Car Resale Value prediction

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY ANDENTERPRENEUSHIP – IT18099

Submitted by

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ABSTRACT

This project aims to create a model to forecast the fair prices of used automobiles based on a number of variables, such as vehicle mileage, year of manufacture, gasoline type, transmission, kilometers driven, vehicle type, and engine power. The market for used automobiles can profit from this approach for sellers, purchasers, and automakers. Based on the information entered by the user, it can return a price prediction that is reasonably accurate. Machine learning and data science are used in the model construction process. Utilized automobile listings were used to compile the information.

The research used a variety of regression techniques, including linear regression, polynomial regression, support vector regression, decision tree regression, and random forest regression, to obtain the best level of accuracy. This project first visualized the data to better understand the dataset before beginning to develop the model. To fit the regression and ensure its effectiveness, the dataset was partitioned and altered. R-square was calculated to assess each regression's performance. The resulting model has a greater prediction accuracy compared to earlier studies and incorporates more elements of used cars.

TABLE OF CONTENTS

1.INTRODUCTION

1.1 PROJECT OVERVIEW:

- The primary goal of developing a system to predict the resale value of cars is to gain practical experience with Python and Data Science.

- Car resale value prediction is a system that estimates a car's resale value based on the user-provided parameters.

- The user fills out the form with the car's information, and the value at which it will be sold is then forecasted.

- The system operates using the machine learning program's trained dataset to determine the exact worth of the car.

1.2 PURPOSE

- The sole purpose of this general-purpose system for estimating resale value is to estimate the amount that the user can probably acquire.

- To help the user acquire an estimated value before reselling the car and avoid making a deal at a loss, we strive to anticipate the amount of resale with an accuracy of best 70–75%.

2.LITERATURE SURVEY

1.1EXISTING PROBLEM

The problem is defined as an optimised method of estimating insurance costs based on the manufacturer with some extra expenses paid by the government in the form of taxes. Used car sales are rising globally as a result of the time and energy-intensive nature of the current methods for cost estimation, the rising cost of new cars, and consumers' reluctance to purchase new vehicles owing to a lack of cash. Customers can buy a new automobile with confidence knowing that the money they invest will be worthwhile because the industry's prices for new cars are set by. To accurately assess the worthiness of the car using a range of features, a used car price prediction system is required. Despite the fact that some websites provide this service, their prediction strategy might not be the greatest. Additionally, many methods and algorithms may enhance the accuracy of forecasting a used car's actual market value. When purchasing or selling, it's critical to understand their true market value.

2.2.REFERENCES

1. W. Q. Zhao, "(2009). Evaluation of product model design based on bp neural network", Computer Engineering & Design, vol. 30, no. 24, pp. 5715-5711.

2. H. Zhang, "(2002). A study on bp networks with combined activation functions", Journal of Ocean University of Qingdao.

3. You Zhou, "(2014). Research on Second-hand car's Value Assessment Methods Based on the Replacement Cost Method", Liaoning University of Technology.

4. T. Deguchi, T. Takahashi and N. Ishii, "(2014). On temporal summation in chaotic neural network with incremental learning", International Journal of Software Innovation, vol. 2, no. 4, pp. 13, 2014.

1.2 PROBLEM STATEMENT DEFNITION

Who does the problem affect?	Car resale value prediction is used by people who want to sell their car for a decent price. It is most common for working people business people etc.
What is the issue?	Car resale value prediction is very important in this modern period where everyone owns a car. Many people are ready to sell their cars once they find a new model or once their car gets old. But the problem Is that they do not know the exact price of their car. Many just approximately quote a price and they just complete a deal; it is either a loss for the seller or a loss for the buyer. This model brings a solution to it, this model helps in predicting the exact or the most appropriate price for the vehicle so that it is not a loss for the seller as well as the buyer
Why is it important that we fix the problem?	It is important to fix this problem because many people do not predict the right prize for their vehicle and either the seller or the buyer tends to face a loss. So this web application helps users get a estimated price of their car and no one gets to face any sorts of loss.
Which solution can be used to address this issue?	A machine learning powered web application model with the strong building of algorithm that helps to identify and predict the price of the vehicle with the identification of the vehicle condition from various parameters entered by the user.
What methodology used to solve the issue?	Supervised and Unsupervised machine learning, Data mining, Python web application interface – Flask , IBM Cloud.

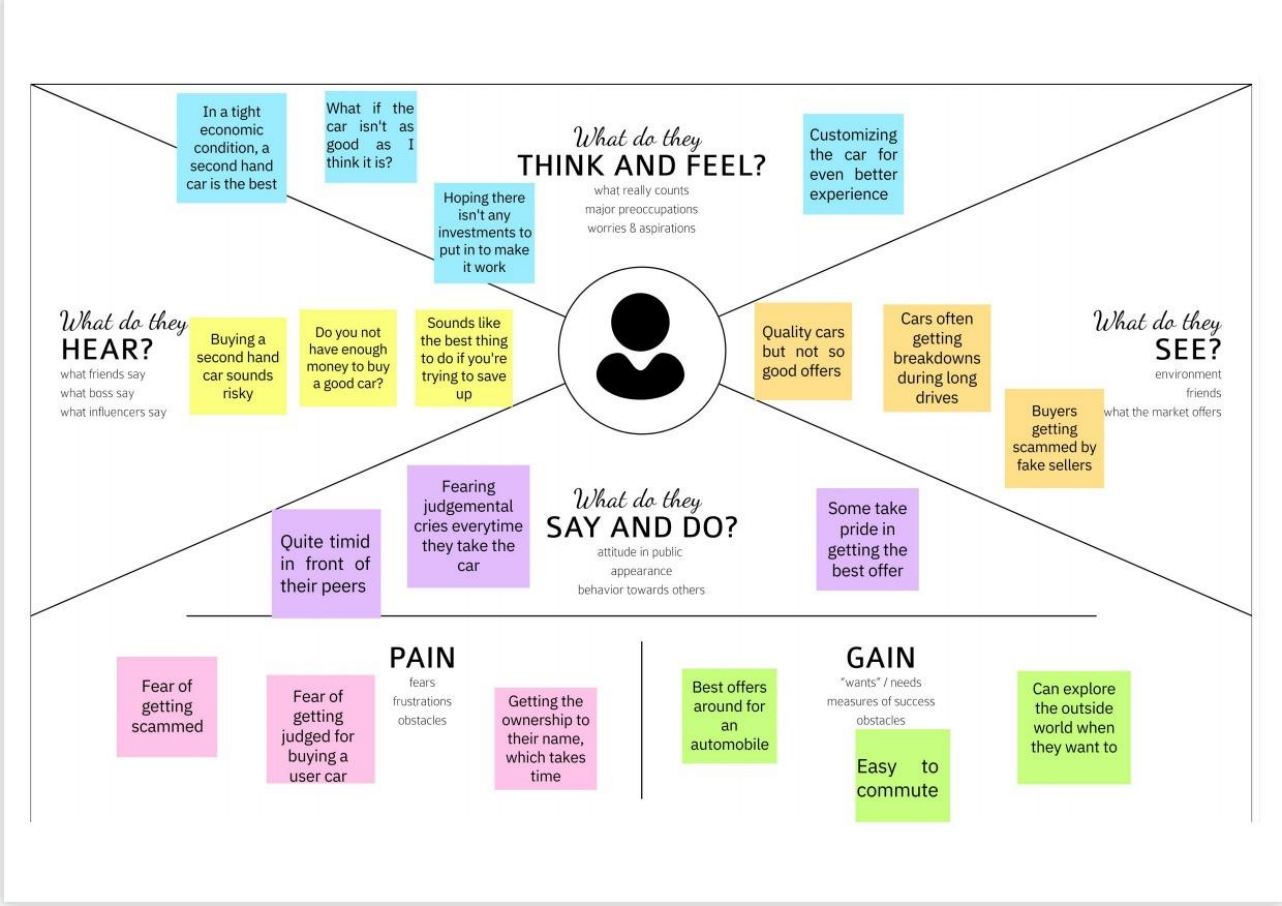
3.IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

Empathy Map :

An empathy map is a straightforward, simple-to-understand picture that summarizes information about a user's actions and views. It is a helpful tool that enables teams to comprehend their users more fully.

It's important to comprehend both the actual issue and the individual who is experiencing it in order to develop a workable solution. Participants learn to think about situations from the user's perspective, including goals and problems, through the exercise of constructing the map.

