Project On

Car Resale Value prediction

Powered by IBM India

Submitted by

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1.1 INTRODUCTION

This project “Car Resale Value Prediction” aims to build a model to predict used cars' reasonable prices based on multiple aspects, including vehicle mileage, year of manufacturing, fuel consumption, transmission, road tax, fuel type, and engine size. This model can benefit sellers, buyers, and car manufacturers in the used cars market. Upon completion, it can output a relatively accurate price prediction based on the information that users input. The model building process involves machine learning and data science. The dataset used was scraped from listings of used cars. Various regression methods, including linear regression, polynomial regression, support vector regression, decision tree regression, and random forest regression, were applied in the research to achieve the highest accuracy. Before the actual start of model-building, this project visualised the data to understand the dataset better. The dataset was divided and modified to fit the regression, thus ensuring the performance of the regression.

1.1 Project Overview

A car price prediction has been a high interest research area, as it requires noticeable effort and knowledge of the field expert. Considerable number of distinct attributes are examined for the reliable and accurate prediction. To build a model for predicting the price of used cars, the applied three machine learning techniques are random forest ,KN-N and linear regression algorithm. Respective performances of different algorithms were then compared to find one that best suits the

available data set. This ability to capture data, analyse it and use it to personalise a shopping experience or implement is the future of retail.

Parameters involved :

Car_name;Year;Selling_Price;Present_Price;Kms_Driven;Fuel_type;

Seller_type;Transmission;Owner and so on.

1.2 Purpose

Car resale value prediction helps the user to predict the resale value of the car depending upon various features like kilo-metres driven, fuel type, etc. This resale value prediction system is made for general purpose to just predict the amount that can be roughly acquired by the user. The most essential elements for forecast are brand and model, period use of vehicle, mileage of vehicle, gear type and fuel type utilised in the vehicle just as fuel utilisation per mile profoundly influences cost of a vehicle because of continuous changes in the cost of a fuel. In view of the differing highlights and factors, and furthermore with the assistance of master information the vehicle value forecast has been done precisely.

2. LITERATURE SURVEY

2.1 Existing problem

The problem is defined as the optimised way to estimate insurance cost based on the manufacturer with some additional costs incurred by the Government in the form of taxes. As the existing methods for estimating the cost takes a lot of time and energy and due to the increased price of new cars and the inability of customers to buy new cars due to the lack of funds, used cars sales are on a global increase.

The prices of new cars in the industry is fixed by the So, customers buying a new car can be assured of the money they invest to be worthy. There is a need for a used car price prediction system to effectively determine the worthiness of the car using a variety of features. Even though there are websites that offer this service, their prediction method may not be the best. Besides, different models and systems may contribute to predicting power for a used car's actual market value. It is important to know their actual market value while both buying and selling.

2.2 References

At present, under the guidance of the new generation of information technology,the rapid accumulation of data, the continuous improvement of computing power, the continuous optimization of algorithm models, and the rapid rise of multi-scene applications have made profound changes in the development environment of Machine Learning.

[1] Kanwal Noor, 2017, Vehicle Price Prediction System using Machine Learning Techniques International Journal of Computer Applications. Volume 167 - Number 9

[2] Mariana Lusitania et al, (2009). Support vector regression analysis for price prediction in a vehicle leasing application [3] Richardson, M. S. (2009). Determinants of used vehicle resale value.

