CAR RESALE VALUE PREDICTION
IN APPLIED DATA SCIENCE

NALAIYA THIRAN REPORT

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BONAFIDE CERTIFICATE

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ACKNOWLEDGEMENT

CAR RESALE VALUE PREDICTION

IN APPLIED DATA SCIENCE

I am very thankful to the management of SKP Engineering College, Tiruvannamalai for giving us this wonderful opportunity to study in this college and utilize all the facilities to the fullest.

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It is a Great pleasure to express my gratitude and thanks towards my project Guide **L.SANKARAN ,M.E** for his uninterruptable suggestions and words of improvements regarding this mini project, which played a major role in guiding me in my track.

We also extend our thanks to our Class Advisor and every member of the faculty who provided valuable academic guidance, and their co-operation to do this successful project. Finally, we would like to thank our parents, relatives and friends for their encouragement and enthusiastic co-operation.

ABSTRACT

This paper aims to build a model to predict used cars' reasonable prices based on multiple aspects, including vehicle mileage, year of manufacturing, fuel consumption, transmission, road tax, fuel type, and engine size. This model can benefit sellers, buyers, and car manufacturers in the used cars market. Upon completion, it can output a relatively accurate price prediction based on the information that user input. The model

building process involves machine learning and data science. The dataset used was scraped from listings of used cars. Various regression methods, including linear regression, polynomial regression, support vector regression, decision tree regression, and random forest regression, were applied in the research to achieve the highest accuracy. Before the actual start of model-building, this project visualized the data to understand the dataset better. The dataset was divided and modified to fit the regression, thus ensure the performance of the regression. To evaluate the performance of each regression, R-square was calculated. Among all regressions in this project, random forest achieved the highest R-square of 0.90416. Compared to previous research, the resulting model includes more aspects of used cars while also having a higher prediction accuracy.

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INTRODUCTION

➤ PROJECT OVERVIEW

- These estimates become the building blocks for our next step. We find little evidence that consumers “undervalue” future gasoline costs when purchasing cars.
- The highly interesting research area that noticed in the last few years is object detection and find out the prediction based on the features that can be benefited to consumers and the industry.
- The outcome of this experiment shows that clustering with linear regression and Random Forest model yield the best accuracy outcomes. Recent years have witnessed the rapid development of online shopping and ecommerce websites, e.g., eBay and OLX.
- Online shopping markets offer millions of products for sale each day. State-of-the-art methods can predict the price of only one item category.
- This proposed method utilizes a deep neural network involving long short-term memory (LSTM) and convolutional neural network architectures for price prediction.
- Using a dataset crawled from a website for second hand items, the proposed method of combining the predicted secondhand item quality score with the forecasted minimum and maximum price outperforms the other models in all of the used accuracy metrics with a significant performance gap.
- In order to standardize the evaluation standards of used car prices and improve the accuracy of used car price forecasts, the linear correlation between vehicle parameters, vehicle conditions, and transaction factors and used car price was comprehensively investigated, grey relational analysis was applied to filter the feature variables of factors affecting used car price, the traditional BP neural network was also optimized by combining the particle swarm optimization algorithm, and a used car price prediction method based on PSOGRA-BPNN was proposed.

➤ PROJECT PURPOSE

- The main idea of making a car resale value prediction system is to get hands-on practice for python using Data Science. Car resale value prediction is the system to predict the amount of resale value based on the parameters provided by the user.

- User enters the details of the car into the form given and accordingly the car resale value is predicted.

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

LITERATURE SURVEY

➢ Existing problem

1. The problem is defined as the optimised way to estimate insurance cost based on the manufacturer with some additional costs incurred by the Government in the form of taxes.

2. As the existingmethods for estimating the cost takes a lot of time and energy and due to the increased price of new cars and the inability of customers to buy new cars due to the lack of funds, used cars sales are on a global increase.

3. The prices of new cars in the industry is fixed by the So, customers buying a new car can be assured of the money they invest to be worthy.

4. There is a need for a used car price prediction system to effectively determine the worthiness of the car using a variety of features.

5. Even though there are websites that offer this service, their

   prediction method may not be the best.

6. Besides, different models and systems may contribute to predicting power for a used car's actual market value.

7. It is important to know their actual market value while both buying and selling.

➢ References

1. Sameerchand Pudaruth, "Predicting the Price of Used Cars using Machine Learning Techniques";(IJICT 2014)
2. Hossein Hadian Jazi, Hugo Gonzalez, Natalia Stakhanova, and Ali A. Ghorbani. "Detecting HTTP-based Application Layer DoS attacks on Web Servers in the presence of sampling." Computer Networks, 2017
3. Bridge, S. (2020, January 10). Why the value of used cars is rising for the first time in the UAE. Retrieved from arabianbusiness: https://www.arabianbusiness.com/retail/435520-whythe-value-of-used-cars-is-rising-for-the-first-time-in-the-uae.
4. NATIONAL TRANSPORT AUTHORITY. 2014. Available from: http://nta.gov.mu/English/Statistics/Pages/Archive.aspx [Accessed 15 January 2014].

➢ Problem Statement Definition

1. Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

2. A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

➤ **Problem Statements for Smart Fashion Recommender Application**

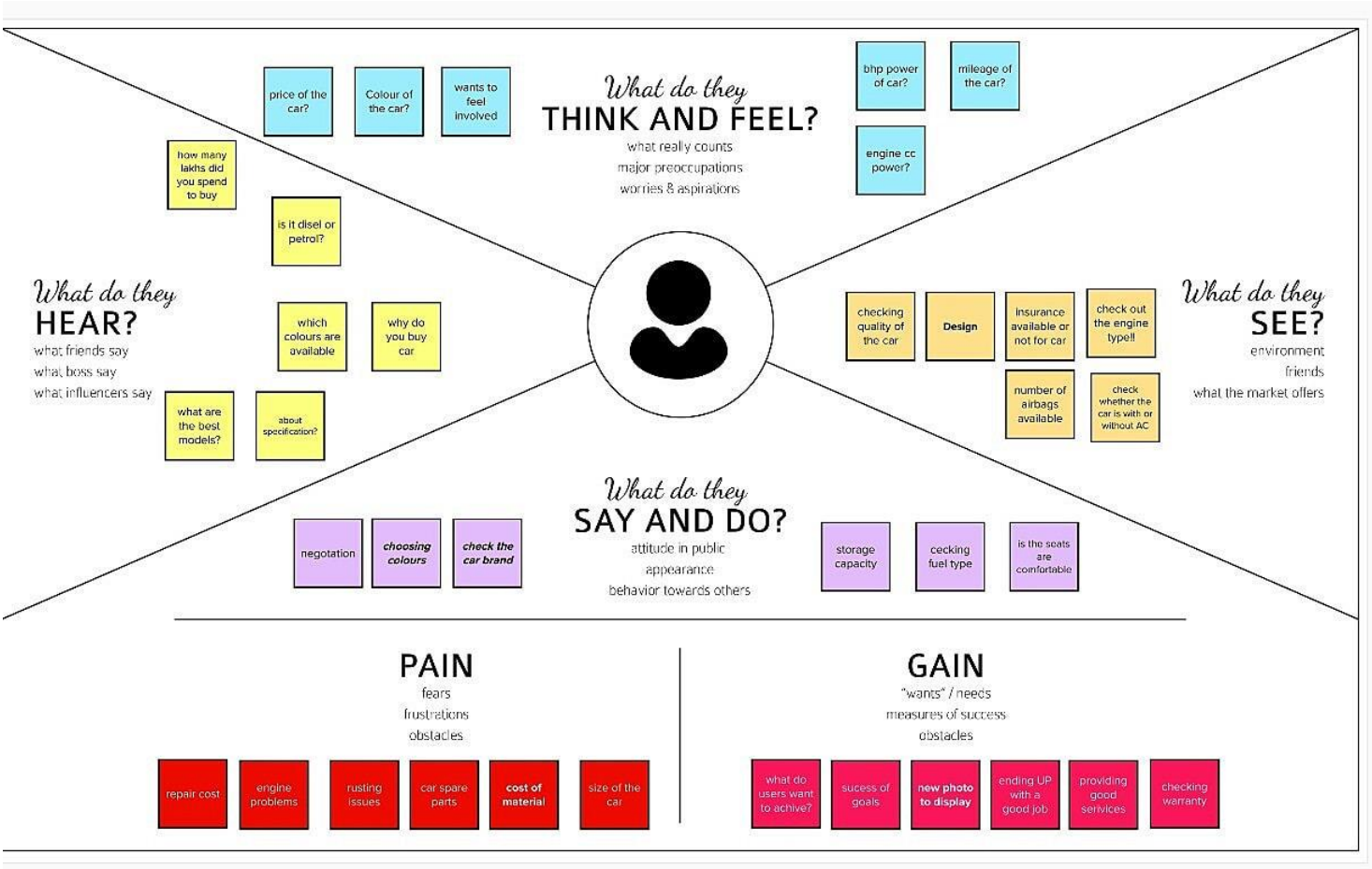
Problem Statement (PS)	**I am (Customer)**	**I'm tryingto**	**But**	**Because**	**Which makesme feel**
PS-1	I'm owner of CarTravels	I'm trying tobuy a Latest Resale Models of Cars for my Travel agency.	I can't find the one that I expect in local.	There is onlyfew Resale Cars are Available But I want a Bunch of Cars.	Like I should justby a new car instead of resale cars.
PS-2	I'm a Car Seller	I'm tryingto sell a Car with Best Price for my Purpose.	I'm not able to find the value/price of my old car.	My old car doesn't have a AC & Auto Pilot Mode So I want to sell it and buy a one.	Like I don'twant to sell my old car.
PS-2	I'm a Son	I'm trying to buy a Resale Car for My Father who is working in a Factory that is 10km away from my home.	I don't have any idea that I can buy a car with good condition within my budget.	It's my first time buying Resale car and I don't want to embarrass myself Infront of my family.	Like I'm overdoing and overthinking it, just because of a Car for My Father and also for My Family.

IDEATION & PROPOSED SOLUTION

➤ Empathy Map Canvas

- An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.
- It is a usefultool to helpsteams better understand their users.
- Creating an effective solution requires understanding the true problem and the person who is experiencing it.