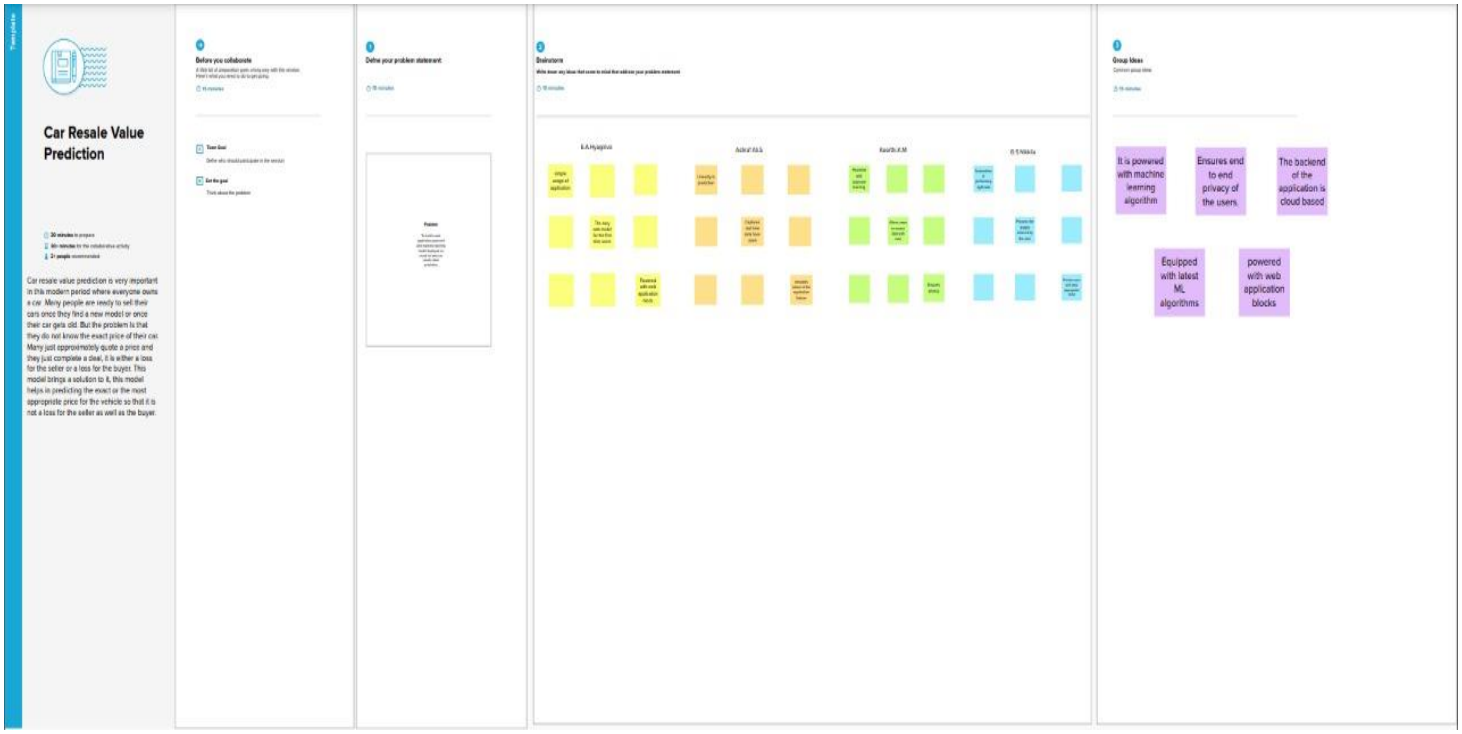


3.2 IDEATION AND BRAINSTORMING

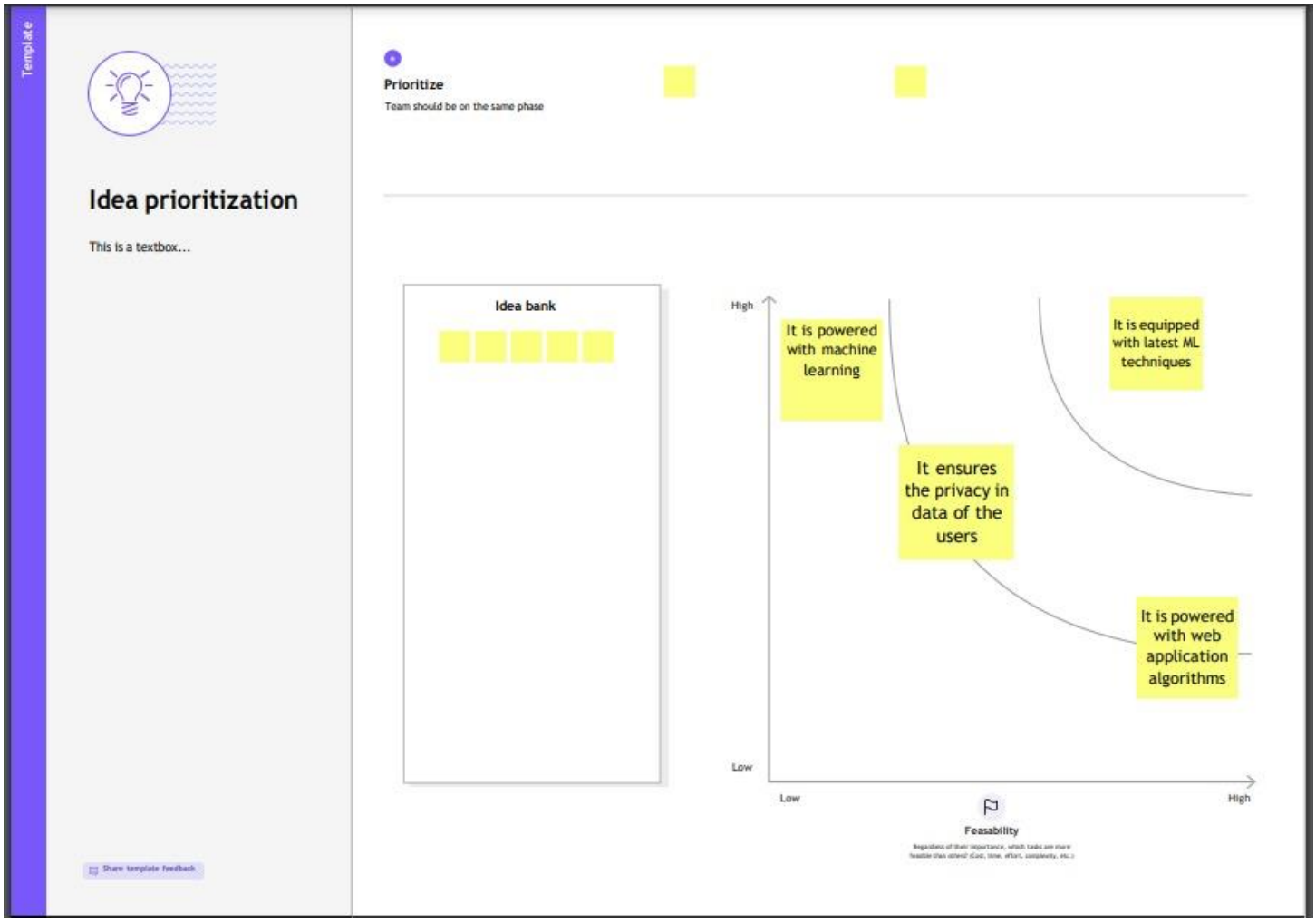
Brainstorm:

In a free and open setting, brainstorming enables team members to engage in the innovative problem-solving process. Prioritizing quantity over quality, unconventional ideas are welcomed and expanded upon, and everyone is urged to cooperate in order to produce a wealth of creative solutions. Utilize this template during your own brainstorming meetings to allow your team to use their creativity and begin developing notions even if you are not in the same room.