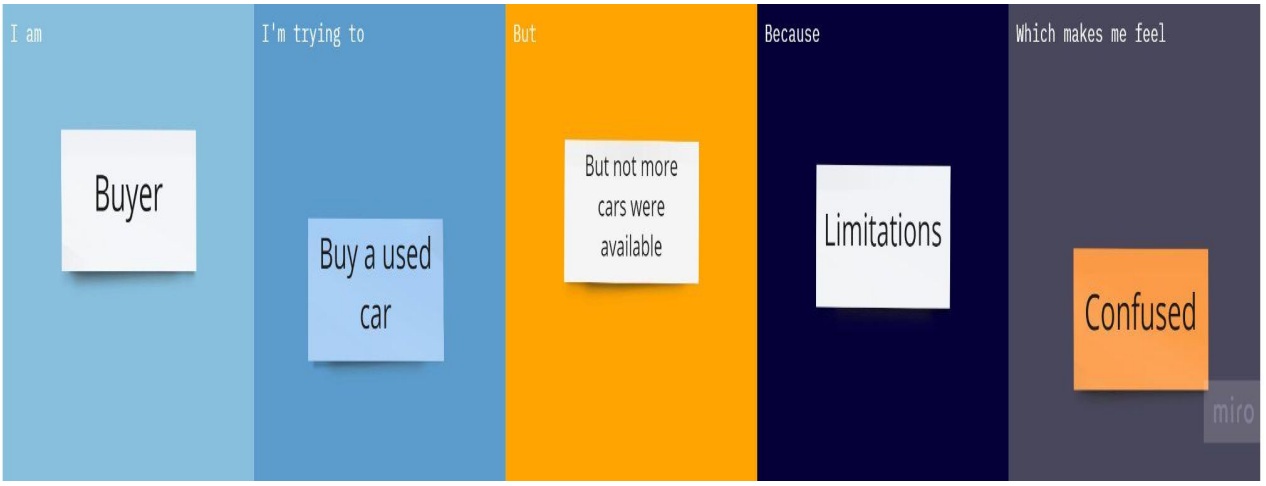
[3] Listiani, M. (2009). Support vector regression analysis for price prediction in a car leasing application (Doctoral dissertation, Master thesis, TU Hamburg-Harburg).

[4]T. D. Phan, "Housing Price Prediction Using Machine Learning Algorithms: The Case of Melbourne City Australia", *2018 International Conference on Machine Learning and Data Engineering (iCMLDE)*, pp. 35-42, 2018.

[5]K. Samruddhi and R. Ashok Kumar, "Used Car Price Prediction using K-Nearest Neighbor Based Model", *International Journal of Innovative Research in Applied Sciences and Engineering*, vol. 4, no. 3, pp. 686-689, 2020.

[6]O. Celik and U. O. Osmanoglu, "Prediction of The Prices of Second-Hand Cars", *Avrupa Bilim ve Teknoloji Dergisi*, no. 16, pp. 77-83, Aug. 2019.

2.3 Problem statement definition



3 .IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2 Ideation & Brainstorming

STEP 1:

- o Prediction using Car image.
- o By using the exterior and interior image of the car.
- o The value will be predicted based on the appearance of the car.If there any damage or n numbers scratches the car resale value will be quite affected.
- o By using neural network value of the car can be predicted.
- o Neural network algorithm is developed by considering the human brain that takes a set of units as input and transfers results to a predefined output.

STEP 2:

- o The main objective of this project is to predict the Prices of used cars, compare the prices and also estimate the lifespan of a particular car.
- o Insurance, Company claims,etc.
- o regression Algorithm is used to predict the value.
- o Regression model based on k-nearest neighbour machine learning algorithm was used to predict the price of a car.

STEP 3:

o Prediction using engine car condition.

oUser should upload engine sound in the format of audio file.

o By using Convolutional Neural Networks methodology price can be predicted.

o CNNs for Machine Learning on sound data by spectrogram approach that was just converts each song (or song segment) into a spectrogram: a two dimensional matrix

STEP 4:

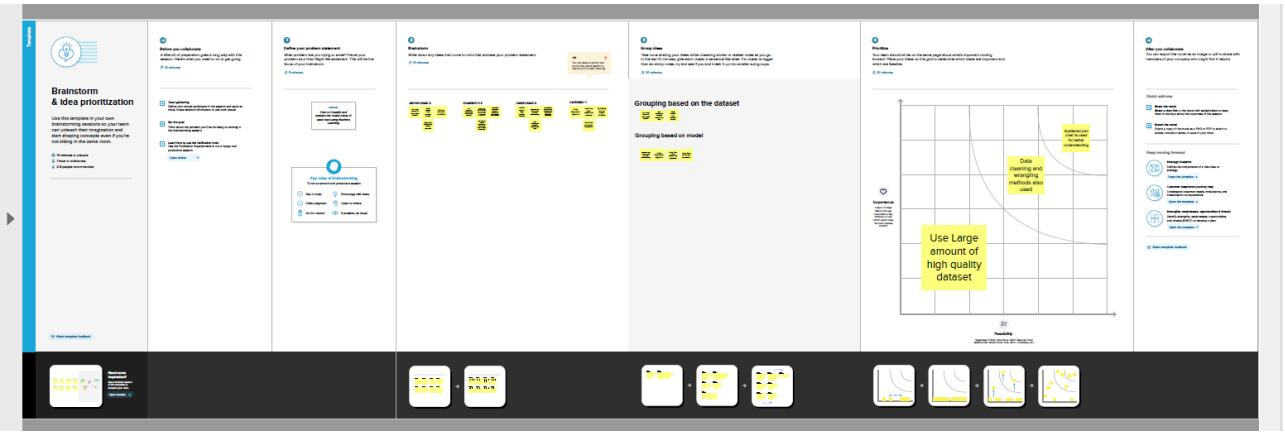
o Economic Conditions.

o Kilo-metres Covered.

o Its mileage (the number of kilometres it has run) and its horsepower

o Car prediction using XGBoost algorithm accurate results will be monitored.

o XGBoost as a regression model gave the best MSLE and RMSE values.

