IBM NALAIYA THIRAN

APPLIED DATASCIENCE

CAR RESALE VALUE PREDICTION

PROJECT REPORT

TEAM ID : PNT2022TMID30206

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

KNOWLEDGE INSTITUTE OF TECHNOLOGY,

SALEM-637504

CAR RESALE VALUE PREDICTION

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CHAPTER – 1

INTRODUCTION

1.1 PROJECT OVERVIEW

With difficult economic conditions, it is likely that sales of second-hand imported (reconditioned) cars and used cars will increase. In many developed countries, it is common to lease a car rather than buying it outright. After the lease period is over, the buyer has the possibility to buy the car at its residual value, i.e. its expected resale value. Thus, it is of commercial interest to sellers/financiers to be able to predict the salvage value (residual value) of cars with accuracy.

In order to predict the resale value of the car, we proposed an intelligent, flexible, and effective system that is based on using regression algorithms. Considering the main factors which would affect the resale value of a vehicle a regression model is to be built that would give the nearest resale value of the vehicle. We will be using various regression algorithms and algorithm with the best accuracy will be taken as a solution, then it will be integrated to the web-based application where the user is notified with the status of his product.

1.2 PURPOSE

The purpose of this project is to develop machine learning models that can accurately predict the price of a used car based on its features. We implement and evaluate various learning methods on a dataset consisting of the sale prices of different makes and models. We will compare the performance of various machine learning algorithms like Linear Regression, Ridge Regression, Lasso Regression, Decision Tree Regression, Random forest regression, XGBoost and choose the best out of it. Depending on various parameters, we

will determine the price of the car. Regression Algorithms are used because they provide us with continuous value as an output and not a categorized value because of which it will be possible to predict the actual price of 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.

CHAPTER – 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

Cars depreciation is the difference between how much your cars was worth when you bought it and what it's worth when you sell it. The value of the car goes down over time with the wear and tear of everyday use. The existing web applications such as cars24 and olxautos does not include all the factors of the car to prediction the cars price.As well as they do not include the factors like engine capacity, max power for prediction

2.2 SURVEY

2.2.1. CAR PRICE PREDICTION [Abhay Yadav, Chavi Ralhan ET AL, 2022]

India has a considerable size of car sales on top of the world day-to-day many buyers usually sell their cars after using for the time to another buyer, they name them as second possessor. Numerous platforms such as cars24.com, OLX.com that come up with these buyers with a platform where they can sell their old cars, but what should be the price of the car, this is the long-lasting query ever by using Machine Learning algorithms and they lead a response to this issue. Using a history of previous used car sales data and machine learning methodologies like Supervised Learning, they used to predict a fair price for the car. They also used machine learning techniques like Random Forest and Extra Tree Regression

2.2.2. USED CAR PRICE PREDICTION AND LIFE SPAN [Aditya Nikhade, Rohan Borde, 2021]

The predictions are based on dataset collected from various websites and Kaggle Websites mostly. This project will compare all this data to all regression algorithms and performance of various machine learning algorithms such as Linear Regression, Ridge Regression, Decision tree Regression and choose the best out of it. Depending on various parameters, the project will determine the price of a car and compare the prices of old cars with new cars. The life span of the car can be determined using Government regulations and Company claims. Apart from various factors, they also consider GPS navigator to predict the price of the car.

2.2.3. Car Price Prediction Using Machine Learning [Ketan Agrahari, Ayush Chaubey ET AL, 2021]

The rise of online websites and other tools like it have made it easier for both buyers and sellers to get a better understanding of the factors that determine the market value of a used car. Based on a set of factors, Machine Learning algorithms may be used to forecast the price of any automobile. The cost is calculated using the amount of characteristics. They used linear regression and lasso regression to develop a price model for used automobiles in a comparative research. The main goal of this study is to discover the best predictive model for estimating the price of a used car.

2.2.4. Used Car Price Prediction using K-Nearest Neighbour Based Model [Samruddhi, Ashok Kumar, 2020]

In this paper, they proposed a model to estimate the cost of the used cars using the K nearest neighbour algorithm which is simple and suitable for small

data set. Here, they have collected a used cars dataset and analysed the same. The data was trained by the model and examined the accuracy of the model among different ratios of trained and test set. The same model is cross-validated for assessing the performance of the model using the K- Fold method which is easy to understand and implement. They have used the K nearest Neighbour algorithm and got accuracy 85% where the accuracy of linear regression is 71%. The proposed model is also validated with 5 and 10 folds by using K Fold Method. The experimental analysis shows that the proposed model is fitted as the optimized model.

2.2.5. Car Price Prediction using Machine Learning Techniques [Enis Gegic, Becir Isakovic ET AL, 2019]

The major step in this prediction process is collection and pre-processing of the data. In this research, PHP scripts were built to normalize, standardize and clean data to avoid unnecessary noise for machine learning algorithms. To build a model that predicting the price of used cars in Bosnia and Herzegovina, they applied three machine learning techniques (Artificial Neural Network, Support Vector Machine and Radom Forest). However, the mentioned techniques were applied to work as an ensemble. The data used for the prediction was collected from the web portal autopijaca.ba using a web scraper that was written in PHP programming language. Respective performances of different algorithms were then compared to find one that best suits the available data set.

