CAR RESALE VALUE PREDICTION

NALAIYA THIRAN PROJECT BASED LEARNING

On

PROFESSIONAL READINESS FOR INNOVATION,EMPLOYABILITY AND ENTREPRENEURSHIP

Submitted By
TEAM ID: PNT2022TMID08581

SANGEETHA G	727619BCS020
THARUN S C	727619BCS028
SANDHYA M	727619BCS098
HARISHMA S	727619BCS072

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Dr. Mahalingam College of Engineering and Technology

Pollachi - 642003

An Autonomous Institution

Affiliated to Anna University, Chennai - 600 025

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Dr. Mahalingam College of Engineering and Technology

Pollachi - 642003

An Autonomous Institution

Affiliated to Anna University, Chennai -600 025

INTERNAL MENTOR

K.PRABHU

Assistant Professor

Department of Information Technology

Dr. Mahalingam College of Engineering and Technology

Pollachi - 642003

INDUSTRY MENTOR

Prof Swetha

ABSTRACT

The Car Resale value prediction which implements, that 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 thecustomers 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 its value in the present-day scenario. In fact, selleralso 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. 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 alsobeen developed which acquires input from any user and displays the Price of a car according to user's inputs.

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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 Regressor and choose the best out of it. Depending on various parameters we will determine the price of the car. 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 displaysthe Price of a car according to user's inputs.

1.1 PROJECT OVERVIEW

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.

1.2 PURPOSE

Due to the huge requirement of used cars and lack of experts who can determine the correct valuation, there is an utmost need of bridging this gap between sellers and buyers. This project focuses on building a system that can accurately predict a resale value of the car based on minimal features like kms driven, year of purchase etc.

2. LITERATURE SURVEY

CAR RESALE VALUE PREDICTION SURVEYS

1. Predicting the Price of Used Cars using Machine Learning Techniques Authors: Sameer Chand Pudaruth.

This 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. Different techniques like naïve bayes and decision trees have been used to make the predictions. The predictions are then evaluated and compared in order to find those which provide the best performances. A seemingly easy problem turned out to be indeed very difficult to resolve with high accuracy. All the four methods provided comparable performance.

2. Car Price Prediction using Machine Learning Techniques Authors: Enis gegic, Becir Isakovic, Dino Keco, Zerina Masetic, Jasmin Kevric.

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 in Bosnia and Herzegovina, we applied three machine learning techniques (Artificial Neural Network, Support Vector Machine and Random Forest). However, the mentioned techniques were applied to work as an ensemble. The data used for the prediction was collected from the web portal autopijaca.ba using web scraper that was written in PHP programming language. Respective performances of different algorithms were then compared to find one that best suits the available data set. The final prediction model 2 was integrated into Java application. Furthermore, the model was evaluated using test data and the accuracy of 87.38% was obtained.

3.Price Evaluation Model in Second Hand Car System Based on BP Neural Network Theory Authors: Ning sun, Hongxi Bai, Yuxia Geng, Huizhu Shi.

With the rapid growth of the number of private cars and the development of the second-hand car market, second-hand cars have become the main choice when people buy cars. The online second-hand car platform provides both buyers and sellers the chance of online P2P trade. In such systems, the accuracy of second-hand car price evaluation largely determines whether the seller and the buyer can get more efficient trading experience.

4. Prediction of Car Price using Linear Regression Authors: A. Rengarajan, Ravi Shastri.

In this paper, we look at how supervised machine learning techniques can be used to forecast car prices in India. Data from the online marketplace quirk was used to make the

predictions. The predictions were made using a variety of methods, including multiple linear regression analysis, Random Forest regressor and Randomized search CV. The predictions are then analyzed and compared to determine which ones provide the best results.

5.Vehicle Price Prediction System using Machine Learning Techniques Authors: Kanwal Noor, Sadaqat Jan.

In this paper, they proposed a model to predict the price of the cars through multiple linear regression method. Here system was able to achieve high level of accuracy using Multiple linear regression models to predict the price of cars collected from used cars website in Pakistan called Pak Wheels that totaled to 1699 records after pre-processing, and where 3 able to achieve accuracy of 98%, this was done after reducing the total amount of attributes using variable selection technique to include significant attributes only and to reduce the complexity of the model**.**

6. New Model for Residual Value Prediction of the Used Car Based on BP Neural Network and Nonlinear Curve Fit Authors: Shen Gongqi, W. Yansong, Zhu Qiang.

A comprehensive method combined by the BP neural network and nonlinear curve fit was introduced for optimizing the model due to its flexible nonlinearity. Firstly, 6 some distribution curves of residual value of the used cars were analyzed in time domain. Then, the BP neural network (NN) was established and used to extract the feature of the distribution curves in various conditions. A set of schemed data was used to train the NN and reached the training goal. Finally, the schemed data as inputs and the NN outputs were organized for nonlinear curve fit. Conclusion was drawn that the newly proposed model is feasible and accurate for residual value prediction of the used cars with various conditions.

7. Predicting the Price of Second-hand Cars using Artificial Neural Networks Authors: Saamiyah Peerun, Sameerchand Pudaruth Nushrah Henna Chummun.

The aim of this study is to assess whether it is possible to predict the price of second-hand cars using artificial neural networks. Thus, data for 200 cars from different sources was gathered and fed to four different machine learning algorithms. We found that support vector machine regression produced slightly better results than using a neural network or linear regression. However, some of the predicted values are quite far away from the actual prices, especially for higher priced cars.

8. Used Car Price Prediction using K-Nearest Neighbor Based Model Authors: K.Samruddhi ¸ Dr. R.Ashok Kumar.

In this paper, a machine learning model is proposed to estimate the cost of the used cars using the K-Nearest Neighbor algorithm. The model is trained with used cars 7 data for different trained and test ratios. Then the proposed model is cross-validated using K fold

method to examine the performance to avoid the over fit**.**

9. Prediction of Prices for Used Car by Using Regression Models Authors: Nitis Monburinon, Prajak Chertchom, Thongchai Kaewkiriya, Suwat Rungpheung, Sabir Buya, Pitchayakit Boonpou.

