A Project Report

on

CAR RESALE VALUE PREDICTION

Under the guidance of

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CHAPTER - 1
INTRODUCTION

1.1 PROJECT OVERVIEW

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

1.2 PURPOSE

Car resale value prediction helps the user to predict the resale value of the car depending upon various features like kilo-metres driven, fuel type, etc. This resale value prediction system is made for general purpose to just predict the amount that can be roughly acquired by the user. The most essential elements for forecast are brand and model, period use of vehicle, mileage of vehicle, gear type and fuel type utilised in the vehicle just as fuel utilisation per mile profoundly influences cost of a vehicle because of continuous changes in the cost of a fuel. In view of the differing highlights and factors, and furthermore with the assistance of master information the vehicle value forecast has been done precisely. This can enable the customers to make decisions. Due to the high pricing of new cars along with the incapability of customers to invest in them, second-hand car sales are on a global increase. A second-hand car price prediction system is required to effectively determine the worthiness of the car using a variety of features. It is important to know their actual market value while both buying and selling. Having a fair estimate of the car's worth is a sure shot way to get the best possible value for the old car. As a seller, he/she wants to get the maximum price but the aim is the opposite for the buyer or the car dealer. So, to become aware of such things should be given importance. Need to calculate resale value of the car with the help of the correct valuation tool to know the market price or what could be the market price of the vehicle. To negotiate with the dealer or seller with due diligence and end up in a profitable deal. Estimating the best price for the car. Getting insight into industry rates and trends. Safeguarding against underhanded practices. Confidence for negotiations.

CHAPTER - 2
LITERATURE SURVEY

2.1 EXISTING PROBLEM

Transportation industry is one of the backbones of the economy. Almost everyone wants their own car these days, but many prefer to buy used cars or second-hand cars because of some factors like affordability and economic conditions. Used car sales are on a global increase due to the increased price of new cars and the financial incapability of the customers to buy the new cars. The used car or second-hand market has continued to expand, as the reduction in the market of new cars. The second-hand market has created business for both buyers and sellers. Nowadays most of the people prefer to buy used cars because of the affordable price and it can also be resold after some years of usage which may get some profit. In fact, the seller may not have an idea about the car's existing value in the present day's scenario or the price he should be selling the car at. Buyer too may not have an idea on the car and its value. So, the problem arises when the seller wants to fix an affordable as well as a profitable resale price for the car which would benefit both the seller and buyer. The price of used cars depends on many factors such as manufacturing year, fuel type, kilometres driven, transmission type, engine, etc., Accurately predicting the used car prices requires expert knowledge due to their nature of dependence on a variety of factors and features. Therefore, an efficient application or website built using an effective evaluation model to predict the resale value of the car is required.

2.2 REFERENCES

2.2.1 TITLE- USED CAR PRICE PREDICTION

AUTHOR- Praful Rane1, Deep Pandya2, Dhawal Kotak3

DESCRIPTION

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

2.2.2 TITLE- Vehicle Price Prediction using SVM Techniques

AUTHOR- S.E. Viswapriya, Darbuka Sai Sandeep Sharma, Gandavarapu Sathya Kiran

DESCRIPTION

The prediction of price for a vehicle has been more popular in research area, and it needs predominant effort and information about the experts of this particular field. The number of different attributes is measured and also it has been considerable to predict the result in more reliable and accurate. To find the price of used vehicles a well-defined model has been developed with the help of three machine learning techniques such as Artificial Neural Network, Support Vector Machine and Random Forest. These techniques were used not on the individual items but for the whole group of data items. This data group has been taken from some web portal and that same has been used for the prediction. The data must be collected using web scraper that was written in PHP programming language.

2.2.3 TITLE- Used Cars Price Prediction and Valuation using Data Mining Techniques

AUTHOR- Abdulla AlShared

DESCRIPTION

Unprecedented number of cars being purchased and sold, used car price prediction is a topic of high interest. Because of the affordability of used cars in developing countries, people tend more purchase used cars. A primary objective of this project is to estimate used car prices by using attributes that are highly correlated with a label (Price). To accomplish this, data mining technology has been employed. Null, redundant, and missing values were removed from the dataset during pre-processing. In this supervised learning study, three regressors (Random Forest Regressor, Linear Regression, and Bagging Regressor) have been trained, tested, and compared against a benchmark dataset. A train-test split of 80/20 with 40 random states was used in all experiments.

2.2.4 TITLE- Prediction of Resale Value of the Car Using Linear Regression Algorithm

AUTHOR- Kiran S

DESCRIPTION

A correlation with each attribute to that of target attribute is found and linear regression curve with the target attribute is drawn. As a final step the total error and accuracy is measured. The demand for used cars has increased significantly in the past decade and it is prognosticated that with Covid-19 outbreak this requirement will augment considerably. Hence to enhance the reliability, with the expansion of the used car market, a model that can forecast the current market price of a used automobile on the basis of a variety of criteria. This analysis can be used to study the trends in the industry, offer better insight into the market, and aid the community in its smooth workflow. The aim of this research paper is to predict the car price as per the data set (previous consumer data like engine capacity, distance travelled, year of manufacture, etc.). The result of these algorithms will be analysed and based on the efficiency and accuracy of these algorithms, the best one of them can be used for the said purpose.

2.3 PROBLEM STATEMENT DEFINITION

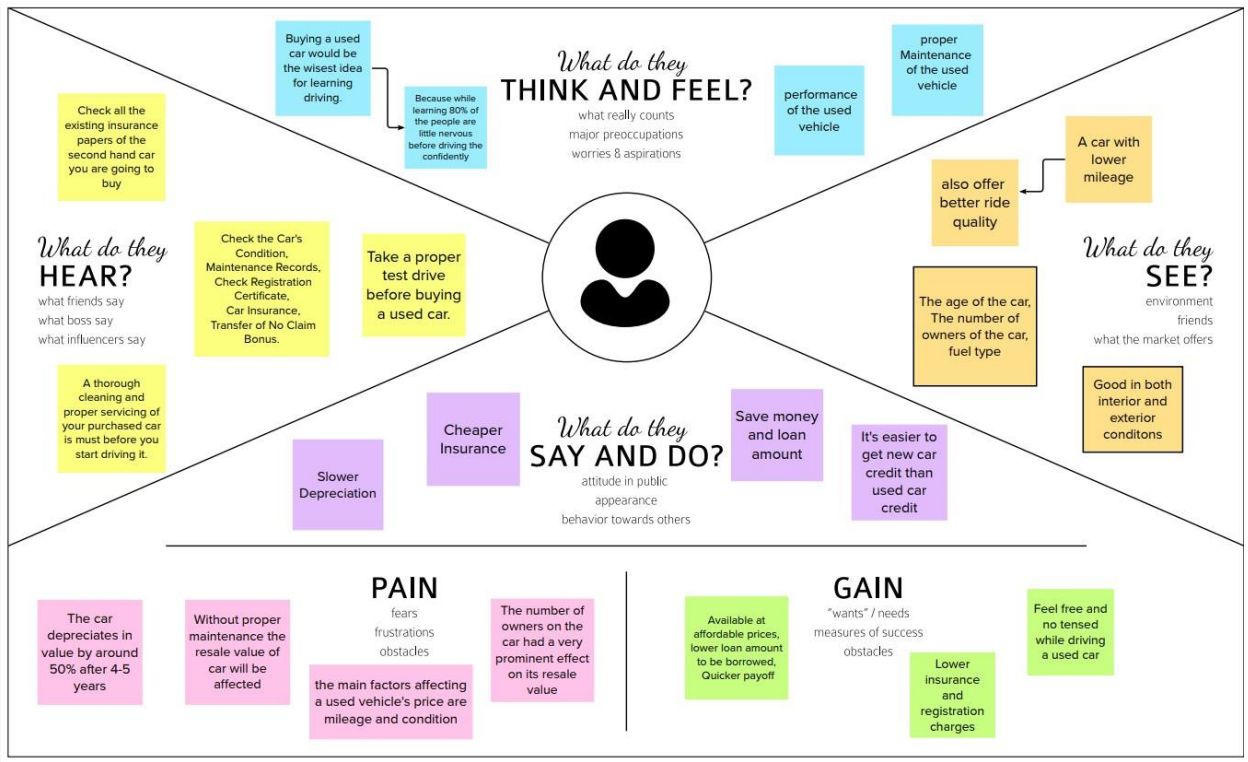
With difficult economic conditions, it is likely that sales of second-hand imported (reconditioned) cars and used cars will increase. In many developed countries, it is common to lease a car rather than buying it outright. After the lease period is over, the buyer has the possibility to buy the car at 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. Therefore, we need an intelligent solution to predict the accurate resale value of the car and present it to the users in a web application.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Owner of the car	Sell the car	Don't know its resale value	Of wear and tear over the years (damage due to daily use)	Worried
PS-2	Owner of the car (high priced /luxury car)	Find resale value of the car	In a dilemma of finding correct resale value	Of high price and high maintenance cost	Confused
PS-3	Owner of the car	Sell the car	In urge of selling the car in a satisfactory price	Urgent financial requirements	Frustrated