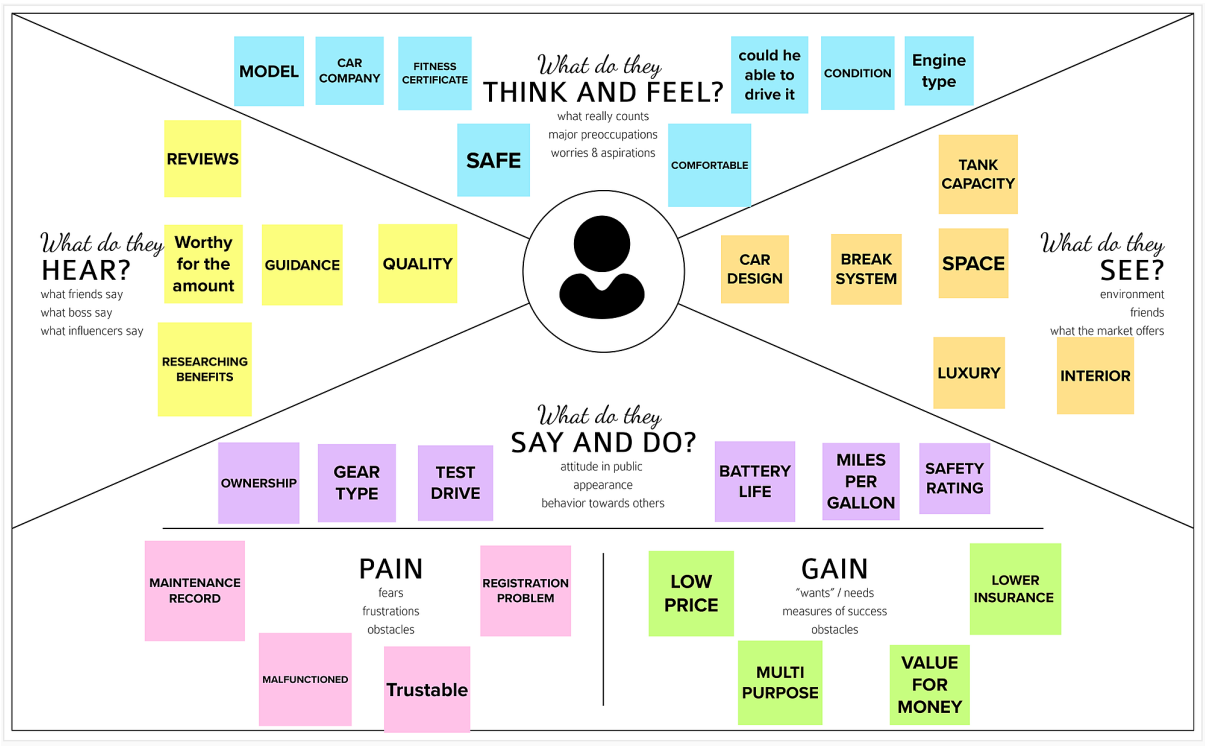
2.3 PROBLEM STATEMENT DEFINITION

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Businessman	Buy a car for my personal use	Don't have Time to search and predict	Of lot of work pressure	Frustrated
PS-2	Travel agent owner	Buy a car for my travel agency	Can't predict the value	Changing market value	Depressed
PS-3	Family man	Buy a car for my family use	Not able to choose the right one	Trying to find a Car that fits my budget	Sorrowful
PS-4	Dealer	Sell a car to the customers	Not able to predict the exact value	Different car has different features	Confused
PS-5	Racer	Buy a sports car	The cars are costly	Higher horse power	Distressed

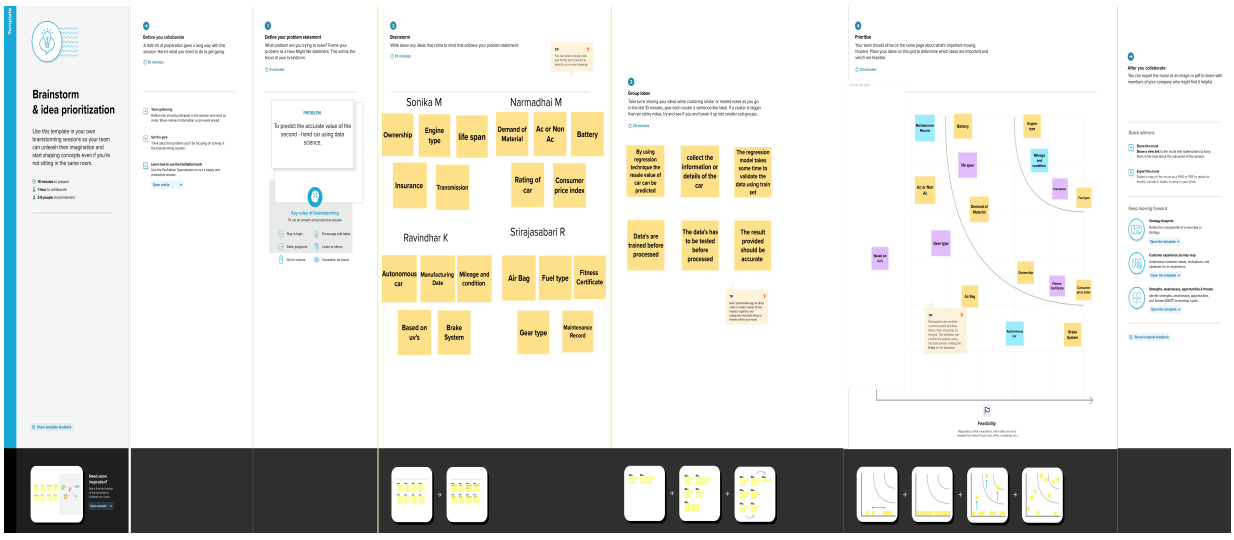
CAR RESALE VALUE PREDICTION

CHAPTER - 3
IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTROMING



3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To Predict the value of the used car using Data Science
2.	Idea / Solution description	Pre-owned car are more popular in developing country. People Who plan to purchase used car often struggle to find a within a budget as well as to predict the price of the second-hand car. So our project helps a potential buyer to estimate the price of a Second-hand car. Analysis Data using various Machine learning algorithm.
3.	Novelty / Uniqueness	We predict Car price mainly based on availability of spare part currently and capitalization chart is provided accordingly.
4.	Social Impact / Customer Satisfaction	By Using this application Customer can know the price of car in the market and chart provided user to create good maintenance and make quality of car.
5.	Business Model (Revenue Model)	Dealing with spare parts makes our idea futuristic and we provided detail information through chart. Being clear and unique, it attracts more customer leading higher revenue.
6.	Scalability of the Solution	Whatever may be the vehicle type or count of vehicle, this system predicts the appropriate resale value If Multiple user access the system at same time, it process scalable.