- The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

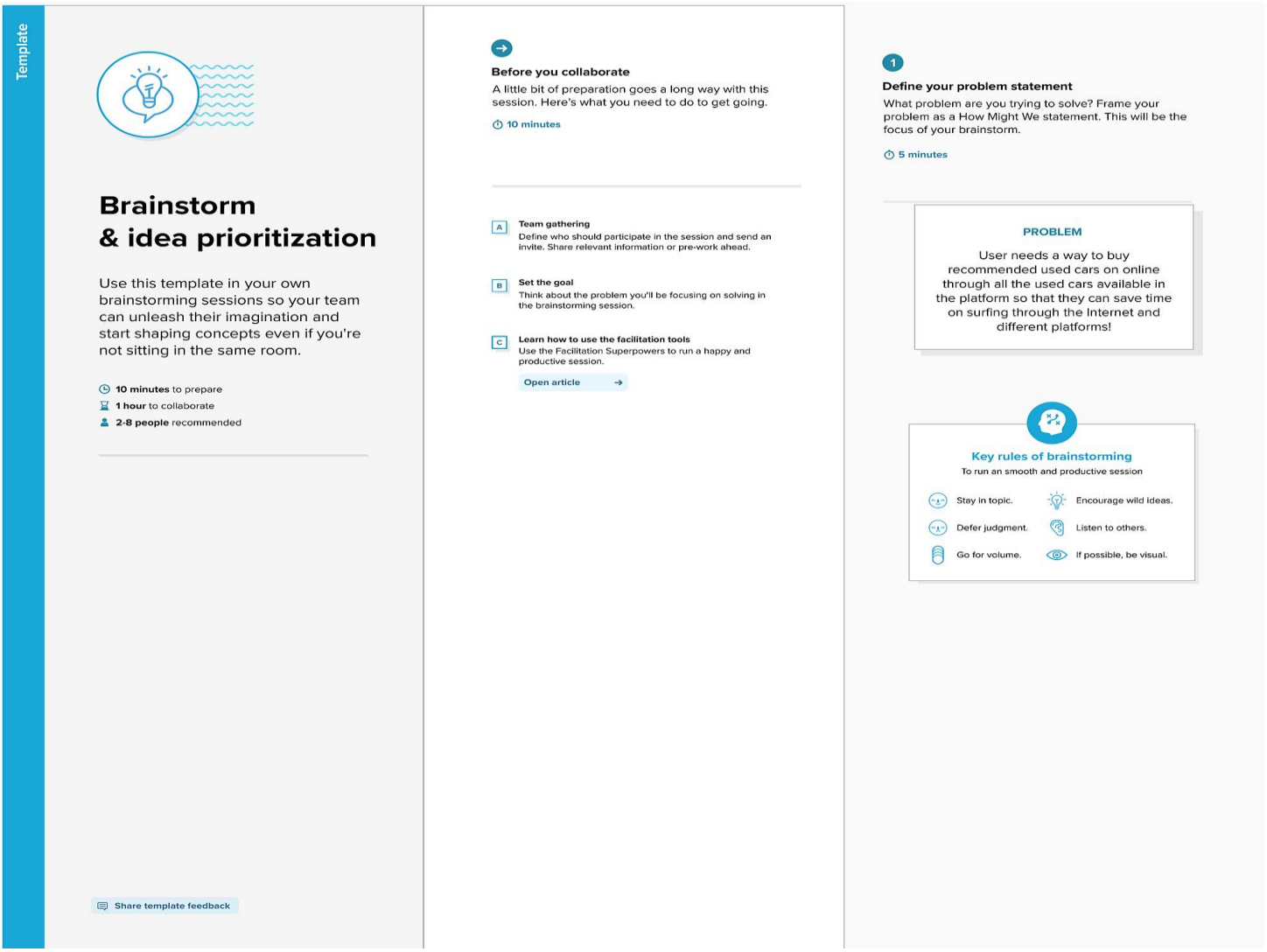


Ideation & Brainstorming

- Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving.
- Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

- Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Step-1: Team Gathering, Collaboration and Select the Problem Statement.



Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

DINESH KUMAR

- predict the price of second-hand cars in online
- PROBLEM FORMULATION
- predictions will be generated based on vehicle's features
- features such as the vehicle's name,make,model year,and mileage
- collected data includes different car features and prices
- data was collected from online websites via scrapping

TAMIL SELVAN

- determine the total number of features and the number of unique elements in each features
- CAR DATA PREPROCESSING(EXPLORATORY DATA ANLYSIS
- Find the null values and missing data
- find out and eliminate non representative samples
- find out useful information about the dataset
- visualize and explore different patterns and distribution in dataset

MAHENDRA KUMAR

- select Regression,linear regression,lasso regression,ridge regression,gradient boosting used for training
- CAR SELECT MODES & MODEL EVALUATION
- Train the model by the selected regressors on trainset
- select the best model
- Parameters using Gridsearch CV
- Evalution metrics: R2 score MSE RMSE MAE

PUSPHA AJITH

- select the model of the car
- LIST THE CAR COMPANY
- Number of seat available
- Gear type
- Engine type
- Car break system

PUSPHA RAJ

- car condition
- MILEAGE AND CONDITION
- car colour
- Engine condition
- Best car company's
- warrenty of the car

ASHOKVARTHNAN

- Number of year used car
- FIX THE PRICE OF THE CAR USER WANT TO BUY
- Check damage of the car
- Manual or auto drive
- petrol or Diesel type
- Air bag system

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 FEATURES

- Antilock brakes (ABS)
- Electronics stability control

CAR HISTORY

- vehicle history service including with RTO registration check at online
- Number of years used

CAR MODELS

- Name the specific vehicle of a brand & search at online
- Sports car crossover couple minivan

CAR APPEARANCE

- How Many previous Owners
- Car Insurance

CHECKING CONDITIONS

- Tramission Fluid
- Oil and coolant levels

AUTHORIZED SITES

- best price for used car on authorized sites free inspection
- Find certified used cars inspected by trained engineer