Step-1: Brainstorm, Idea Listing and Grouping



Step-2: Idea Prioritization

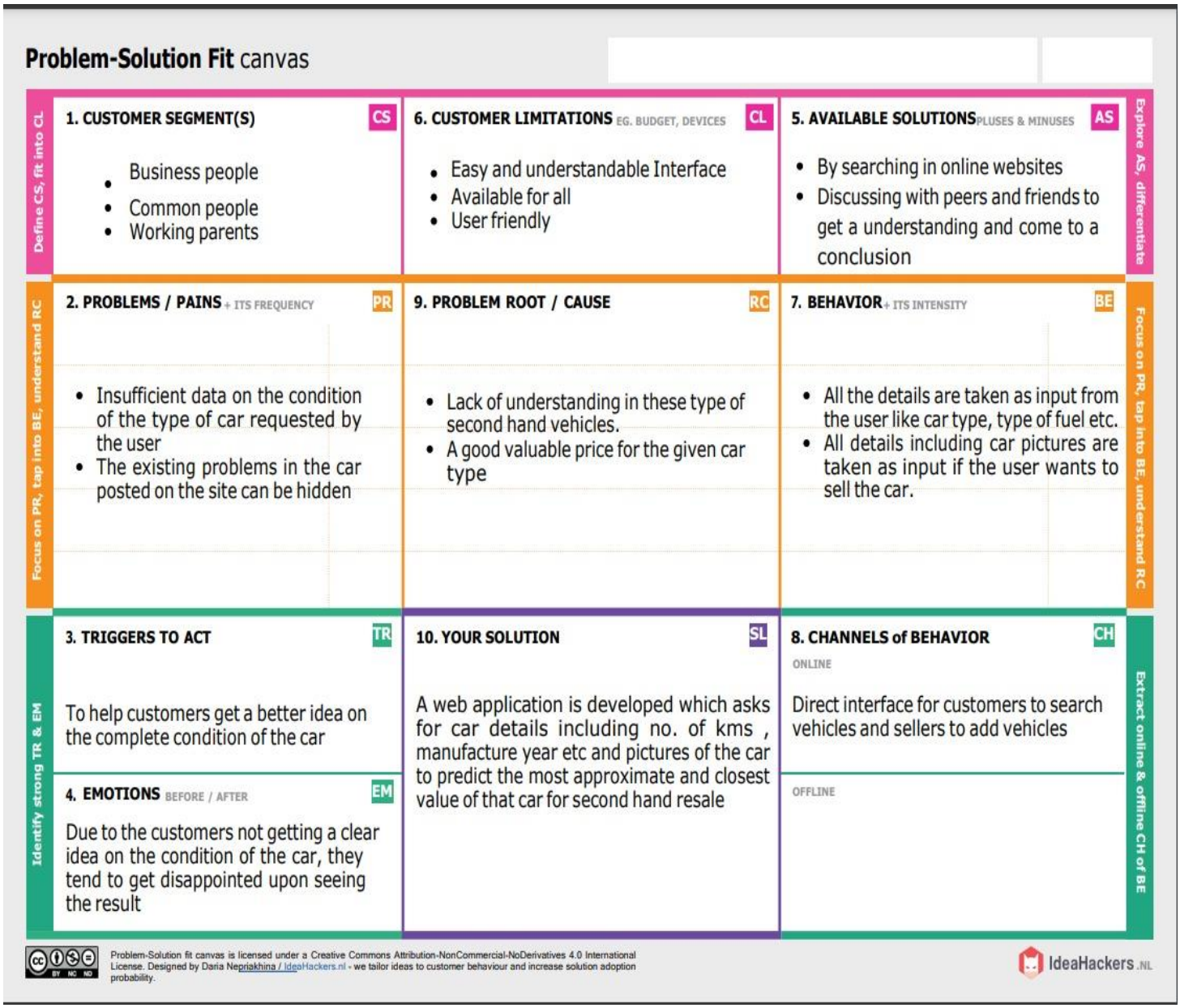


3.3 PROPOSED SOLUTION

S.NO	Parameter	Description
1.	Problem Statement (Problem to be solved)	• Car resale value prediction is very important in this modern period where everyone owns a car.Many people are ready to sell their cars once they find a new model or once their car gets old. But the problem Is that they do not know the exact price of their car. Many just approximately quote a price and they just complete a deal, it is either a loss for the seller or a loss for the buyer. This model brings a solution to it, this model helps in predicting the exact or the most appropriate price for the vehicle so that it is not a loss for the seller as well as the buyer.
2.	Idea / Solution description	• Almost all the existing car details and their most common type of selling details are stored in a csv format. • This data is then loaded, preprocessed in order to remove null values, segregate the dependent and independent variables, encode the needed columns, create analysis maps, split the data into training and testing data, choose the model which can suit this problem, train the model with the training data, test the accuracy with the test data against predicted data and save the model to integrate it with a web app. • A web app is built which renders a form for the user to enter the attributes. The saved model is loaded and the entered values are fed into the loaded model and the predicted results are returned to the user. • The model is then deployed into the cloud for the web app to request from the deployed model.
3.	Novelty / Uniqueness	• The seller must add all the details about the vehicle such as kilometers driven , year of manufacture, model , brand etc, and add pictures of the car. • Most of the vehicle service centers have a tool

		that estimates the amount of life remaining in a tire until it completely wears out, so in this web application it is recommended for the sellers to also mention those percentages and submit a copy of their last 1year service history to give the buyer a clear idea on the condition of the car as well as to get the most appropriate price for their vehicle.
4.	Social Impact/ Customer Satisfaction	• Personalize the UI experience • Improves accurate result as expected • Cloud deployed Machine Learning Model λ • Accurate prediction at good time complexity
5.	Business Model (Revenue Model)	• Solutions prospects of improvement • Suits for better saving of involvements • Economic Development • Easy interface
6.	Scalability of the Solution	• Since the machine learning model is saved and deployed in a cloud environment the app is fast to response to user's requests or queries or to accept multiple user submission of the details of their vehicles and predict the result and return the response to the users. The web app is deployed in a auto scaling environment

3.4 PROBLEM SOLUTION FIT



4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

REQUIREMENT ID	REQUIREMENT DESCRIPTION
1	Users should be able to see the options in which they enter the car details such as kilometers driven, engine condition etc. when they enter the home URL.
2	Users should select all the details with all the necessary attributes filled and should be appropriately notified when some values are missing.
3	The app should accept the test values and fees those inputs into pre-saved trained machine learning model and should return the prediction result.
4	The app should redirect the users to the appropriate page based on the prediction result.

4.2 NON-FUNCTIONAL REQUIREMENTS

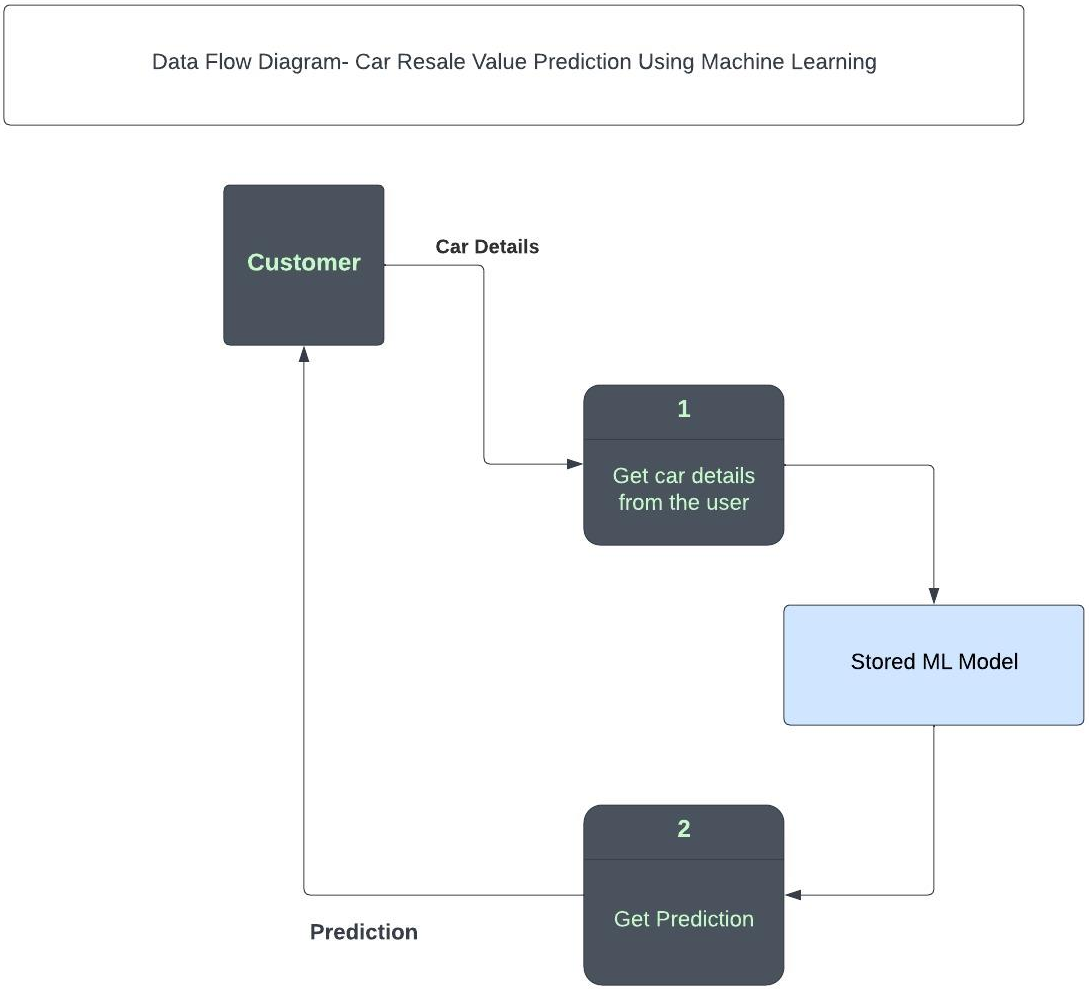
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Indicates how effectively and easy users can learn and use a system.
NFR-2	**Security**	Assures all data inside the system or its partwill be protected against malware attacks or unauthorized access.
NFR-3	**Reliability**	Specifies the probability of the software performing without failure for a specific number of uses or amount of time.
NFR-4	**Performance**	Deals with the measure of the system's response time under different load conditions.

NFR-5	**Availability**	Describes how likely the system is accessible for a user at a given point in time.
NFR-6	**Scalability**	Accesses the highest workload under whichthe system will still meet the performance requirements.