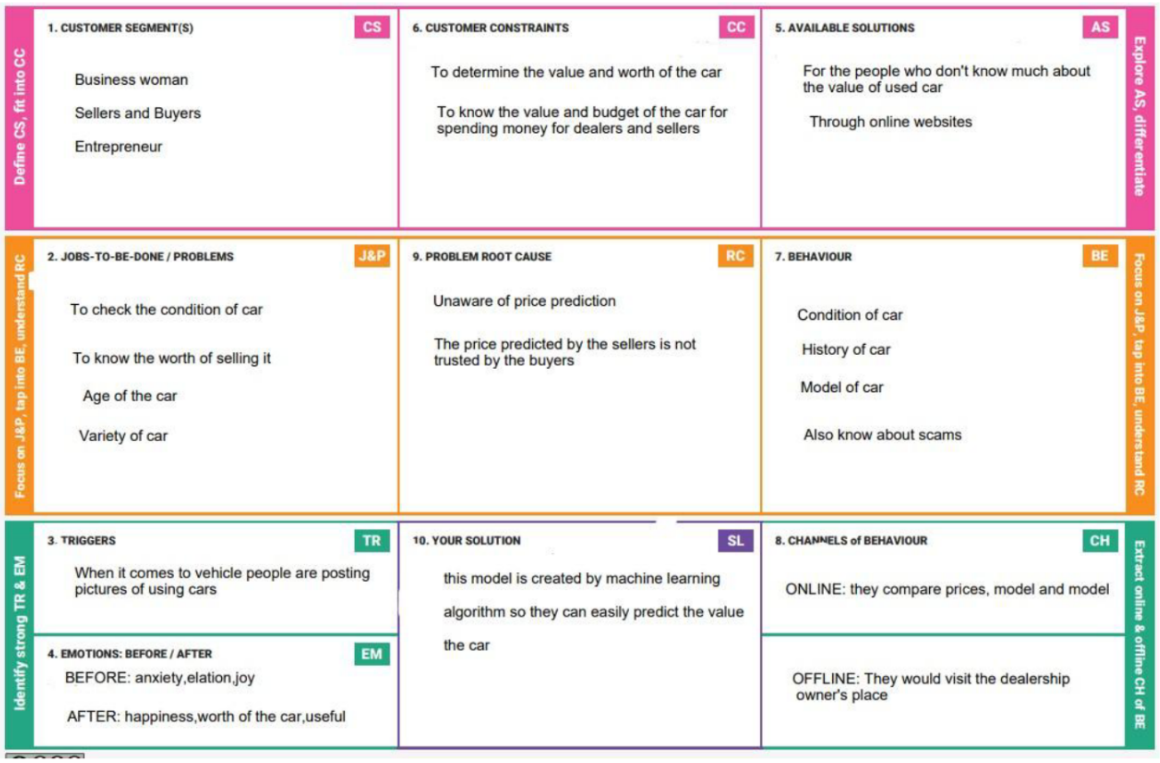


3.3 Proposed Solution

S. No.	*Parameter*	*Description*
1.	*Problem Statement (Problem to be solved*	*The main aim of this project is to predict the price of used cars using the various Machine Learning (ML) models*
2.	*Idea / Solution description*	*The model is to be built that would give the nearest resale value of the vehicle. By using these best accuracy values will be taken as a solution and it will be integrated to the web-based application where the user is notified with the status of his product.*
3.	*Novelty / Uniqueness*	*Used car price prediction is effectively used to determine the worthiness of the car on its own within a few minutes by using various features such as year, model, mileage(km), etc.*
4.	*Social Impact / Customer Satisfaction*	*· If the user wants to buy or sell a car it helps users to predict the correct valuation by their own.* *· A loss function is to be optimised and mainly a weak learner can make predictions for used cars easily.*
5.	*Business Model (Revenue*	*· It helps users to predict the*

	Model)	***correct valuation of the car remotely with perfect valuation and without human intervention like car dealers in the process to eliminate biassed valuation predicted by the dealer.***
6.	***Scalability of the Solution***	***· Using Stored data and machine learning approaches, this project proposed a scalable framework for predicting values for different type of used cars present all over India***

3.4 Proposed Solution fit



4 REQUIREMENT ANALYSIS

4.1. Functional Requirement

The functional Requirements of this projects involves the better understanding of Pre-processing, Application designing using HTML & CSS and
IBM Watson Cloud. IBM Watson.
provides the services such as Database, deployment etc.
Hardware requirements Operating system- Windows 7,8,10
Software Requirements