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

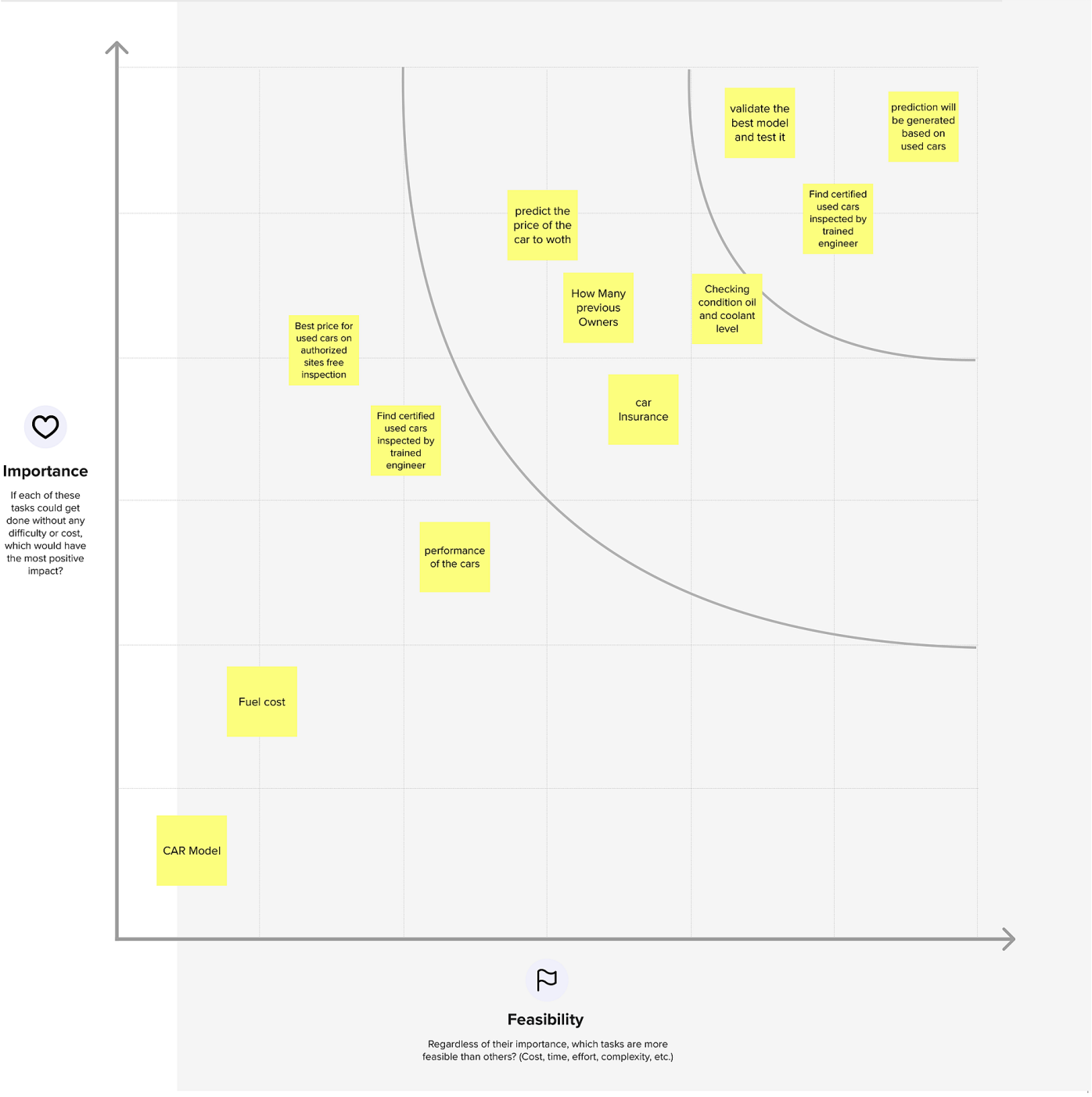
Step-3: Idea Prioritization

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



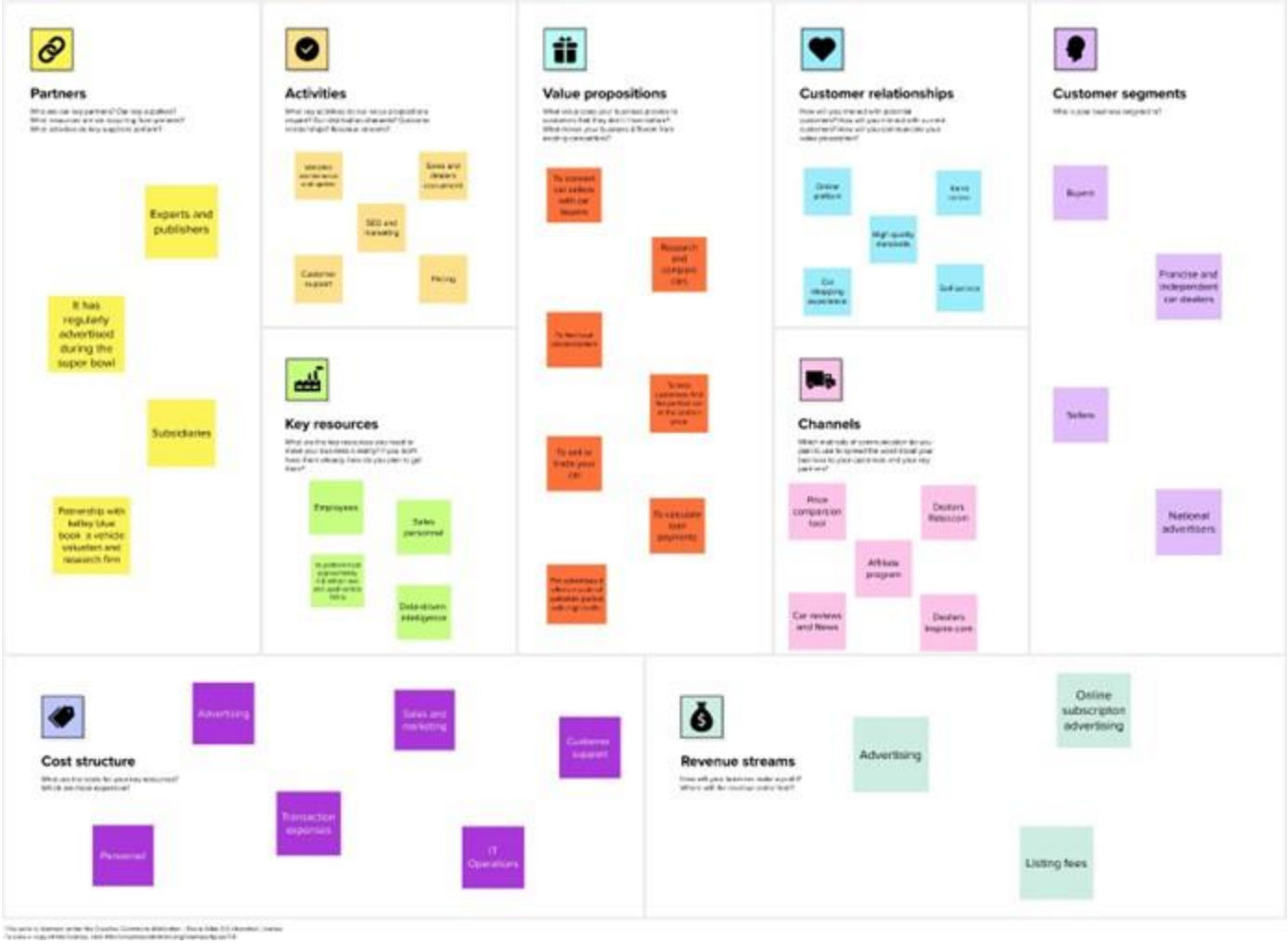
Proposed Solution

- Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description

1.	Problem Statement (Problem to be solved)	User will try to predict the price of used cars based on their features. As it would help the people to decide whetherthe used cars is worth the posted by different online used-car sites. It would also help peoplewhen they plan sellingtheir cars!
2.	Idea / Solution description	We utilized a hybrid CNN-LSTM model for the task of price prediction which achieved a better performance in comparison with the baseline model. This proposed method utilizes a deep neuralnetwork involving long short-term memory (LSTM) and convolutional neural network architectures for price prediction. This system can be effective in filling such gaps which enables the users to predict the price of vehicles according to market value.
3.	Novelty / Uniqueness	Accuracy in priceprediction
4.	Social Impact / Customer Satisfaction	Offer a seamless flexible buying experience complement the in person purchasing experience by incorporating automated platforms that provide information and option to help buyers along their decision-making journey.The customer analysis section of your car dealership business plan must detail the customers you serve and/or expect to the serve. The purpose of the system is to predictthe price of the usedcars according to themarket.
5.	Business Model(Revenue Model)	Business model is attached below.
6.	Scalability of the Solution	There are various topics on which the prediction can be applied. Positive correlation basically relates to the concept of direct proportion whereas Negative correlation relates to theconcept of inverse proportion. These estimates becomethe building blocks for our next step. The R2 score of Regression analysis was good for predictions and close to the original selling prices in the market. The pre-processing is required to increases the performance of UCPAS. The proposed modelhighlights the feasibility of combining images and textualdata to makea prediction.

Business model for car resale value prediction:



➤ Problem Solution fit

TheProblem-Solution Fit simplymeans that you have founda problem with your customerand thatthe solution you have realized for it actually solves the customer's problem. It helps entrepreneurs,marketers and corporate innovators identify behavioral patterns and recognize what would work and why

Purpose:

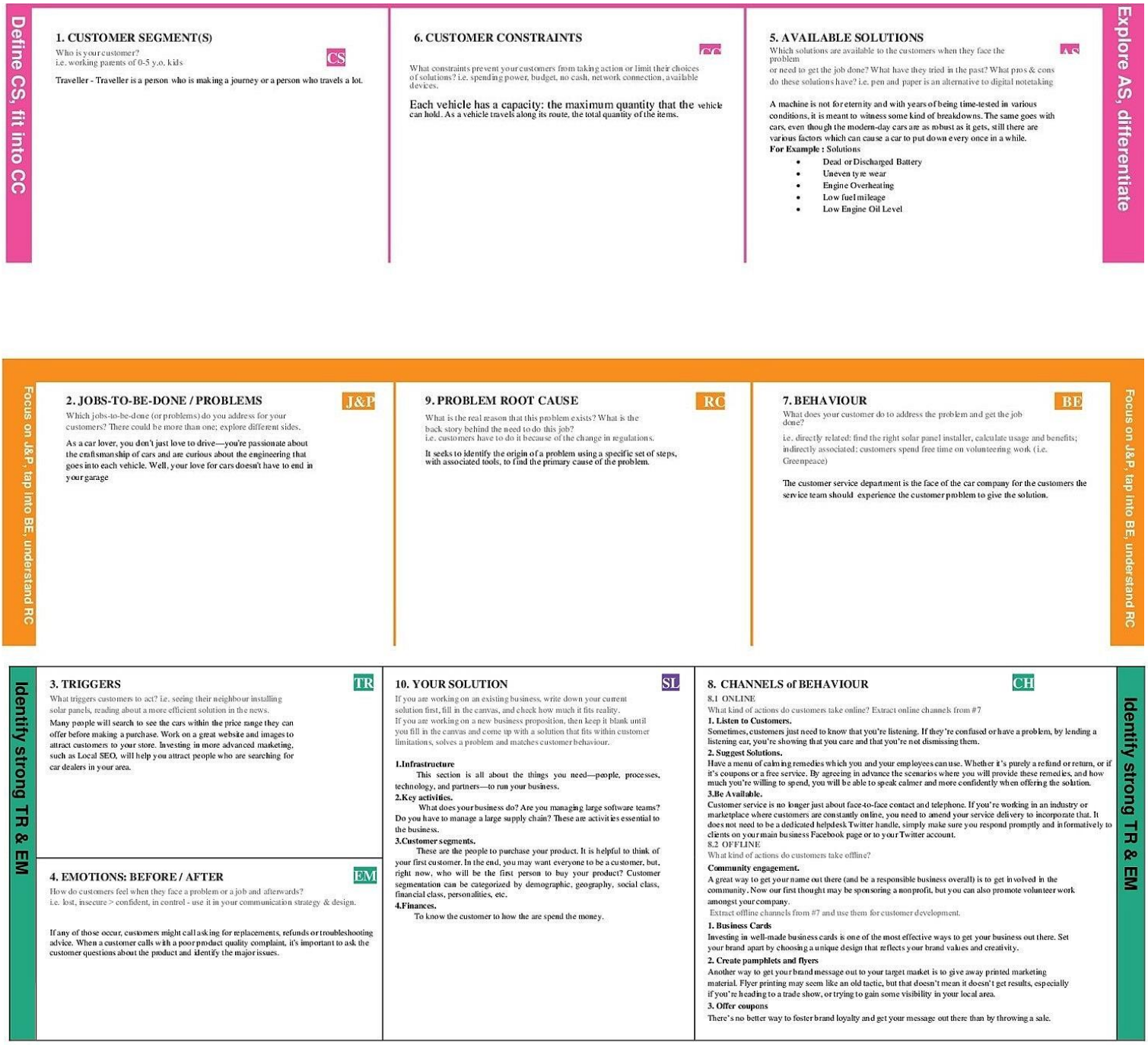
1. Solve complex problemsin a way that fits the state of your customers.

2. Succeed faster and increase your solution adoptionby tapping into existing mediumsandchannels of behavior.

3. Sharpen your communication and marketing strategywith the righttriggers and messaging.

4. Increase touch-points with your companyby finding the right problem-behavior fit andbuilding trust by solvingfrequent annoyances, or urgent or costly problems.

5.Understand the existing situation in order to improve it for your target group.