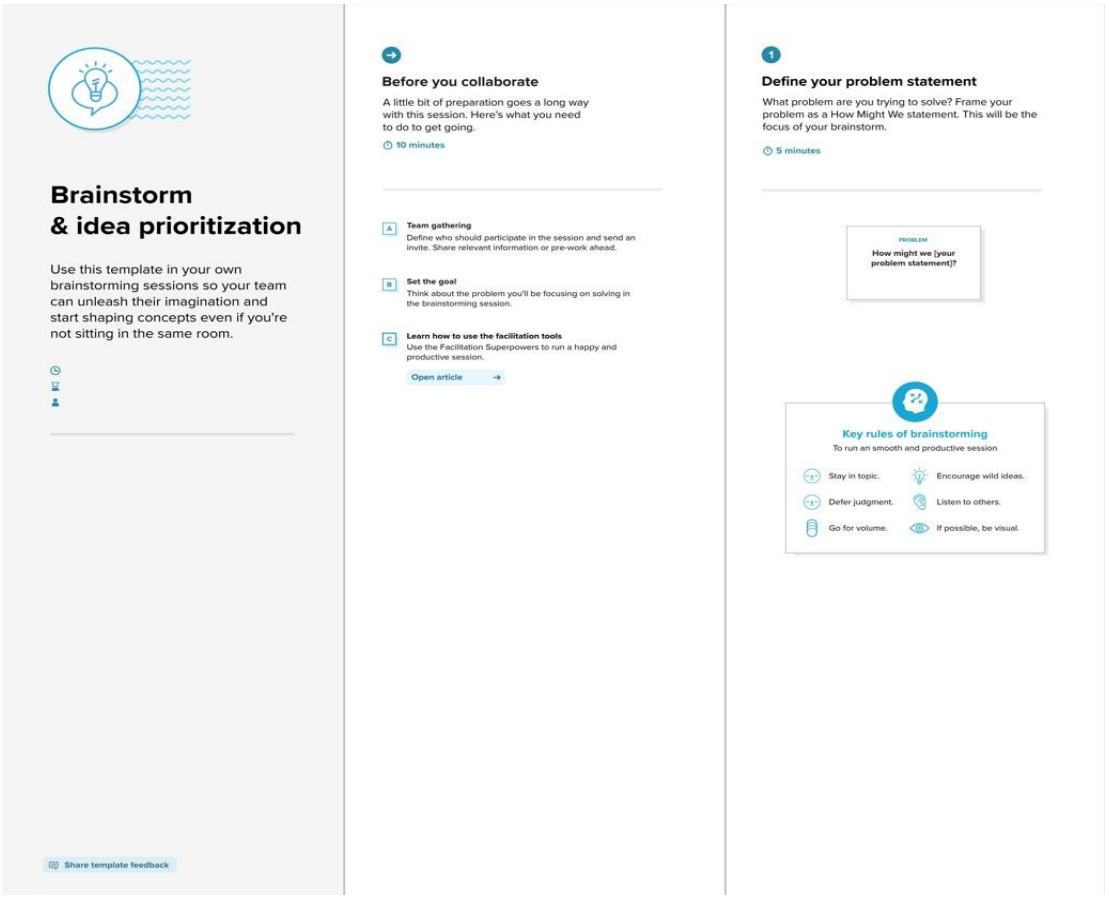
CHAPTER - 3

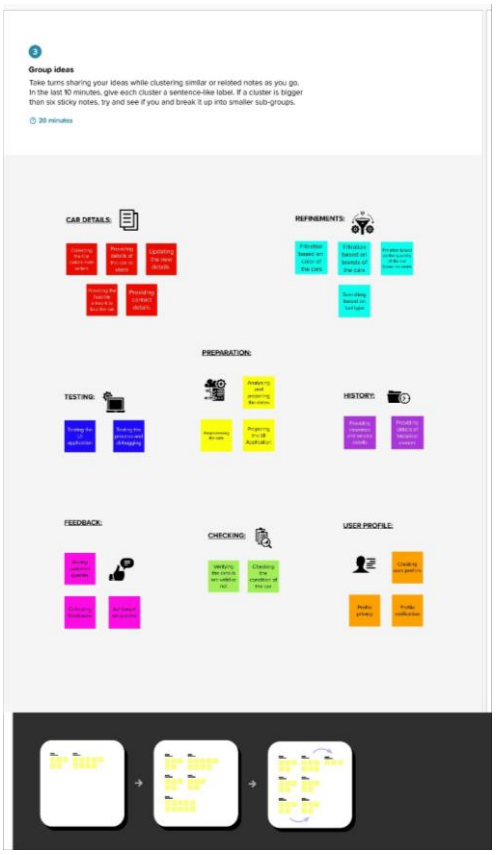
IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING




3
Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
CAR DETAILS:
REFINEMENTS:
PREPARATION:
TESTING:
HISTORY:
FEEDBACK:
CHECKING:
USER PROFILE:


4
Prioritize
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.
20 minutes
Importance
Feasibility


2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
Marcus Durairaj
Collecting the car details from sellers
Verifying the details are not valid
Checking the condition of the car
Filtration based on brands of the cars
Creating user profiles
Profile privacy
Malavika.T
Filtration based on color of the cars
Providing details of the car to users
Profile verification
Asking customers queries
Act based on queries
Collecting feedback
Saisathiya.R
Providing contact details
Searching based on fuel type
Analyzing and preparing the datas
Processing the data
Preparing the UI Application
Providing details of historical owners
Krithika Sree.T
Filtration based on the quantity of the car based on seats
Providing the feasible amount to buy the car
Providing insurance and service details
Testing the UI application
Testing the process and debugging
Updating the new details

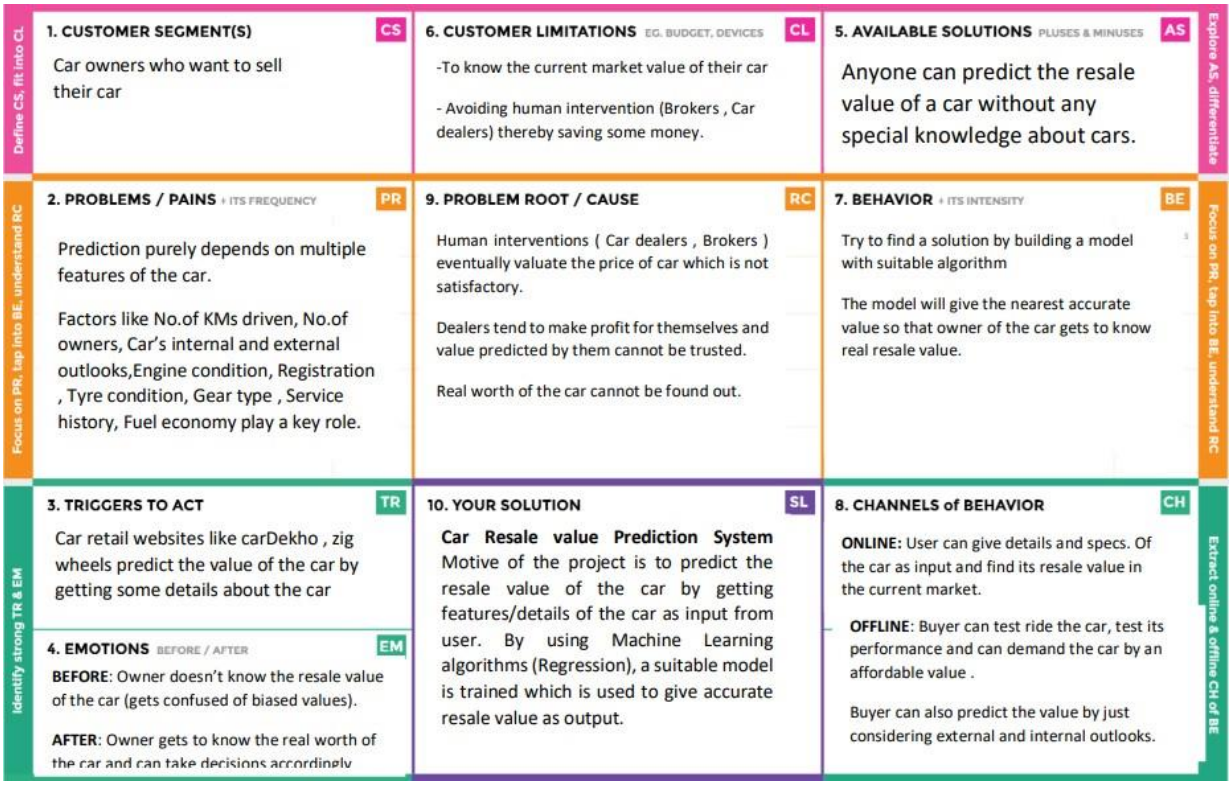
3.3 PROPOSED SOLUTION

S. No.	Parameter	Description
1	Problem Statement (Problem to be solved)	To develop a web application to predict the resale value of a car based on its features
2	Idea / Solution description	To train the system with the dataset and train them using a regression model
3	Novelty / Uniqueness	Predict more accurate value based on the input given by the user.
4	Social Impact / CustomerSatisfaction	Customer can get a clear recommendation of the resale value of the car and based on the evaluation; customer can take decisions on selling the car.
5	Business Model (Revenue Model)	Free and can be accessed by anyone. Prediction purely depends on features of the car.
6	Scalability of the Solution	More the specific details, more the accuracy. Anaccurate resale value is predicted by the trained model.