- Python
- Pycharm
- PIP 2.7
- Jupyter Notebook
- Chrome

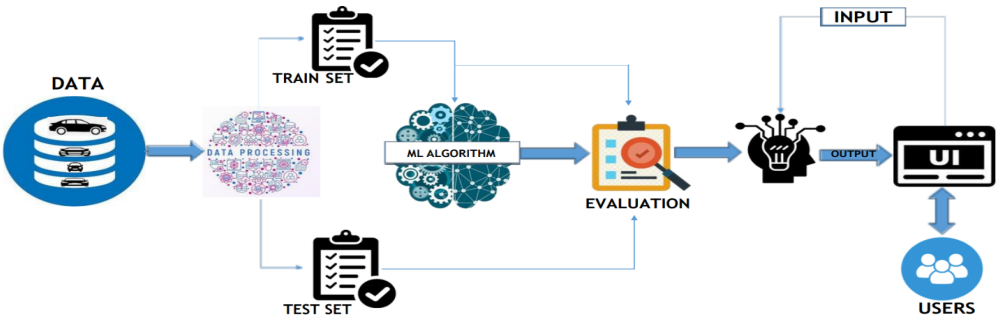
4.2. Non Functional Requirement

The Non - Functional Requirements of this project are,

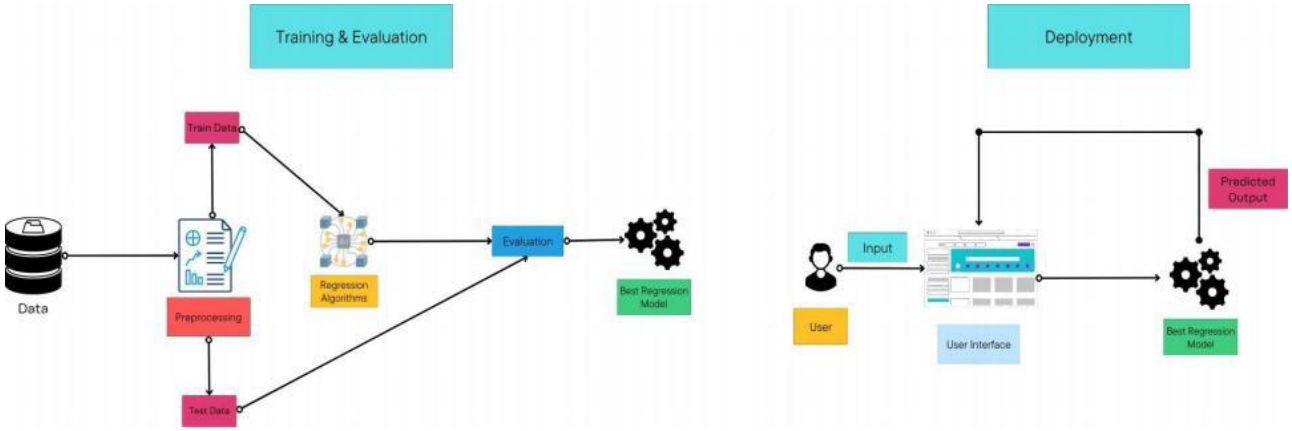
- Highly accurate Image Predictive model
- better user responsive web application
- Cloud database for storing the informations

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

Jser Type	Functional Requirement (epic)	User story number (S .NO)	User Story /Task	Acceptance criteria	Priority	Release
Customer(we user)	Enter ‘s into the browser	USN -1	As a user, I can access to website using any web browser	I can enter by selecting the appropriate web link in the browser.	High	Sprint 1
Any user -		USN-2	As a user, I can proceed to the prediction page by selecting the check value button in the home page.	I can enter into it without any acceptance .	High	Sprint 1
Customer*(if n case nobile user	Enter ’s into a mobile browser	USN-3	As a user, I can use any of the appropriate mobile browsers to enter into the website.	I can enter by using an appropriate web link.	Medium	Sprint 1
Customer Care Executive	Giving a missed call		Drop a query ,we will get back to you.			

6.PROJECT PLANNING

6.1 Sprint Planning and Estimation

Sprint	**Functional (Requirements)**	**User Story Number**	**User story/Task**	**Story points**	**Priority**
Sprint 1	Home page	USN 1	As a user, I can view the home page of the	20	Low

			web application.		
Sprint 2	Car resale value display	USN 2	As a user, I can be redirected to the data entry page.	20	medium
Sprint 3	Required data entry	USN 3	As a user, I can enter my car details in the required fields.	20	medium
Sprint 4	Resale vale prediction	USN 4	As a user, I expect the application to predict the resale value of my car.	20	medium

6.2 Sprint Delivery Schedule

- Pre -requisites
- Import Required libraries
- Collect Data Set
- Pre the process the data
- Choose the Appropriate Model
- Train the model on IBM
- Integrate with Flask endpoint
- Index..html
- Registration form.html
- Flask application
- App.py

