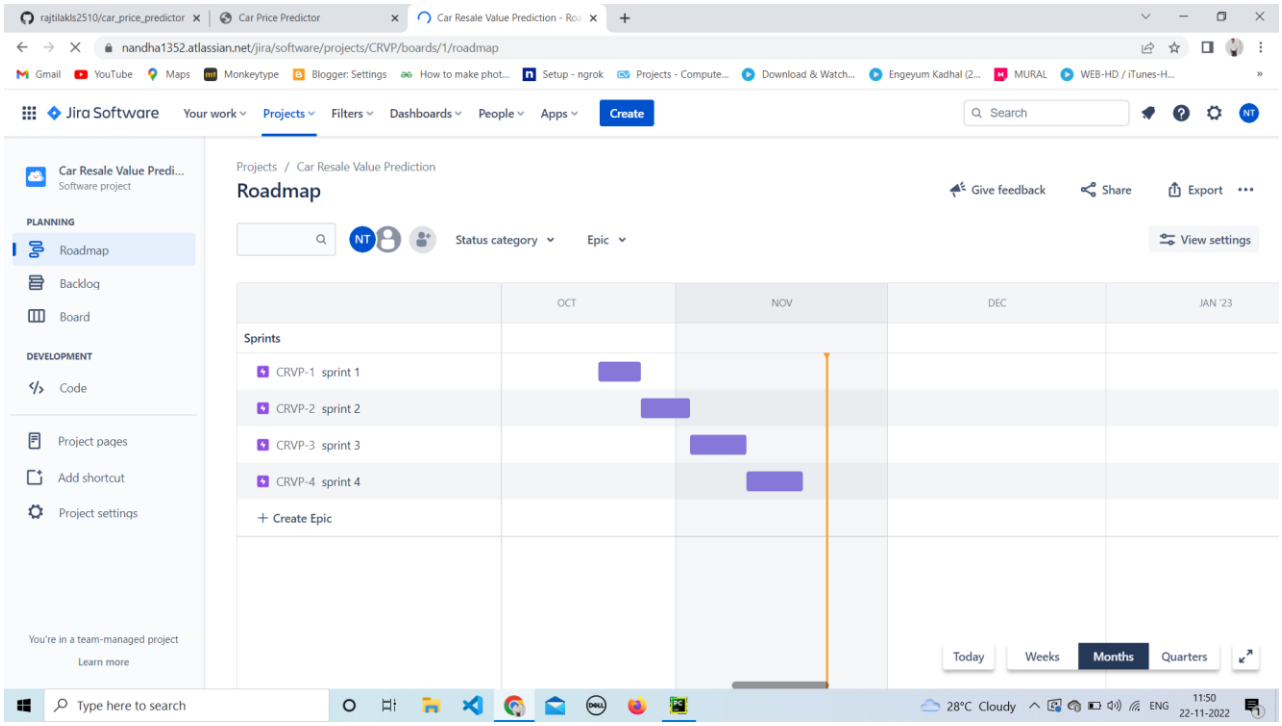
6.1. Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User story Number	User Story / Task	Story Points	Priority	Team members
Sprint-1	Interface	USN-1	As a user, I need to enter the details to view the prediction value	5	High	Nandhakumar T Guhan G Harish S Mickel Sachin M S
Sprint-1	Data Collecting	USN-2	As a user, In need to gather the data in the form of CSV and clean the data.	5	High	Nandhakumar T Guhan G Mickel Sachin M S
Sprint-1	Upload dataset	USN-3	As a user, I can view the data of the car.	5	Medium	Mickel Sachin M S Guhan G Harish s
Sprint-2	Data Preparation	USN-4	As a user, I need to filter the data for visualization.	5	High	Nandhakumar T Guhan G Harish S
Sprint-2	Data Visualization	USN-5	As a usesr, I need to filter it for Data Visualization.	5	High	Nandhakuamr T Guhan G Harish S
Sprint-2	Dashboard	USN-6	As a user, I need to filter it for Data Visualization.	10	High	Nandhakumar T Guhan G Mickel Sachin M S
Sprint-3	Dashboard	USN-7	As a user, I must plan visualizations in a way that I'm able to understand the prediction process.	10	High	Nandhakumar T Guhan G Harish S Mickel Sachin M S
Sprint-4	Prediction	USN-8	As a user, I can see the prediciton value of the specific car.	10	Medium	Nandhakuamr T Harish S Mickel Sachin M S
Sprint-4	Report	USN-9	As a user, I can view the Reale value of the Specific car.	10	High	Nandhakuamr T Guhan G Harish S Mickel Sachin M S
Sprint-4	Story	USN-10	As a user, I can see the Predicted value of the specific car.	10	High	Nandhakumar T Guhan G Harish S Mickel Sachin M S