3.4 PROBLEM SOLUTION FIT

CHAPTER - 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

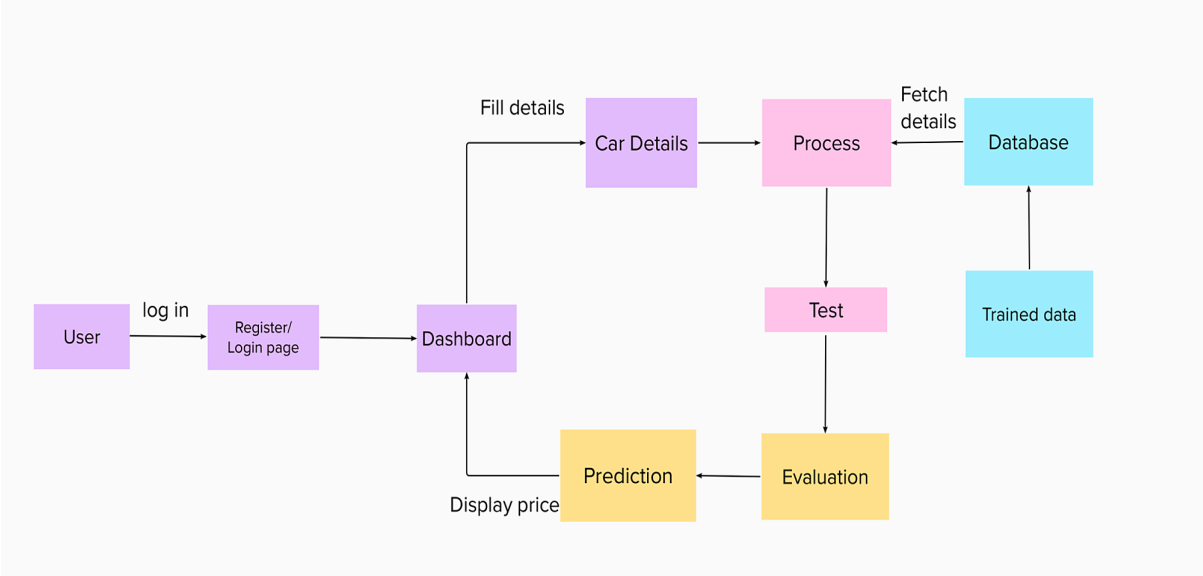
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Phone number Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Login	Login using credentials
FR-4	Car's Data	Fill in the required data
FR-5	Prediction	Analyses the car's price
FR-6	Mail	Provide the analysed data via chart

4.2 NON-FUNCTIONAL REQUIREMENTS

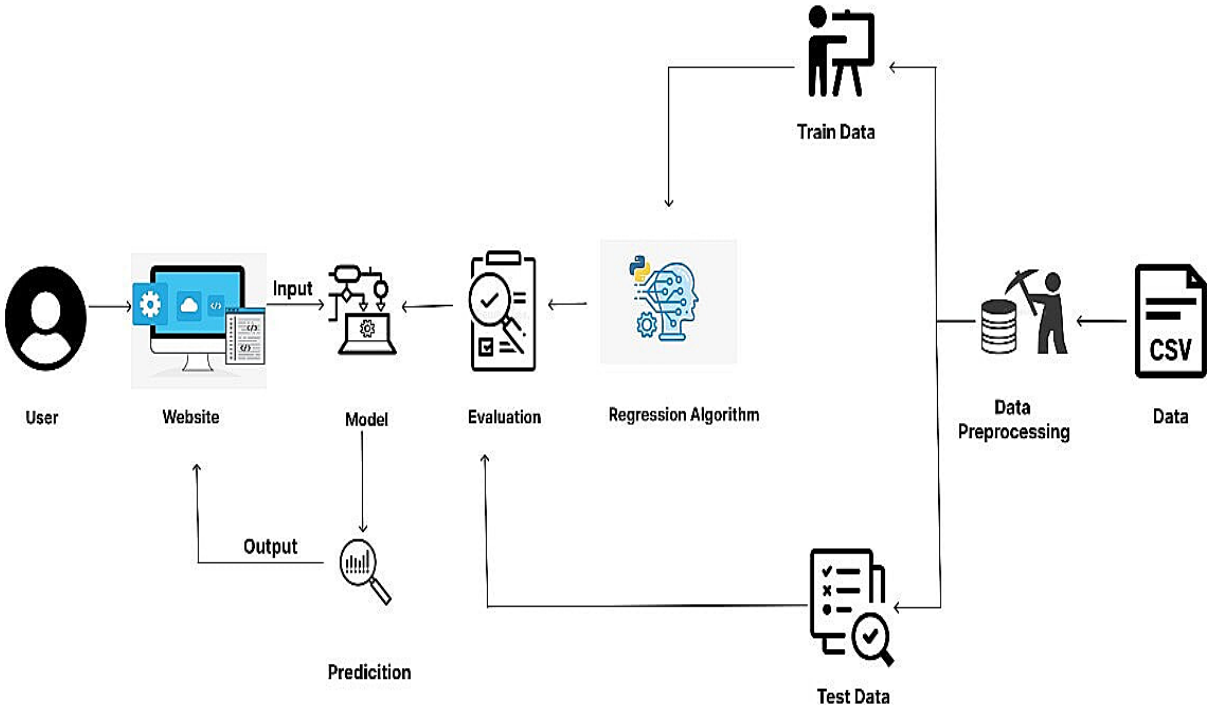
NFR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to predict car's price.
NFR-2	**Security**	Two step verification.
NFR-3	**Reliability**	Prediction of accurate car's resale value.
NFR-4	**Performance**	Reducing overall load time.
NFR-5	**Availability**	Can be accessed anytime and anywhere. Available for everyone.
NFR-6	**Scalability**	Multiple users can access the website at same time.