3.4 PROBLEM SOLUTION FIT

The sales of second-hand imported cars and used cars is increasing nowadays. Predicting the price of used cars is an important and interesting problem. Predicting the resale value of a car is not an easy task. It is trite knowledge that the value of used cars depends on a number of factors. The value of a car drops right from the moment it is bought and the depreciation continues with each passing year. In fact, in the first year itself, the value of a car decreases by 20 percent of its initial value. The make and model of a car, total kilometres driven, overall condition of the car and various other factors further affect the car's resale value. So, it is necessary to build a model and design an application or website to estimate the price of used cars. The model should take car related parameters and output a selling price of the car. The selling price of a used car depends on certain features as mentioned below:

- Fuel Type
- Manufacturing Year
- Miles Driven
- Number of Historical Owners
- Maintenance Record, etc.,



CHAPTER – 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Opens Website	Server Opens the site
FR-2	User Enters the Values	User enters Car details
FR-3	Validation	User Values Checks and validation
FR-4	Prediction	Car Price Prediction

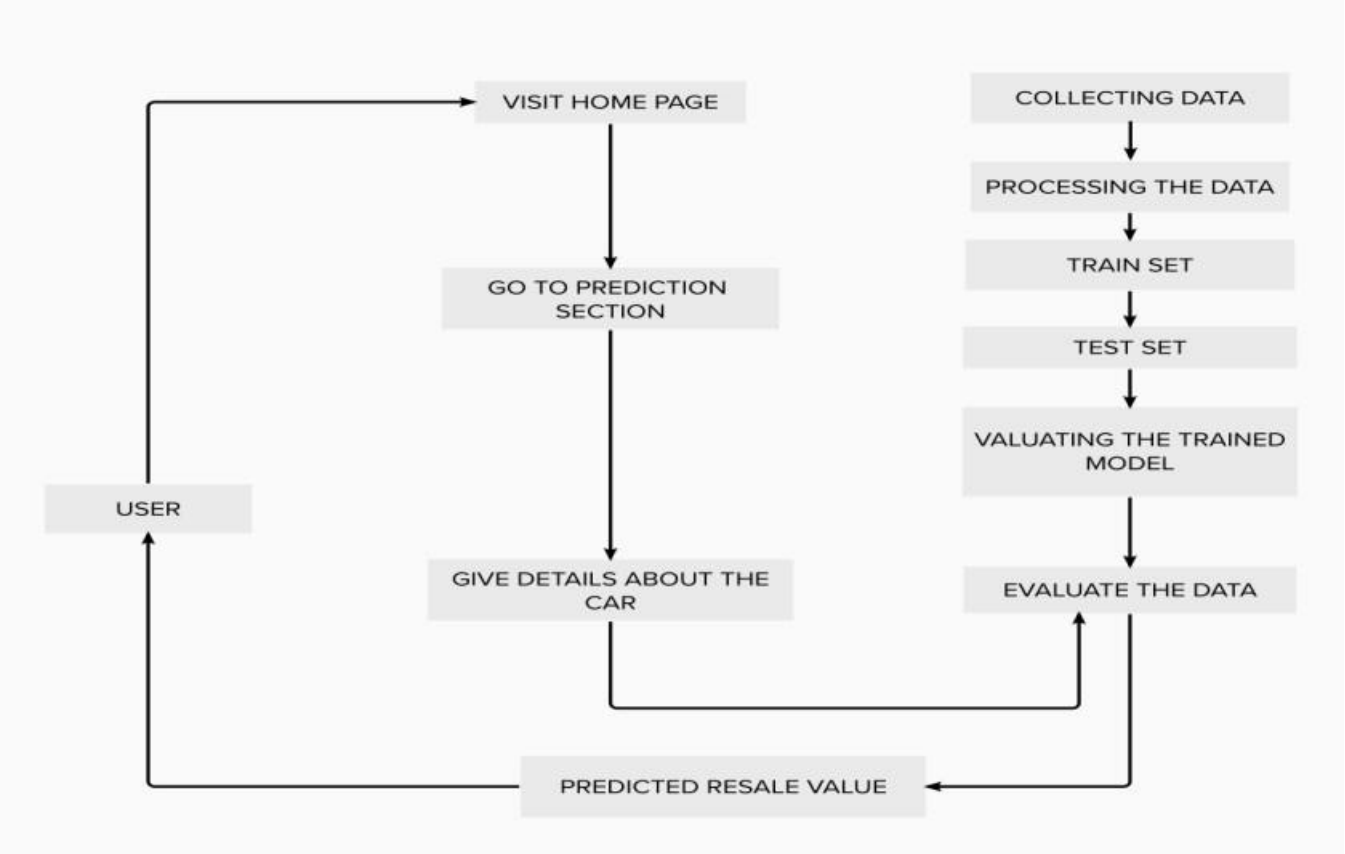
4.2 NON-FUNCTIONAL REQUIREMENTS

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	A Simple, User-friendly user interface which can give solution to the user. (i.e resale value
NFR-3	Reliability	Reliable and consistent prediction can be done.
NFR-4	Performance	Performance does not depend on amount of end users. It is scalable, consistent with no delay.
NFR-5	Availability	Uninterrupted services must be available other than any server issues.
NFR-6	Scalability	It can handle any amount of data irrespective of number of users. It can perform computations in a fast & cost-effective manner.