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 (Actual)
Sprint-1	15	6 Days	21 Oct 2022	26 Oct 2022	15	25 Oct 2022
Sprint-2	20	7 days	27 Oct 2022	2 Nov 2022	20	2 Nov 2022
Sprint-3	10	8 days	3 Nov 2022	10 Nov 2022	10	10 Nov 2022
Sprint-4	20	8 days	11 Nov 2022	18 Nov 2022	20	18 Nov 2022

6.3 Reports From JIRA



7.CODING & SOLUTIONING

7.1 Feature-1

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File  Edit  Selection  Find  View  Goto  Tools  Project  Preferences  Help

index.html

<!DOCTYPE html>
<html lang="en">
<head xmlns="http://www.w3.org/1999/xhtml">
    <meta charset="UTF-8">
    <title>Car Price Predictor</title>
    <link rel="stylesheet" href="static/css/style.css">
    <link rel="stylesheet" type="text/css"
          href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.11.2/css/all.css">
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
    <script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.0/dist/umd/popper.min.js"
            integrity="sha384-Q6E9RHvbIyZFJoft+2mJbHaEWldlvI9IOYy5n3zV9zzTtmI3UksdQRVvoxMfooAo"
            crossorigin="anonymous"></script>

    <!-- Bootstrap CSS -->
    <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/css/bootstrap.min.css"
          integrity="sha384-9aIt2nRpC12Uk9gS9baDl411NQApFmC26EwAOH8WgZl5MYYxFfc+NcPb1dKGj7Sk" crossorigin="anonymous">
    <script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@2.0.0/dist/tf.min.js"></script>

</head>
<body class="bg-dark">

<div class="container">
    <div class="row">
        <div class="card mt-50" style="width: 100%; height: 100%">
            <div class="card-header" style="text-align: center">
                <h1>Welcome to Car Price Predictor</h1>
            </div>
            <div class="card-body">
                <div class="col-12" style="text-align: center">
                    <h5>This webpage is predicts the price of a car you want to sell. Try filling the details below: </
                    h5>
                </div>
                <br>
                <form method="post" accept-charset="utf-8" name="Modelform">

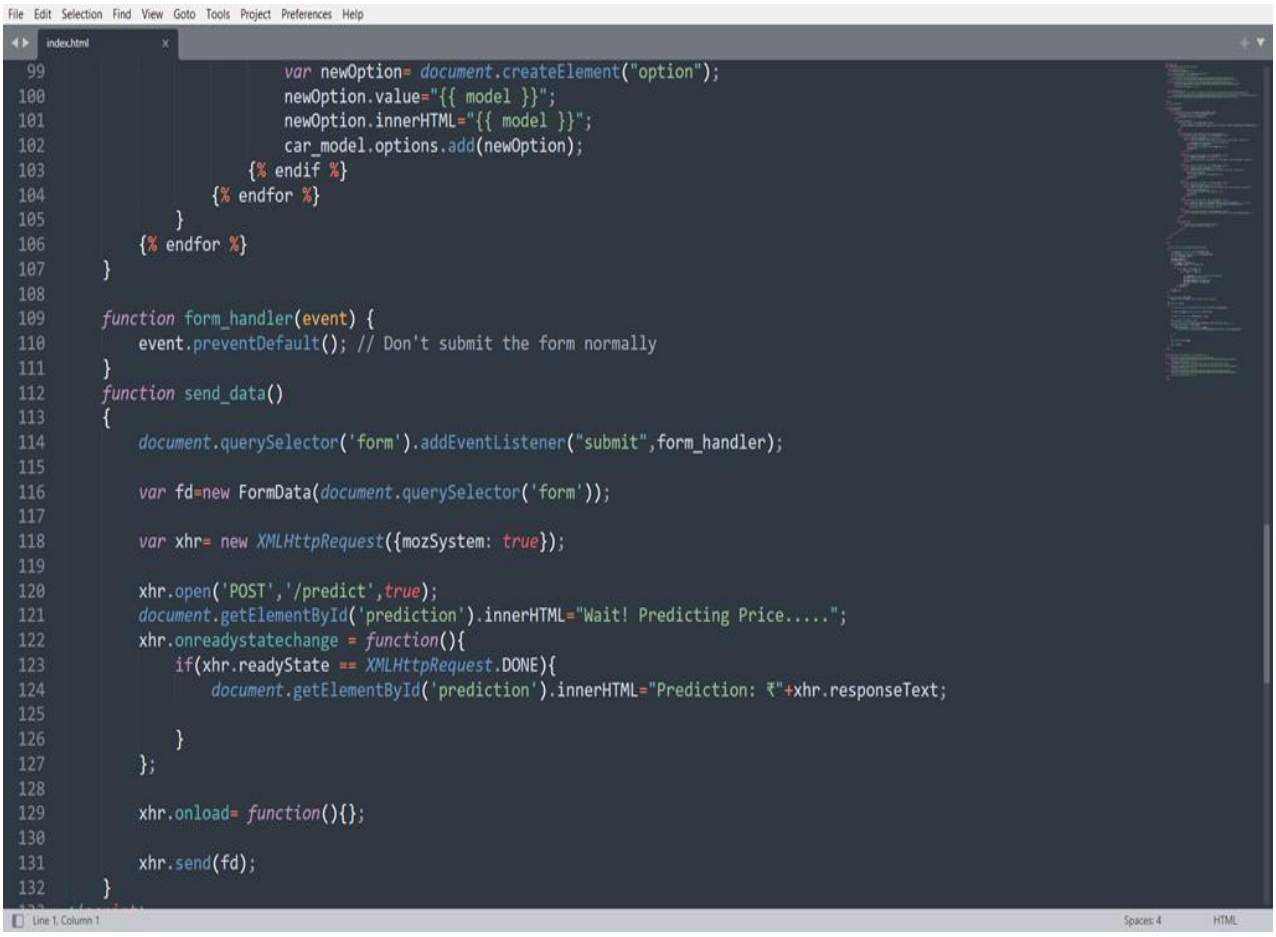
Line 1, Column 1                                                    Spaces: 4    HTML
```

File Edit Selection Find View Goto Tools Project Preferences Help

index.html