In this paper, the authors selected the data from the German ecommerce site. The main goal of this work is to find a suitable predictive model to predict the used cars price. They used different machine learning techniques for comparison and used the mean absolute error(MAE) as the metric. They proposed that their model with gradient boosted regression has a lower error with MAE value 0.28 and this gives the higher performance where linear regression has the MAE value 0.55, random forest with MAE value 0.35.

10. Used car price prediction using SVM Authors: Gegic, Isakovic, Keco, Masetic, & Kevric.

In this paper, using data scrapped from a local Bosnian website for used cars totaled at 797 car samples after pre-processing, and proposed using these methods: Support Vector Machine, Random Forest and Artificial Neural network. Results have shown using only one machine learning algorithm achieved results less than 50%, whereas after combing the algorithms with pre calcification of prices using Random Forest, results with accuracies up to 87.38% was recorded.

2.1 EXISTING PROBLEM

Unknown history, You may not know the accident and/or mechanical history of a used vehicle. Higher financing rates: Used cars tend to come with higher financing rates than their new counterparts, leading to increased costs down the line.

2.2 REFERENCES

- Sameerchand Pudaruth, “Predicting the Price of Used Cars using MachineLearning Techniques”;(IJICT 2014)
- Enis gegic, Becir Isakovic, Dino Keco, Zerina Masetic, Jasmin Kevric, ”CarPrice Prediction Using Machine Learning”; (TEM Journal 2019)

2.3 PROBLEM STATEMENT DEFINITION

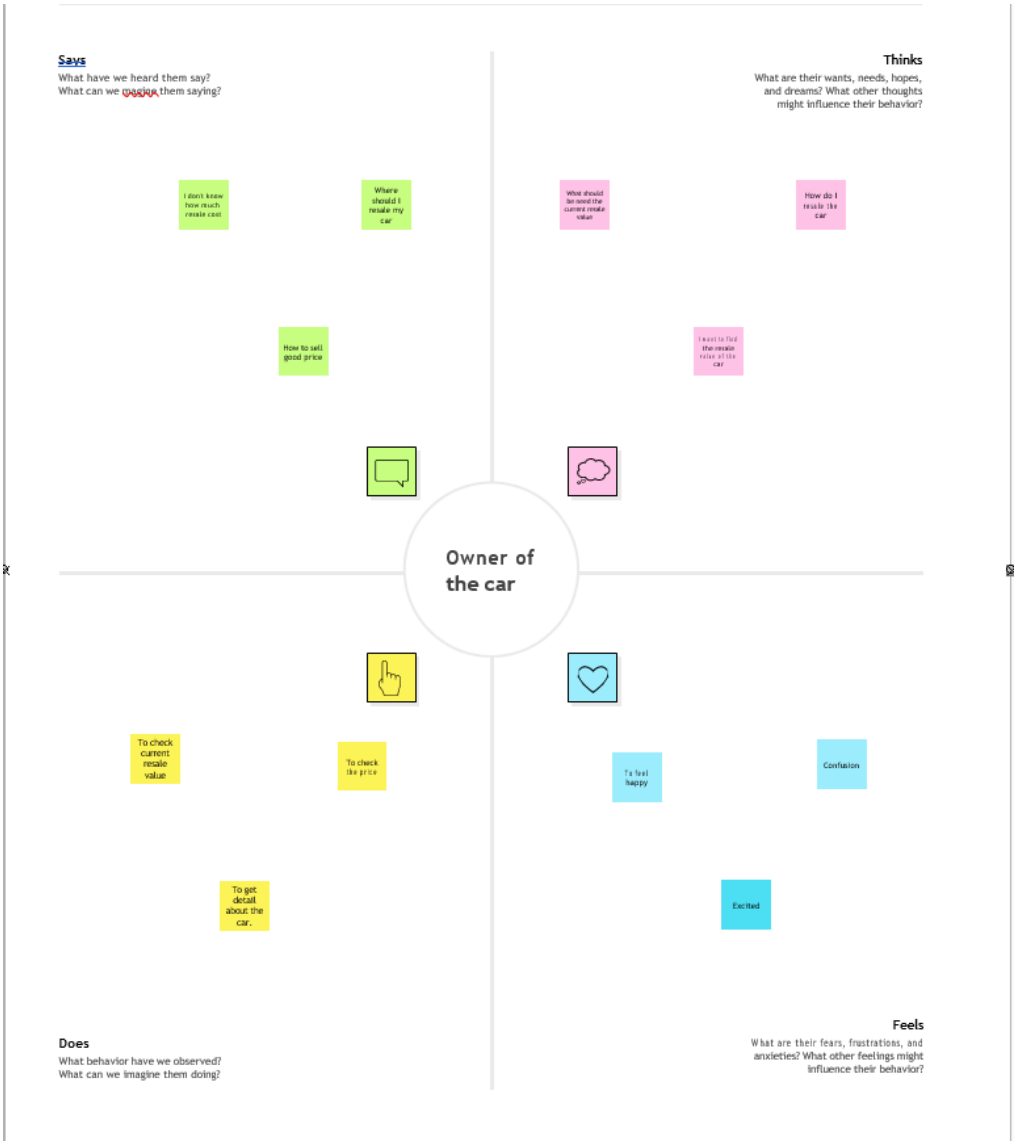
The problem to be solved is to fix the prices of used vehicles that is car and the aim is to eliminate the intermediate person who fixes the price of the vehicles without proper study. Due to the increased price of cars and the incapability of customers to buy new cars due to the lack of funds, used cars sales are on a global increase. There is a need for used vehicle price predictionsystem to effectively determine the worthiness of the car using a certain features or criteria. The main goal of this system is to predict the resale value of car based on user's input like kilometer, vehicle type, year of Register, model using random forest regressor algorithm.