CHAPTER - 5
PROJECT DESIGN

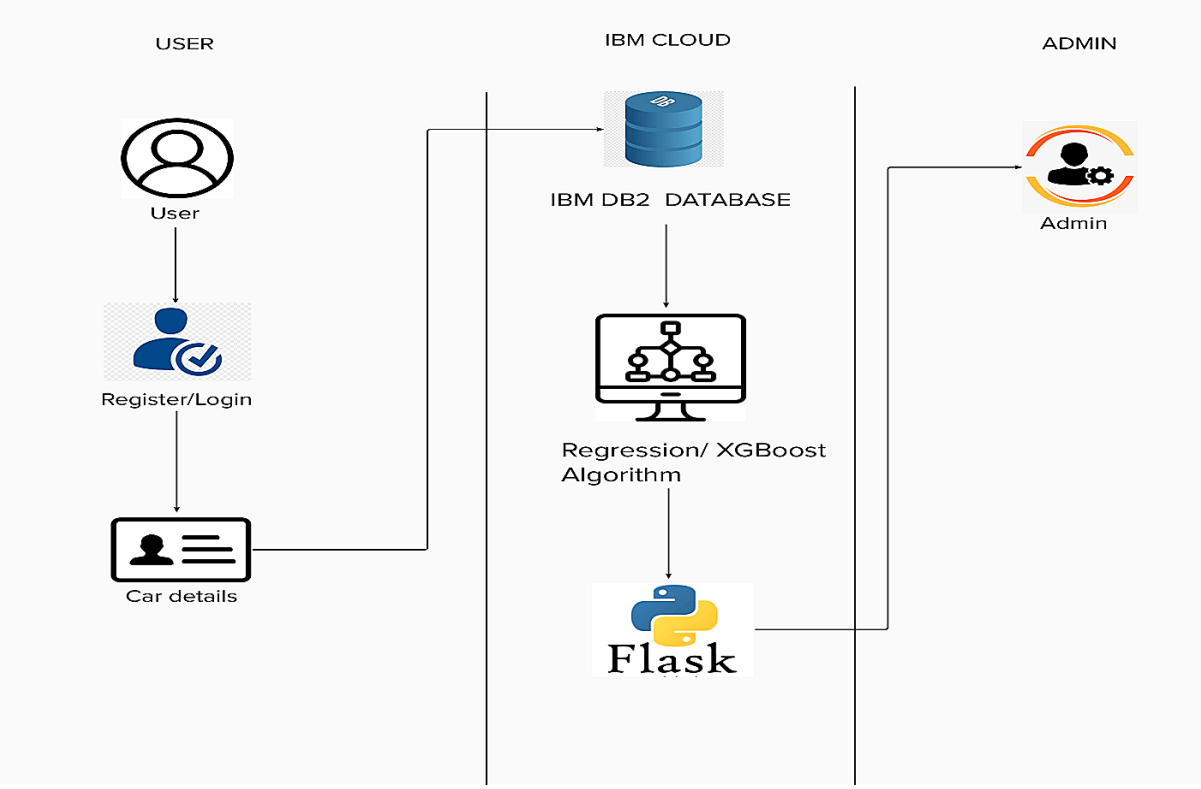
5.1 DATA FLOW DIAGRAM



5.2 SOLUTION & TECHNICAL ARCHITECTURE



SOLUTION ARCHITECTURE



TECHNICAL ARCHITECTURE

5.3 USER STORIES

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation emailonce I have registered for the application	I can receive confirmati onemail & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through mobile number	I can register & access the dashboard using mobile number	Medium	Sprint-1
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard	Medium	Sprint-1

	Login	USN-5	As a user, I can log into the application by entering email & password	I can access thedashboard	High	Sprint-1
	Dashboard	USN-6	As a user, I can visit the home page	I can edit my profile	Medium	Sprint-1
	Car details	USN-7	As a user, I should give the car details like car model, engine and fuel type, etc…	I should the give cardetails	High	Sprint-2
	Car Price	USN-8	As a user, I can view the current rate of the used car price	I know the car price	High	Sprint-4
Admin	Model Building	USN-9	As an admin, I should train and test the given dataset	I can build the train andtest model	High	Sprint-3
	Prediction Chart	USN-10	As an admin, I should send the prediction chart and the nearest service centre location	I can provide chart	Medium	Sprint-3
	Predict	USN-11	As an admin, I will predict the price	I can predict the car price	High	Sprint-4

CHAPTER - 6

PROJECT PLANNING & SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirmingmy password.	5	High	Ravindhar K
Sprint-1		USN-2	As a user, I can register for the application through Mobile number.	3	Low	Sonika M
Sprint-1		USN-3	As a user, I can register for the application through Gmail	4	Medium	Ravindhar K
Sprint-1	Login	USN-4	As a user, I can log into the application by entering email & password	5	High	Srirajasabari R
Sprint-2	Car details	USN-5	As a user, I should give the car details like carmodel, engine and fuel type, etc.	5	High	Sonika M
Sprint-4	Car price	USN-6	As a user, I can view the predicted rate of theused car price.	5	High	Narmadhai M
Sprint-3	User detail	USN-7	As a admin, I should store details of user.	6	Medium	Srirajasabai R
Sprint-2	Data Pre-Processing	USN-8	As a admin, I should clean and pre-process data using pandas.	5	High	Sonika M
Sprint-2		USN-9	As a admin, I should train and test the datasetusing learn.	5	High	Narmadhai M
Sprint-3	Model Building	USN-10	As an admin, I should predict the accuracy ofdata using supervised machine learning.	12	High	Narmadhai M
Sprint-4	API	USN-11	As an admin, I should connect the presentation tier, logic tier and data tier using python flask.	10	High	Ravindhar K
Sprint-4	Notification	USN-12	As an admin, I should send the prediction chart via mail	5	Medium	Srirajasabari R

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	17	8 Days	22 Oct 2022	29 Oct 2022	29 Oct 2022	29 Oct 2022
Sprint-2	15	4 Days	31 Oct 2022	03 Nov2022	03 Nov 2022	05 Nov 2022
Sprint-3	18	5 Days	04 Nov 2022	08 Nov 2022	08 Nov 2022	12 Nov 2022
Sprint-4	20	4 Days	09 Nov 2022	12 Nov 2022	12 Nov 2022	18 Nov 2022

Velocity:

$$\text{AVERAGE VELOCITY} = \frac{sprintduration}{velocity}$$

Average velocity of sprint-1: AV = 17/8 = 2.125

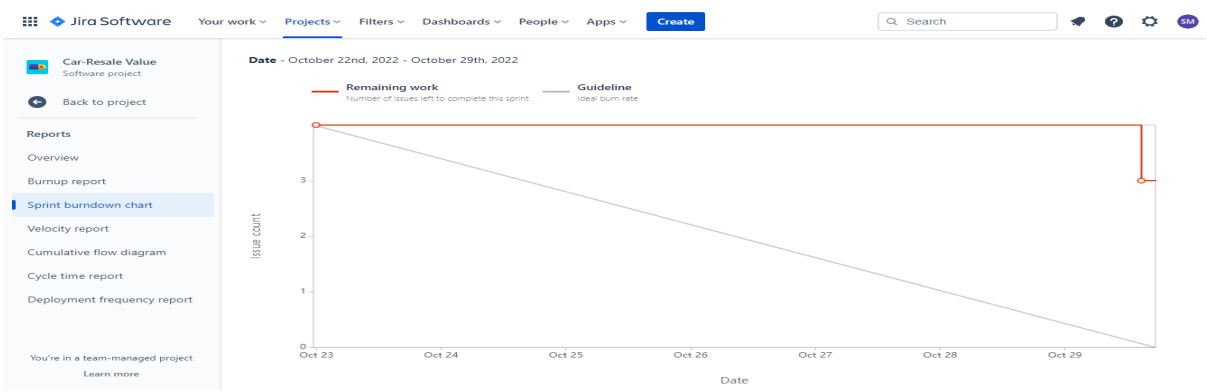
Average velocity of sprint-2: AV = 15/4 = 3.75