2. PROJECT DESIGN

5.1 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 value of the resale car 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 AND TECHNICAL ARCHITECTURE

i.SOLUTION ARCHITECTURE

FUNCTIONAL REQUIREMENTS

REQUIREMENT ID	REQUIREMENT DESCRIPTION
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ii. TECHNICAL ARCHITECTURE

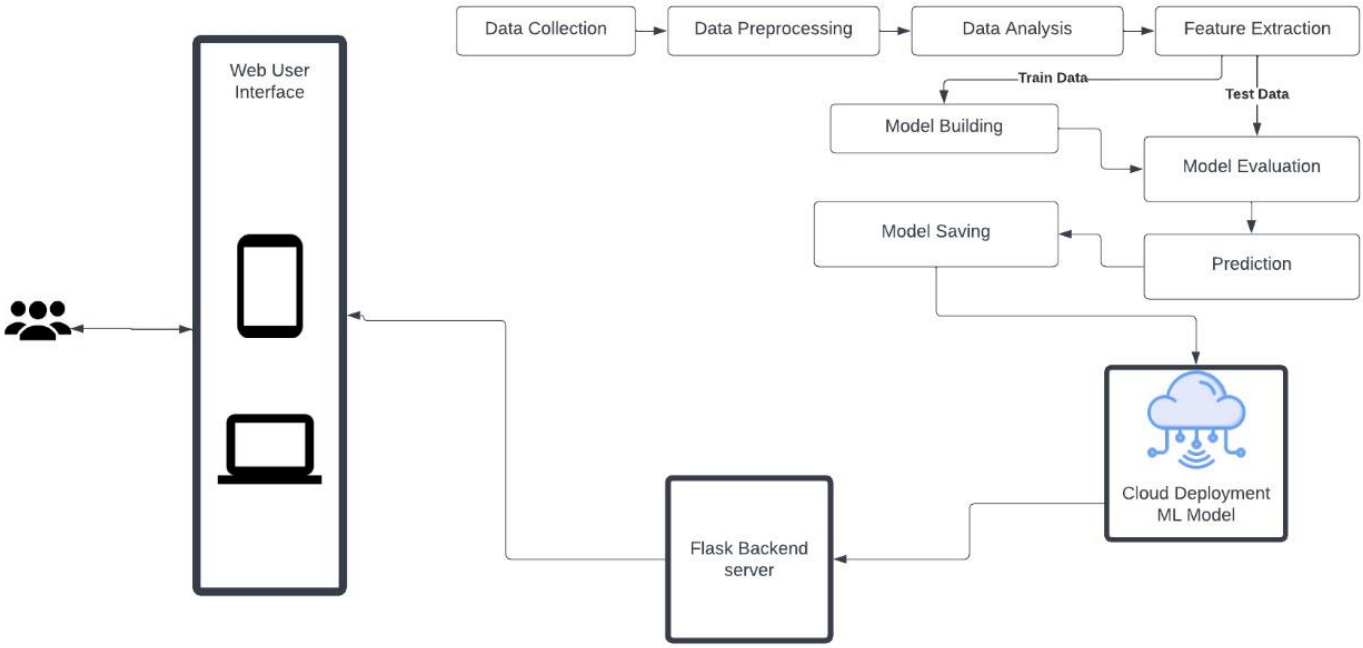


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web Ui only	HTML, CSS,Python, Flask
2.	Application Logic-1	Load the data set and find the test data and train data	Python
3.	Application Logic-2	Logic for a process in the application	Pandas, numpy, sklearn
4.	Application Logic-3	Logic for a process in the application	flask
5.	Database	Data Type, Configurations etc.	Dataset
6.	Cloud Database	Database Service on Cloud	IBM Cloud

7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM cloud API, etc.
9.	Machine Learning Model	Purpose of Machine Learning Model	Regression Model.
10.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Scalable Architecture	Justify the scalability of architecture (3 – tier, - services)	Machine Learning
3.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Machine Learning

5.3USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	Dashboard	USN-1	Entering the car details in the webpage		High	Sprint-1
Customer (Web- user)	Process	USN-2	As a user, I can enter the car details for which I want to know the resale value.		Medium	Sprint-2
Customer Care Executive	Maintenance	USN-3	As a executive,I can rectify Customer's Problems as well as Comments	I can interact through comments	High	Sprint-4

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

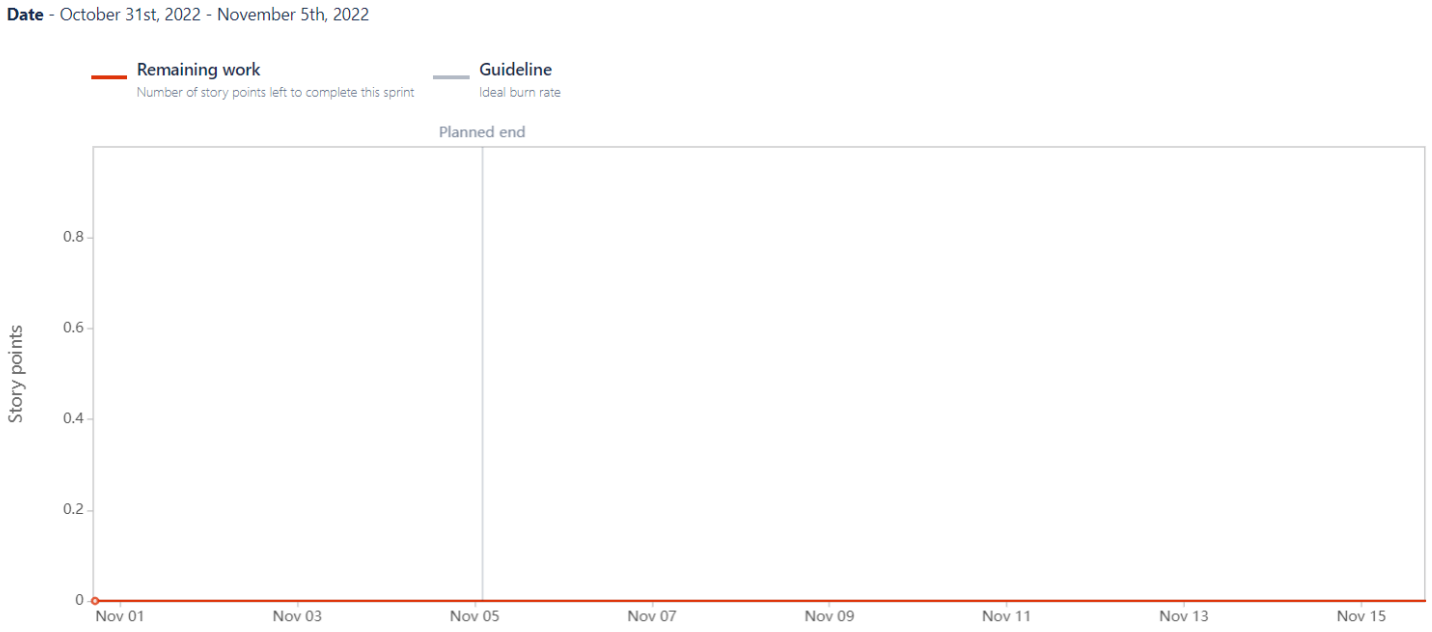
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data collection	USN-1	Collect dataset	1	low	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-1	Preprocess data	USN-2	Read and clean the dataset	2	low	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-2	Model building	USN-3	Splitting into independent and dependent variables	3	medium	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	regression	USN-4	Applying regression model	3	medium	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-3	Application building	USN-5	Build the python flask application and HTML page	5	High	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-3	Testing	USN-6	Execute the code and test	5	high	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-4	Training the model /Integrating flask	USN-7	Training the model on IBM cloud and integrate flask	5	high	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S

6.2 SPRINT DELIVERY SCHEDULE

Sprint	**Total Story Points**	**Duration**	**SprintStart Date**	**Sprint End Date (Planned)**	**Story Points Completed (as on Planned End Date)**	**Sprint Release Date (Actual)**
Sprint-1	15	5 Days	24 Oct2022	29 Oct2022	15	29Oct 2022
Sprint-2	15	5 Days	31 Oct2022	05 Nov2022	15	05Nov 2022
Sprint-3	15	5 Days	07 Nov 2022	12 Nov2022	15	12Nov 2022
Sprint-4	15	5 Days	14 Nov 2022	19 Nov2022	15	19Nov 2022