CHAPTER - 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS

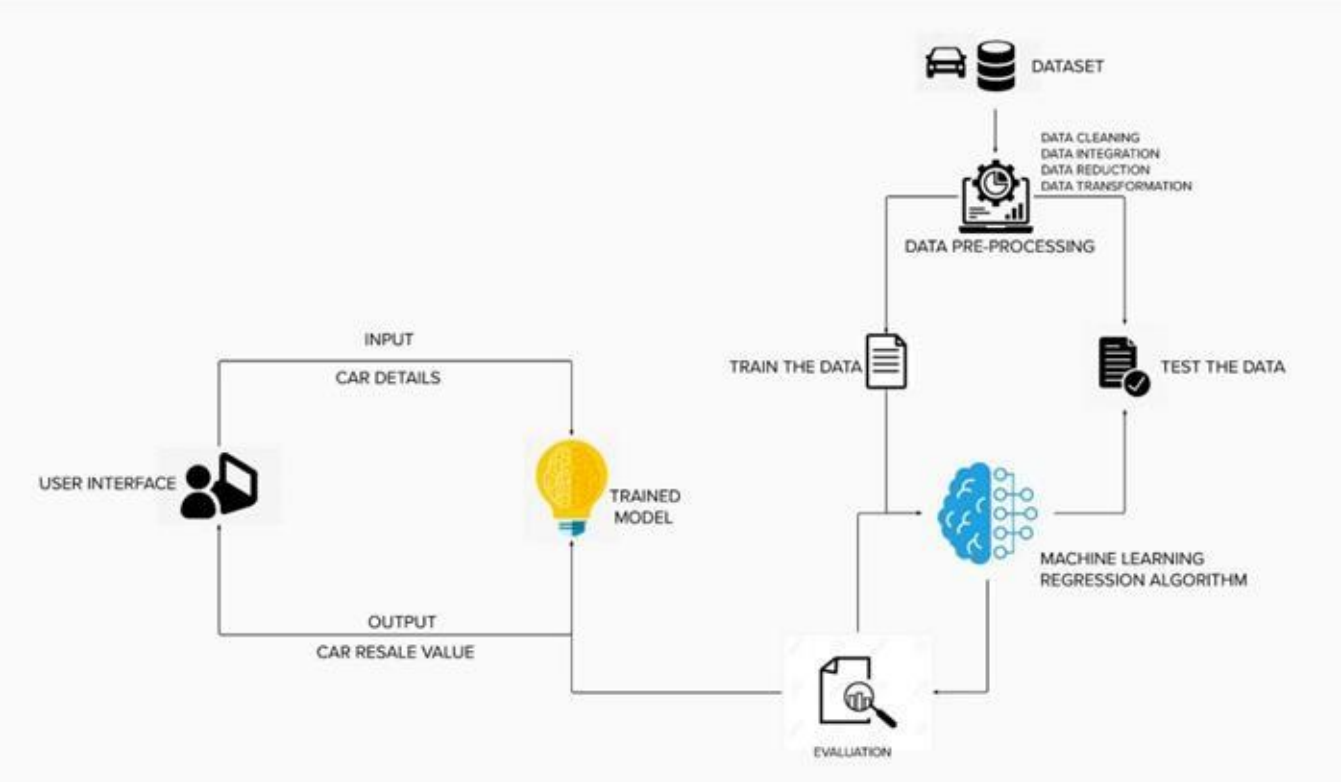


5.2 SOLUTION & TECHNICAL ARCHITECTURE

Solution Architecture is an architectural description of a specific solution. It is the practice of designing, describing, and managing solution engineering to match its specific business problems. It comprises subprocesses that draw guidance from various enterprise architecture viewpoints. Solution Architecture is the initial step taken when an organization aims to create a set of enterprise solutions, applications and processes that integrate with each other in order to address specific needs and requirements and that often lead to software architecture and technical architecture work.

Technical architecture—which is also often referred to as application architecture, IT architecture, business architecture, etc.—refers to creating a structured software solution that will meet the business needs and expectations while providing a strong technical plan for the growth of the software application through its lifetime. IT architecture is equally important to the business team and the information technology team. Technical architecture includes the major components of the system, their relationships, and the contracts that define the interactions between the components. The goal of technical architects is to achieve all the business needs with an application that is optimized for both performance and security. The technical architecture of the proposed project is as follows:

S.No	Component	Technology
1	User Interface	HTML, CSS, JavaScript
2	Application Logic-1	Python - Flask
3	Application Logic-2	IBM Watson STT service
4	Machine learning	Regression, Random Forest



5.2 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (user)	Visit the website	USN-1	As a user, i can visit the home page of the website and get to know about the website.	I can access the website by correct URL.	High	Sprint-1
	Enter the condition	USN-2	User can enter the car conditions.	User can able to enter the details	High	Sprint-1
	Predict the value of my old car	USN-3	As a user, I can predict the resale Value of the car by giving its details/ Features.	I can enter car details	High	Sprint-2
	Look for a price of a used car	USN-4	As a user and also a buyer or Seeker, I can also get to know the Price of the used car.	I can choose most likely car.	Medium	Sprint-3
Administrator	Application	USN-5	As an administrator I can upgrade / update /modify the application with additional features.		Medium	Sprint-4

CHAPTER - 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team. In scrum, the sprint is a set period of time where all the work is done. However, before you can leap into action you have to set up the sprint. You need to decide on how long the time box is going to be, the sprint goal, and where you're going to start. The sprint planning session kicks off the sprint by setting the agenda and focus. If done correctly, it also creates an environment where the team is motivated, challenged, and can be successful. Bad sprint plans can derail the team by setting unrealistic expectations. The following is the sprint planning and estimation for the project

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Pre-process data	USN-1	Collect dataset	5	Medium	Krithika Sree T Marcus Durairaj
Sprint-1	Pre-process data	USN-2	Import required libraries Read and clean dataset	10	High	Krithika Sree T Marcus Durairaj
Sprint-2	Model Building	USN-3	Selecting the appropriate Model	10	High	Malavika T Saisathiya R
Sprint-2	Model Building	USN-4	Evaluating the metrics and saving the Model	10	Medium	Malavika T Saisathiya R
Sprint-3	Application Building	USN-5	Building Python Flask application and HTML File	20	High	Krithika Sree T Marcus Durairaj Malavika T Saisathiya R
Sprint-4	Training the Model in IBM	USN-6	Training the Model in IBM Integrate Flask with Scoring End Pointin Cloud	20	High	Krithika Sree T Marcus Durairaj Malavika T Saisathiya R

6.2 SPRINT DELIVERY SCHEDULE

Since sprints take place over a fixed period of time, it's critical to avoid wasting time during planning and development. And this is precisely where sprint scheduling enters the equation.In case you're unfamiliar, a sprint schedule is a document that outlines sprint planning from end to end. It's one of the first steps in the agile sprint planning process—and something that requires adequate research, planning, and communication. Sprint Delivery Schedule for the proposed solution:

Sprint	**Total Story Points**	**Duration**	**Sprint Start Date**	**Sprint End Date (Planned)**	**Story Points Completed**	**Sprint Release Date (Actual)**
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	26 Oct 2022
Sprint-2	15	6 Days	31 Oct 2022	05 Nov 2022	15	01 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	17 Nov 2022

CHAPTER - 7

CODING & SOLUTIONING

7.1 FEATURE 1

Developing the model and building the application using Random Forest Regression With greater accuracy the model building will be possible with building the model with pickle setup which is used with label encoder to get the desired integer labels for the string inputs. It's very much effective method will get better accuracy the linear regression methods.

```
import pandas as pd
import numpy as np
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
import pickle
print("IMPORTED REQUIRED LIBRARIES")

import os, types
import pandas as pd
from botocore.client import Config
import ibm_boto3
import io
def__iter__(self): return 0


# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your
credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
   ibm_api_key_id=' rtM67NclbfmQqWVdp-tCviqTbLyYtLCRc3x1VcbQziof ',
   ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
   config=Config(signature_version='oauth'),
   endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')


bucket = 'carresalevalueprediction-donotdelete-pr-yuhtmzidi0ka1p'
object_key = 'autos.csv'


body = cos_client.get_object(Bucket=bucket,Key=object_key)
```

```
df = pd.read_csv((io.BytesIO(body['Body'].read())) , header=0 , sep=','
,encoding='Latin1',low_memory=False)
df.head()
# df = pd.read_csv("C:/Users/SUGARANJAN/Desktop/IBM/Data/autos.csv", header=0 , sep=','
,encoding='Latin1',low_memory=False)
# df.head()
import os, types
import pandas as pd
from botocore.client import Config
import ibm_boto3
import io
def __iter__(self): return 0

# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your
credentials.
# You might want to remove those credentials before you share the notebook.
cos_client = ibm_boto3.client(service_name='s3',
    ibm_api_key_id='DT15l-lL0017uhnUGwXyhG_Eort5gohoW6XJTNoT3RKk',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.us.cloud-object-storage.appdomain.cloud')

bucket = 'carresalevalueprediction-donotdelete-pr-yuhtmzidi0ka1p'
object_key = 'autos.csv'

body = cos_client.get_object(Bucket=bucket,Key=object_key)
df = pd.read_csv((io.BytesIO(body['Body'].read())) , header=0 , sep=','
,encoding='Latin1',low_memory=False)
df.head()
print(df.seller.value_counts())
df[df.seller !='gewerblich']
df=df.drop('seller',axis=1)

print(df.offerType.value_counts())
df[df.offerType !='Gesuch']
df=df.drop('offerType',axis=1)
```

```
print(df.shape)
df=df[(df.powerPS>50) & (df.powerPS<900)]
print(df.shape)
df=df[(df.yearOfRegistration>=1950)&(df.yearOfRegistration<2022)]
print(df.shape)
df.drop(['name','abtest','dateCrawled','nrOfPictures','lastSeen','postalCode','dateCreated'],
axis='columns',inplace=True)
new_df=df.copy()
new_df=new_df.drop_duplicates(['price','vehicleType','yearOfRegistration','gearbox','powerPS','
model','kilometer','monthOfRegistration','fuelType','notRepairedDamage'])
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'),('samll
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)
from ibm_watson_machine_learning import APIClient
wml_credentials={
   "url":"https://us-south.ml.cloud.ibm.com",
   "apikey":"GUHVuufHi0YvdaXTEnAsHFze4ydIPqCFuqypAnHL21C8"
}
client =APIClient(wml_credentials)
def guide_from_space_name(client, space_name):
   space = client.spaces.get_details()
#     print(space)
   return(next(item for item in space['resources'] if
item['entity']["name"]==space_name)['metadata']['id'])
space_uid=guide_from_space_name(client,'CAR')
print("Space UID"+ space_uid)
client.set.default_space(space_uid)
client.software_specifications.list()
```

```
software_spec_uid = client.software_specifications.get_uid_by_name("runtime-22.1-py3.9")
software_spec_uid
print(new_df)
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)
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'))
model_details = client.repository.store_model(model=regressor,meta_props={
    client.repository.ModelMetaNames.NAME: "resale_model",
    client.repository.ModelMetaNames.SOFTWARE_SPEC_UID: software_spec_uid,
    client.repository.ModelMetaNames.TYPE: "scikit-learn_1.0"
```

```
})
model_id = client.repository.get_model_id(model_details)
model_id
X_train[0]
regressor.predict([[2012.0, 179.0, '1500000', 12.0, 0, 0, 30, 1, 1, 4]])
```

Here we have implemented the pandas and numpy packages to read the input files as well to get the load and dump files in the pickle package. Here we have built the model with IBM Watson because we can't use always the application in offline we need a online source that every user can use the prediction methods. Where IBM cloud will deploy the application and we can get better user results of price of used car.