	I am (Customer)	**I'm trying to**	**But**	**Because**	**Which makes me feel**
PS-1	Owner	To find the current resale value of the car based on the current condition of the car.	I don't know the market value	Some parts are not efficient	Confusion

3. IDEATION & PROPOSED SOLUTION

Empathy Map Canvas: An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

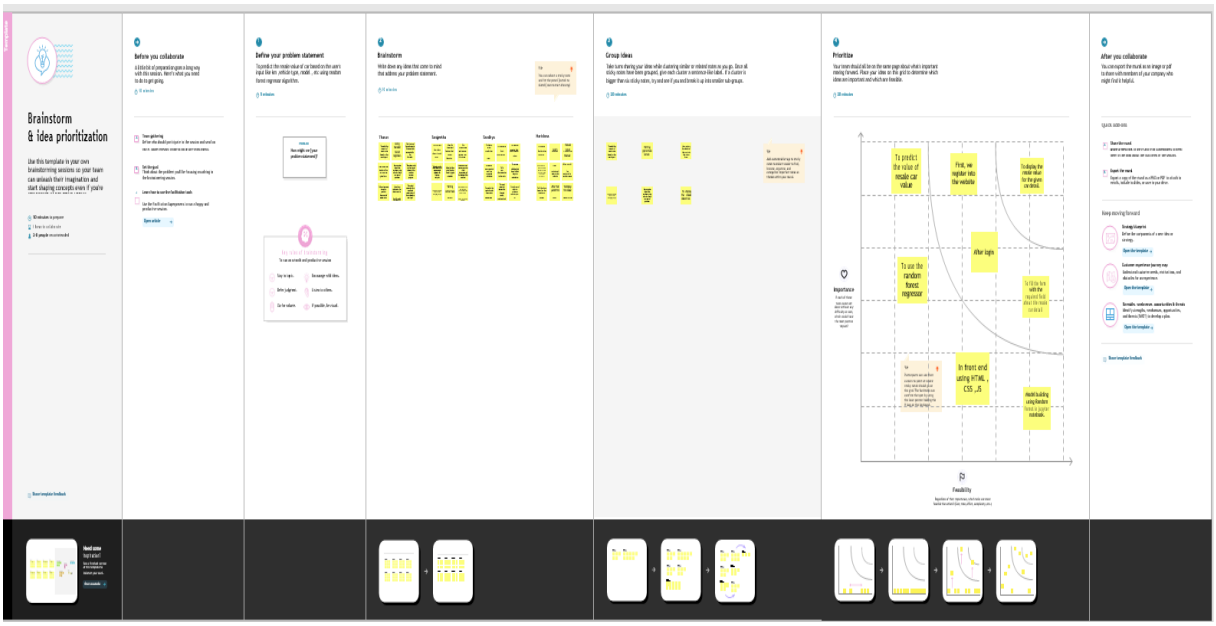
3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING

Brainstorm &Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich number of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Reference: https://www.mural.co/templates/empathy-map-canvas