6.3 REPORTS FROM JIRA



7.CODING AND SOLUTIONING

7.1 FEATURE 1

```
import pandas as pd
import numpy as np
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
import pickle

#Load the dataset
df = pd.read_csv(r"E:\car_resale\Data\autos.csv", header=0, sep=',', encoding='Latin1', )


#print all the different sellers
print(df.seller.value_counts())
#remove the seller type haveing only 3 car
df[df.seller != 'gewerblich']
#now all the sellers are same so we can get rid of this column
df=df.drop(columns=['seller'])  #1 refer the columns & 0 refer the index
```

```
#print all different seller
print(df.offerType.value_counts())
#remove the offers type having only 12 listings
df[df.offerType != 'Gesuch']
#now all offer are sameso we can get rid this collumn
df=df.drop(columns=['offerType']) # 1 refer the columns & 0 refer the index
'''car having power les then 50ps and above 900ps seems a little suspicious, let's remove
them and see what we have got now'''
print(df.shape)
df = df[(df.powerPS > 50) & (df.powerPS < 900)]
print(df.shape)
#around 50000 cars ahave been removed which could have introunduced error toour data
#Simlarly, filtering our the cars having registeration years not in the mentioned range
#print(df.shape)
df = df[(df.yearOfRegistration >= 1950) & (df.yearOfRegistration < 2017)]
print(df.shape)
#not much of a difference but still, 10000 rows have been reduced. it's better to
#get rid of faulty data instead of keeping them just to increase the size

'''removing irrelevent columns which are either the same for all the cars in the dataset, or can
introduce bias, so removing them too..'''
df.drop(['name', 'abtest', 'dateCrawled', 'nrOfPictures', 'lastSeen',
      'postalCode', 'dateCreated'], axis='columns', inplace=True)

'''dropping the duplicates from the dataframe and stroing it in a new
here all row having same value in all the mentioned columns will be deleted and by defult,
only first occurance of any such row is kept'''
new_df = df.copy()
new_df = new_df.drop_duplicates(['price', 'vehicleType', 'yearOfRegistration', 'gearbox',
'powerPS',
                                 'model', 'kilometer', 'monthOfRegistration', 'fuelType',
'notRepairedDamage'])
```

```
#As the dataset contained same german words for many features, changing them to engilsh
new_df.gearbox.replace(('manuell','automatik'), ('manual','automatic'), inplace=True)
new_df.fuelType.replace(('benzin','andere','elektro'), ('petrol','others','electric'), inplace=True)
new_df.vehicleType.replace(('kleinwagen','cabrio','kombi','andere'),
                           ('small car','canvertible','combination','others'), inplace=True)
new_df.notRepairedDamage.replace(('ja','nein'), ('Yes','No'), inplace=True)
#### Removing the outliers
new_df = new_df[(new_df.price >= 100) & (new_df.price <= 150000)]

''' Filling NaN values for columns whose data might not be there with the information provider,
which might lead to some variance but our model but we will still be able to give some estimate
to the user'''
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)



#can save the csv for future purpose.
new_df.to_csv("autos_preprocessed.csv")
#Columns which contain categorical values, which we'll need to convert via label encoding
labels = ['gearbox', 'notRepairedDamage', 'model', 'brand', 'fuelType', 'vehicleType']

'''looping over the labels to the label encoding for all at once and
saveing the LABEL ENCODING FILES'''
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)

#Final data to be put in a new dataframe called "LABELED",
labeled = new_df[
    [
        'price',
        'yearOfRegistration',
        'powerPS',
        'kilometer',
        'monthOfRegistration'
    ] + [x+"_labels" for x in labels]]
print(labeled.columns)
#Storing price in Y and reset of the data in X
Y = labeled.iloc[:,0].values
X = labeled.iloc[:,1:].values
#need to reshape the Y values
Y = Y.reshape(-1,1)
#traing data and test data
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)

#Model building and fitting
from sklearn.metrics import r2_score
Model=LGBMRegressor(boosting_type="gbdt",learning_rate=0.07,metric="rmse",n_estimators=300,objective="root_
mean_squared_error",random_state=42,reg_sqrt=True)
model.fit(X_train, Y_train)
Y_pred = model.predict(X_test)
find_scores(Y_test, Y_pred, X_train)
filename = 'resale_model.pkl'
pickle.dump(regressor, open(filename, 'wb'))
```

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

7.1 FEATURE 2

```
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='C:/Users/Hyagiriva/OneDrive/Desktop/docs/nalaiya thiran/New folder/final1/Final
Deliverables/Model Building/resale_model.sav'):
return pickle.load(open(file, 'rb'))


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


@app.route('/predict_page')
def predict_page():
return render_template('value.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(
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)

payload_scoring = {"input_data": [{"fields": [['yearOfReg', 'powerPS', 'kilometer', 'monthOfRegistration',
'gearbox_labels',
'notRepairedDamage_labels', 'model_labels', 'brand_labels', 'fuelType_labels', 'vehicletype_labels']], "values": X}]}
print("Final prediction :", predict)

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


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

Upon from submission,the data is sent to the ML model via Flask API and the model responds with a predicted resale value of the car based on user input.The prediction is displayed on the web page using a render template .Thus,with minimal information and without human intervention or manual examination,a user can predict the resale value of his car.

8.TESTING

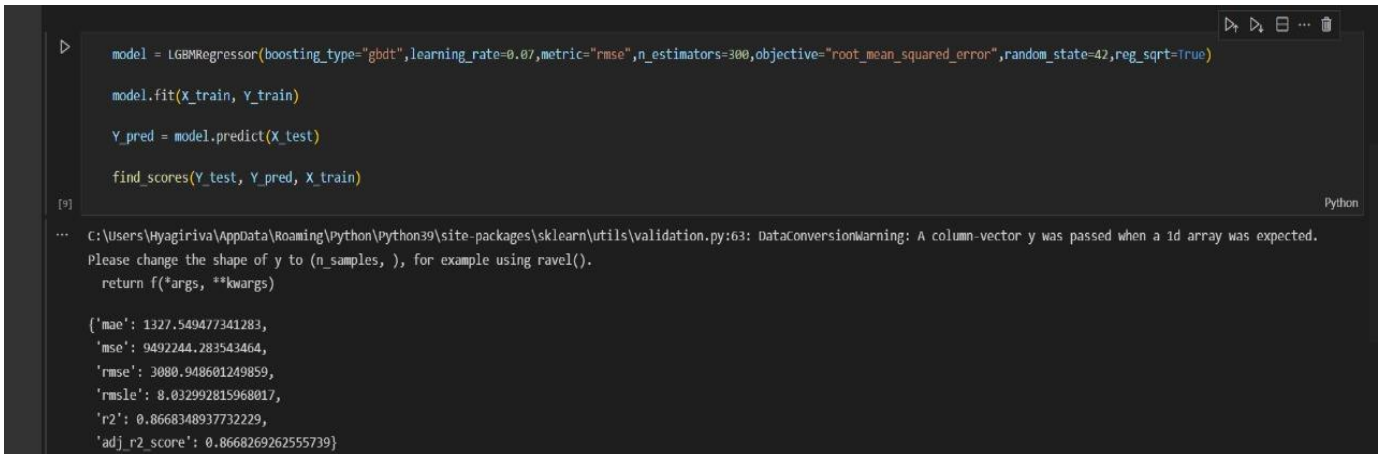
8.1 TEST CASES

1.)Metrics:

Values:

Regression Model: LGBM Regressor

'mae': 1327.549477341283,
'mse': 9492244.283543464,
'rmse': 3080.948601249859,
'rmsle': 8.032992815968017,
'r2': 0.8668348937732229,
'adj_r2_score': 0.8668269262555739



2.)Tune the model:

Hyperparameter Tuning:

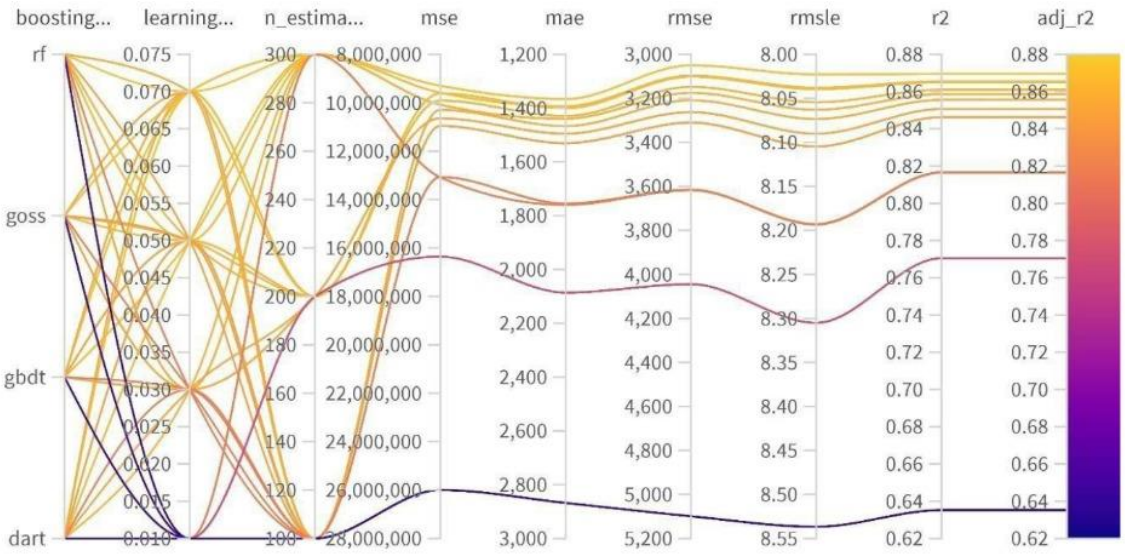
1) Learning Rate: [0.01, 0.03, 0.05, 0.07]
2) Boosting Type: ['gbdt','dart','goss','rf']
3) Number of Estimators: [100,200,300]

Validation Method: Grid Search Cross Validation

Best Parameters: Learning Rate – 0.07 Boosting Type – ‘gbdt’
Number of Estimators - 300