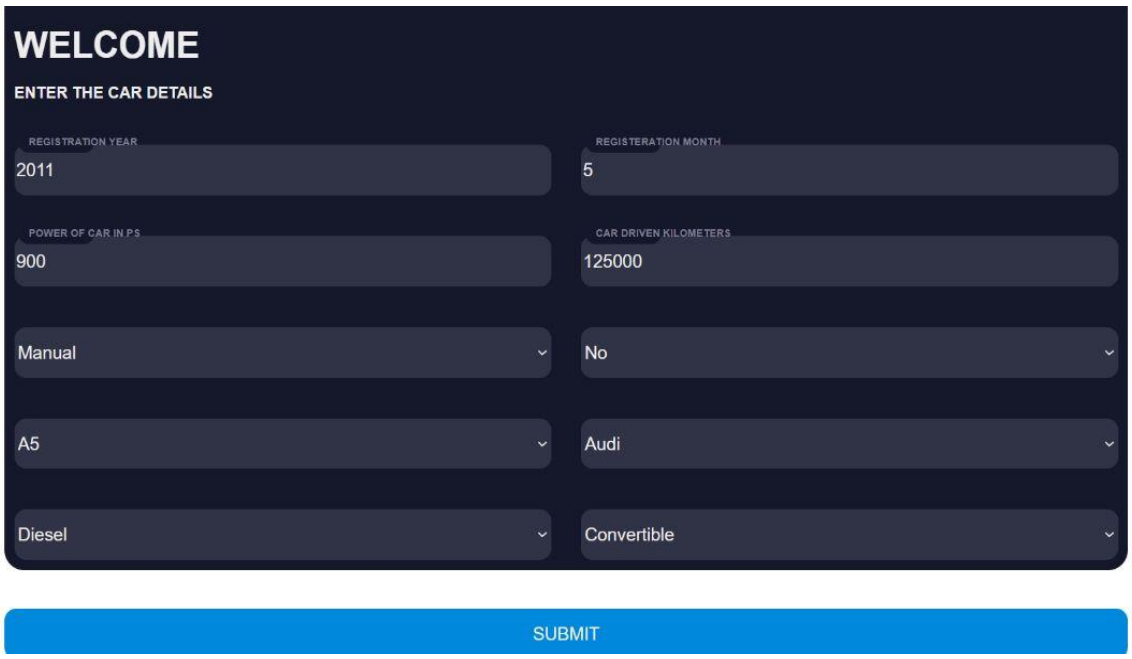
7.2 FEATURE 2

Always the user can't come to the Coding part and comes to get the results because the user don't know about the coding applications so the User builds need interactive website which user can easily catch the results by just entering the car functionalities and just the details of car.

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

app=Flask(_name_,template_folder='../IBM')
filename = 'resale_model.sav'
model_rand = pickle.load(open(filename,'rb'))

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

@app.route('/resaleintro.html')
def p():
    return render_template('resaleintro.html')

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

@app.route('/y_predict',methods=['GET','POST'])
def y_predict():
    regyear = int(request.form['regyear'])
    powerps = float(request.form['powerps'])
```

```
        kms = float(request.form['kms'])
        regmonth = int(request.form.get('regmonth'))
        gearbox = request.form['gearbox']
        damage = request.form['dam']
        model = request.form.get('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,'monthOfRegistr
    ation':regmonth,'gearbox':gearbox,'notRepairedDamage':damage,'model':model,'bra
    nd':brand,'fuelType':fuelType,'vehicleType':vehicletype}

        print(new_row)
        new_df =
    pd.DataFrame(columns=['vehicleType','yearOfRegistration','gearbox','powerPS','m
    odel','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)
            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('resalepredict.html',ypred="{:.2f}".format(y_prediction[0]))

    if_name_== '_main_':
        app.run(host='Localhost',debug=True,threaded=False)
```

```
Command Prompt - python /

D:\>cd D:\Projects\Car Resale Value Prediction\Flask

D:\Projects\Car Resale Value Prediction\Flask>python App.py
C:\Python310\lib\site-packages\scipy\__init__.py:146: UserWarning: A NumPy version >=1.16.5 and <1.23.0 is required for this version of SciPy (detected vers
ion 1.23.4
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
C:\Python310\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator DecisionTreeRegressor from version 1.1.1 when using version 1.
1.3. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
C:\Python310\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator RandomForestRegressor from version 1.1.1 when using version 1.
1.3. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
 * Serving Flask app 'App' (lazy loading)
 * Environment: production
   WARNING: This is a development server. Do not use it in a production deployment.
   Use a production WSGI server instead.
 * Debug mode: on
 * Restarting with stat
C:\Python310\lib\site-packages\scipy\__init__.py:146: UserWarning: A NumPy version >=1.16.5 and <1.23.0 is required for this version of SciPy (detected vers
ion 1.23.4
  warnings.warn(f"A NumPy version >={np_minversion} and <{np_maxversion}"
C:\Python310\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator DecisionTreeRegressor from version 1.1.1 when using version 1.
1.3. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
C:\Python310\lib\site-packages\sklearn\base.py:329: UserWarning: Trying to unpickle estimator RandomForestRegressor from version 1.1.1 when using version 1.
1.3. This might lead to breaking code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
 * Debugger is active!
 * Debugger PIN: 477-210-193
 * Running on http://Localhost:5000/ (Press CTRL+C to quit)
127.0.0.1 - - [19/Nov/2022 23:50:36] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [19/Nov/2022 23:50:43] "GET /resaleintro.html HTTP/1.1" 200 -
{'yearOfRegistration': 2011, 'powerPS': 900.0, 'kilometer': 125000.0, 'monthOfRegistration': 5, 'gearbox': 'manual', 'notRepairedDamage': 'No', 'model': Non
e, 'brand': 'audi', 'fuelType': 'diesel', 'vehicleType': 'convertible'}
D:\Projects\Car Resale Value Prediction\Flask\App.py:41: FutureWarning: The frame.append method is deprecated and will be removed from pandas in a future ve
rsion. Use pandas.concat instead.
```



CHAPTER - 8

TESTING

8.1 TEST CASES

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute
HOME_ PAGE_01	Functional	Home Page	User can See the Images and Hyper Links and visits the calculate Button	Internet Connectivity	1.Enter URL and click go 2.See the Images and Styles 3.Button to redirect page
PREDICTION_ PAGE_01	Functional	Predict	User can enter the values as their car condition	Car details	1.Enter URL Predict button and click go 2.User should enter the details 3. Verify UI elements: a. Text box b. Value scrolls c. Select options 3. User can click submit
RESULT PAGE	Functional	Result	User can able to see the car price		Only to see the Price

Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation(Y/N)	Executed By
	Home page Should Open	Working as expected	Pass	Improving CSS	N	Krithika Sree T
vehicleType','yearOfRegistration','gearbox','powerPS','model','kilometer','monthOfRegistration','fuelType','brand','notRepairedDamage'	1. User can able to see the input page. 2. User can enter the values. 3. Values able to enter	Working as expected	Pass	Nill	N	Malavika.T
	User can see the Car Resale Price	Working as expected	Pass	Nill	N	Krithika Sree T

8.2 USER ACCEPTANCE TESTING

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	5	5	1	1	12
Duplicate	1	0	0	0	1
External	0	0	0	0	0
Fixed	4	4	1	1	10
Not Reproduced	0	0	0	0	0
Skipped	1	1	0	0	2
Won't Fix	0	0	0	0	0
Totals	11	10	2	2	25

Section	TotalCases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	10	0	0	10
Security	2	0	1	1
Final Report Output	5	0	0	5
Version Control	2	0	0	2

CHAPTER - 9

RESULTS

Fig : Project Output

9.1 PERFORMANCE METRICS

S. No.	Parameter	Values	Screenshot
1.	Metrics	**Regression Model:** MAE - , MSE - , RMSE - , R2 score - **Classification Model:** Confusion Matrix - , Accuray Score- & Classification Report -	**{'mae': 1325.112086905962, 'mse': 9577053.62710202, 'rmse': 3094.6815065692977, 'rmsle': 8.03744027403009, 'r2': 0.8661221626879432, 'adj_r2_score': 0.8661152969113608}**

2.	Tune the Model	Hyperparameter Tuning - Validation Method -	`y_pred = regressor.predict(X_test)`
			`print(r2_score(Y_test,y_pred))`
			`0.8310350387286918`

CHAPTER - 10
ADVANTAGES & DISADVANTAGES

ADVANTAGES

- **Used car sellers (dealers):** They are one of the biggest target groups that can be interested in results of this study. If used car sellers better understand what makes a car desirable, what the important features are for a used car, then they may consider this knowledge and offer a better service.

- **Online pricing services:** There are websites that offers an estimate value of a car. They may have a good prediction model. However, having a second model may help them to give a better prediction to their users. Therefore, the model developed in this study may help online web services that tells a used car's market value.

- **Individuals:** There are lots of individuals who are interested in the used car market at some points in their life because they wanted to sell their car or buy a used car. In this process, it's a big corner to pay too much or sell less then it's market value

- Able to give accurate and acceptable price for both buyer and seller.
- Have range of option on buying on budget.
- Helps in saving money than giving to brokerage.

DISADVANTAGES

- Poor checking and invalid information affect the value of prediction.
- Cars are limited usage vehicles some people only could afford this basis on knowledge-based purchasing.

CHAPTER - 11
CONCLUSION

We started with understanding the use case of machine learning in the Automotive industry and how machine learning has transformed the driving experience. We build a Random Forest Regression model to predict the resale value of a used car. Finally, we evaluated the performance of the model using the R squared score and Residual Plot. We could have also used simpler regression algorithms like Linear Regression and Lasso Regression. Still, we need to make sure there are no outliers in the dataset before implementing them. Pair plots and scatter plots help visualize the outliers. Then we have used a Flask application to display the predicted value to the users based on their corresponding input. This car resale value prediction can be used by the public to estimate the resale value of the car. The increased prices of new cars and the financial incapability of the customers to buy them, Used Car sales are on a global increase. Therefore, there is an urgent need for a Used Car Price Prediction system which effectively determines the worthiness of the car using a variety of features. The proposed system will help to determine the accurate price of used car price prediction. This paper compares 3 different algorithms for machine learning: Linear Regression, Lasso Regression and Ridge Regression.

CHAPTER - 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.

CHAPTER - 13
APPENDIX

13.1 SOURCE CODE

13.1.1 App.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 pickle


app=Flask(_name_,template_folder='../IBM')
filename = 'resale_model.sav'
model_rand = pickle.load(open(filename,'rb'))

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

@app.route('/resaleintro.html')
def p():
    return render_template('resaleintro.html')

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

@app.route('/y_predict',methods=['GET','POST'])
def y_predict():
    regyear = int(request.form['regyear'])
    powerps = float(request.form['powerps'])
    kms = float(request.form['kms'])
    regmonth = int(request.form.get('regmonth'))
    gearbox = request.form['gearbox']
    damage = request.form['dam']
    model = request.form.get('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':regmont
h,'gearbox':gearbox,'notRepairedDamage':damage,'model':model,'brand':brand,'fuelType':fuelTy
pe,'vehicleType':vehicletype}

    print(new_row)
    new_df =
pd.DataFrame(columns=['vehicleType','yearOfRegistration','gearbox','powerPS','model','kilomet
er','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)
        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('resalepredict.html',ypred="{:.2f}".format(y_prediction[0]))

if__name__== '_main_':
    app.run(host='Localhost',debug=True,threaded=False)
```