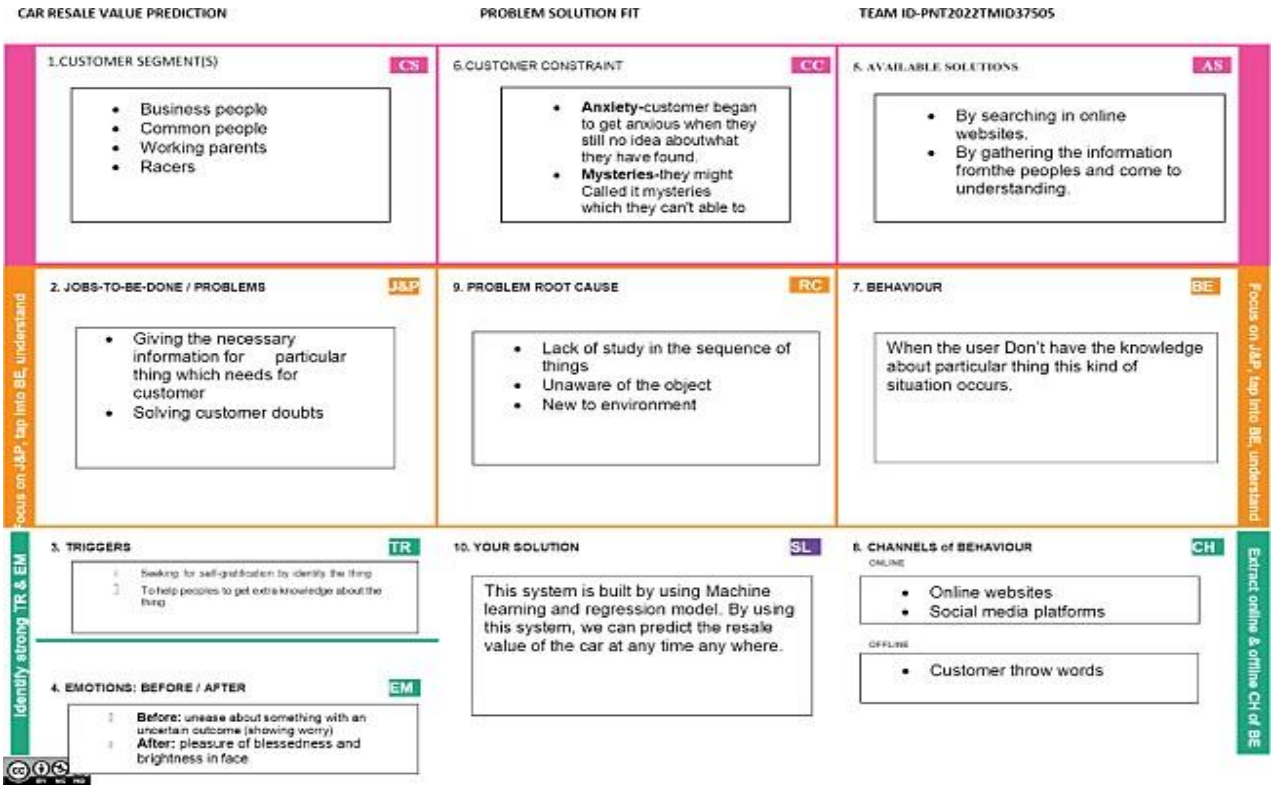


3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to besolved)	The problem to be solved is to fix the prices of used vehicles that is car and the aim is to eliminate the intermediate person who fixes the price of the vehicles without proper study. The main goal of this system is to predict the resale value of car based on user's input like kilometer, vehicle type, year of Register, model using random forest regressor algorithm.
2.	Idea / Solution description	The idea of our project is to develop an efficient and effective model which predicts the price of a used car according to user's inputs(data). To achieve good accuracy and todevelop a user interface which is user-friendlyand takes input from the user and predicts the price using random forest regressor.
3.	Novelty / Uniqueness	We implement and evaluate various learning methods on a dataset consisting of the sale prices of different makes and models. We willcompare the performance of various machinelearning algorithm random Forest regressor. User Interface has also been developed whichacquires input from any user and displays the Price of a car according to user's inputs.
4.	Social Impact / Customer Satisfaction	As this project is very useful for people who selltheir car, this contains the high number of attributes that should be considered for the accurate prediction.
5.	Business Model (Revenue Model)	As this project is very useful for people who selltheir car, this contains the high number of attributes that should be considered for the accurate prediction. So, this may be used in small institution for making money from the customer.

6.	Scalability of the Solution	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 VehiclePrice 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

3.4 PROPOSED SOLUTION



4. REQUIREMENT ANALYSIS

Requirements analysis, also called requirements engineering, is the process of determining user expectations for a new or modified product. These features, calledrequirements, must be quantifiable, relevant and detailed. In software engineering, such requirements are often called functional specifications. Requirements analysis is critical to the success or failure of a systems or software project. The requirements should be documented, actionable, measurable, testable, traceable, related to identified business needs or opportunities, and defined to a level of detail sufficient for system design.

4.1 FUNCTIONAL REQUIREMNTS

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Using Email ID and setting up password.
FR-2	User Confirmation	Confirmation via Email.
FR-3	User login	Using the registered Email ID and password.
FR-4	Dashboard	Viewing the profile, pages navigation.
FR-5	Value Prediction	Predicting the car resale value using the details given by the user
FR-6	Feedback	Collecting feedback against the accuracy of the prediction for further improvement