REQUIREMENT ANALYSIS

➤ Functional requirement

Following are the functional requirements of the proposedsolution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration throughLinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Process of Value Prediction	Accuracy in Price Prediction

➢ Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

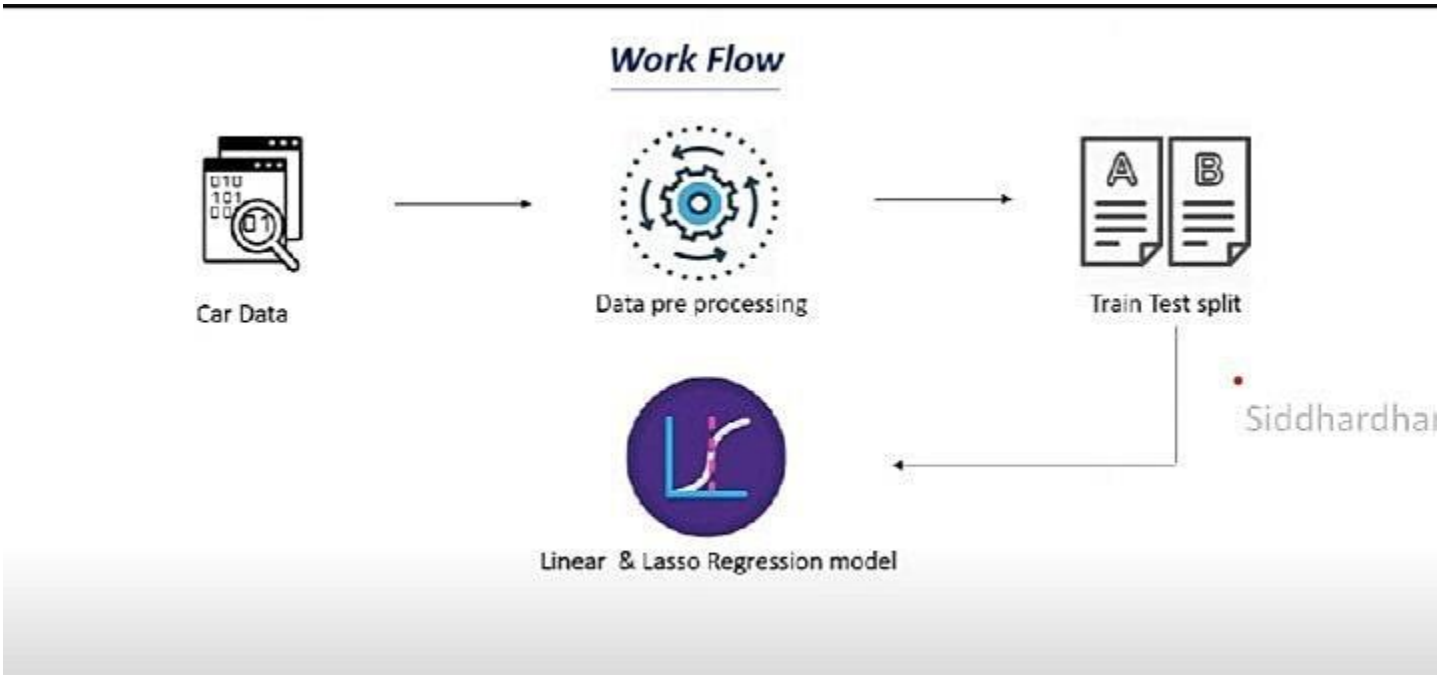
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Indicates how effectively and easy userscan learnand use a system.
NFR-2	**Security**	Assures all data inside the system or its part will be protected against malware attacks or unauthorized access.
NFR-3	**Reliability**	Specifies the probability of the software performing without failure for a specific number of uses or amount of time.
NFR-4	**Performance**	Deals with the measure of the system's response time underdifferent load conditions.
NFR-5	**Availability**	Describes howlikely the system is accessible for a user at agiven point in time.
NFR-6	**Scalability**	Accesses the highestworkload under whichthe system will still meet the performance requirements.

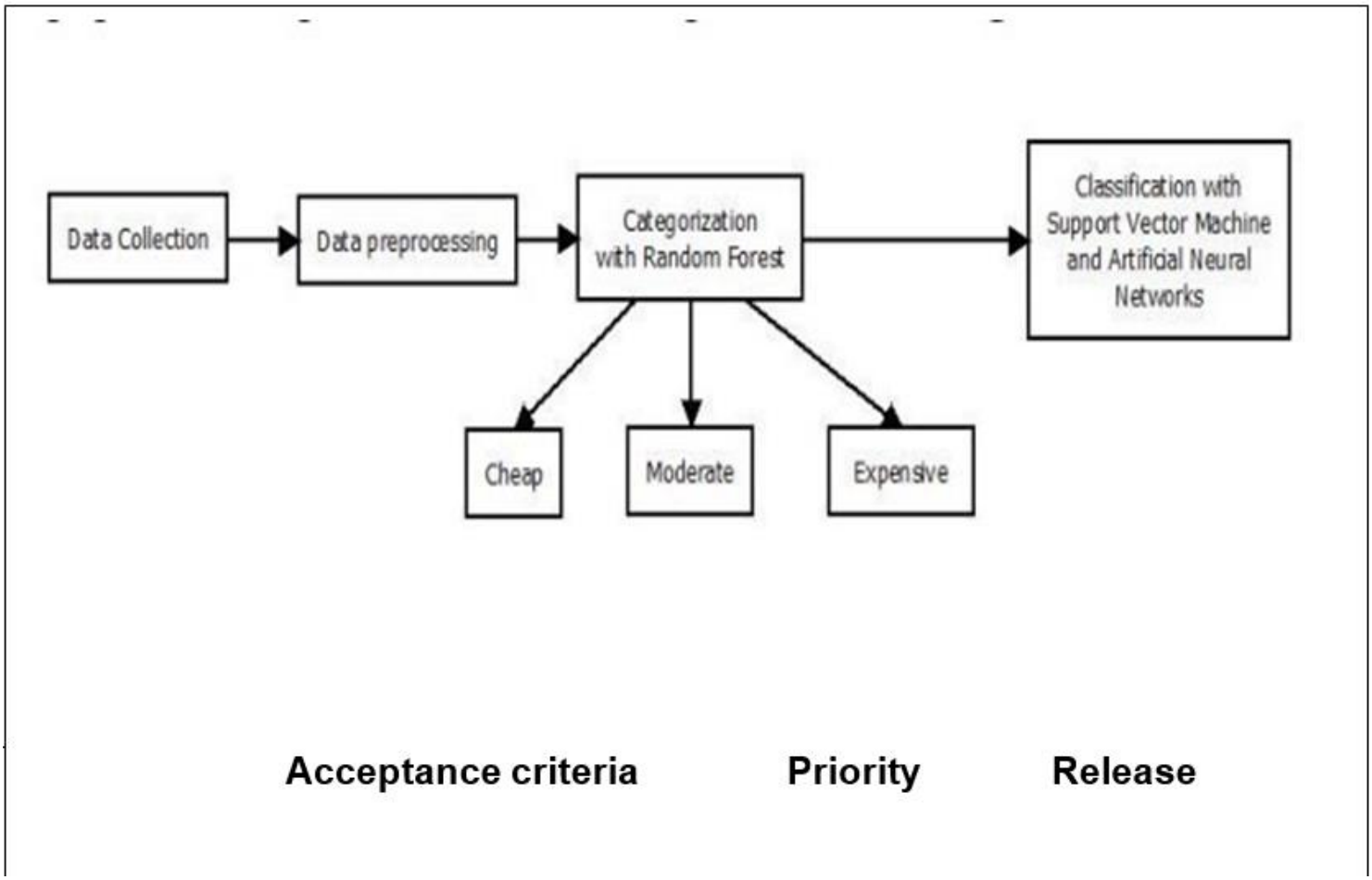
PROJECT DESIGN

➢ Data Flow Diagrams

1 .A Data Flow Diagram(DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depictthe right value of the resale car of the system requirement graphically.

2 .It shows how data enters and leaves the system, what changes the information, and where data is stored.





- **Solution & Technical Architecture**

- **Solution Architecture:**

1. Solution architecture is a complexprocess – with many sub-processes – that bridgesthe gap betweenbusiness problems and technology solutions. Its goals are to:

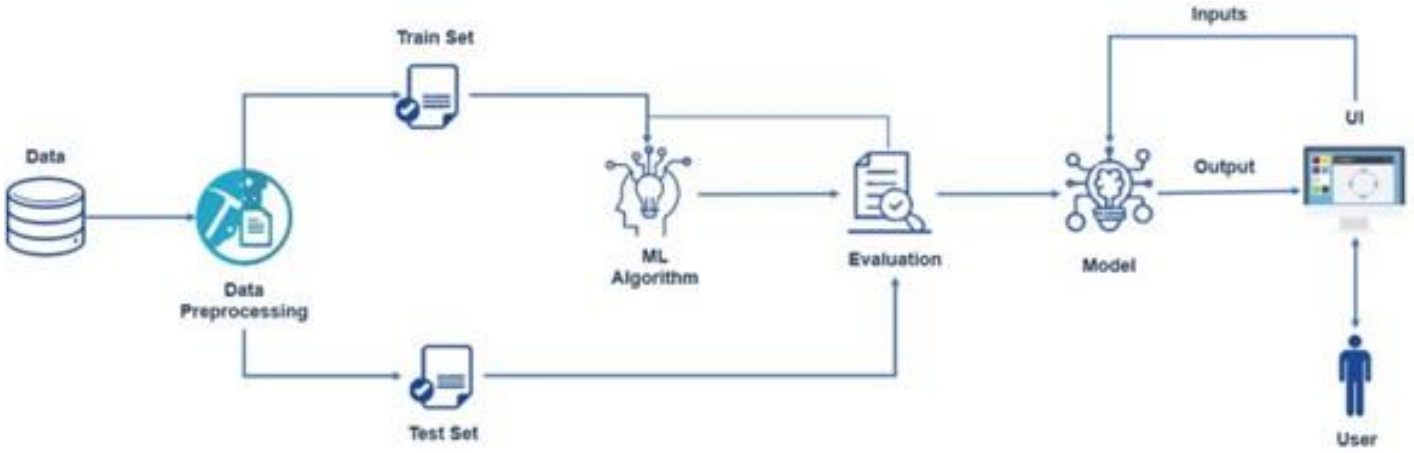
1. Find the best tech solutionto solve existingbusiness problems.