```
lgbm_configs = {
    "name":'LGBMRegressor',
    "method": "grid",
    "metric": {
        "name": "adj_r2",
        "goal": "maximize"
    },
    "parameters": {
        "learning_rate": {
            "values": [0.01, 0.03, 0.05, 0.07]
        },
        "objective": {
            "values": ['root_mean_squared_error']
        },
        "boosting_type": {
            "values": ['gbdt','dart','goss','rf']
        },
        "reg_sqrt": {
            "values": [True]
        },
        "metric": {
            "values": ['rmse']
        },
        "n_estimators": {
            "values": [100,200,300]
        },
        "random_state": {
            "values": [42]
        }
    }
}
```

Wandb sweep:


boosting...
learning...
n_estima...
mse
mae
rmse
rmsle
r2
adj_r2
rf
goss
gbdt
dart
0.075
0.070
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
300
280
260
240
220
200
180
160
140
120
100
8,000,000
10,000,000
12,000,000
14,000,000
16,000,000
18,000,000
20,000,000
22,000,000
24,000,000
26,000,000
28,000,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,000
3,200
3,400
3,600
3,800
4,000
4,200
4,400
4,600
4,800
5,000
5,200
8.00
8.05
8.10
8.15
8.20
8.25
8.30
8.35
8.40
8.45
8.50
8.55
0.88
0.86
0.84
0.82
0.80
0.78
0.76
0.74
0.72
0.70
0.68
0.66
0.64
0.62
0.88
0.86
0.84
0.82
0.80
0.78
0.76
0.74
0.72
0.70
0.68
0.66
0.64
0.62

8.2 USER ACCEPTANCE TESTING :

				Date	19-Nov-22								
				Team ID	PNT2022TMID53471								
				Project Name	Project - Car Resale Value Prediction								
				Maximum Marks	4 marks								
Testcase ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	Tc for Automation(Y/N)	BUG ID	Executed By
HomePage_TC_001	UI	Home Page	Verify all the UI elements in Home page rendered properly		1. Enter URL and click go 2. Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Hyagiriya E A
HomePage_TC_002	Functional	Home Page	Verify the Data Entry page can be reachable.		1. Enter URL and click go 2. Verify all the UI elements displayed or not. 3.Press the Check Price button.	-	User should be navigated to Data EntryPage	Working as expected	Pass		N		Ashraf Ali.S
DataEntryPage_TC_001	UI	Data Entry Page	Verify all the UI elements in Data Entry page rendered properly		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Price button in the home page 4. Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Keerthi K M
DataEntryPage_TC_002	Functional	Data Entry Page	Verify if user is able to enter allvalues		1.Enter URL and click go 2.Verify all the UI elements displayed or not 3.Press the Check Pricebutton in the home page 4.Verify all the UI elements displayed or not 5.Verify if all values can be entered	2009 12 12 200000 Manual no Golf Volkswagen Diesel SUV	User should be able to enter all values in data entry page	Working as expected	Pass		N		Nikkila.G.S
DataEntryPage_TC_003	Functional	Data Entry Page	Verify the Output Display page can be reachable.		1.Enter URL and click go 2.Verify all the UI elements displayed or not 3.Press the Check Pricebutton in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press the submit Button	-	User should be navigated to OutputDisplay Page	Working as expected	Pass		N		E.A.Hyagiriya
OutputDisplayPage_TC_001	UI	Output Display Page	Verify all the UI elements in Output Display page rendered properly		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Pricebutton in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press thesubmit Button 7. Verify all the UI elements displayed or not	-	All the UI elements rendered properly	Working as expected	Pass		N		Ashraf Ali.S
OutputDisplayPage_TC_002	Functional	Output Display Page	Verify user is able to get predicted result		1.Enter URL and click go 2.Verify all the UI elements displayed or not. 3.Press the Check Pricebutton in the home page 4. Verify all the UI elements displayed or not 5. Verify if all values can be entered 6. Press submit Button 7. Verify all the UI elements displayed or not 8. Verify if the predicted value is displayed or not	-	Predicted Car Resale Value is displayedon the page	Working as expected	Pass		N		Keerthi K M Nikkila.G.S

Test Scenarios :

Verify user is able to see home page?

Verify user is able to navigate to data entry page?

Verify user is able to see data entry page?

Verify user is able to enter values in the fields?

Verify user is able to navigate to output display page?

9.RESULTS

9.1 PERFORMANCE METRICS

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data collection	USN-1	Collect dataset	1	low	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-1	Preprocess data	USN-2	Read and clean the dataset	2	low	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-2	Model building	USN-3	Splitting into independent and dependent variables	3	medium	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	regression	USN-4	Applying regression model	3	medium	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-3	Application building	USN-5	Build the python flask application and HTML page	5	High	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-3	Testing	USN-6	Execute the code and test	5	high	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S
Sprint-4	Training the model /Integrating flask	USN-7	Training the model on IBM cloud and integrate flask	5	high	Hyagiriva.E.A Ashraf Ali.S Keerthi.K.M Nikkila.G.S

Sprint	Total Story Points	Duration	SprintStart Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	15	5 Days	24 Oct2022	29 Oct2022	15	29Oct 2022
Sprint-2	15	5 Days	31 Oct2022	05 Nov2022	15	05Nov 2022
Sprint-3	15	5 Days	07 Nov 2022	12 Nov2022	15	12Nov 2022
Sprint-4	15	5 Days	14 Nov 2022	19 Nov2022	15	19Nov 2022

10. ADVANTAGES AND DISDVANTAGES

i. ADVANTAGES

- Value for the money pre-owned vehicles have lower sticker prices, better value for the money spent.
- Slower rate of depreciation.
- Reduced insurance and registration costs.
- Lower loan amount to be borrowed
- Higher inflation

ii. DISDVANTAGES

- Little to No Financing
- Little to No Warranty
- New Models Not Available
- No Accurate Prediction

11. CONCLUSION

The large number of factors that must be taken into account for an effective prediction makes predicting car prices a difficult undertaking. Although one of the techniques that improves prediction performance is data cleansing, it is insufficient in the case of complicated data sets like the one used in this study. The accuracy of a single machine algorithm applied to the data set was less than 50%. Because of this, the ensemble of various machine learning algorithms has been suggested, and this combination of ML methods improves approximate price prediction. When compared to the use of a single machine learning method, this represents a significant improvement. However, the suggested system has the disadvantage of using significantly more computational resources than a single machine learning method.

12. FUTURE SCOPE

Once sufficient data has been gathered, efficient deep learning techniques like RNNs or LSTMs (Long Short-Term Memory) can be used. The accuracy and RMSE can both be significantly improved. By using CNN to recognise dents, scratches, and other physical flaws in a car's photos, one may also forecast a car's resale value that is more pertinent to its physical state.

13. APPENDIX CODING

Source code:

Resale value prediction final.ipynb

```
import pandas as pd
import numpy as np
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
import pickle

#Load the dataset
df = pd.read_csv(r"E:\car_resale\Data\autos.csv", header=0, sep=',', encoding='Latin1', )

#print all the different sellers
print(df.seller.value_counts())
#remove the seller type haveing only 3 car
df[df.seller != 'gewerblich']
#now all the sellers are same so we can get rid of this column
df=df.drop(columns=['seller'])  #1 refer the columns & 0 refer the index
```

```
#print all different seller
print(df.offerType.value_counts())
#remove the offers type having only 12 listings
df[df.offerType != 'Gesuch']
#now all offer are sameso we can get rid this collumn
df=df.drop(columns=['offerType']) # 1 refer the columns & 0 refer the index
'''car having power les then 50ps and above 900ps seems a little suspicious, let's remove
them and see what we have got now'''
print(df.shape)
df = df[(df.powerPS > 50) & (df.powerPS < 900)]
print(df.shape)
#around 50000 cars ahave been removed which could have introunduced error toour data
#Simlarly, filtering our the cars having registeration years not in the mentioned range
#print(df.shape)
df = df[(df.yearOfRegistration >= 1950) & (df.yearOfRegistration < 2017)]
print(df.shape)
#not much of a difference but still, 10000 rows have been reduced. it's better to
#get rid of faulty data instead of keeping them just to increase the size

'''removing irrelevent columns which are either the same for all the cars in the dataset, or can
introduce bias, so removing them too..'''
df.drop(['name', 'abtest', 'dateCrawled', 'nrOfPictures', 'lastSeen',
      'postalCode', 'dateCreated'], axis='columns', inplace=True)