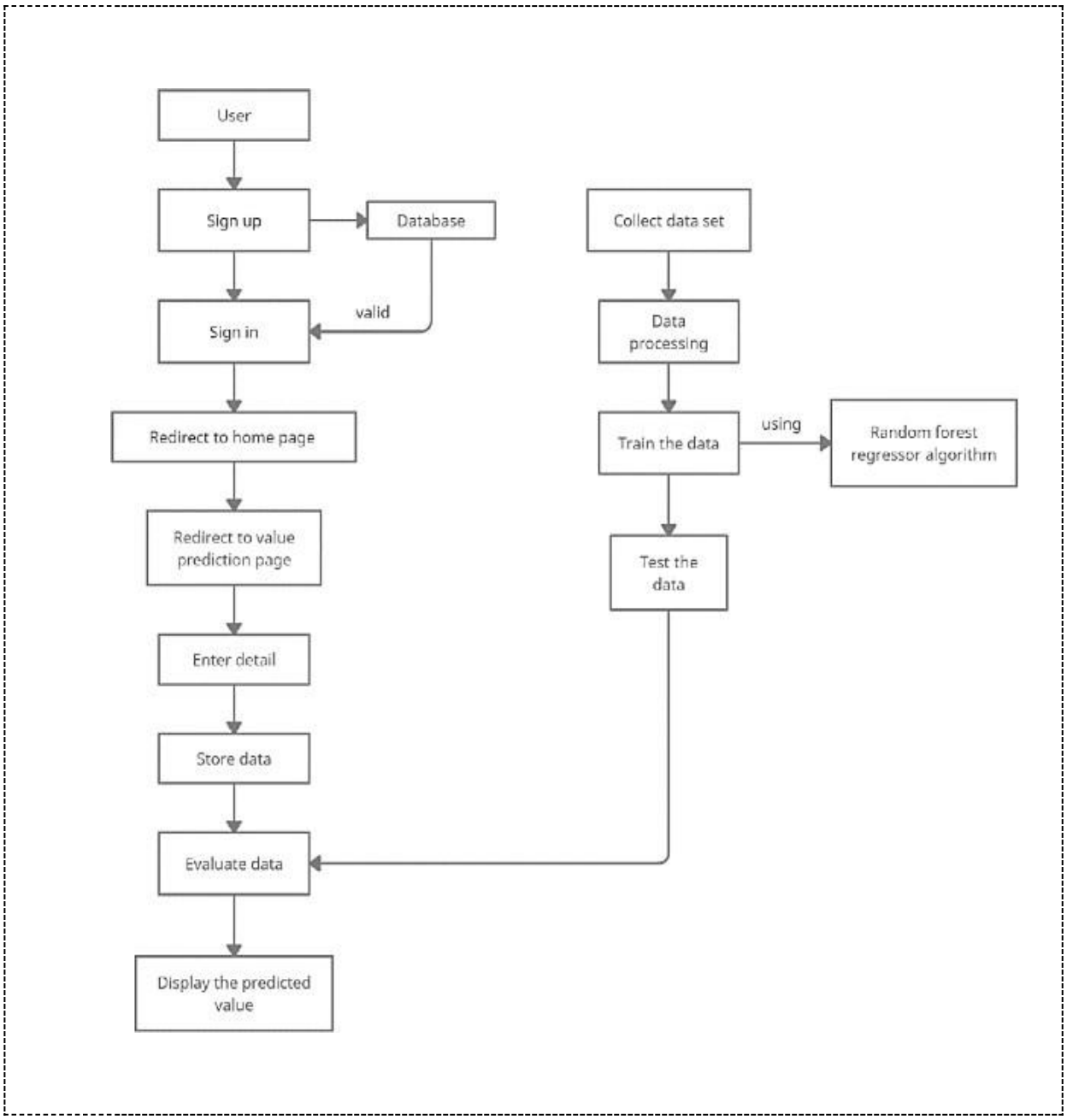
4.2 FUNCTIONAL REQUIREMNTS

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

5. PROJECT DESIGN

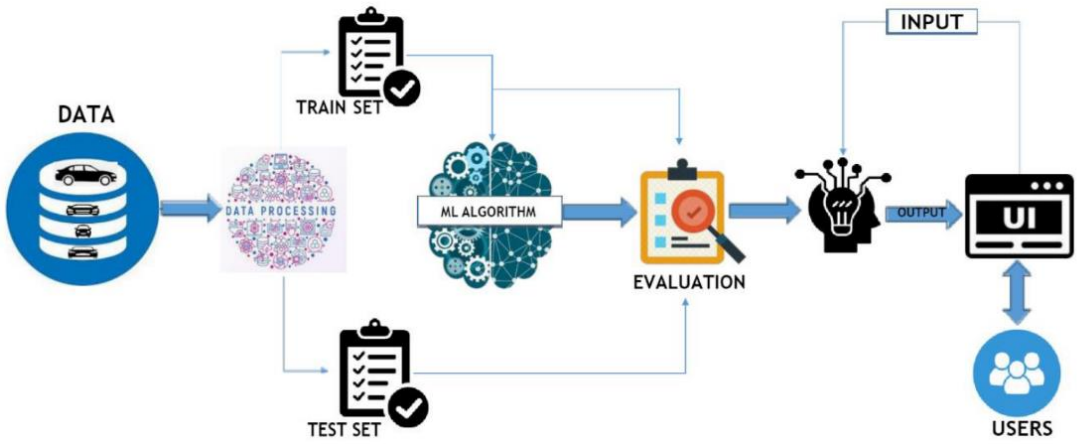
5.1 DATA FLOW DIAGRAMS

Data Flow Diagrams: A Data Flow Diagram (DFD) 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 is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to: Find the best tech solution to solve existing business problems. Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders. Define features, development phases, and solution requirements. Provide specifications according to which the solution is defined, managed, and delivered.



5.3 USER STORIES

A user story is an informal, natural language description of features ofa software system. They are written from the perspective of an end user or user of asystem, and may be recorded on index cards, post-it notes, or digitally in project management software. Depending on the project, user stories may be written by different stakeholders like client, user, manager, or development team.

User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
User in website	Registration	USN-1	User can register for the application by entering username, email, password and confirming password, phone number	Account specific tasks and action can be performed	High	Sprint-1
		USN-2	User will receive confirmation email once registered for the application.	Verify the registered account.	High	Sprint-1
		USN-3	Validation of the user can be done directly using Gmail.	Account validated and go access to dashboard	Medium	Sprint-1
	Login	USN-4	Enter the Username and Password to login to the application.	Right account credentials should be entered	High	Sprint-1
	Dashboard	USN-5	User can view the detail about the website		Medium	Sprint-2
		USN-6	User can view the account details and history	User should be verified.	High	Sprint-2
		USN-7	User can give the feedback on the accuracy of the prediction and on the user interface		High	Sprint-2
Core development team	Core function	USN-8	Design Develop the application in the way of the best user interface and maintenance should be take care.	Easy and self-understandable user interface.	High	Sprint-3
		USN-9	The website should be responsive on all the device and the screen size	User experience should be good responsive of the device.	Medium	Sprint-3
		USN-10	Collect the dataset and process the data		High	Sprint-3
User in website	Enter the detail about car	USN-8	User should enter the information about the car.	Entered data should be correct	High	Sprint-4
		USN-11	User can view the prediction value		High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

7.	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	User can register for the application by entering username, email, password and confirmingpassword, phone number.	2	High	Sangeetha
Sprint-1		USN-2	User will receive confirmation email onceregistered for the application.	1	High	Sangeetha
Sprint-1		USN-3	Validation of the user can be done directly usingGmail.	2	Medium	Sangeetha
Sprint-1	Login	USN-4	Enter the Username and Password to login tothe application.	2	High	Sangeetha
Sprint-2	Dashboard	USN-5	User can view the detail about the website	1	Medium	Tharun
Sprint-2		USN-6	User can view the account details and history	1	High	Tharun
Sprint-2		USN-7	User can give the feedback on the accuracy ofthe prediction and on the user interface.	1	High	Tharun
Sprint-3	Core function	USN-8	Design Develop the application in the way of the best user interface and maintenance shouldbe taken care.	2	High	Sandhya
Sprint-3		USN-9	The website should be responsive on all the device and the screen size.	1	Medium	Sandhya
Sprint-3		USN-10	Collect the dataset and process the data	2	High	Sandhya
Sprint-4	Enter the detail aboutcar	USN-8	User should enter the information about the car.	2	High	Harishma
Sprint-4		USN-11	User can view the prediction value	2	High	Harishma