7. CODING & SOLUTION

7.1 Feature 1

Import Libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import pickle
from lightgbm import LGBMRegressor
```

Import Dataset

In [2]:
```
df=pd.read_csv("Dataset.csv", header=0, sep=',', encoding='Latin1',)
```

Read Dataset

In [3]:
```
df.head()
```

Out[3]:

7.2 Feature 2

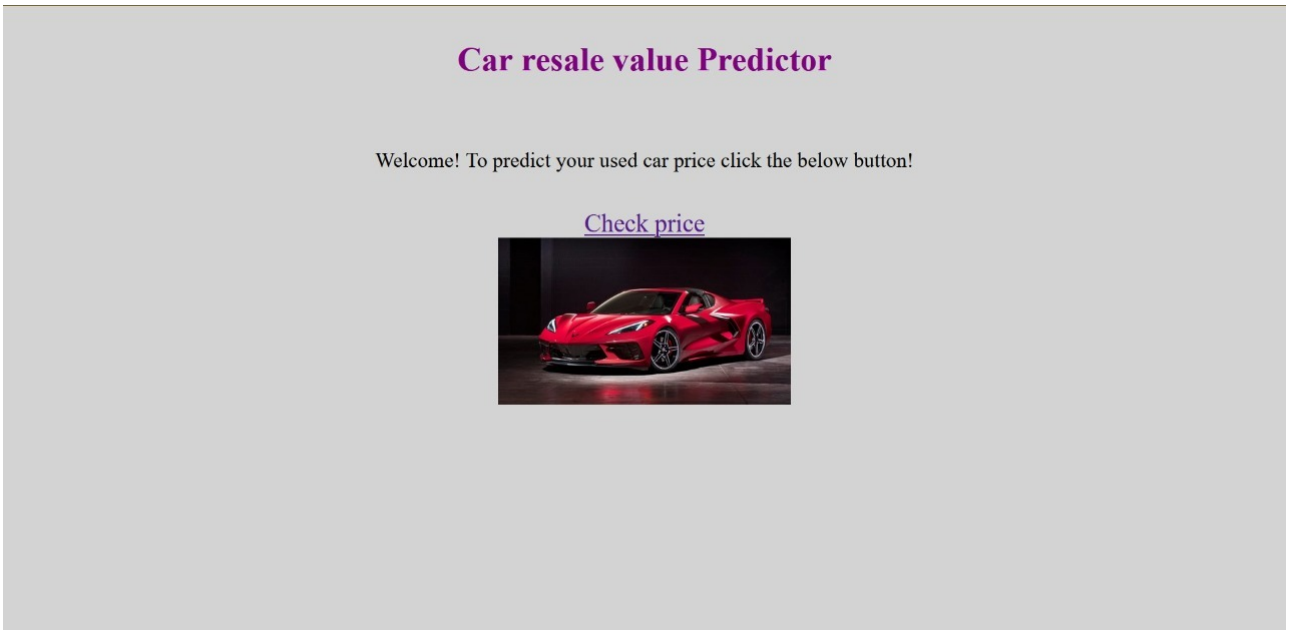
```
model_rand=pickle.load(open(filename,'rb'))
#Configure app.py to fetch the parameter values from the ui,and return the prediction
@app.route('/')
def index():
return render_template('resaleintro.html')
@app.route('/predict')
def predict():
return render_template('resalepredict.html')
@app.route(y_predict', methods=['GET', 'POST'])
def y_predict():
regyear = int (request.form['regyear'])
powerps = float(request.form['powerps'])
kms = float(request.form['kms'])
regmonth int(request.form.get('regmonth'))
gearbox = request.form['gearbox']
damage request.form['dam']
model request.form.get('modeltype') brand= request.form.get('brand')
fuelType = request.form.get('fuel') vehicletype= request.form.get('vehicletype')
new_row("yearOfRegistration':regyear, 'powerPS':powerps, 'kilometer':kms,
monthofRegistration': regmonth, gearbox gearbox, 'notRepairedDamage': damage,
'model':model, 'brand':brand, 'fuelType': fuelType,
'vehicleType': vehicletype)
```

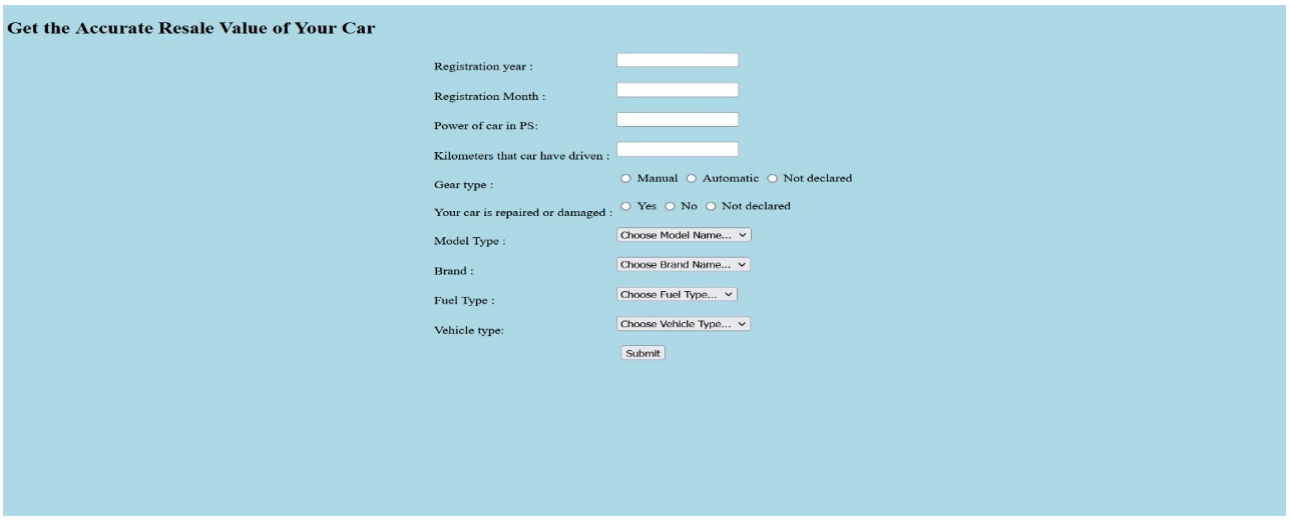
8. TESTING

8.1. Test Cases

1. User Login and Registration test
2. Database Update test
3. Prediction test

8.2. User Acceptance Testing





The login web page is tested with the invalid user information to check the invalid login testing into the webpage.

The Predicted Car Resale Value is
[8141.40810415]

Estimated Car resale value is 81.414081

9. PERFORMANCE

9.1 Performance metrics

{'mae': 1325.112086905962,
'mse': 9577053.62710202,
'rmse': 3094.6815065692977,
'rmsle': 8.03744027403009,
'r2': 0.8661221626879432,
'adj_r2_score': 0.8661152969113608}

The model is tested with the various damaged car
images which is not used during the training and validation of the model which also shows that the model works with the accuracy of about 98% in the overall performance

10. ADVANTAGES AND DISADVANTAGES

- To develop an efficient and effective model which predicts the price of a used car according to the user's inputs and achieve good accuracy.

CONS:

- Less effective

11. CONCLUSION

The increased prices of new cars and the financial incapability of the customers to buy them, Used Car sales are on a global increase. Therefore, there is an urgent need for a Used Car Price Prediction system which effectively determines the worthiness of the car using a variety of features. The proposed system will help to determine the accurate price of used car price prediction.