```
<form method="post" accept-charset="utf-8" name="Modelform">
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the company:</b> </label><br>
        <select class="selectpicker form-control" id="company" name="company" required="1"
                onchange="load_car_models(this.id,'car_models')">
            {% for company in companies %}
            <option value="{{ company }}">{{ company }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the model:</b> </label><br>
        <select class="selectpicker form-control" id="car_models" name="car_models" required="1">
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select Year of Purchase:</b> </label><br>
        <select class="selectpicker form-control" id="year" name="year" required="1">
            {% for year in years %}
            <option value="{{ year }}">{{ year }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the Fuel Type:</b> </label><br>
        <select class="selectpicker form-control" id="fuel_type" name="fuel_type" required="1">
            {% for fuel in fuel_type %}
            <option value="{{ fuel }}">{{ fuel }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Enter the Number of Kilometres that the car has travelled:</b> </label><br>
        <input type="text" class="form-control" id="kilo_driven" name="kilo_driven"
```

Line 1, Column 1 Spaces: 4 HTML



```
                        var newOption= document.createElement("option");
                        newOption.value="{{ model }}";
                        newOption.innerHTML="{{ model }}";
                        car_model.options.add(newOption);
                    {% endif %}
                {% endfor %}
            }
        {% endfor %}
    }

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

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

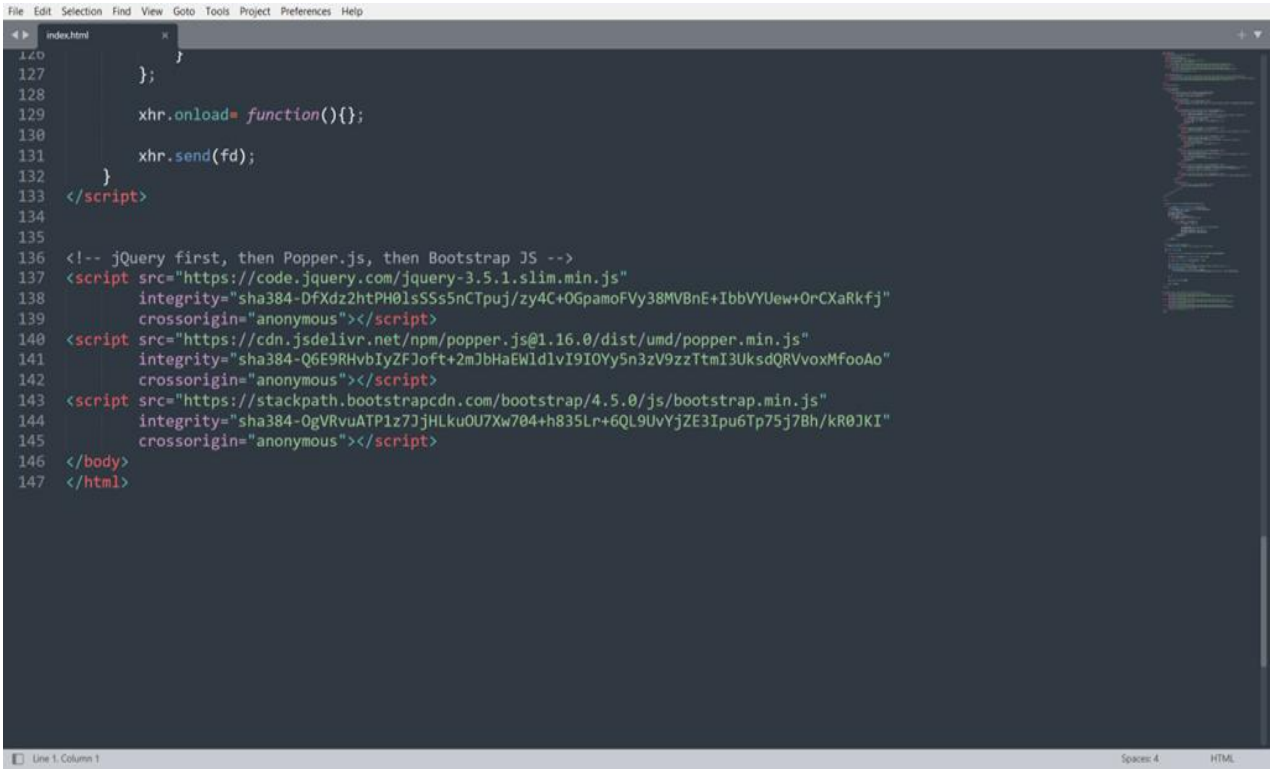
        var xhr= new XMLHttpRequest({mozSystem: true});