Average velocity of sprint-3: AV = 18/5 = 3.6

Average velocity of sprint-4: AV = 20/4 = 5

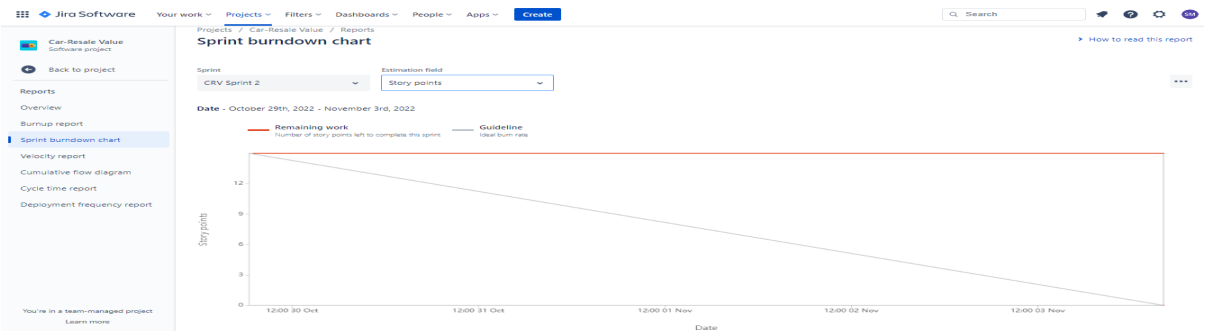
6.3 REPORTS FROM JIRA

BURNDOWN CHART

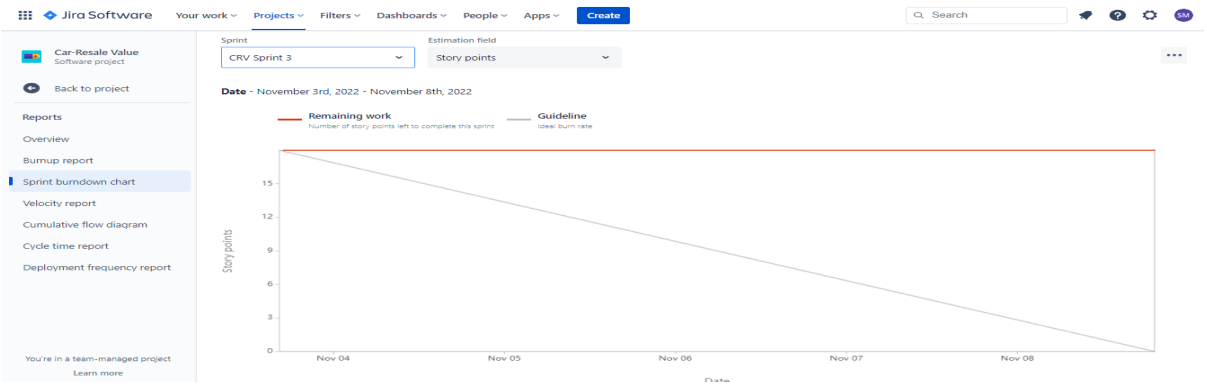


SPRINT - 1

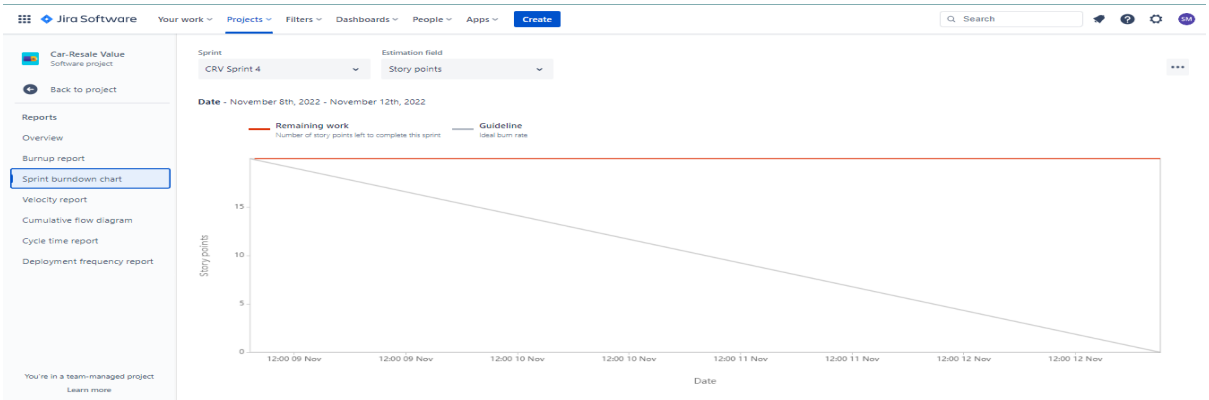
CAR RESALE VALUE PREDICTION



SPRINT - 2

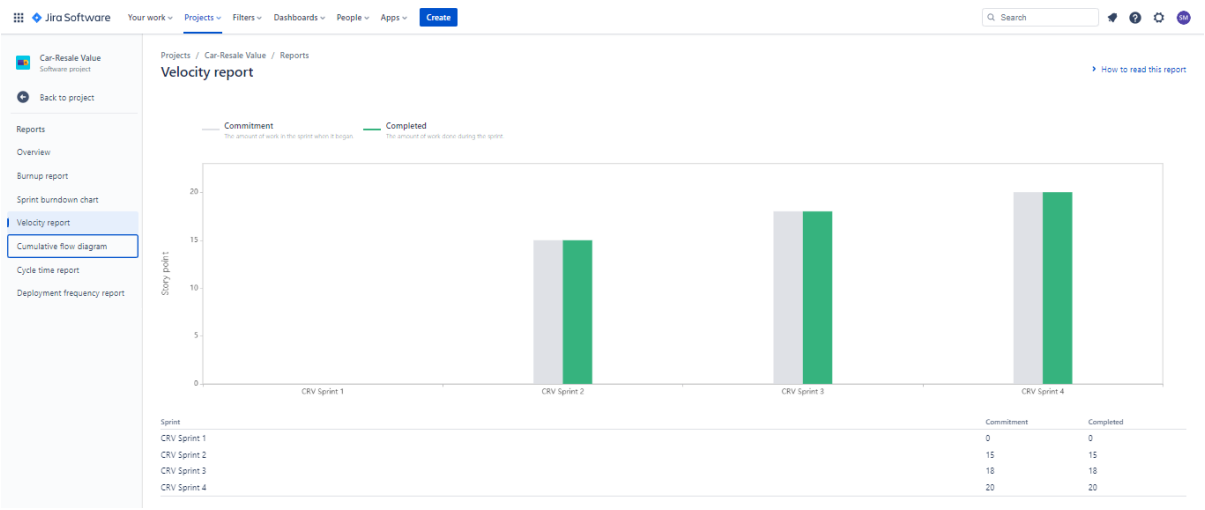


SPRINT - 3

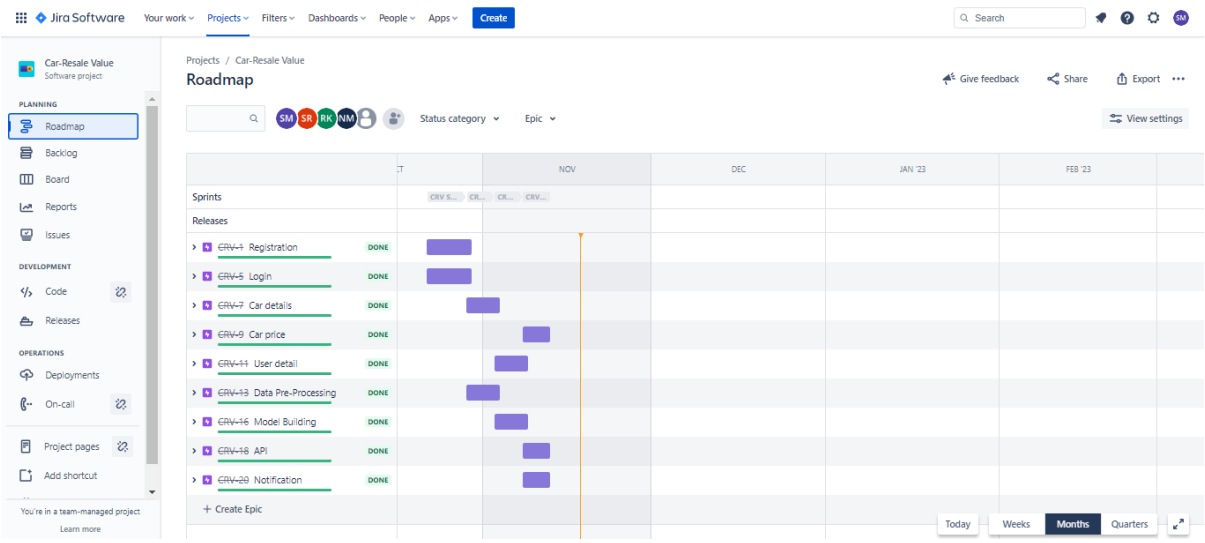


SPRINT-4

VELOCITY CHART



ROADMAP



CHAPTER-7

CODING & SOLUTIONING

FEATURE 1

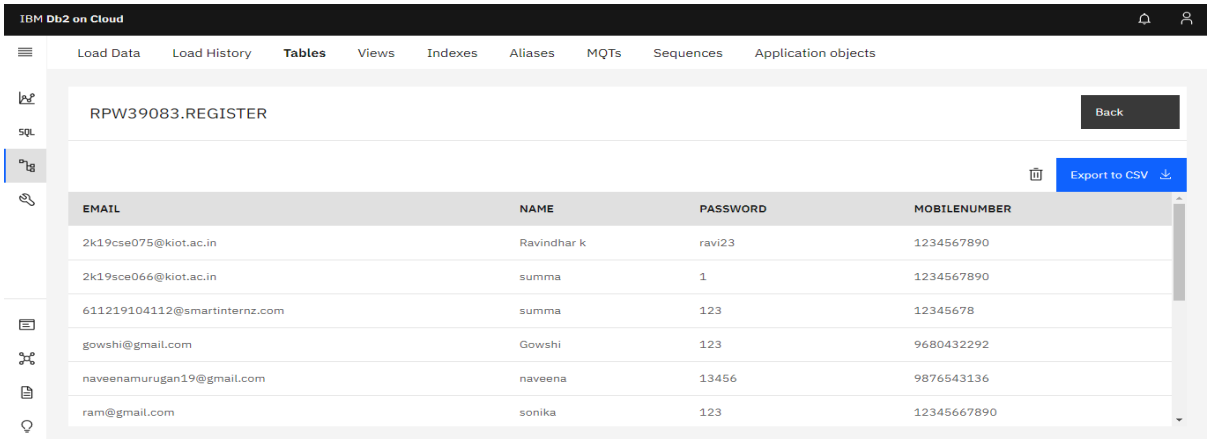
The used car price mainly depends on the brand, model, vehicle age, kilometer driven, Transmission type and fuel type but we also include max power, engine capacity, owner type and number of seats available in that car to predict the accurate rate and this factors also play a major role in choosing the second - hand car and to fix the price of the car.We compare the performance of various machine learning algorithms like Linear Regression, Ridge Regression, Lasso Regression, Decision Tree Regression, Random forest regression, XGBoost and choose the best out of it.

FEATURE 2

Charts are often used to ease understanding of large quantities of data and the relationships between parts of the data. Charts can usually be read more quickly than the raw data. The chart is provided to users registered mail ID to understand the difference between their input value and dataset value and they can know whether their car is in good condition to sale or not.

DATABASE SCHEMA

When the user registered to our web application their details like mail ID, Name, password and mobile number gets stored in IBM Cloud (IBM Db2)



EMAIL	NAME	PASSWORD	MOBILENUMBER
2k19cse075@kiot.ac.in	Ravindhar k	ravi23	1234567890
2k19sce066@kiot.ac.in	summa	1	1234567890
611219104112@smartinternz.com	summa	123	12345678
gowshi@gmail.com	Gowshi	123	9680432292
naveenamurugan19@gmail.com	naveena	13456	9876543136
ram@gmail.com	sonika	123	12345667890

CHAPTER - 8

TESTING

8.1 TEST CASES

We usually write two different classes of tests for Machine Learning systems:

- Pre-train tests
- Post-train tests

Pre-train tests:

The intention is to write such tests which can be run without trained parameters so that we can catch implementation errors early on. This helps in avoiding the extra time and effort spent in a wasted training job. It includes Ensuring a gradient step training on a batch of data leads to a decrease in the lossdata profiling assertions

Post-train tests:

Post-train tests are aimed at testing the model's behavior.invariance tests which involve testing the model by tweaking only one feature in a data point and checking for consistency in model predictions.