'''dropping the duplicates from the dataframe and stroing it in a new
here all row having same value in all the mentioned columns will be deleted and by defult,
only first occurance of any such row is kept'''
new_df = df.copy()
new_df = new_df.drop_duplicates(['price', 'vehicleType', 'yearOfRegistration', 'gearbox',
'powerPS',
                        'model', 'kilometer', 'monthOfRegistration', 'fuelType',
'notRepairedDamage'])
```

```
#As the dataset contained same german words for many features, changing them to engilsh
new_df.gearbox.replace(('manuell','automatik'), ('manual','automatic'), inplace=True)
new_df.fuelType.replace(('benzin','andere','elektro'), ('petrol','others','electric'), inplace=True)
new_df.vehicleType.replace(('kleinwagen','cabrio','kombi','andere'),
                           ('small car','canvertible','combination','others'), inplace=True)
new_df.notRepairedDamage.replace(('ja','nein'), ('Yes','No'), inplace=True)
#### Removing the outliers
new_df = new_df[(new_df.price >= 100) & (new_df.price <= 150000)]

''' Filling NaN values for columns whose data might not be there with the information provider,
which might lead to some variance but our model but we will still be able to give some estimate
to the user'''
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)



#can save the csv for future purpose.
new_df.to_csv("autos_preprocessed.csv")
#Columns which contain categorical values, which we'll need to convert via label encoding
labels = ['gearbox', 'notRepairedDamage', 'model', 'brand', 'fuelType', 'vehicleType']

'''looping over the labels to the label encoding for all at once and
saveing the LABEL ENCODING FILES'''
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)

    #Final data to be put in a new dataframe called "LABELED",
    labeled = new_df[
        [
            'price',
            'yearOfRegistration',
            'powerPS',
            'kilometer',
            'monthOfRegistration'
        ] + [x+"_labels" for x in labels]]
    print(labeled.columns)
    #Storing price in Y and reset of the data in X
    Y = labeled.iloc[:,0].values
    X = labeled.iloc[:,1:].values
    #need to reshape the Y values
    Y = Y.reshape(-1,1)
    #traing data and test data
    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)

    #Model building and fitting
    from sklearn.metrics import r2_score
Model=LGBMRegressor(boosting_type="gbdt",learning_rate=0.07,metric="rmse",n_estimators=300,objective="root_
mean_squared_error",random_state=42,reg_sqrt=True)
model.fit(X_train, Y_train)
Y_pred = model.predict(X_test)
find_scores(Y_test, Y_pred, X_train)
    filename = 'resale_model.pkl'
    pickle.dump(regressor, open(filename, 'wb'))
```

x

Resale_flask.py

```
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='C:/Users/Hyagiriva/OneDrive/Desktop/docs/nalaiya thiran/New folder/final1/Final
Deliverables/Model Building/resale_model.sav'):
return pickle.load(open(file, 'rb'))


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


@app.route('/predict_page')
def predict_page():
return render_template('value.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(
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)

payload_scoring = {"input_data": [{"fields": [['yearOfReg', 'powerPS', 'kilometer', 'monthOfRegistration',
'gearbox_labels',
'notRepairedDamage_labels', 'model_labels', 'brand_labels', 'fuelType_labels', 'vehicletype_labels']], "values": X}]}
print("Final prediction :", predict)

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


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

Predict.html

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

<head>
  <meta charset="UTF-8">
  <meta http-equiv="X-UA-Compatible" content="IE=edge">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Car Resale Predicted Value</title>
</head>

<body style="background-color:coral;">
  <div class="text-box">
    <h1 style="color: black;">The Predicted Car Resale Value is </h1>
    <h1 style="color: black;">{{predict}}</h1>
```

```
  </div>


</body>

</html>
```

Value.html

```
<!DOCTYPE html>
<html lang="en" dir="ltr">

<head>
<link rel="stylesheet" href="../static/css/value.css">
<title>Car resale value</title>

</head>

<body>
<section class="form">
<form action="http://localhost:5000/predict" method="GET">
<table>
<tbody>
<h1>Predict Resale Value of Your Car</h1>
<tr>
<td><label for="year" padding:10px>Registration year: </label></td>
<td><input id="year" maxlength="50" name="regyear" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="month">Registration Month: </label></td>
<td><input id="month" maxlength="50" name="regmonth" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="power">Power of car in PS: </label></td>
<td><input id="power" maxlength="50" name="powerps" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="kilometer">Kilometers that car have driven: </label></td>
```

```
<td><input id="kilometer" maxlength="50" name="kms" type="text" />
<br>
<br>
</td>
</tr>

<tr>
<td><label for="geartype">Gear type: </label></td>
<td><input type="radio" name="geartype" value="manual" /> Manual
<input type="radio" name="geartype" value="automatic" /> Automatic
<input type="radio" name="geartype" value="not-declared" /> Not declared
<br>
<br>
</td>
</tr>

<tr>
<td><label for="damage">Your car is repaired or damaged: </label></td>
<td><input type="radio" name="damage" value="yes" /> Yes
<input type="radio" name="damage" value="no" /> No
<input type="radio" name="damage" value="not-declared" /> Not declared
<br>
<br>
</td>
</tr>