index.html

```
<!DOCTYPE html>
<html>

<head>
    <title> CAR RESALE VALUE PREDICTION</title>
    <style>
        body {
            font-family: 'Lato', sans-serif;
            font-weight: 400;
            font-size: 16px;
            line-height: 1.7;
            color: #eee;
        }

        .header {
            height: 100vh;
            background-image:
                linear-gradient(to right bottom,
                    rgba(45, 46, 47, 0.8),
                    rgba(30, 108, 217, 0.8)),
                url('https://wallpaperaccess.com/full/20687.jpg');

            background-size: cover;
            background-position: top;
            position: relative;

            clip-path: polygon(0 0, 100% 0, 100% 75vh, 0 100%);
        }

        .brand-box {
            position: absolute;
            top: 40px;
```

```
    left: 40px;
}

.brand {
    font-size: 20px;
}

.text-box {
    position: absolute;
    top: 50%;
    left: 50%;
    transform: translate(-50%, -50%);
    text-align: center;
}

.heading-primary {
    color: #fff;
    text-transform: uppercase;

    backface-visibility: hidden;
    margin-bottom: 30px;
}

.heading-primary-main {
    display: block;
    font-size: 26px;
    font-weight: 400;
    letter-spacing: 5px;
}

.heading-primary-sub {
    display: block;
    font-size: 18px;
    font-weight: 700;
    letter-spacing: 7.4px;
}

.btn:link,
.btn:visited {
    text-transform: uppercase;
    text-decoration: none;
    padding: 10px 20px;
    display: inline-block;
    border-radius: 100px;
    transition: all .2s;
    position: relative;
}

.btn:hover {
    transform: translateY(-3px);
    box-shadow: 0 10px 20px rgba(0, 0, 0, 0.2);
}

.btn:active {
```

```
            transform: translateY(-1px);
            box-shadow: 0 5px 10px rgba(0, 0, 0, 0.2);
        }

        .btn-white {
            background-color: #fff;
            color: #777;
            font-size: 14px;
        }
    </style>
</head>

<body>
    <header class="header">
        <div class="brand-box">
            <span class="brand">PNT2022TMID18719</span>
        </div>

        <div class="text-box">
            <h1 class="heading-primary">
                <span class="heading-primary-main">CAR RESALE VALUE PREDICTION</span>
                <span class="heading-primary-sub"> PREDICT THE CAR PRICE</span>
            </h1>
            <a href="resaleintro.html" class="btn btn-white btn-animated">Predict..!!</a>
        </div>
    </header>

</body>

</html>
```