12.FUTURE SCOPE

In future this machine learning model may bind with various websites which can provide real time data for price prediction. Also we may add large historical data of car price which can help to improve accuracy of the machine learning model. We can build an android app as a user interface for interacting with users. For better performance, we plan to judiciously design deep learning network structures, use adaptive learning rates and train on clusters of data rather than the whole dataset.

13. APPENDIX

Github Repo:

https://github.com/IBM-EPBL/IBM-Project-20011-1659710833

VideoLink:

https://drive.google.com/uc?id=1oHz_84FFfpyIOkbLJ_vpsvWuvXaIC0ZY&export=download

App.py

```
# Import Libraries
import pandas as pd
import numpy as np
from flask import Flask, render_template, Response, request
import pickle
from sklearn.preprocessing import LabelEncoder
import requests
app = Flask(__name__)

def load_model(file='car_model.sav'):
        return pickle.load(open(file, 'rb'))
```

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

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

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

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

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

```
        print(new_row)

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

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

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

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

        # NOTE: manually define and pass the array(s) of values to be scored in the next line
```

```
        payload_scoring = {"input_data": [{"fields": [['yearOfReg', 'powerPS', 'kilometer', 'monthOfRegistration','gearbox_labels', 'notRepairedDamage_labels', 'model_labels','brand_labels', 'fuelType_labels', 'vehicletype_labels']], "values": X}]}

        response_scoring = requests.post('https://us-south.ml.cloud.ibm.com/ml/v4/deployments/7f67cbed-6222-413b-9901-b2a72807ac82/predictions?version=2022-10-30', json=payload_scoring, headers={'Authorization': 'Bearer ' + mltoken})
        predictions = response_scoring.json()
        print(response_scoring.json())
        predict = predictions['predictions'][0]['values'][0][0]
        print("Final prediction :",predict)

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

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