8.2 USER ACCEPTANCE TESTING

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

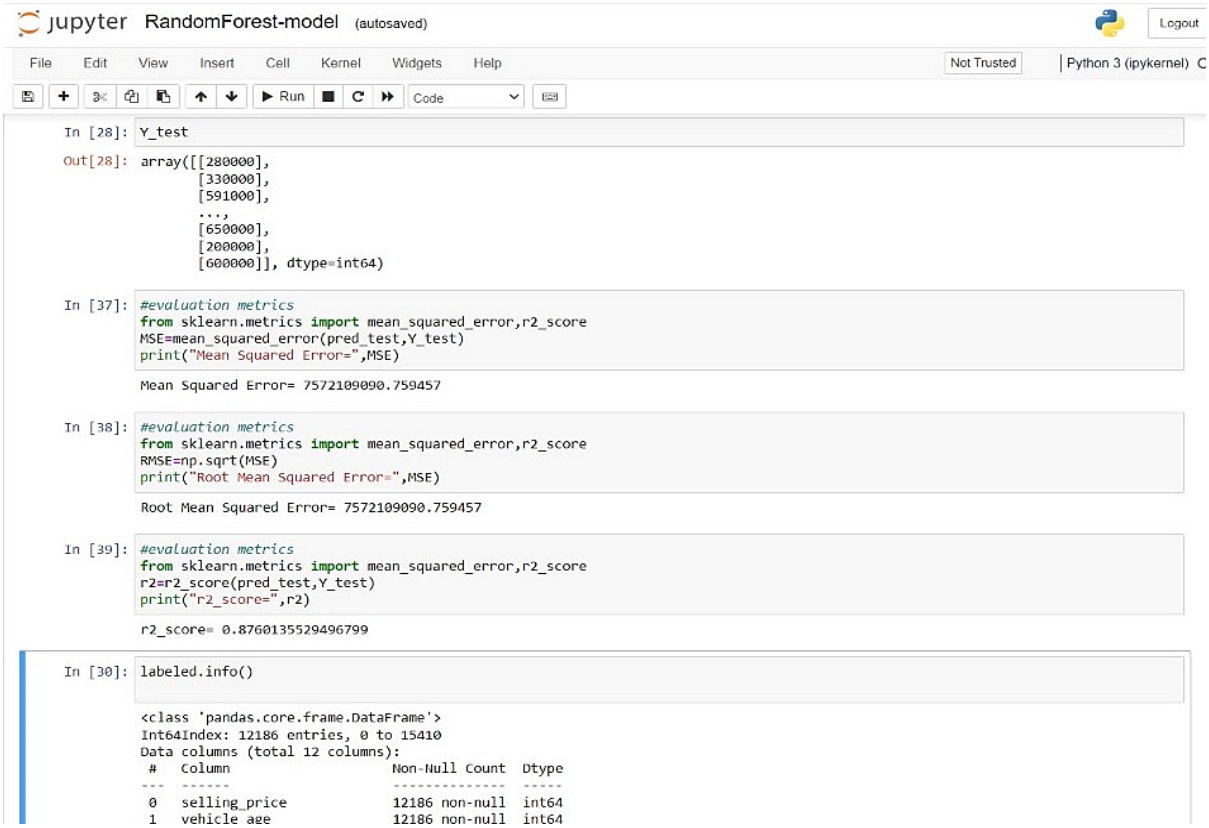
CHAPTER - 9

RESULTS

9.1 PERFORMANCE METRICS

Random Forest Regression is used in model building to predict the accurate rate. Random Forest Regression is a supervised learning algorithm that uses ensemble learning method for regression.

We compare the performance of various machine learning algorithms like Linear Regression, Ridge Regression, Lasso Regression, Decision Tree Regression, Random forest regression and XGBoost Alogorithm among these algorithms Random Forest Regression provides 98% accuracy in train data and 88% accuracy in test data. In Regression model, the performance testing like mean square error, root mean square error and r2 score has been evaluated.



CHAPTER - 10

ADVANTAGES & DISADVAANTAGES

ADVANTAGES

- This project helps the user to know the used car price accurately.
- This project helps the car dealers to fix the second - hand car rate according to the result of the prediction.
- Chart is provided to the user to understand the difference between their input value and dataset value and they can know whether their car is in good condition to sale or not.

DISADVANTAGES

- The dataset which is used for prediction is only applicable for indian cars and for specified brand and model.
- No 100% accuracy in prediction.

CHAPTER - 11

CONCLUSION

Car price prediction can be a challenging task due to the high number of attributes that should be considered for the accurate prediction and in the situation of increasing the prices of new cars in the market there is necessity of used car selling in every Taluka level for those people who are unable to buy high priced new cars. Therefore, there is the necessity of a car Price Prediction system which will determine the value of the car using a variety of features. The major step in the prediction process is collection and preprocessing of the data. The uses of this model system will help to determine the accurate price of used car price prediction. With a help of most of survey paper we create a model this using Random Forest regression algorithm and we can create a UI application for that.

CHAPTER - 12

FUTURE SCOPE

This Project In machine learning model that will be connected with may dataset and with various website which can provide real time data for price prediction Will Stored in their site or GitHub. Also, we may add big amount of data of car price which can help an improve accuracy of the machine learningmodel. We also trying to develop an android app as user interface for interacting and user-friendly with user. For better performance of the model, we also plan a to use neural network