resaleintro.html

```
<!DOCTYPE html>
<html>

<head>
    <title> CAR RESALE VALUE PREDICTION</title>
    <style>
        body {
            align-items: center;
            background-color: lime;
            display: flex;
            justify-content: center;
            height: auto;
        }

        .form {
            background-color: #15172b;
            border-radius: 20px;
            box-sizing: border-box;
            height: auto;
            padding: 10px;
```

```
    margin-top: 30px;
    width: 100%;
}

.title {
    color: #eee;
    font-family: sans-serif;
    font-size: 36px;
    font-weight: 600;
    margin-top: 20px;
}

.subtitle {
    color: #eee;
    font-family: sans-serif;
    font-size: 16px;
    font-weight: 600;
    margin-top: 10px;
}

.input-container {
    height: 50px;
    position: relative;
    width: 100%;
}

.ic1 {
    margin-top: 40px;
}

.ic2 {
    margin-top: 30px;
}

.input {
    background-color: #303245;
    border-radius: 12px;
    border: 0;
    box-sizing: border-box;
    color: #eee;
    font-size: 18px;
    height: 100%;
    outline: 0;
    width: 100%;
}

.cut {
    background-color: #15172b;
    border-radius: 10px;
    height: 20px;
    left: 20px;
    position: absolute;
    top: -20px;
    transform: translateY(0);
```

```
    transition: transform 200ms;
    width: 76px;
}

.cut-short {
    width: 50px;
}

.input:focus~.cut,
.input:not(:placeholder-shown)~.cut {
    transform: translateY(8px);
}

.placeholder,
.option {
    color: #65657b;
    font-family: sans-serif;
    left: 20px;
    line-height: 14px;
    pointer-events: none;
    position: absolute;
    transform-origin: 0 50%;
    transition: transform 200ms, color 200ms;
    top: 20px;
}

.input:focus~.placeholder,
.input:not(:placeholder-shown)~.placeholder {
    transform: translateY(-30px) translateX(10px) scale(0.75);
}

.input:not(:placeholder-shown)~.placeholder {
    color: #808097;
}

.input:focus~.placeholder {
    color: #dc2f55;
}

.submit {
    background-color: #08d;
    border-radius: 12px;
    border: 0;
    box-sizing: border-box;
    color: #eee;
    cursor: pointer;
    font-size: 18px;
    height: 50px;
    margin-top: 38px;
    text-align: center;
    width: 100%;
}

.submit:active {
```

```
            background-color: #06b;
        }
    </style>
    <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">
</head>

<body>
    <form action="/y_predict" method="post">
        <div class="container">
            <div class="form">
                <div class="title">WELCOME</div>
                <div class="subtitle">ENTER CAR DETAILS</div>
                <div class="row">
                    <div class="input-container ic1  col-sm-6">
                        <input id="regyear" class="input" type="text" name="regyear" required
placeholder=" " />
                        <div class="cut"></div>
                        <label for="regyear" class="placeholder">REGISTRATION YEAR</label>
                    </div>
                    <div class="input-container ic1 col-sm-6">
                        <input id="regmonth" class="input" type="text" name="regmonth"
required  placeholder=" " />
                        <div class="cut"></div>
                        <label for="regmonth" class="placeholder">REGISTRATION MONTH</label>
                    </div>

                </div>
                <div class="row">
                    <div class="input-container ic1  col-sm-6">
                        <input id="powerps" class="input" type="text" name="powerps"
required  placeholder=" " />
                        <div class="cut"></div>
                        <label for="powerps" class="placeholder">POWER OF CAR IN PS</label>
                    </div>
                    <div class="input-container ic1 col-sm-6">
                        <input id="kms" class="input" type="text" name="kms" required  placeholder="
" />
                        <div class="cut"></div>
                        <label for="kms" class="placeholder">CAR DRIVEN KILOMETERS</label>
                    </div>
                </div>
                <div class="row">
                    <div class="input-container ic1  col-sm-6">
                        <select id="gearbox" class="input" name="gearbox" required >
                            <option selected disabled> GEAR BOX TYPE</option>
                            <option value="manual">Manual</option>
                            <option value="automatic">Automatic</option>
                            <option value="not-declared">Not-Declared</option>
                        </select>
                    </div>
                    <div class="input-container ic1  col-sm-6">
                        <select id="dam" class="input" name="dam" required >
                            <option selected disabled>CAR IS DAMAGED OR REPAIRED</option>
```

```
                <option value="No">No</option>
                <option value="Yes">Yes</option>
                <option value="not-declared">Not-Declared</option>
              </select>
            </div>
          </div>
          <div class="row">
            <div class="input-container ic1  col-sm-6">
              <select id="modeltype" class="input" name="modeltype" required >
                <option selected disabled>MODEL TYPE</option>
                <option value="80">80</option>
                <option value="90">90</option>
                <option value="100">100</option>
                <option value="145">145</option>
                <option value="147">147</option>
                <option value="156">156</option>
                <option value="159">159</option>
                <option value="200">200</option>
                <option value="500">500</option>
                <option value="850">850</option>
                <option value="900">900</option>
                <option value="911">911</option>
                <option value="9000">9000</option>
                <option value="1_reihe">1_Reihe</option>
                <option value="1er">1Er</option>
                <option value="2_reihe">2_Reihe</option>
                <option value="3_reihe">3_Reihe</option>
                <option value="300c">300C</option>
                <option value="3er">3Er</option>
                <option value="4_reihe">4_Reihe</option>
                <option value="5_reihe">5_Reihe</option>
                <option value="5er">5Er</option>
                <option value="6_reihe">6_Reihe</option>
                <option value="6er">6Er</option>
                <option value="7er">7Er</option>
                <option value="a_klasse">A_Klasse</option>
                <option value="a1">A1</option>
                <option value="a2">A2</option>
                <option value="a3">A3</option>
                <option value="a4">A4</option>
                <option value="a5">A5</option>
                <option value="a6">A6</option>
                <option value="a8">A8</option>
                <option value="accord">Accord</option>
                <option value="agila">Agila</option>
                <option value="alhambra">Alhambra</option>
                <option value="almera">Almera</option>
                <option value="altea">Altea</option>
                <option value="amarok">Amarok</option>
                <option value="andere">Andere</option>
                <option value="antara">Antara</option>
                <option value="arosa">Arosa</option>
                <option value="astra">Astra</option>
                <option value="auris">Auris</option>
```

```
<option value="avensis">Avensis</option>
<option value="aveo">Aveo</option>
<option value="aygo">Aygo</option>
<option value="b_klasse">B_Klasse</option>
<option value="b_max">B_Max</option>
<option value="beetle">Beetle</option>
<option value="berlingo">Berlingo</option>
<option value="bora">Bora</option>
<option value="boxster">Boxster</option>
<option value="bravo">Bravo</option>
<option value="c_klasse">C_Klasse</option>
<option value="c_max">C_Max</option>
<option value="c_reihe">C_Reihe</option>
<option value="c1">C1</option>
<option value="c2">C2</option>
<option value="c3">C3</option>
<option value="c4">C4</option>
<option value="c5">C5</option>
<option value="caddy">Caddy</option>
<option value="calibra">Calibra</option>
<option value="captiva">Captiva</option>
<option value="carisma">Carisma</option>
<option value="carnival">Carnival</option>
<option value="cayenne">Cayenne</option>
<option value="cc">Cc</option>
<option value="ceed">Ceed</option>
<option value="charade">Charade</option>
<option value="cherokee">Cherokee</option>
<option value="citigo">Citigo</option>
<option value="civic">Civic</option>
<option value="cl">Cl</option>
<option value="clio">Clio</option>
<option value="clk">Clk</option>
<option value="clubman">Clubman</option>
<option value="colt">Colt</option>
<option value="combo">Combo</option>
<option value="cooper">Cooper</option>
<option value="cordoba">Cordoba</option>
<option value="corolla">Corolla</option>
<option value="corsa">Corsa</option>
<option value="cr_reihe">Cr_Reihe</option>
<option value="croma">Croma</option>
<option value="crossfire">Crossfire</option>
<option value="cuore">Cuore</option>
<option value="cx_reihe">Cx_Reihe</option>
<option value="defender">Defender</option>
<option value="delta">Delta</option>
<option value="discovery">Discovery</option>
<option value="discovery_sport">Discovery_Sport</option>
<option value="doblo">Doblo</option>
<option value="ducato">Ducato</option>
<option value="duster">Duster</option>
<option value="e_klasse">E_Klasse</option>
<option value="elefantino">Elefantino</option>
```

```
<option value="eos">Eos</option>
<option value="escort">Escort</option>
<option value="espace">Espace</option>
<option value="exeo">Exeo</option>
<option value="fabia">Fabia</option>
<option value="fiesta">Fiesta</option>
<option value="focus">Focus</option>
<option value="forester">Forester</option>
<option value="forfour">Forfour</option>
<option value="fortwo">Fortwo</option>
<option value="fox">Fox</option>
<option value="freelander">Freelander</option>
<option value="fusion">Fusion</option>
<option value="g_klasse">G_Klasse</option>
<option value="galant">Galant</option>
<option value="galaxy">Galaxy</option>
<option value="getz">Getz</option>
<option value="gl">Gl</option>
<option value="glk">Glk</option>
<option value="golf">Golf</option>
<option value="grand">Grand</option>
<option value="i_reihe">I_Reihe</option>
<option value="i3">I3</option>
<option value="ibiza">Ibiza</option>
<option value="impreza">Impreza</option>
<option value="insignia">Insignia</option>
<option value="jazz">Jazz</option>
<option value="jetta">Jetta</option>
<option value="jimny">Jimny</option>
<option value="juke">Juke</option>
<option value="justy">Justy</option>
<option value="ka">Ka</option>
<option value="kadett">Kadett</option>
<option value="kaefer">Kaefer</option>
<option value="kalina">Kalina</option>
<option value="kalos">Kalos</option>
<option value="kangoo">Kangoo</option>
<option value="kappa">Kappa</option>
<option value="kuga">Kuga</option>
<option value="laguna">Laguna</option>
<option value="lancer">Lancer</option>
<option value="lanos">Lanos</option>
<option value="legacy">Legacy</option>
<option value="leon">Leon</option>
<option value="lodgy">Lodgy</option>
<option value="logan">Logan</option>
<option value="lupo">Lupo</option>
<option value="lybra">Lybra</option>
<option value="m_klasse">M_Klasse</option>
<option value="m_reihe">M_Reihe</option>
<option value="materia">Materia</option>
<option value="matiz">Matiz</option>
<option value="megane">Megane</option>
<option value="meriva">Meriva</option>
```

```
<option value="micra">Micra</option>
<option value="mii">Mii</option>
<option value="modus">Modus</option>
<option value="mondeo">Mondeo</option>
<option value="move">Move</option>
<option value="musa">Musa</option>
<option value="mustang">Mustang</option>
<option value="mx_reihe">Mx_Reihe</option>
<option value="navara">Navara</option>
<option value="niva">Niva</option>
<option value="not-declared">Not-Declared</option>
<option value="note">Note</option>
<option value="nubira">Nubira</option>
<option value="octavia">Octavia</option>
<option value="omega">Omega</option>
<option value="one">One</option>
<option value="outlander">Outlander</option>
<option value="pajero">Pajero</option>
<option value="panda">Panda</option>
<option value="passat">Passat</option>
<option value="phaeton">Phaeton</option>
<option value="picanto">Picanto</option>
<option value="polo">Polo</option>
<option value="primera">Primera</option>
<option value="ptcruiser">Ptcruiser</option>
<option value="punto">Punto</option>
<option value="q3">Q3</option>
<option value="q5">Q5</option>
<option value="q7">Q7</option>
<option value="qashqai">Qashqai</option>
<option value="r19">R19</option>
<option value="range_rover">Range_Rover</option>
<option value="range_rover_evoque">Range_Rover_Evoque</option>
<option value="range_rover_sport">Range_Rover_Sport</option>
<option value="rangerover">Rangerover</option>
<option value="rav">Rav</option>
<option value="rio">Rio</option>
<option value="roadster">Roadster</option>
<option value="roomster">Roomster</option>
<option value="rx_reihe">Rx_Reihe</option>
<option value="s_klasse">S_Klasse</option>
<option value="s_max">S_Max</option>
<option value="s_type">S_Type</option>
<option value="s60">S60</option>
<option value="samara">Samara</option>
<option value="sandero">Sandero</option>
<option value="santa">Santa</option>
<option value="scenic">Scenic</option>
<option value="scirocco">Scirocco</option>
<option value="seicento">Seicento</option>
<option value="serie_2">Serie_2</option>
<option value="serie_3">Serie_3</option>
<option value="sharan">Sharan</option>
<option value="signum">Signum</option>
```

```
                <option value="sirion">Sirion</option>
                <option value="sl">Sl</option>
                <option value="slk">Slk</option>
                <option value="sorento">Sorento</option>
                <option value="spark">Spark</option>
                <option value="spider">Spider</option>
                <option value="sportage">Sportage</option>
                <option value="sprinter">Sprinter</option>
                <option value="stilo">Stilo</option>
                <option value="superb">Superb</option>
                <option value="swift">Swift</option>
                <option value="terios">Terios</option>
                <option value="tigra">Tigra</option>
                <option value="tiguan">Tiguan</option>
                <option value="toledo">Toledo</option>
                <option value="touareg">Touareg</option>
                <option value="touran">Touran</option>
                <option value="transit">Transit</option>
                <option value="transporter">Transporter</option>
                <option value="tt">Tt</option>
                <option value="tucson">Tucson</option>
                <option value="twingo">Twingo</option>
                <option value="up">Up</option>
                <option value="v_klasse">V_Klasse</option>
                <option value="v40">V40</option>
                <option value="v50">V50</option>
                <option value="v60">V60</option>
                <option value="v70">V70</option>
                <option value="vectra">Vectra</option>
                <option value="verso">Verso</option>
                <option value="viano">Viano</option>
                <option value="vito">Vito</option>
                <option value="vivaro">Vivaro</option>
                <option value="voyager">Voyager</option>
                <option value="wrangler">Wrangler</option>
                <option value="x_reihe">X_Reihe</option>
                <option value="x_trail">X_Trail</option>
                <option value="x_type">X_Type</option>
                <option value="xc_reihe">Xc_Reihe</option>
                <option value="yaris">Yaris</option>
                <option value="yeti">Yeti</option>
                <option value="ypsilon">Ypsilon</option>
                <option value="z_reihe">Z_Reihe</option>
                <option value="zafira">Zafira</option>

            </select>
        </div>
        <div class="input-container ic1  col-sm-6">
            <select id="brand" class="input" name="brand" required >
                <option selected disabled>CAR BRAN</option>
                <option value="audi">Audi</option>
                <option value="alfa_romeo">Alfa_Romeo</option>
                <option value="fiat">Fiat</option>
                <option value="volvo">Volvo</option>
```

```
                <option value="saab">Saab</option>
                <option value="porsche">Porsche</option>
                <option value="mazda">Mazda</option>
                <option value="peugeot">Peugeot</option>
                <option value="bmw">Bmw</option>
                <option value="chrysler">Chrysler</option>
                <option value="mercedes_benz">Mercedes_Benz</option>
                <option value="honda">Honda</option>
                <option value="opel">Opel</option>
                <option value="seat">Seat</option>
                <option value="nissan">Nissan</option>
                <option value="volkswagen">Volkswagen</option>
                <option value="hyundai">Hyundai</option>
                <option value="mitsubishi">Mitsubishi</option>
                <option value="lancia">Lancia</option>
                <option value="toyota">Toyota</option>
                <option value="renault">Renault</option>
                <option value="chevrolet">Chevrolet</option>
                <option value="suzuki">Suzuki</option>
                <option value="kia">Kia</option>
                <option value="citroen">Citroen</option>
                <option value="ford">Ford</option>
                <option value="jaguar">Jaguar</option>
                <option value="skoda">Skoda</option>
                <option value="rover">Rover</option>
                <option value="smart">Smart</option>
                <option value="mini">Mini</option>
                <option value="lada">Lada</option>
                <option value="daewoo">Daewoo</option>
                <option value="jeep">Jeep</option>
                <option value="daihatsu">Daihatsu</option>
                <option value="subaru">Subaru</option>
                <option value="dacia">Dacia</option>
                <option value="land_rover">Land_Rover</option>
                <option value="trabant">Trabant</option>
                <option value="sonstige_autos">Sonstige_Autos</option>
            </select>
        </div>
    </div>
    <div class="row">
        <div class="input-container ic1  col-sm-6">
            <select id="fuel" class="input" name="fuel" required >
                <option selected disabled>FUEL TYPE</option>
                <option value="petrol">Petrol</option>
                <option value="diesel">Diesel</option>
                <option value="lpg">Lpg</option>
                <option value="hybrid">Hybrid</option>
                <option value="cng">Cng</option>
                <option value="electric">Electric</option>
                <option value="not-declared">Not-Declared</option>
                <option value="others">Others</option>
            </select>
        </div>
        <div class="input-container ic1  col-sm-6">
```

```
                    <select id="vehicletype" class="input" name="vehicletype" required >
                      <option selected disabled>VEHICLE TYPE</option>
                      <option value="convertible">Convertible</option>
                      <option value="limousine">Limousine</option>
                      <option value="combination">Combination</option>
                      <option value="coupe">Coupe</option>
                      <option value="samll car">Samll Car</option>
                      <option value="bus">Bus</option>
                      <option value="not-declared">Not-Declared</option>
                      <option value="others">Others</option>
                    </select>
                  </div>
                </div>

              </div>
              <button type="text" class="submit">SUBMIT</button>
            </div>
            </div>
          </form>
        </body>

        </html>
```