1. Describe the structure, characteristics, behavior, and other aspectsof thesoftware to projectstakeholders.

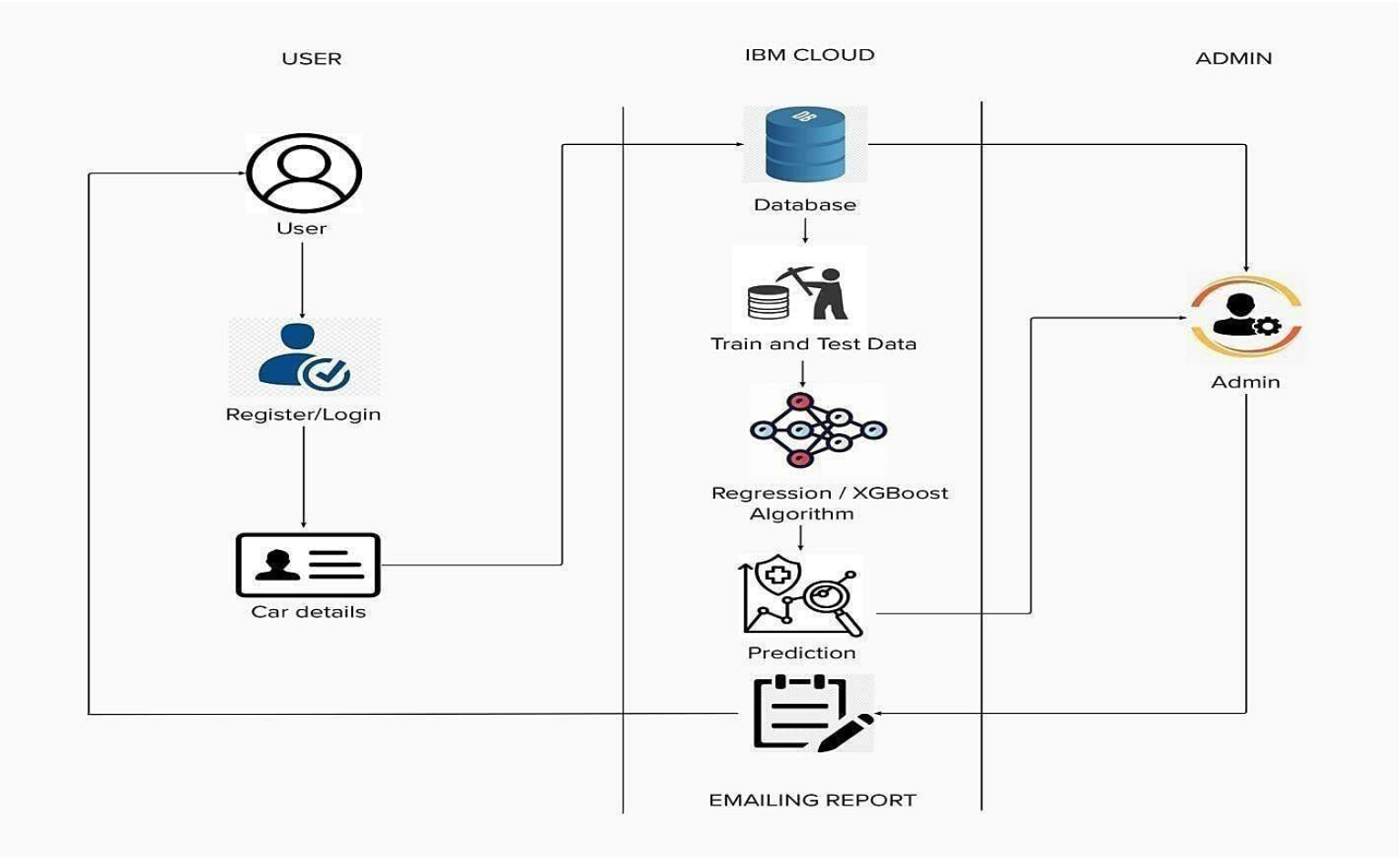
2. Define features, development phases, and solutionrequirements.

3. Provide specifications accordingto which the solution is defined, managed,and delivered.

Example - Solution Architecture Diagram



- **Technical Architecture:**



User Stories

User Type	Functi-onal Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer(Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email,password, and confirmingmy password.	I can accessmy account /dashboard	High	Sprint-1
		USN-2	As a user, I will receiveconfirmation emailoncel have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user,I can register for the applicationthrough Facebook	I can register &access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user,I can register for the applicationthrough Gmail		Medium	Sprint-1

	Login	USN-5	As a user,I can log into the application byentering email & password		High	Sprint-1
	Dashboard	USN-6	Entering the car details in the application		High	Sprint-1
Customer (Web user)	Process	USN-1	As a user, I can enterthe car whichI want to predict theprice		Medium	Sprint-2
Customer Care Executive	Maintenance	USN-2	As a executive, I can rectify Customer's Problems as well as Comments	I can interact throughcomments	High	Sprint-2
Administrator	Developing		As a administrator, I can checkthe car prediction values are up to date	I can gather thedetails of eachcar	High	Sprint-2

PROJECT PLANNING & SCHEDULING

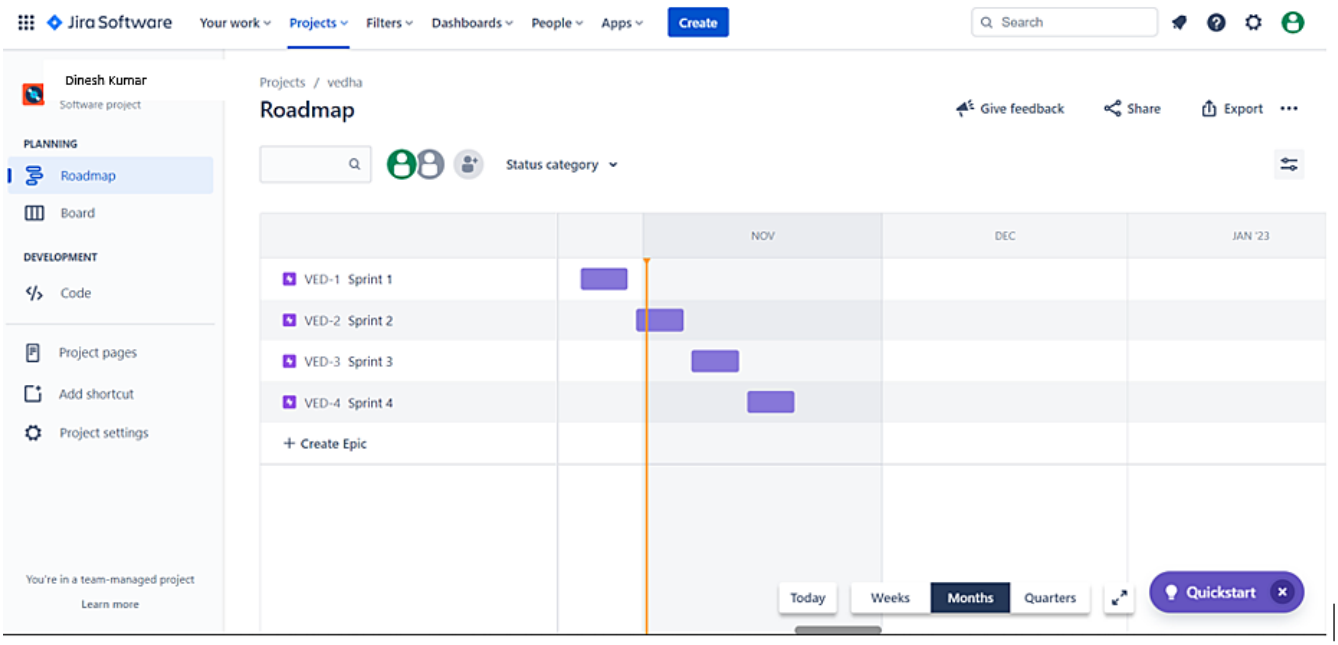
➤ Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story/ Task	Story Points	Priority	Team Members
Sprint-1	Dataset reading and Pre-processing	USN-1	Cleaning thedataset and splitting to dependentand independent variables	2	High	Pushpa ajith ,Pushparaj
Sprint -2	Building the model	USN-2	Choosing the appropriate modelfor buildingandsaving the modelas pickle file	1	High	Ashokavarthanan, Mahendra kumar
Sprint-3	Application building	USN-3	Using flask deploying the ML model	2	Medium	Tamilselvan , Pushparaj
Sprint-4	Train the model in IBM	USN-4	Finally trainthe model on IBM cloudand deploy the application	2	Medium	Dinesh kumar , Tamilselvan

➤ 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	15	5 Days	24 Oct 2022	29 Oct 2022	15	29 Oct 2022
Sprint-2	15	5 Days	31 Oct 2022	05 Nov 2022	15	05 Nov 2022
Sprint-3	15	5 Days	07 Nov 2022	12 Nov 2022	15	12 Nov 2022
Sprint-4	15	5 Days	14 Nov 2022	19 Nov 2022	15	19 Nov 2022

➤ Reports from JIRA



CODING & SOLUTIONING

(Explain the features added in the project along with code)