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

            }
        };

        xhr.onload= function(){};

        xhr.send(fd);
    }
```



```
        };

        xhr.onload= function(){};

        xhr.send(fd);
    }
</script>


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

8.Testing

8.1 Test Case

Test Scenarios

- Verify user able to see the webpage
- Verify user able to access the webpage
- Verify user able to see the prediction value
- Verify user able to access all the fields

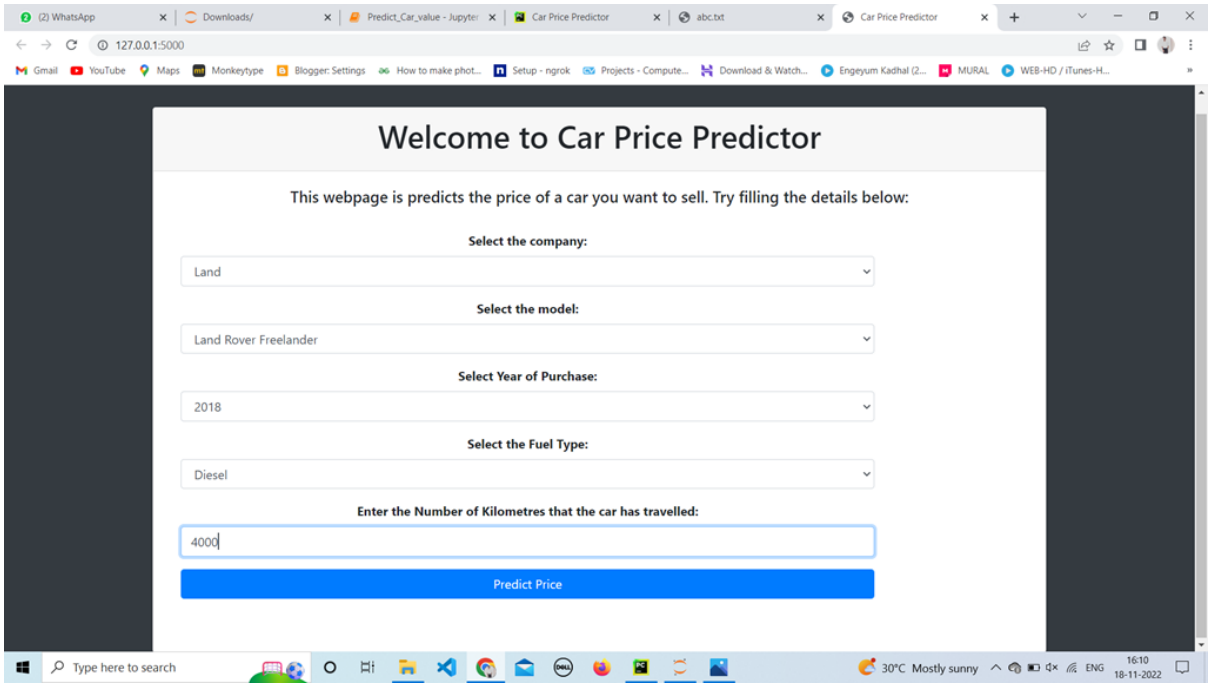
8.2 User Acceptance Testing

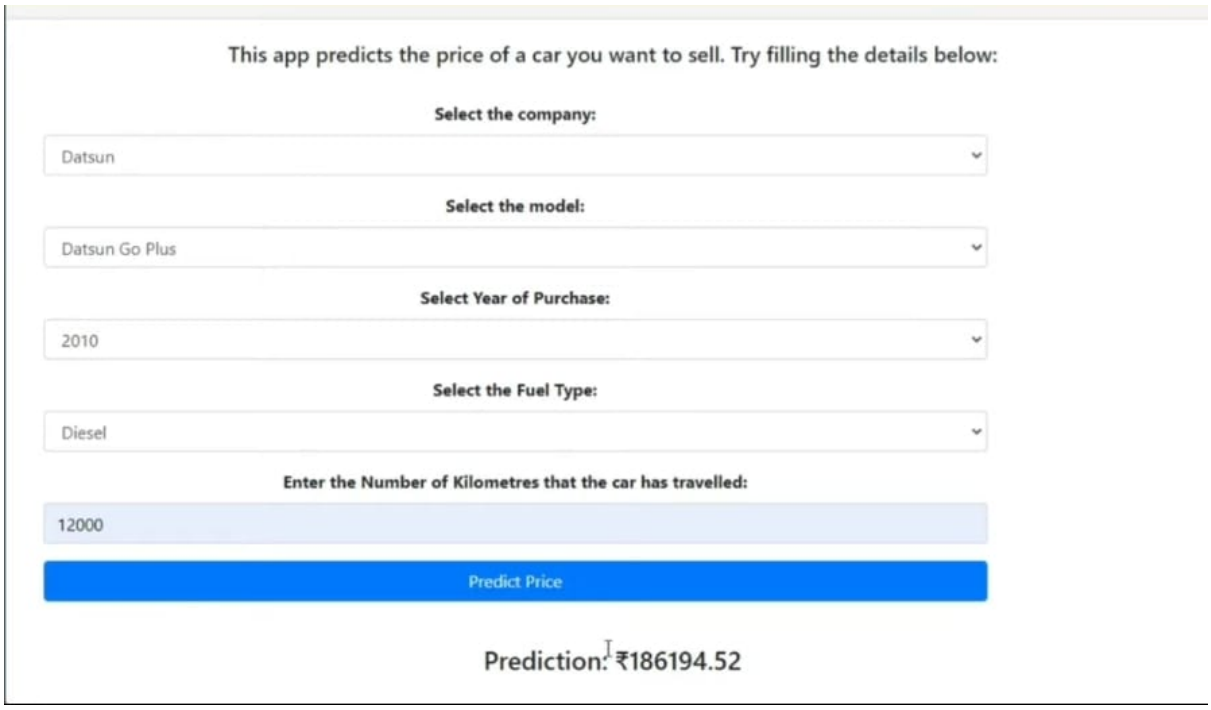
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	2	1	1	9
Duplicate	0	0	0	0	0
External	2	3	0	1	6
Fixed	4	1	2	2	9
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Total	**11**	**6**	**3**	**4**	**24**