<tr>
<td><label for="model">Model Type: </label></td>
<td>
<select name="model" id="model">
<option value="" disabled selected hidden>Choose Model Name...</option>
<option value="golf">Golf </option>
<option value="grand">Grand </option>
<option value="fabia">Fabia </option>
<option value="3er">3er </option>
<option value="2_reihe">2 Reihe </option>
<option value="andere">Andere </option>
<option value="c_max">C Max </option>
<option value="3_reihe">3 Reihe </option>
<option value="passat">Passat </option>
<option value="navara">Navara </option>
<option value="ka">Ka </option>
<option value="polo">Polo </option>
<option value="twingo">Twingo </option>
<option value="a_klasse">A klasse </option>
<option value="scirocco">Scirocco </option>
<option value="5er">5er </option>
<option value="meriva">Meriva </option>
<option value="arosa">Arosa </option>
<option value="c4">C4 </option>
<option value="civic">Civic </option>
```

<option value="transporter">Transporter </option>
<option value="punto">Punto </option>
<option value="e_klasse">E Klasse </option>
<option value="clio">Clio </option>
<option value="kadett">Kadett </option>
<option value="kangoo">Kangoo </option>
<option value="corsa">Corsa </option>
<option value="one">One </option>
<option value="fortwo">Fortwo </option>
<option value="1er">1er </option>
<option value="b_klasse">B Klasse </option>
<option value="signum">Signum </option>
<option value="astra">Astra </option>
<option value="a8">A8 </option>
<option value="jetta">Jetta </option>
<option value="fiesta">Fiesta </option>
<option value="c_klasse">C Klasse </option>
<option value="micra">Micra </option>
<option value="vito">Vito </option>
<option value="sprinter">Sprinter </option>
<option value="156">156 </option>
<option value="escort">Escort </option>
<option value="forester">Forester </option>
<option value="xc_reihe">Xc Reihe </option>
<option value="scenic">Scenic </option>
<option value="a4">A4 </option>
<option value="a1">A1 </option>
<option value="insignia">Insignia </option>
<option value="combo">Combo </option>
<option value="focus">Focus </option>
<option value="tt">Tt </option>
<option value="a6">A6 </option>
<option value="jazz">Jazz </option>
<option value="omega">Omega </option>
<option value="slk">Slk </option>
<option value="7er">7er </option>
<option value="80">80 </option>
<option value="147">147 </option>
<option value="glk">Glk </option>
<option value="100">100 </option>
<option value="z_reihe">Z Reihe </option>
<option value="sportage">Sportage </option>
<option value="sorento">Sorento </option>
<option value="v40">V40 </option>
<option value="5er">5er </option>
<option value="ibiza">Ibiza </option>
<option value="3er">3er </option>
<option value="mustang">Mustang </option>
<option value="eos">Eos </option>
<option value="touran">Touran </option>
<option value="getz">Getz </option>

<option value="a3">A3 </option>
<option value="almera">Almera </option>
<option value="megane">Megane </option>
<option value="7er">7er </option>
<option value="1er">1er </option>
<option value="lupo">Lupo </option>
<option value="r19">R19 </option>
<option value="zafira">Zafira </option>
<option value="caddy">Caddy </option>
<option value="2_reihe">2 Reihe </option>
<option value="mondeo">Mondeo </option>
<option value="cordoba">Cordoba </option>
<option value="colt">Colt </option>
<option value="impreza">Impreza </option>
<option value="vectra">Vectra </option>
<option value="berlingo">Berlingo </option>
<option value="80">80 </option>
<option value="m_klasse">M Klasse </option>
<option value="tiguan">Tiguan </option>
<option value="i_reihe">I Reihe </option>
<option value="espace">Espace </option>
<option value="sharan">Sharan </option>
<option value="6_reihe">6 Reihe </option>
<option value="panda">Panda </option>
<option value="up">Up </option>
<option value="seicento">Seicento </option>
<option value="ceed">Ceed </option>
<option value="5_reihe">5 Reihe </option>
<option value="yeti">Yeti </option>
<option value="octavia">Octavia </option>
<option value="mii">Mii </option>
<option value="rx_reihe">Rx Reihe </option>
<option value="6er">6er </option>
<option value="modus">Modus </option>
<option value="fox">Fox </option>
<option value="matiz">Matiz </option>
<option value="beetle">Beetle </option>
<option value="c1">C1 </option>
<option value="rio">Rio </option>
<option value="touareg">Touareg </option>
<option value="logan">Logan </option>
<option value="spider">Spider </option>
<option value="cuore">Cuore </option>
<option value="s_max">S Max </option>
<option value="a2">A2 </option>
<option value="x_reihe">X Reihe </option>
<option value="a5">A5 </option>
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<option value="c3">C3 </option>
<option value="viano">Viano </option>
<option value="s_klasse">S Klasse </option>

<option value="1_reihe">1 Reihe </option>
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<option value="sl">Sl </option>
<option value="roomster">Roomster </option>
<option value="q5">Q5 </option>
<option value="kaefer">Kaefer </option>
<option value="santa">Santa </option>
<option value="cooper">Cooper </option>
<option value="leon">Leon </option>
<option value="4_reihe">4 Reihe </option>
<option value="500">500 </option>
<option value="laguna">Laguna </option>
<option value="ptcruiser">Ptcruiser </option>
<option value="clk">Clk </option>
<option value="primera">Primera </option>
<option value="exeo">Exeo </option>
<option value="159">159 </option>
<option value="transit">Transit </option>
<option value="juke">Juke </option>
<option value="qashqai">Qashqai </option>
<option value="carisma">Carisma </option>
<option value="accord">Accord </option>
<option value="corolla">Corolla </option>
<option value="lanos">Lanos </option>
<option value="phaeton">Phaeton </option>
<option value="boxster">Boxster </option>
<option value="verso">Verso </option>
<option value="swift">Swift </option>
<option value="rav">Rav </option>
<option value="kuga">Kuga </option>
<option value="picanto">Picanto </option>
<option value="kalos">Kalos </option>
<option value="superb">Superb </option>
<option value="stilo">Stilo </option>
<option value="alhambra">Alhambra </option>
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<option value="cayenne">Cayenne </option>
<option value="galant">Galant </option>
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<option value="agila">Agila </option>
<option value="duster">Duster </option>
<option value="cr_reihe">Cr Reihe </option>
<option value="v50">V50 </option>

<option value="discovery">Discovery </option>
<option value="c_reihe">C Reihe </option>
<option value="v_klasse">V Klasse </option>
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<option value="c5">C5 </option>
<option value="aygo">Aygo </option>
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<option value="bora">Bora </option>
<option value="forfour">Forfour </option>
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<option value="tigra">Tigra </option>
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<option value="100">100 </option>
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<option value="q3">Q3 </option>
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<option value="v70">V70 </option>
<option value="x_type">X Type </option>
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<option value="ducato">Ducato </option>
<option value="s_type">S Type </option>
<option value="x_trail">X Trail </option>
<option value="toledo">Toledo </option>
<option value="altea">Altea </option>
<option value="7er">7er </option>
<option value="voyager">Voyager </option>
<option value="calibra">Calibra </option>
<option value="bravo">Bravo </option>
<option value="range_rover">Range Rover </option>
<option value="antara">Antara </option>
<option value="tucson">Tucson </option>
<option value="q7">Q7 </option>
<option value="citigo">Citigo </option>
<option value="jimny">Jimny </option>
<option value="cx_reihe">Cx Reihe </option>
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<option value="lybra">Lybra </option>
<option value="range_rover_sport">Range Rover Sport </option>
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<option value="freelander">Freelander </option>
<option value="captiva">Captiva </option>
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<option value="range_rover_evoque">Range Rover Evoque </option>
<option value="sandero">Sandero </option>
<option value="note">Note </option>

<option value="900">900 </option>
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<option value="clubman">Clubman </option>
<option value="samara">Samara </option>
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<option value="1er">1er </option>
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<option value="3_reihe">3 Reihe </option>
<option value="4_reihe">4 Reihe </option>
<option value="5er">5er </option>
<option value="6_reihe">6 Reihe </option>
<option value="legacy">Legacy </option>
<option value="pajero">Pajero </option>
<option value="auris">Auris </option>
<option value="niva">Niva </option>
<option value="5_reihe">5 Reihe </option>
<option value="s60">S60 </option>
<option value="nubira">Nubira </option>
<option value="vivaro">Vivaro </option>
<option value="g_klasse">G Klasse </option>
<option value="lodgy">Lodgy </option>
<option value="850">850 </option>
<option value="serie_2">Serie 2 </option>
<option value="6er">6er </option>
<option value="charade">Charade </option>
<option value="croma">Croma </option>
<option value="outlander">Outlander </option>
<option value="gl">Gl </option>
<option value="doblo">Doblo </option>
<option value="musa">Musa </option>
<option value="amarok">Amarok </option>
<option value="156">156 </option>
<option value="move">Move </option>
<option value="9000">9000 </option>
<option value="v60">V60 </option>
<option value="145">145 </option>
<option value="aveo">Aveo </option>
<option value="200">200 </option>
<option value="300c">300c </option>
<option value="b_max">B Max </option>
<option value="delta">Delta </option>
<option value="terios">Terios </option>
<option value="rangerover">RangeRover </option>
<option value="90">90 </option>
<option value="materia">Materia </option>
<option value="kalina">Kalina </option>
<option value="elefantino">Elefantino </option>
<option value="i3">I3 </option>

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<option value="kappa">Kappa </option>
<option value="serie_3">Serie 3 </option>
<option value="48429">48429 </option>
<option value="serie_1">Serie 1 </option>
<option value="discovery_sport">Discovery Sport </option>

</select>
<br>
<br>
</td>
</tr>

<tr>
<td><label for="brand">Brand :</label></td>
<td>
<select name="brand" id="brand">
<option value="" disabled selected hidden>Choose Brand Name...</option>
<option value="volkswagen">Volkswagen </option>
<option value="audi">Audi </option>
<option value="jeep">Jeep </option>
<option value="skoda">Skoda </option>
<option value="bmw">Bmw </option>
<option value="peugeot">Peugeot </option>
<option value="ford">Ford </option>
<option value="mazda">Mazda </option>
<option value="nissan">Nissan </option>
<option value="renault">Renault </option>
<option value="mercedes_benz">Mercedes Benz </option>
<option value="opel">Opel </option>
<option value="seat">Seat </option>
<option value="citroen">Citroen </option>
<option value="honda">Honda </option>
<option value="fiat">Fiat </option>
<option value="mini">Mini </option>
<option value="smart">Smart </option>
<option value="hyundai">Hyundai </option>
<option value="sonstige_autos">Sonstige Autos </option>
<option value="alfa_romeo">Alfa Romeo </option>
<option value="subaru">Subaru </option>
<option value="volvo">Volvo </option>
<option value="mitsubishi">Mitsubishi </option>
<option value="kia">Kia </option>
<option value="suzuki">Suzuki </option>
<option value="lancia">Lancia </option>
<option value="porsche">Porsche </option>
<option value="toyota">Toyota </option>
<option value="chevrolet">Chevrolet </option>
<option value="dacia">Dacia </option>
<option value="daihatsu">Daihatsu </option>
<option value="trabant">Trabant </option>
<option value="saab">Saab </option>
```

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<option value="chrysler">Chrysler </option>
<option value="jaguar">Jaguar </option>
<option value="daewoo">Daewoo </option>
<option value="rover">Rover </option>
<option value="land_rover">Land Rover </option>
<option value="lada">Lada </option>
</select>
<br>
<br>
</td>
</tr>

<tr>
<td><label for="fuelType">Fuel Type :</label></td>
<td>
<select name="fuelType" id="brand">
<option value="" disabled selected hidden>Choose Fuel Type...</option>
<option value="petrol"> Petrol </option>
<option value="diesel"> Diesel </option>
<option value="not-declared"> Not Declared </option>
<option value="lpg">LPG </option>
<option value="cng">CNG </option>
<option value="hybrid">Hybrid </option>
<option value="others">Others </option>
<option value="electric">Electric </option>
</select>
<br>
<br>
</td>
</tr>

<tr>
<td><label for="vehicletype">Vehicle type:</label></td>
<td>
<select name="vehicletype" id="vehicle">
<option value="" disabled selected hidden>Choose Vehicle Type...</option>
<option value="coupe">Coupe </option>
<option value="suv">SUV </option>
<option value="kleinwagen">Kleinwagen </option>
<option value="limousine">Limousine </option>
<option value="cabrio">Cabrio </option>
<option value="bus">Bus </option>
<option value="kombi">Kombi </option>
<option value="andere">Andere </option>
<option value="volkswagen">Volkswagen </option>
</select>
<br>
<br>
</td>
</tr>
</tbody>
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```
</table>
<input name="Submit" type="Submit" value="Submit" id="button" />
</form>
</section>

</body>

</html>
```

GitHub & Project Demo Link

Github

Demowork