6.2 SPRINT DELIVERY SCHEDULE

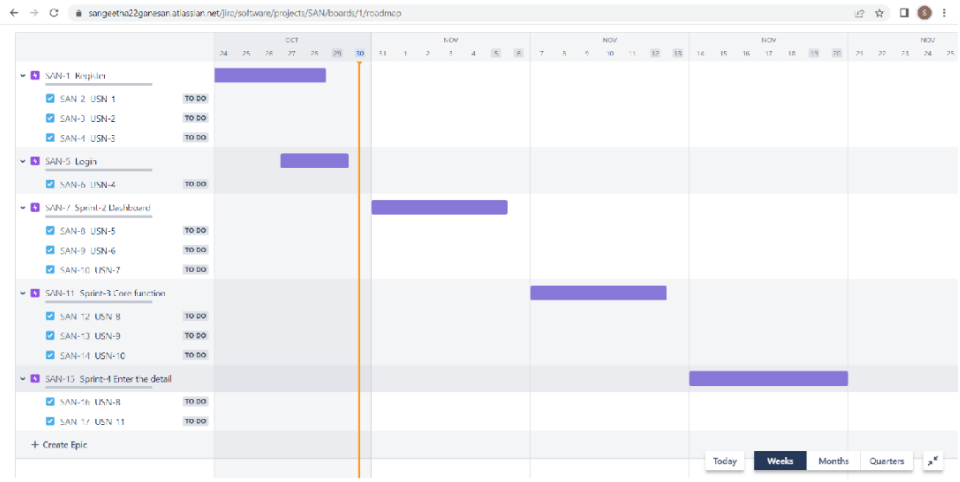
Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	15 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	15 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	15 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	15 Oct 2022

6.3REPORT FROM JIRA

Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.



7.CODING & SOLUTION

7.1 FEATURE 1 -Flask App

```
import pandas as pd
import numpy as np
from flask import Flask,render_template,Response,request
import pickle
from sklearn.preprocessing import LabelEncoder


app = Flask(__name__,template_folder="template")
filename = 'resale_model.sav'
model_rand = pickle.load(open(filename,'rb'))


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


@app.route('/predict')
def predict():
        return render_template('prediction.html')


@app.route('/y_predict',methods=['GET','POST'])
def y_predict():
        regyear = request.form.get('regyear')
        powerps = request.form.get('powerps')
        kms= request.form.get('kms')
        regmonth = request.form.get('regmonth')
        gearbox = request.form.get('gearbox')
        damage = request.form.get('dam')
        model  = request.form.get('model_type')
        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,'gear
box':gearbox,'notRepairedDamage':damage,'model':model,'brand':brand,'fuelType':fuelType,'vehicleType
':vehicletype}
```

```
        print(new_row)
        new_df =
pd.DataFrame(columns=['yearOfRegistration','vehicleType','gearbox','powerPS','model','kilometer','mo
nthOfRegistration','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(str('classes'+i+'.npy'),allow_pickle=True)
                tr = mapper[i].fit_transform(new_df[i])
                new_df.loc[:,i+'_Labels'] = pd.Series(tr,index=new_df.index)
        labeled = new_df[ ['yearOfRegistration','powerPS','kilometer','monthOfRegistration'] +
[x+"_Labels" for x in labels]]



        X = labeled.values
        print(X)
        y_prediction = model_rand.predict(X)
        print(y_prediction)
        return render_template('value.html',ypred="The resale value predicted is  $
{:.2f}".format(y_prediction[0]))


if __name__ == '__main__':
        app.run(host='Localhost',debug=True,threaded=False)
```

7.2 FEATURE 2-User Interface

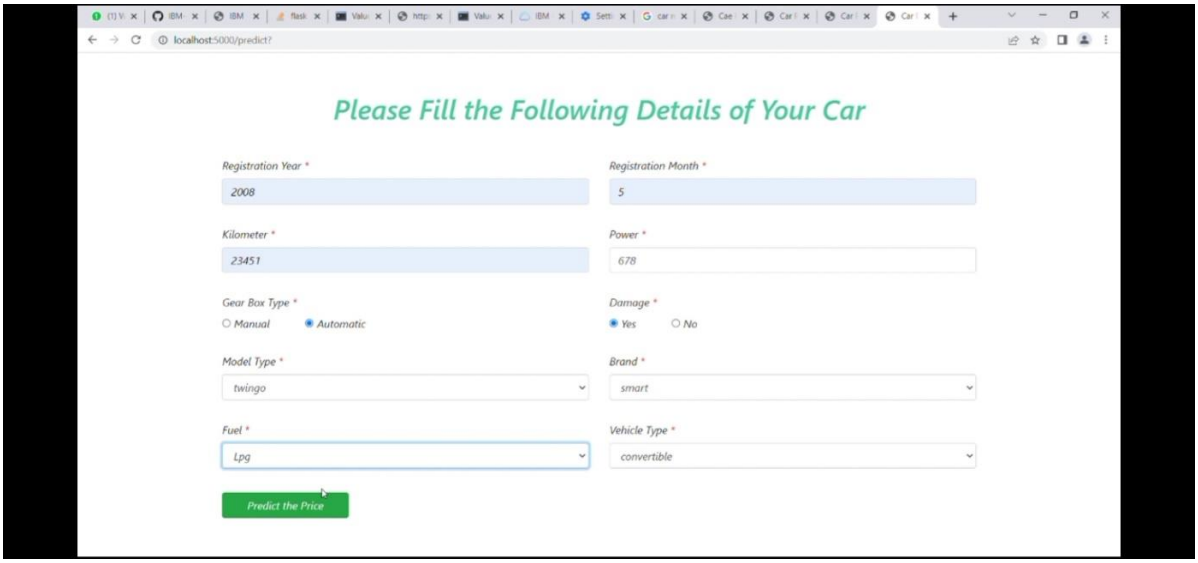
```
import pandas as pd
import numpy as np
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
import pickle
df=pd.read_csv(r"autos.csv",header=0,sep=',',encoding='Latin1',)
df[df.seller != 'gewerblich']
df=df.drop( 'seller', 1)
df[df.offerType != 'Gesuch']
df=df.drop( 'offerType', 1)
df = df[ (df.powerPS > 50) & (df.powerPS < 900) ]
df = df[ (df.yearOfRegistration >= 1950) & (df.yearOfRegistration < 2017)]
df.drop(['name','abtest','dateCrawled','nrOfPictures','lastSeen','postalCode','dat
eCreated'],axis='columns',inplace=True)
new_df = df.copy()
```