9. RESULTS

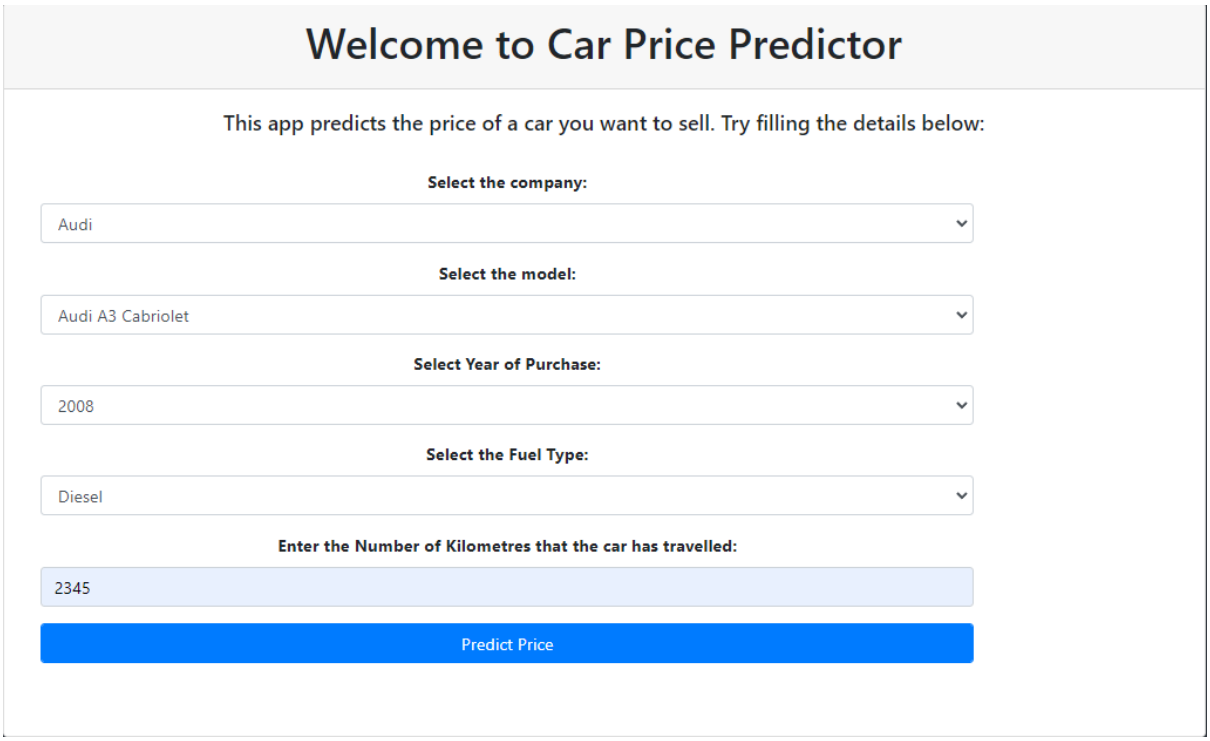
Screenshots of Web Application

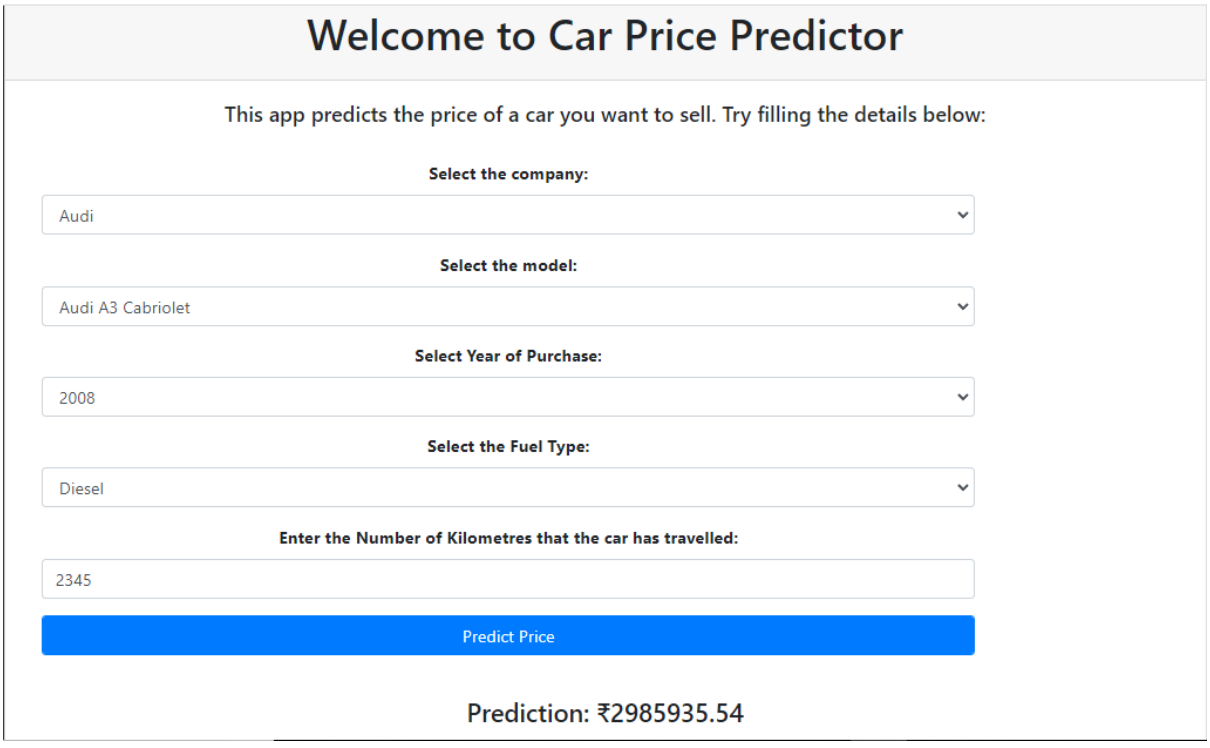
Test 1:





Test 2:


Welcome to Car Price Predictor
This app predicts the price of a car you want to sell. Try filling the details below:
Select the company:
Audi
Select the model:
Audi A3 Cabriolet
Select Year of Purchase:
2008
Select the Fuel Type:
Diesel
Enter the Number of Kilometres that the car has travelled:
2345
Predict Price


Welcome to Car Price Predictor
This app predicts the price of a car you want to sell. Try filling the details below:
Select the company:
Audi
Select the model:
Audi A3 Cabriolet
Select Year of Purchase:
2008
Select the Fuel Type:
Diesel
Enter the Number of Kilometres that the car has travelled:
2345
Predict Price
Prediction: ₹2985935.54

10. ADVANTAGES AND DISADVANTAGES

Advantages:

- It is used to identify the prediction valu**e.**
- Car Resale prediction will user to sell their car at a good rate.
- We can easily access the process by having less number of Data.
- Better prediction performance.
- Helps to check their vehicle's sell rate.

Disadvantage:

- Prediction pattern maybe changed
- Due to lesser data may lead to wrong predictions.
- Can't perform prediction when the server is rush or busy.

11. CONCLUSION

We started with understanding the use case of machine learning in the Automotive Industry and how machine learning has transformed the driving experience. Moving on, we looked at the various factors that affect the resale value of a used car and performed Data Pre-processing. Further, we build a Linear Regression model to predict the resale value of a used car.

12. FUTURE SCOPE

Use the technology to collect and use car details to derive the prediction of the car resale value. It is used to identify, optimize and predict the resale value. An efficient mode that generates trusted prediction value.