CHAPTER - 13

APPENDIX

SOURCE CODE

index.html

```
<!DOCTYPE html>
<html>
<head>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/6.2.0/css/all.min.css">
<link rel="stylesheet" href="{{url_for('static', filename='css/index.css')}}">
</head>
<body>
<img src="{{url_for('static', filename='css/image_5.jpeg')}}" style="width:100%;height:100%;position:absolute;border-radius:0;opacity:0.6">
<div id="image">
<img src="{{url_for('static', filename='css/groot.jpeg')}}" style="opacity:0.9">
<button id="name_1" onclick="up()">Sign Up</button>
<button id="name_2" onclick="down()">Sign In</button>
</div>
<div id="sign_up" class="animate">
<form id="fom1" align="center" action="/adduser" method="POST">
<input type="text" placeholder="Name"  name="name"required id="fom1"><br>
<input type="email" placeholder="Email"  name="email"><br>
<input id="pwd" type="password" placeholder="Password" name="password"required><br>
<input id="pwd" type="password" placeholder="Retype-Password" name="repassword"required><br>
<input type="text" placeholder="Phone" name="mobilenumber"required><br><br>
<input value="Sign up" type="submit">
```

```
<input value="Reset" type="reset">
</form>
</div>
<div id="sign_in" align="center" class="animate">
<form action="/login" method="POST">
<input type="email" placeholder="Email"name="email" required><br>
<input id="pwd" type="password" placeholder="Password"name="password"
required><br><br>
<label><input type="checkbox">Remember me</label><br><br>
<label><input id="submit" value="Sign in" type="submit"></label>
<p>----------------------------------------------------</p>
<div id="icon1">
<a href="{{url_for("google")}}" style="text-decoration:none;color:white">
<i class="fab fa-google"></i>
<p id="cwg">continue with google</p>
</a>
</div>
</form>
</div>
<script>
function up(){
document.getElementById("sign_up").style.display="block";
document.getElementById("sign_in").style.display="none";
}
function down(){
document.getElementById("sign_in").style.display="block";
document.getElementById("sign_up").style.display="none";
}
</script>
</body>
</html>
```

app.py

```
from flask import Flask, render_template, request, redirect, url_for, session,
redirect, request
import requests
import ibm_db
app=Flask(__name__)
GOOGLE_CLIENT_ID = "564634383443-
f47nsem7k4kl0julaj8j1bn1fkcf3t71.apps.googleusercontent.com"
GOOGLE_CLIENT_SECRET = "GOCSPX-
uR0PnKeKFBaf0kvTu0S_AvBF18QH"
REDIRECT_URI = '/google/auth'
conn = None
##connecting database db2
try:
   conn = ibm_db.connect("DATABASE=bludb;HOSTNAME=824dfd4d-99de-
440d-9991-
629c01b3832d.bs2io90l08kqb1od8lcg.databases.appdomain.cloud;PORT=3011
9;SECURITY=SSL;SSLServerCertificate=DigiCertGlobalRootCA.crt;UID=rp
w39083;PWD=V7tkkK8SHe1YYXjy;PROTOCOL=TCPIP",",")
   print("Successfully connected with db2")
except:
   print("Unable to connect: ", ibm_db.conn_errormsg())
@app.route('/')
@app.route('/entry')
def entry():
   return render_template('index.html')
##Google authentication:
@app.route("/google")
def google():
   return
redirect(f"https://accounts.google.com/o/oauth2/v2/auth?scope=https://www.go
ogleapis.com/auth/userinfo.profile&access_type=offline&include_granted_scop
es=true&response_type=code&redirect_uri=http://127.0.0.1:5000/google/auth&
client_id={GOOGLE_CLIENT_ID}")
```

```
@app.route("/google/auth")
def google_auth():
    r = requests.post("https://oauth2.googleapis.com/token",
    data={
        "client_id": GOOGLE_CLIENT_ID,
        "client_secret": GOOGLE_CLIENT_SECRET,
        "code": request.args.get("code"),
        "grant_type": "authorization_code",
        "redirect_uri": "http://127.0.0.1:5000/google/auth"
    })
    r =
requests.get(f'https://www.googleapis.com/oauth2/v2/userinfo?access_token={r.
json()["access_token"]}').json()
    print(r)
    return redirect("/details")
@app.route("/adduser", methods=["POST"])
def adduser():
    name = request.form.get("name")
    email = request.form.get("email")
    password = request.form.get("password")
    mobilenumber= request.form.get("mobilenumber")
    sql = "SELECT * FROM register WHERE email = ?"
    stmt = ibm_db.prepare(conn, sql)
    ibm_db.bind_param(stmt, 1, email)
    ibm_db.execute(stmt)
    account = ibm_db.fetch_assoc(stmt)
    if account:
        return render_template('index.html', msg="You are already a member,
please login using your details")
    else:
        insert_sql = "INSERT INTO register VALUES (?,?,?,?)"
        prep_stmt = ibm_db.prepare(conn, insert_sql)
        ibm_db.bind_param(prep_stmt, 1, email)
        ibm_db.bind_param(prep_stmt, 2, name)
```

```
        ibm_db.bind_param(prep_stmt, 3, password)
        ibm_db.bind_param(prep_stmt, 4, mobilenumber)
        ibm_db.execute(prep_stmt)
        return render_template('index.html', msg="You are Successfully Registered
with IMS, please login using your details")
@app.route("/login", methods=["POST"])
def login():
    email = request.form.get("email")
    password = request.form.get("password")
    sql = "SELECT * FROM register WHERE email = ?"
    stmt = ibm_db.prepare(conn, sql)
    ibm_db.bind_param(stmt, 1, email)
    ibm_db.execute(stmt)
    account = ibm_db.fetch_assoc(stmt)
    if not account:
        return render_template('index.html', msg="You are not yet registered,
please sign up using your details")
    else:
        if(password == account['PASSWORD']):
            email = account['EMAIL']
            name = account['NAME']
            return redirect(url_for('details'))
        else:
            return render_template('index.html', msg="Please enter the correct
password")
@app.route("/details")
def details():
    return render_template('main.html')
if __name__ == '__main__':
    app.run(host='0.0.0.0', port=5000)
```

13.2 GITHUB & PROJECT DEMO LINK

Github - https://github.com/IBM-EPBL/IBM-Project-17542-1659673150

Project Demo Link - https://youtu.be/24QcQd6fiLo

CHAPTER - 14

REFERENCE

1. Enis gegic, Becir Isakovic, Dino Keco, Zerina Masetic, Jasmin Kevric, ”Car Price Prediction Using Machine Learning”; (TEM Journal 2019)
2. Praful Rane1, Deep Pandya2, Dhawal Kotak "Used Car Price Prediction";(IRJET 2021)
3. Doan Van Thai, Luong Ngoc Son, Pham Vu Tien, NguyenNhat Anh, Nguyen Thi Ngoc Anh, “Prediction car pricesusing qualify qualitative data and knowledge-based system” (Hanoi National University)
4. Ning sun, Hongxi Bai, Yuxia Geng, Huizhu Shi, “Price Evaluation Model In Second Hand Car System Based On BP Neural Network Theory”; (Hohai University Changzhou, China)
5. **https://scikit-learn.org/stable/modules/classes.html :** Scikit-learn: Machine Learning in Python, Pedregosa et al., JMLR 12, pp. 2825-2830, 2011.
6. Listiani M. 2009. Support Vector Regression Analysis for Price Prediction in a Car Leasing Application. Master Thesis. Hamburg University of Technology