➤ **Feature 1**

Model building

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

```
import pandas as pd
import numpy as np
```

```
import matplotlib as plt
from sklearn.preprocessing import LabelEncoder
import pickle

df = pd.read_csv("C:/Users/hp/Documents/project/autos.csv", header=0, sep=',', encoding =
'Latin1' ,)

#print all the different sellers

print(df.seller.value_counts())

#remove the seller type having only 3 cars

df[df.seller != 'gewerblich']

#now all the sellers are same so we can get rid of this column

df=df.drop('seller',1)

#print all the different sellers

print(df.offerType.value_counts())
#remove the offer type having only 12 listings
df[df.offerType !='Gesuch']
#now all the offers are same so we can get rid of this column
df=df.drop('offerType',1)

#car having power less than 50ps and above 900ps seems a little suspicious,
#let's remove then and see what we've got now
print(df.shape)
df=df[(df.powerPS >50) & (df.powerPS <900)]
print(df.shape)
#around 50000 cars a have been removed which could inrouduced error to our data

#similarly ,filtering our the cars having registeration years not in the mentioned range
#print(df.shape)

df=df[(df.yearOfRegistration >=1950) & (df.yearOfRegistration < 2017)]
print(df.shape)

#not much of a difference but still, 10000 rows have been reduced.it's better to
#get rid of faulty data instead of keeping them just to increase the size.

#removing irrelevant columns which are either the same for all the cars in teh datast, or can
#introduce bias,so removing them too.

df.drop(['name','abtest','dateCrawled','nrOfPictures','lastSeen','postalCode','dateCreated'],
axis='columns',inplace=True)
```

```
#dropping the duplicates from the dataframe and storing it in a new df.
#here all rows having same value in all the mentioned columns will be deleted and by defaults,
#only first occurance of anysuch row is kept

new_df = df.copy()
new_df = new_df.drop_duplicates(['price','vehicleType','yearOfRegistration','gearbox','powerPS',
'model','kilometer','monthOfRegistration','fuelType','notRepairedDamage'])

#AS the dataset contained some german words for many features, changing them to english
new_df.gearbox.replace(('manuell','automatik'),('manual','automatic'),inplace=True)
new_df.fuelType.replace(('benzin','andere','elektro'),('petrol','others','electric'),inplace=True)
new_df.vehicleType.replace(('kleinwagen','cabrio','kombi','andere'),
('small car','convertible','combination','others'),inplace=True)
new_df.notRepairedDamage.replace(('ja','nein'),('Yes','No'),inplace=True)

###removing  the outliers
new_df = new_df[(new_df.price >=100) & (new_df.price <=150000)]

#filling nan values for columns whose data might not be there with the information provider,
#which might lead to some varaince but our model
#but we will still be able to give some estimate to the user

new_df['notRepairedDamage'].fillna(value='not-declared',inplace=True)
new_df['fuelType'].fillna(value='not-declared',inplace=True)
new_df['gearbox'].fillna(value='not-declared',inplace=True)
new_df['vehicleType'].fillna(value='not-declared',inplace=True)
new_df['model'].fillna(value='not-declared',inplace=True)

#can save the csv for future purpose.
new_df.to_csv("autos_preprocessed.csv")

#columns which contain categorical values which we'll need to convert via label encoding

labels = ['gearbox','notRepairedDamage','model','brand','fuelType','vehicleType']

#looping over the labels to do the label encoding for all at once and
#saving the label encoding files
mapper={}
for i in labels:
mapper[i] = LabelEncoder()
mapper[i].fit(new_df[i])
tr = mapper[i].transform(new_df[i])
np.save(str('classes'+i+'.npy'), mapper[i].classes_)
print(i,":",mapper[i])
new_df.loc[:,i+'_labels']= pd.Series(tr, index=new_df.index)

#final data to be put in a new dataframe called "LABELED"
labeled=new_df[ ['price'
   ,'yearOfRegistration'
```

```
  ,'powerPS'
  ,'kilometer'
  ,'monthOfRegistration'
  ]
 +[x+"_labels" for x in labels ]]
print(labeled.columns)

#storing price in Y and rest of the data in X

Y=labeled.iloc[:,0].values
X=labeled.iloc[:,1:].values

#need to reshape the Y values

Y = Y.reshape(-1,1)

from sklearn.model_selection import cross_val_score, train_test_split
X_train, X_test, Y_train, Y_test = train_test_split(X,Y, test_size=0.3, random_state=3)

#model building and fiiting

from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import r2_score
regressor = RandomForestRegressor(n_estimators=1000,max_depth=10,random_state=34)

#fitting the model
regressor.fit(X_train, np.ravel(Y_train,order='C'))

#predicting the value of test
y_pred = regressor.predict(X_test)

#printing the Accuraccy for test set
print(r2_score(Y_test, y_pred))

#save the model for future use.
filename = 'resale_model.sav'
pickle.dump(regressor,open(filename,'wb'))
```

➤ Feature 2

Application building

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

```
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__   )
filename = 'resale_model.sav'
model_rand = pickle.load(open(filename,'rb'))

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

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

@app.route('/y_predict',methods=['GET','POST'])
def y_predict():
regyear = int(request.form['regyear'])
powerps = float(request.form['powerps'])
kms = float(request.form['kms'])
regmonth = int(request.form.get('regmonth'))
gearbox = request.form['gearbox']
damage = request.form['damage']
model  = request.form.get('model_type')
brand = request.form.get('brand')
fuelType = request.form.get('fuel')
vehicletype= request.form.get('vehicletype')
new_row
{'yearOfRegistration':regyear,'powerPS':powerps,'kilometer':kms,'monthOfRegistration':regmonth,'gearbox':gearbox,'notRepairedDamag
e':damage,'model':model,'brand':brand,'fuelType':fuelType,'vehicleType':vehicletype}

print(new_row)
new_df =
pd.DataFrame(columns=['vehicleType','yearOfRegistration','gearbox','powerPS','model','kilometer','monthOfRegistration','fuelType','bra
nd','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="The predicted resale value is ₹ {:.2f} ".format(y_prediction[0]*82.53))

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

TESTING

➤ Test Cases

Test Scenarios:

Verify user is able to see home page?
Verify user is able to navigate to data entry page? Verify user is able to see data entry page?
Verify user is able to enter values in the fields?
Verify user is able to navigate to output display page? Verify user is able to view the output display page?

Test Case	Feature	Component	Test Scenario	Expected Result	Actual Result	Status	Comments	Bug	Executed By
Home Page_Tc_001	UI	Home page	Verify all the UI Elements in Home page rendered properly	All the UI Elements rendered properly	Working as excepted	Pass	Successful	-	Ashoka varthanan

Home Page_Tc_002	Functional	Home Page	Verify the data entry page can be reachable	User should navigate to data entry page	Working as excepted	Pass	Successful	-	Pushpa ajith
Data Entry Page_Tc_001	UI	Data entry page	Verify the User able to enter all values	All the UI Elements rendered properly	Working as excepted	Pass	Successful	-	Mahendra kumar
Data Entry Page_Tc_002	Functional	Data entry page	Verify the User able to enter all values	User should be able to enter all values in data entry page	Working as excepted	Pass	Successful	-	Tamilselvan
Data Entry Page_Tc_003	Functional	Data Entry Page	Verify the output display can be reachable	User should navigate the data output display page	Working as excepted	Pass	Successful	-	pushparaj
Output display page_Tc_001	UI	Output display page	Verify the all UI elements in output display page rendered properly	All the UI Elements rendered properly	Working as excepted	Pass	Successful	-	Dinesh Kumar

➤ User Acceptance Testing

■ Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Car Resale Value Prediction project at the time of the release to User Acceptance Testing (UAT).

■ Defect Analysis

This reportshows the numberof resolved or closed bugs at each severity level,and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	18	4	2	3	27
Duplicate	0	2	3	0	5
External	2	3	1	1	7
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	31	16	14	26	87

Test Case Analysis

This report showsthe number of test casesthat have passed,failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	11	0	0	11
Client Application	45	0	0	45
Security	10	0	0	10
Outsource Shipping	1	0	0	1
Exception Reporting	2	0	0	2
Final ReportOutput	3	0	0	3

Version Control	4	0	0	4

RESULTS

➤ Performance Metrics

Model Performance Testing:

Project team shall fill the followinginformation in the model performance testing template.

S.No.	Parameter	Values	Screenshot

1	Metrics	**Regression Model:** MAE - , MSE - , RMSE - , R2 score -	In [25]:
			`from sklearn.metrics import mean_squared_error,mean_absolute_error`
			`mse = mean_squared_error(Y_test, y_pred)`
			`print(mse)`
			`11837192.971239958`
			
			In [26]:
			`rmse = np.sqrt(mse)`
			`print(rmse)`
			`mae = mean_absolute_error(Y_test, y_pred)`
			`print(mae)`
			`3440.5221945570934`
			`1635.1608915188156`
			
			In [17]:
			`y_pred = regressor.predict(X_test)`
			`print(r2_score(Y_test,y_pred))`
			`0.834527626497731`

2	Tune the Model	Hyperparameter Tuning - **n_estimators** = [5,20,50,100] **max_features** = ['auto', 'sqrt'] **max_depth** = [10-120] **min_samples_split** = [2, 6, 10] **min_samples_leaf** = [1, 3, 4] **bootstrap** = [True, False] Validation Method - **RandomisedGridSearchCV**	In [33]: ``` n_estimators = [5,20,50,100] max_features = ['auto', 'sqrt'] max_depth = [int(x) for x in np.linspace(10, 120, num = 12)] min_samples_split = [2, 6, 10] min_samples_leaf = [1, 3, 4] bootstrap = [True, False] random_grid = {'n_estimators': n_estimators, 'max_features': max_features, 'max_depth': max_depth, 'min_samples_split': min_samples_split, 'min_samples_leaf': min_samples_leaf, 'bootstrap': bootstrap} ``` In [34]: ``` from sklearn.model_selection import RandomizedSearchCV rf_random = RandomizedSearchCV(estimator = regressor,param_distributions = random_grid, n_iter = 100, cv = 5, verbose=2, random_state=35, n_jobs = -1) ``` In [36]: ``` rf_random.fit(X_train, Y_train) ``` Fitting 5 folds for each of 100 candidates, totalling 500 fits C:\ProgramData\Anaconda3\lib\site-packages\sklearn\model_selection_search.py:926: DataC passed when a 1d array was expected. Please change the shape of y to (n_samples,), for e self.best_estimator_.fit(X, y, **fit_params) Out[36]: ``` RandomizedSearchCV(cv=5, estimator=RandomForestRegressor(max_depth=10, n_estimators=1000, random_state=34), n_iter=100, n_jobs=-1, param_distributions={'bootstrap': [True, False], 'max_depth': [10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120], 'max_features': ['auto', 'sqrt'], 'min_samples_leaf': [1, 3, 4], 'min_samples_split': [2, 6, 10], 'n_estimators': [5, 20, 50, 100]}, random_state=35, verbose=2) ```

ADVANTAGES & DISADVANTAGES

➤ Advantages

- ✓ Value for money. Pre-owned cars come with a lower price tag and offer a much better
  - value for the amount paid.
- ✓ Slow rate of depreciation.
- ✓ Lower insurance and registration charges.
- ✓ Higher inflation.
- ✓ Lower loan amount to be borrowed.

➤ Disadvantages

- ✓ Not Made to Order. When you buy a new car, it's made to order.
- ✓ Little to No Warranty.
- ✓ Old Technology.
- ✓ Possibly Less Safe.
- ✓ Worse Fuel Efficiency.
- ✓ Little to No Financing.
- ✓ High Maintenance.
- ✓ Previous Owners.

CONCLUSION

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

FUTURE SCOPE

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

APPENDIX

➤ Source Code

RESALEINTRO .HTML