13. APPENDIX

13. Source Code

File Edit Selection Find View Goto Tools Project Preferences Help

index.html

```
<!DOCTYPE html>
<html lang="en">
<head xmlns="http://www.w3.org/1999/xhtml">
    <meta charset="UTF-8">
    <title>Car Price Predictor</title>
    <link rel="stylesheet" href="static/css/style.css">
    <link rel="stylesheet" type="text/css"
        href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.11.2/css/all.css">
    <script src="https://ajax.googleapis.com/ajax/libs/jquery/3.4.1/jquery.min.js"></script>
    <script src="https://cdn.jsdelivr.net/npm/popper.js@1.16.0/dist/umd/popper.min.js"
        integrity="sha384-Q6E9RHvbIyZFJoft+2mJbHaEWldlvI9IOYy5n3zV9zzTtmI3UksdQRVvoxMfooAo"
        crossorigin="anonymous"></script>

    <!-- Bootstrap CSS -->
    <link rel="stylesheet" href="https://stackpath.bootstrapcdn.com/bootstrap/4.5.0/css/bootstrap.min.css"
        integrity="sha384-9aIt2nRpC12Uk9gS9baDl411NQApFmC26EwAOH8WgZl5MYYxFfc+NcPb1dKGj7Sk" crossorigin="anonymous">
    <script src="https://cdn.jsdelivr.net/npm/@tensorflow/tfjs@2.0.0/dist/tf.min.js"></script>

</head>
<body class="bg-dark">

<div class="container">
    <div class="row">
        <div class="card mt-50" style="width: 100%; height: 100%">
            <div class="card-header" style="text-align: center">
                <h1>Welcome to Car Price Predictor</h1>
            </div>
            <div class="card-body">
                <div class="col-12" style="text-align: center">
                    <h5>This webpage is predicts the price of a car you want to sell. Try filling the details below: </
                    h5>
                </div>
                <br>
                <form method="post" accept-charset="utf-8" name="Modelform">
```

Line 1, Column 1 Spaces: 4 HTML

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index.html

```
<form method="post" accept-charset="utf-8" name="Modelform">
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the company:</b> </label><br>
        <select class="selectpicker form-control" id="company" name="company" required="1"
                onchange="load_car_models(this.id,'car_models')">
            {% for company in companies %}
            <option value="{{ company }}">{{ company }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the model:</b> </label><br>
        <select class="selectpicker form-control" id="car_models" name="car_models" required="1">
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select Year of Purchase:</b> </label><br>
        <select class="selectpicker form-control" id="year" name="year" required="1">
            {% for year in years %}
            <option value="{{ year }}">{{ year }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Select the Fuel Type:</b> </label><br>
        <select class="selectpicker form-control" id="fuel_type" name="fuel_type" required="1">
            {% for fuel in fuel_type %}
            <option value="{{ fuel }}">{{ fuel }}</option>
            {% endfor %}
        </select>
    </div>
    <div class="col-md-10 form-group" style="text-align: center">
        <label><b>Enter the Number of Kilometres that the car has travelled:</b> </label><br>
        <input type="text" class="form-control" id="kilo_driven" name="kilo_driven"
```

Line 1, Column 1 Spaces: 4 HTML

```
                        var newOption= document.createElement("option");
                        newOption.value="{{ model }}";
                        newOption.innerHTML="{{ model }}";
                        car_model.options.add(newOption);
                    {% endif %}
                {% endfor %}
            }
        {% endfor %}
    }

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

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

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

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

            }
        };

        xhr.onload= function(){};

        xhr.send(fd);
    }
```