resalepredict.html

```
        <!DOCTYPE html>
        <html>

        <head>
          <title> CAR RESALE VALUE PREDICTION</title>
          <style>
            body {
              font-family: Avenir, Helvetica;
            }

            h1 {
              text-align: center;
              font-size: 4.5em;
            }

            h2 {
              text-align: center;
              font-size: 2em;
              font-weight: normal;
              font-style: italic;
            }

            h3 {
              font-size: 2em;
              font-weight: bold;
              margin: 3% 20% 1% 20%;
            }
```

```
h4 {
    font-size: 1.5em;
    font-weight: bold;
    margin: 3% 20% 1% 20%;
}

p {
    font-size: 1.2em;
    margin: 1% 20%;
}

li {
    font-size: 1.2em;
    font-weight: bold;
    margin: 1% 20%;
}

footer {
    font-family: Avenir, Helvetica;
    text-align: center;
    font-size: 0.8em;
    margin: 0 20%;
}

figure {
    width: 50%;
    display: block;
    margin-left: auto;
    margin-right: auto;
    margin-top: 2%;
    margin-bottom: 2%;
    background-color: white;
    border-width: 5px;
    border-style: solid;
    border-color: White;
}

.img-block {
    display: block;
    width: 100%;
}

figcaption {
    text-align: right;
    font-size: 0.8em;
}

.block {
    width: 90%;
    margin-left: auto;
    margin-right: auto;
    margin-top: 2%;
    margin-bottom: 2%;
    background-color:  linear-gradient rgba(76, 216, 255, 0.8);
```

```
        }
    </style>
    <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/4.7.0/css/font-awesome.min.css">
</head>

<body>

    <body style="text-align: center;">
        <div class="block">
            <br>
            <br>
            <h1>THE PREDICTED RESALE VALUE  OF THE CAR IS </h1>
            <h2><i class="fa fa-inr"></i>{{ypred}}</h2>
    </body>
</div>
</html>
```

13.2 GITHUB & PROJECT DEMO LINK

13.2.1 GITHUB

https://github.com/IBM-EPBL/IBM-Project-26179-1660020275

13.2.2 PROJECT DEMO LINK

https://drive.google.com/file/d/1S8sH7CSXTbGsjrUO2yYHkNI6BA9nsjxv/view?usp=sharing