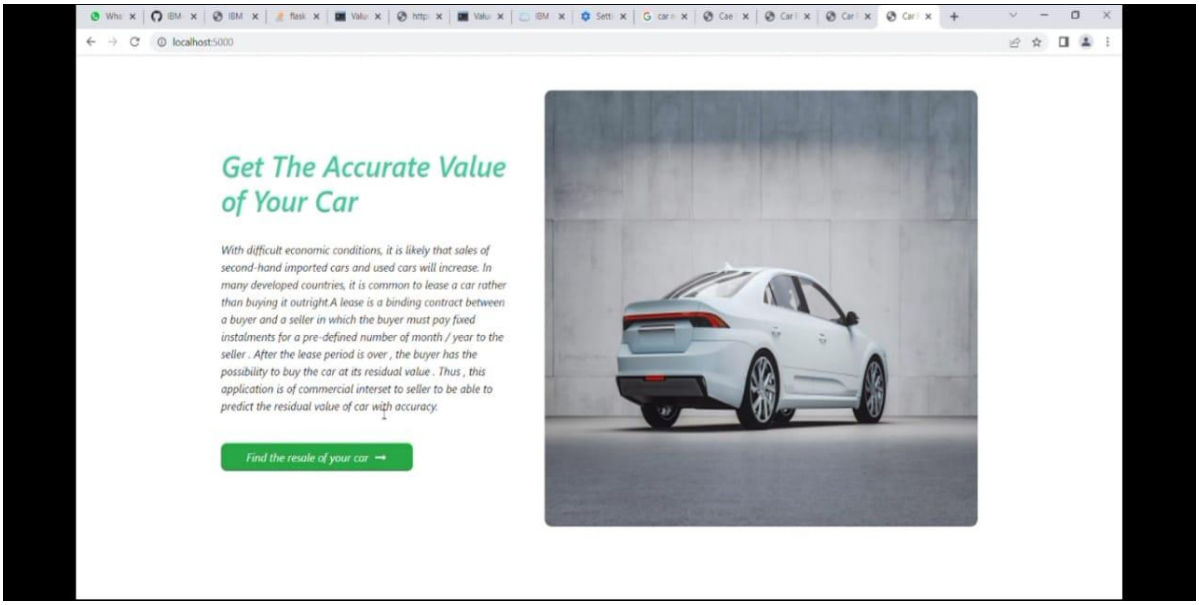
```
new_df =
new_df.drop_duplicates(['price','vehicleType','yearOfRegistration','gearbox','powe
rPS','model','kilometer','monthOfRegistration','fuelType','notRepairedDamage'])
new_df.gearbox.replace(('manuell','automatik'),('manual','automatic'),inplace=True
)
new_df.fuelType.replace(('benzin','andere','elektro'),('petrol','others','electirc
'),inplace=True)
new_df.vehicleType.replace(('kleinwagen','cabrio','kombi','andere'),('small
car','convertible','combination','others'),inplace=True)
new_df.notRepairedDamage.replace(('ja','nein'),('Yes','No'),inplace=True)
new_df = new_df[(new_df.price >= 100) & (new_df.price <= 150000)]
new_df['notRepairedDamage'].fillna(value='not-declared',inplace=True)
new_df['fuelType'].fillna(value='not-declared',inplace=True)
new_df['gearbox'].fillna(value='not-declared',inplace=True)
new_df['vehicleType'].fillna(value='not-declared',inplace=True)
new_df['model'].fillna(value='not-declared',inplace=True)
new_df.to_csv("autos_preprocessed.csv")

#label encoding the categorical data
labels = ['gearbox','notRepairedDamage','model','brand','fuelType','vehicleType']
mapper = {}
for i in labels:
        mapper[i] = LabelEncoder()
        mapper[i].fit(new_df[i])
        tr = mapper[i].transform(new_df[i])
        np.save(str('classes'+i+'.npy'),mapper[i].classes_)
        print(i,";",mapper[i])
        new_df.loc[:,i+'_labels'] = pd.Series(tr,index = new_df.index)
labeled = new_df[ [ 'price' ,
'yearOfRegistration','powerPS','kilometer','monthOfRegistration'] + [x+"_labels"
for x in labels]]
print(labeled.columns)
print(labeled.columns)
Y = labeled.iloc[:,0].values
X = labeled.iloc[:,1:].values
Y = Y.reshape(-1,1)
from sklearn.model_selection import cross_val_score , train_test_split
X_train,X_test,Y_train,Y_test = train_test_split(X,Y,test_size=0.3,random_state=3)
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import r2_score
regressor = RandomForestRegressor(n_estimators =
1000,max_depth=10,random_state=34)
regressor.fit(X_train,np.ravel(Y_train,order='C'))
y_pred = regressor.predict(X_test)
print(r2_score(Y_test,y_pred))
filename = 'resale_model.sav'
pickle.dump(regressor,open(filename,'wb'))
!pip install -U ibm-watson-machine-learning
from ibm_watson_machine_learning import APIClient
wml_credentials = {
    "apikey":"y9fOFST6bMUm-ugNLk5iQoRH9dK4auxmxI6Wj61jiF5R",
    "url":"https://us-south.ml.cloud.ibm.com"
}
client = APIClient(wml_credentials)
client.spaces.list()
```

```
SPACE_ID="7dae8252-921f-4da4-9086-60d2b0466f5e"
client.set.default_space(SPACE_ID)
client.software_specifications.list()
software_spec_uid=client.software_specifications.get_uid_by_name("runtime-22.1-
py3.9")
software_spec_uid
software_spec_uid=client.software_specifications.get_uid_by_name("runtime-22.1-
py3.9")
software_spec_uid
model_id
'0e5be457-c8ac-4d67-b10d-1dbb9311497f'
Y_pred=regressor.predict(X_test)
y_pred
```

7.3 DATABASE SCHEMA




localhost:5000
Get The Accurate Value of Your Car
With difficult economic conditions, it is likely that sales of second-hand imported cars and used cars will increase. In many developed countries, it is common to lease a car rather than buying it outright.A lease is a binding contract between a buyer and a seller in which the buyer must pay fixed instalments for a pre-defined number of month / year to the seller . After the lease period is over , the buyer has the possibility to buy the car at its residual value . Thus , this application is of commercial interset to seller to be able to predict the residual value of car with accuracy.
Find the resale of your car