```
    < ! <!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1.0">
   <title>Document</title>
   <!-- <link rel="stylesheet" href="/static/css/index.css"> -->
   <link rel="stylesheet" href="{{ url_for('static', filename='css/index.css') }}">
</head>
<body>
```

```
  <div class="heading">
    <h1>Get the accurate resale value of your car</h1>
  </div>
  <img src="/static/image/car.jpg" alt=" This is Car Image">
  <div class="para">
    <aside> <p>With difficult economic conditions, it is likely that sales of
        reconditioned second-hand cars will increase. In most of the
        countries, it is common to lease a car rather than buying it
        outright. A lease is a binding contract between a buyer and a
        seller in which the buyer must pay fixed instalments for a pre-
        defined number of months/years to the seller/financer. After
        the lease period is over, the buyer has the possibility to buy the
        car at its residual value, ic. its expected resale value. Thus, this
        application is of commercial interest to seller/financers to be
        able to predict the residual value of cars with accuracy.
    </p></aside>
  </div>
  <div class="btn">
    <button><a href="predict">want to know resale value of your car</a></button>
  </div>
</body>
</html>
```

RESALE PREDICT.HTML

```
<html>

        <head>
                <link rel="stylesheet" href="/static/css/resalepredict.css">

                 <!-- <link rel="stylesheet" type="text/css" href="{{ url_for('static',filename='css/resalepredict.css') }}"> -->
                <!-- <link rel="stylesheet" type="text/css" href="{{ url_for('static',filename='css/resalepredict.css') }}">  -->


        </head>
        <section class="banner_main">
                <div class="container">
                        <form action="/y_predict" method="post">
                                <center>
                                        <h2 style="color:aliceblue">Predict the Price!</h2>
                                </center>

                                <div class="row">
                                        <h4>Registration year  
                                        <input type="number" name="regyear" id="regyear"
                                                        placeholder="Registration Year" required/>
                                        </h4>
                                        <h4>Registration Month
                                                <!-- <div class="input-group"><input type="number" name="regmonth"
id="regmonth"
                                                        placeholder="Registration Month" /> -->
                                                <select name="regmonth" id="wgtmsr">
                                                        <option value=1>January</option>
                                                        <option value=2>February</option>
                                                        <option value=3>March</option>
                                                        <option value=4>April</option>
                                                        <option value=5>May</option>
                                                        <option value=6>June</option>
                                                        <option value=7>July</option>
                                                        <option value=8>August</option>
                                                        <option value=9>September</option>
```

```
                                        <option value=10>October</option>
                                        <option value=11>November</option>
                                        <option value=12>Decemeber</option>
                                    </select>
                                </h4>
                                <h4>Power of car in PS  
                                <input type="number" name="powerps" placeholder="Power of the Car in PS" required/>
                                </h4>
                                <h4>Kilometers Driven 
                                <input type="number" name="kms" placeholder="Kilometers of the car has driven"
required/>
                                </h4>
                                <div class="gear">
                                <h4>Gear Box Type
            
                                        <input id="gear-manual" type="radio" name="gearbox" value="manual" />
                                        <label for="gear-manual">Manual</label>
                                        <input id="gear-automatic" type="radio" name="gearbox"
value="automatic" />
                                        <label for="gear-automatic">Automatic</label>
                                        <input id="gear-notdeclared" type="radio" name="gearbox" value="not
declared" />
                                        <label for="gear-notdeclared">Not declared</label>
                                </h4>
                                </div>
                                <div class="damage">
                                    <h4>Your Car is Damaged or Repaired   
                                        <input id="yes" type="radio" name="damage" value="Yes" />
                                        <label for="yes">Yes</label>
                                        <input id="damaged-no" type="radio" name="damage" value="No" />
                                        <label for="damaged-no">No</label>
                                        <input id="damaged-notdeclared" type="radio" name="damage"
value="Not declared" />
                                        <label for="damaged-notdeclared">Not declared</label>
                                    </h4>
                                </div>

                                    <h4>Fuel type of the car
                                        <select name="fuel" id="brand">
                                            <option value="not-declared">not-declared</option>
                                            <option value="diesel">diesel</option>
                                            <option value="petrol">petrol</option>
                                            <option value="lpg">lpg</option>
                                            <option value="others">others</option>
                                            <option value="hybrid">hybrid</option>
                                            <option value="cng">cng</option>
                                            <option value="electric">electric</option>
                                        </select>
                                    </h4>


                                <div class="brand">
                                    <h4>Brand of the Car  
                                        <select name="brand" id="brand">
                                            <option value="audi">audi</option>
                                            <option value="jeep">jeep</option>
                                            <option value="volkswagen">volkswagen</option>
                                            <option value="skoda">skoda</option>
                                            <option value="bmw">bmw</option>
                                            <option value="peugeot">peugeot</option>
```

```
                                <option value="ford">ford</option>
                                <option value="mazda">mazda</option>
                                <option value="nissan">nissan</option>
                                <option value="renault">renault</option>
                                <option value="mercedes_benz">mercedes_benz</option>
                                <option value="honda">honda</option>
                                <option value="fiat">fiat</option>
                                <option value="opel">opel</option>
                                <option value="mini">mini</option>
                                <option value="smart">smart</option>
                                <option value="hyundai">hyundai</option>
                                <option value="alfa_romeo">alfa_romeo</option>
                                <option value="subaru">subaru</option>
                                <option value="volvo">volvo</option>
                                <option value="mitsubishi">mitsubishi</option>
                                <option value="kia">kia</option>
                                <option value="seat">seat</option>
                                <option value="lancia">lancia</option>
                                <option value="porsche">porsche</option>
                                <option value="citroen">citroen</option>
                                <option value="toyota">toyota</option>
                                <option value="chevrolet">chevrolet</option>
                                <option value="dacia">dacia</option>
                                <option value="suzuki">suzuki</option>
                                <option value="daihatsu">daihatsu</option>
                                <option value="chrysler">chrysler</option>
                                <option value="sonstige_autos">sonstige_autos</option>
                                <option value="jaguar">jaguar</option>
                                <option value="daewoo">daewoo</option>
                                <option value="rover">rover</option>
                                <option value="saab">saab</option>
                                <option value="land_rover">land_rover</option>
                                <option value="lada">lada</option>
                                <option value="trabant">trabant</option>

                        </select>
                </h4>
        </div>


        <div class="model">
                <h4>Model Type     
                        <select name="model_type" id="brand">
                                <option value="not-declared">not-declared</option>
                                <option value="grand">grand</option>
                                <option value="golf">golf</option>
                                <option value="fabia">fabia</option>
                                <option value="3er">3er</option>
                                <option value="2_reihe">2_reihe</option>
                                <option value="c_max">c_max</option>
                                <option value="3_reihe">3_reihe</option>
                                <option value="passat">passat</option>
                                <option value="navara">navara</option>
                                <option value="polo">polo</option>
                                <option value="twingo">twingo</option>
                                <option value="a_klasse">a_klasse</option>
                                <option value="scirocco">scirocco</option>
                                <option value="5er">5er</option>
                                <option value="andere">andere</option>
                                <option value="civic">civic</option>
```

<option value="punto">punto</option>
<option value="e_klasse">e_klasse</option>
<option value="clio">clio</option>
<option value="kadett">kadett</option>
<option value="one">one</option>
<option value="fortwo">fortwo</option>
<option value="1er">1er</option>
<option value="b_klasse">b_klasse</option>
<option value="a8">a8</option>
<option value="jetta">jetta</option>
<option value="c_klasse">c_klasse</option>
<option value="micra">micra</option>
<option value="vito">vito</option>
<option value="sprinter">sprinter</option>
<option value="astra">astra</option>
<option value="156">156</option>
<option value="escort">escort</option>
<option value="forester">forester</option>
<option value="xc_reihe">xc_reihe</option>
<option value="fiesta">fiesta</option>
<option value="scenic">scenic</option>
<option value="ka">ka</option>
<option value="a1">a1</option>
<option value="transporter">transporter</option>
<option value="focus">focus</option>
<option value="a4">a4</option>
<option value="tt">tt</option>
<option value="a6">a6</option>
<option value="jazz">jazz</option>
<option value="omega">omega</option>
<option value="slk">slk</option>
<option value="7er">7er</option>
<option value="combo">combo</option>
<option value="corsa">corsa</option>
<option value="80">80</option>
<option value="147">147</option>
<option value="glk">glk</option>
<option value="z_reihe">z_reihe</option>
<option value="sorento">sorento</option>
<option value="ibiza">ibiza</option>
<option value="mustang">mustang</option>
<option value="eos">eos</option>
<option value="touran">touran</option>
<option value="getz">getz</option>
<option value="insignia">insignia</option>
<option value="almera">almera</option>
<option value="megane">megane</option>
<option value="a3">a3</option>
<option value="r19">r19</option>
<option value="caddy">caddy</option>
<option value="mondeo">mondeo</option>
<option value="cordoba">cordoba</option>
<option value="colt">colt</option>
<option value="impreza">impreza</option>
<option value="vectra">vectra</option>
<option value="lupo">lupo</option>
<option value="berlingo">berlingo</option>
<option value="m_klasse">m_klasse</option>
<option value="tiguan">tiguan</option>
<option value="6_reihe">6_reihe</option>

<option value="c4">c4</option>
<option value="panda">panda</option>
<option value="up">up</option>
<option value="i_reihe">i_reihe</option>
<option value="ceed">ceed</option>
<option value="kangoo">kangoo</option>
<option value="5_reihe">5_reihe</option>
<option value="yeti">yeti</option>
<option value="octavia">octavia</option>
<option value="zafira">zafira</option>
<option value="mii">mii</option>
<option value="rx_reihe">rx_reihe</option>
<option value="6er">6er</option>
<option value="modus">modus</option>
<option value="fox">fox</option>
<option value="matiz">matiz</option>
<option value="beetle">beetle</option>
<option value="rio">rio</option>
<option value="touareg">touareg</option>
<option value="logan">logan</option>
<option value="spider">spider</option>
<option value="cuore">cuore</option>
<option value="s_max">s_max</option>
<option value="a2">a2</option>
<option value="x_reihe">x_reihe</option>
<option value="a5">a5</option>
<option value="galaxy">galaxy</option>
<option value="c3">c3</option>
<option value="viano">viano</option>
<option value="s_klasse">s_klasse</option>
<option value="1_reihe">1_reihe</option>
<option value="sharan">sharan</option>
<option value="avensis">avensis</option>
<option value="sl">sl</option>
<option value="roomster">roomster</option>
<option value="q5">q5</option>
<option value="santa">santa</option>
<option value="leon">leon</option>
<option value="cooper">cooper</option>
<option value="4_reihe">4_reihe</option>
<option value="sportage">sportage</option>
<option value="laguna">laguna</option>
<option value="ptcruiser">ptcruiser</option>
<option value="clk">clk</option>
<option value="primera">primera</option>
<option value="espace">espace</option>
<option value="exeo">exeo</option>
<option value="159">159</option>
<option value="transit">transit</option>
<option value="juke">juke</option>
<option value="v40">v40</option>
<option value="carisma">carisma</option>
<option value="accord">accord</option>
<option value="corolla">corolla</option>
<option value="lanos">lanos</option>
<option value="phaeton">phaeton</option>
<option value="boxster">boxster</option>
<option value="verso">verso</option>
<option value="rav">rav</option>
<option value="kuga">kuga</option>

<option value="qashqai">qashqai</option>
<option value="swift">swift</option>
<option value="picanto">picanto</option>
<option value="superb">superb</option>
<option value="stilo">stilo</option>
<option value="alhambra">alhambra</option>
<option value="911">911</option>
<option value="m_reihe">m_reihe</option>
<option value="roadster">roadster</option>
<option value="ypsilon">ypsilon</option>
<option value="galant">galant</option>
<option value="justy">justy</option>
<option value="90">90</option>
<option value="sirion">sirion</option>
<option value="signum">signum</option>
<option value="crossfire">crossfire</option>
<option value="agila">agila</option>
<option value="duster">duster</option>
<option value="v50">v50</option>
<option value="mx_reihe">mx_reihe</option>
<option value="meriva">meriva</option>
<option value="discovery">discovery</option>
<option value="c_reihe">c_reihe</option>
<option value="v_klasse">v_klasse</option>
<option value="yaris">yaris</option>
<option value="c5">c5</option>
<option value="aygo">aygo</option>
<option value="seicento">seicento</option>
<option value="cc">cc</option>
<option value="carnival">carnival</option>
<option value="fusion">fusion</option>
<option value="bora">bora</option>
<option value="cl">cl</option>
<option value="tigra">tigra</option>
<option value="300c">300c</option>
<option value="500">500</option>
<option value="100">100</option>
<option value="q3">q3</option>
<option value="cr_reihe">cr_reihe</option>
<option value="spark">spark</option>
<option value="x_type">x_type</option>
<option value="ducato">ducato</option>
<option value="s_type">s_type</option>
<option value="x_trail">x_trail</option>
<option value="toledo">toledo</option>
<option value="altea">altea</option>
<option value="voyager">voyager</option>
<option value="calibra">calibra</option>
<option value="v70">v70</option>
<option value="bravo">bravo</option>
<option value="range_rover">range_rover</option>
<option value="forfour">forfour</option>
<option value="tucson">tucson</option>
<option value="q7">q7</option>
<option value="c1">c1</option>
<option value="citigo">citigo</option>
<option value="jimny">jimny</option>
<option value="cx_reihe">cx_reihe</option>
<option value="cayenne">cayenne</option>
<option value="wrangler">wrangler</option>