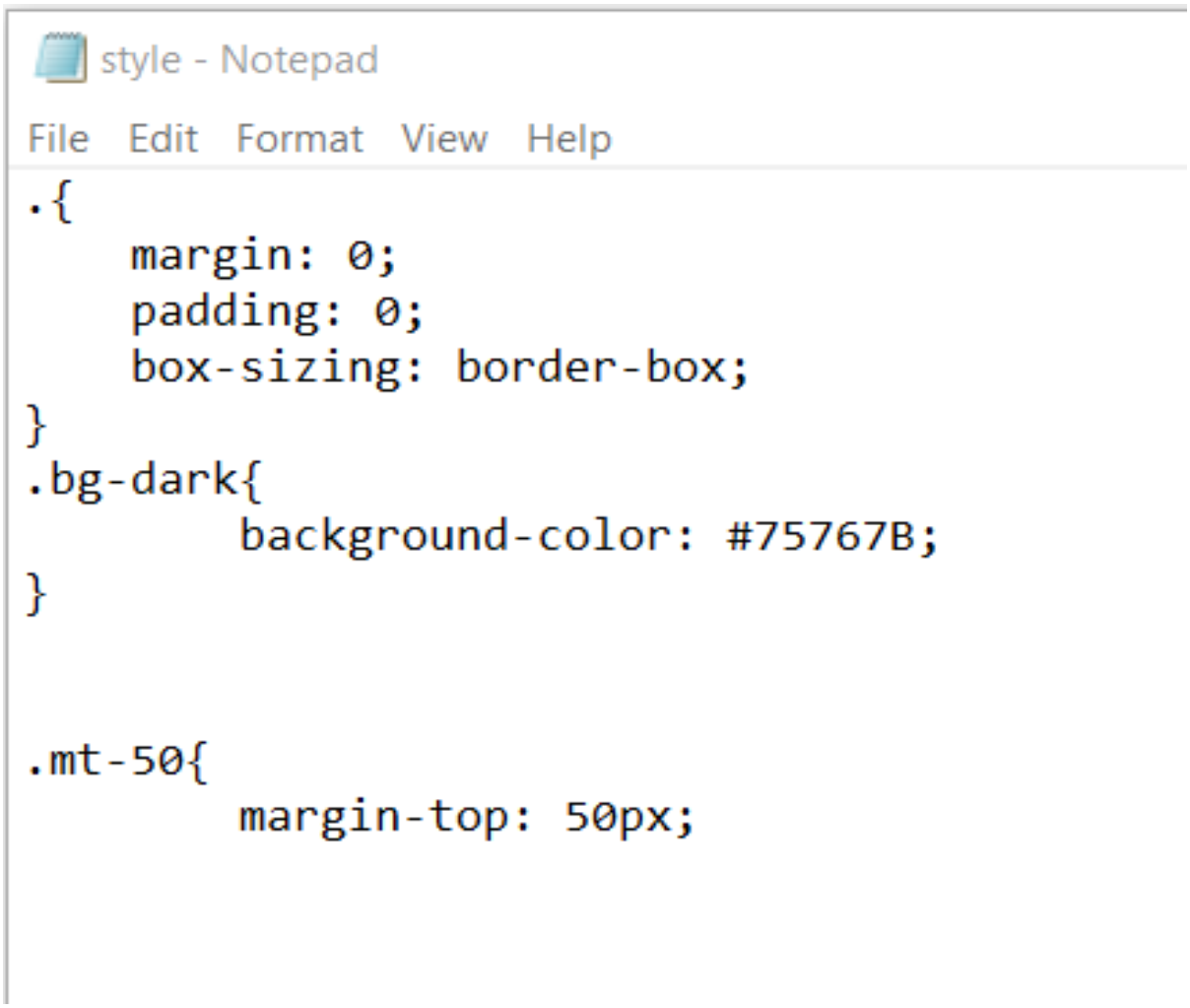
```
        };

        xhr.onload= function(){};

        xhr.send(fd);
    }
</script>


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

style.css


style - Notepad
File Edit Format View Help
.{
margin: 0;
padding: 0;
box-sizing: border-box;
}
.bg-dark{
background-color: #75767B;
}
.mt-50{
margin-top: 50px;

main.py

main.py - D:\IBM project\Project Development Phase\Sprint 2\main.py (3.11.0)

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```
from flask import Flask,render_template,request,redirect
from flask_cors import CORS
import pickle
import pandas as pd
import numpy as np
from sklearn.preprocessing import LabelEncoder
app=Flask(__name__)
cors=CORS(app)
model=pickle.load(open('LinearRegressionModel.pkl','rb'))
car=pd.read_csv('Cleaned_Car_data.csv')


@app.route('/',methods=['GET','POST'])
def index():
    companies=sorted(car['company'].unique())
    car_models=sorted(car['name'].unique())
    year=sorted(car['year'].unique(),reverse=True)
    fuel_type=car['fuel_type'].unique()
    companies.insert(0,'Select Company')
    return render_template('index.html',companies=companies, car_models=car_models, years=year,fuel_types=fuel_type)


def cross_origin(**kwargs):
    _options = kwargs


def decorator(f):
    LOG.debug("Enabling %s for cross_origin using options:%s", f, _options)
    if _options.get('automatic_options', True):
        f.required_methods = getattr(f, 'required_methods', set())
        f.required_methods.add('OPTIONS')
        f.provide_automatic_options = False

    def wrapped_function(*args, **kwargs):
        # Handle setting of Flask-Cors parameters
        options = get_cors_options(current_app, _options)

        if options.get('automatic_options') and request.method == 'OPTIONS':
            resp = current_app.make_default_options_response()
        else:
            resp = make_response(f(*args, **kwargs))

        set_cors_headers(resp, options)
        setattr(resp, FLASK_CORS_EVALUATED, True)
        return resp

    return update_wrapper(wrapped_function, f)
    return decorator
```

main.py - D:\IBM project\Project Development Phase\Sprint 2\main.py (3.11.0)

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


def cross_origin(**kwargs):
    _options = kwargs


def decorator(f):
    LOG.debug("Enabling %s for cross_origin using options:%s", f, _options)
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        if options.get('automatic_options') and request.method == 'OPTIONS':
            resp = current_app.make_default_options_response()
        else:
            resp = make_response(f(*args, **kwargs))

        set_cors_headers(resp, options)
        setattr(resp, FLASK_CORS_EVALUATED, True)
        return resp

    return update_wrapper(wrapped_function, f)
    return decorator


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

    company=request.form.get('company')

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

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


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

Demo link - https://drive.google.com/file/d/1Tgjus2_iSTD32AXCWoPhn3mS8Qt4Mjwh/view?usp=drivesdk