8.TESTING

8.1TEST CASES

		Car_names	Brands	year	Price	kms_driven	fuel_type
2	0	Mahindra Jeep CL550	Mahindra	2006	425000	40	Diesel
3	2	Hyundai Grand i10	Hyundai	2014	325000	28000	Petrol
4	3	Ford EcoSport Titanium	Ford	2014	575000	36000	Diesel
5	5	Ford Figo	Ford	2012	175000	41000	Diesel
6	6	Hyundai Eon	Hyundai	2013	190000	25000	Petrol
7	7	Ford EcoSport Ambiente	Ford	2016	830000	24530	Diesel
8	8	Maruti Suzuki Alto	Maruti	2015	250000	60000	Petrol
9	9	Skoda Fabia Classic	Skoda	2010	182000	60000	Petrol
10	10	Maruti Suzuki Stingray	Maruti	2015	315000	30000	Petrol
11	11	Hyundai Elite i20	Hyundai	2014	415000	32000	Petrol
12	12	Mahindra Scorpio SLE	Mahindra	2015	320000	48660	Diesel
13	13	Hyundai Santro Xing	Hyundai	2007	80000	45000	Petrol
14	14	Mahindra Jeep CL550	Mahindra	2006	425000	40	Diesel
15	15	Audi A8	Audi	2017	1000000	4000	Petrol
16	16	Audi Q7	Audi	2014	500000	16934	Diesel
17	17	Mahindra Scorpio S10	Mahindra	2016	350000	43000	Diesel
18	18	Maruti Suzuki Alto	Maruti	2014	160000	35550	Petrol
19	19	Mahindra Scorpio S10	Mahindra	2016	350000	43000	Diesel
20	20	Mahindra Scorpio S10	Mahindra	2016	310000	39522	Diesel
21	21	Maruti Suzuki Alto	Maruti	2015	75000	39000	Petrol
22	22	Hyundai i20 Sportz	Hyundai	2012	100000	55000	Petrol

8.3USER ACCEPTANCE TESTING

User Acceptance Testing (UAT) is a type of testing performed by the end user or the client to verify/accept the software system before moving the software application to the production environment. UAT is done in the final phase of testing after functional, integration and system testing are done. The User Acceptance of this product is not surveyed enough to give a solid conclusion. The theoretical and hypothetical acceptance is calculated to be high enough toconclude that his product is usable and valuable.

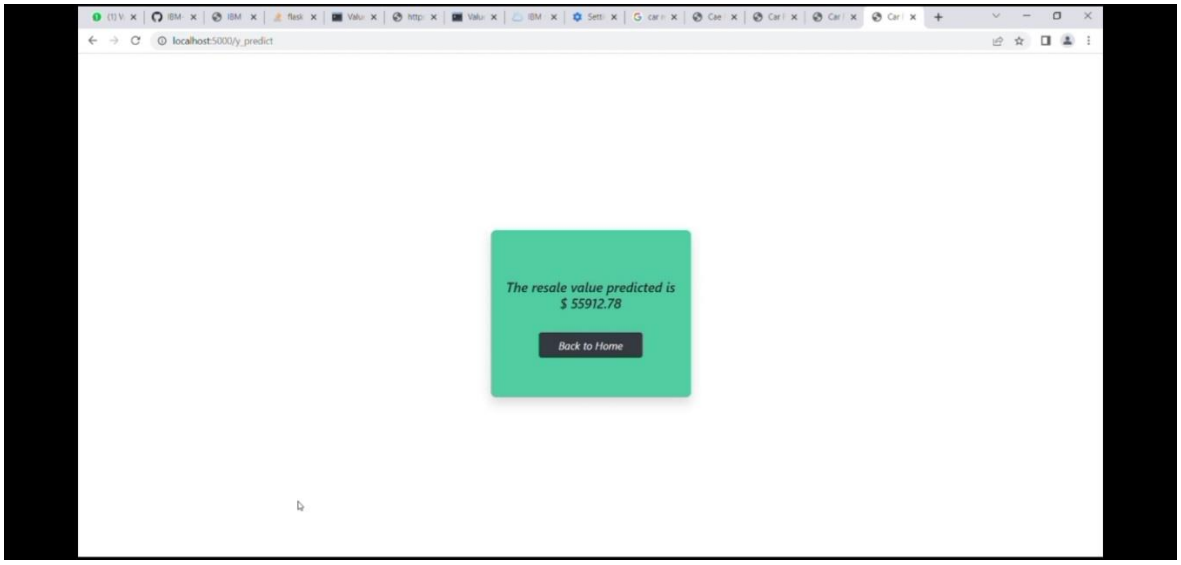
9.RESULTS

9.1 PERFORMANCE METRICS

The Performance is the Accuracy of the model trained.

The training accuracy of the model is 92%.

The testing accuracy of the model is 89%.



10.ADVANTAGES & DISADVANTAGES

Pros:

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

Cons:

- Consumes more time
- Requires high computational power

11.CONCLUSION

We have successfully developed an application using python flask, HTML,CSS. By using the application, we can predict weather we can get admission in the desired University or not. The increased prices of new cars and the financial incapability of the customers tobuy 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. This paper compares 3 different algorithms for machine learning: LinearRegression, Lasso Regression and Ridge Regression.

12. FUTURE SCOPE

In future this machine learning model may bind with various website 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 user interface for interacting with user. 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

SOURCE CODE

https://github.com/IBM-EPBL/IBM-Project-3083-1658499934/tree/main/Project%20Final%20Deliverables/Flask

GITHUB & PROJECT DEMO LINK

https://github.com/IBM-EPBL/IBM-Project-3083-1658499934/tree/main/Project%20Final%20Deliverables