```
                                        <option value="lybra">lybra</option>
                                        <option value="range_rover_sport">range_rover_sport</option>
                                        <option value="lancer">lancer</option>
                                        <option value="freelander">freelander</option>
                                        <option value="captiva">captiva</option>
                                        <option
value="range_rover_evoque">range_rover_evoque</option>
                                        <option value="sandero">sandero</option>
                                        <option value="note">note</option>
                                        <option value="antara">antara</option>
                                        <option value="900">900</option>
                                        <option value="defender">defender</option>
                                        <option value="cherokee">cherokee</option>
                                        <option value="clubman">clubman</option>
                                        <option value="arosa">arosa</option>
                                        <option value="legacy">legacy</option>
                                        <option value="pajero">pajero</option>
                                        <option value="auris">auris</option>
                                        <option value="c2">c2</option>
                                        <option value="niva">niva</option>
                                        <option value="s60">s60</option>
                                        <option value="nubira">nubira</option>
                                        <option value="vivaro">vivaro</option>
                                        <option value="g_klasse">g_klasse</option>
                                        <option value="lodgy">lodgy</option>
                                        <option value="850">850</option>
                                        <option value="serie_2">serie_2</option>
                                        <option value="charade">charade</option>
                                        <option value="croma">croma</option>
                                        <option value="outlander">outlander</option>
                                        <option value="gl">gl</option>
                                        <option value="kaefer">kaefer</option>
                                        <option value="doblo">doblo</option>
                                        <option value="musa">musa</option>
                                        <option value="amarok">amarok</option>
                                        <option value="9000">9000</option>
                                        <option value="kalos">kalos</option>
                                        <option value="v60">v60</option>
                                        <option value="200">200</option>
                                        <option value="145">145</option>
                                        <option value="b_max">b_max</option>
                                        <option value="delta">delta</option>
                                        <option value="aveo">aveo</option>
                                        <option value="rangerover">rangerover</option>
                                        <option value="move">move</option>
                                        <option value="materia">materia</option>
                                        <option value="terios">terios</option>
                                        <option value="kalina">kalina</option>
                                        <option value="elefantino">elefantino</option>
                                        <option value="i3">i3</option>
                                        <option value="samara">samara</option>
                                        <option value="kappa">kappa</option>
                                        <option value="serie_3">serie_3</option>
                                        <option value="discovery_sport">discovery_sport</option>
                                    </select>
                                </h4>
                            </div>
                                <h4>Vehicle Type    
                                    <select name="vehicletype" id="wgtmsr">
                                        <option value="coupe">coupe</option>
```

```
                                        <option value="suv">suv</option>
                                        <option value="small car">small car</option>
                                        <option value="limousine">limousine</option>
                                        <option value="convertible">convertible</option>
                                        <option value="bus">bus</option>
                                        <option value="combination">combination</option>
                                        <option value="not-declared">not-declared</option>
                                        <option value="others">others</option>
                                    </select>
                                </h4>
                            </div>
                                <center><button type="submit">Predict</button></center>
                            <center>
                                <h3 style="font-family:verdana; color: yellow;">{{ypred}}</h3>
                            </center>
                            <br>
                            <center> <a href="/">Click here to go back Home!</a></center>
                    </form>

                </div>

        </html>
```

INDEX.CSS

```
body{
   background-color: lightblue;
}

.heading{

   text-align: center;
   background-color: black;
   padding: 20px;
   color: white;
   margin: auto;
  margin-left: -3rem;
  margin-right: -3rem;
   margin-top: -2rem;
   font-size: 20px;

}

img{
   height: 30rem;
   width: 40rem;
   margin-left: -1rem;
}
.para{
   font-size: larger;
   font-weight: 900;
   font-style: normal;
   text-align: left;
   margin-left: 3rem;
   padding-left: 40rem;
   margin-top: -26rem;
    display: flex;


}
```

```
.btn{
   justify-content: center;
   text-align: left;
   padding-left: 40rem;
   margin-top: 2rem;
   display: flex;
   border: none;



}
button {

   text-decoration: none;
   background-color: green;
   border: none;
   border-radius: 2rem ;
   height: 30px;
   width: 20rem;

}
button a{
   text-decoration: none;
   color: white;
   cursor: pointer;
}

.btn :hover{

   background-color:blue;
}

`
```

RESALEPREDICT.CSS

```
button {
   border: none;
   color: white;
   padding: 15px 32px;
   text-align: center;
   margin-top: 20px;
   text-decoration: none;
   display: inline-block;
   font-size: 16px;
   margin: 4px 2px;
   margin-top: 2em;
   cursor: pointer;
   background-color:blue;
   padding: 0.6rem 3rem;
}

body {
   padding: 1em;
   font-family: "Open Sans", "Helvetica Neue", Helvetica, Arial, sans-serif;
   font-size: 15px;
   background-image: url('/static/image/bacroundimg.jpg');
   background-size: cover;
}


.row h4{
   color:aliceblue;
```

```
    text-align: left;
    margin-left: 400px;
    font-weight: 00;
}
input{
    margin: 1rem 8rem;
    text-align: center;
    padding: 0rem 1.2rem ;
}
select{
    text-align: center;
    margin: 1rem 8.4rem;
    padding: 0rem 3.7rem;
}

.gear{
    text-align: center;
}

.gear input{
 margin: 0rem 0rem;
}
.damage input{
    margin: 0rem 0rem;
}
.brand select{
    padding: 0rem 3rem;
    text-align: center;
}


.model select{
    padding: 0rem 2.2rem;
    text-align: center;
}
a{
    color: white;
    text-decoration: none;
}
```

RESALE FLASK.PY

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

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

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

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

```
@app.route('/y_predict',methods=['GET','POST'])
def y_predict():
                                    regyear = int(request.form['regyear'])
                                    powerps = float(request.form['powerps'])
                                    kms = float(request.form['kms'])
                                    regmonth = int(request.form.get('regmonth'))
                                    gearbox = request.form['gearbox']
                                    damage = request.form['damage']
                                    model  = request.form.get('model_type')
                                    brand = request.form.get('brand')
                                    fuelType = request.form.get('fuel')
                                    vehicletype= request.form.get('vehicletype')
                                    new_row =
{'yearOfRegistration':regyear,'powerPS':powerps,'kilometer':kms,'monthOfRegistration':regmonth,'gearbox':gearbox,'notRepaire
dDamage':damage,'model':model,'brand':brand,'fuelType':fuelType,'vehicleType':vehicletype}

                                    print(new_row)
                                    new_df =
pd.DataFrame(columns=['vehicleType','yearOfRegistration','gearbox','powerPS','model','kilometer','monthOfRegistration','fuelTy
pe','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="The predicted resale value is ₹ {:.2f}
".format(y_prediction[0]*82.53))

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

GitHub & Project Demo Link：

Git Hub Link : https://github.com/IBM-EPBL/IBM-Project-28225-1660109103

Project Demo Link : https://www.youtube.com/embed/7XKIl84Qt_w