



# **CAR RESALE VALUE PREDICTION**

**NALAIYA THIRAN PROJECT BASED LEARNING**

**ON**

**PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY  
AND ENTREPRENEURSHIP**

**Submitted By**

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## **1. INTRODUCTION**

Car resale value prediction system is made with the purpose of predicting the correct valuation of used cars that helps users to sell the car remotely with perfect valuation and without human intervention in the process to eliminate biased valuation. For this project, we developed the car resale value using a variety of algorithms and methodologies. prediction algorithms that take into account the car's many qualities. In a nutshell, automobile resale value prediction enables users to forecast the resale worth of a car based on a variety of factors, such as the number of miles traveled and the type of fuel used. The project focuses on getting input like kilometers a vehicle has run, year of manufacture, the owner, number of services the car has been given since its purchase, previous damages and so on.

### **1.1 PROJECT OVERVIEW**

In this project we have used different algorithms with different techniques for developing Car resale value prediction systems considering different features of the car. In a nutshell, car resale value prediction helps the user to predict the resale value of the car depending upon various features like kilometers driven, fuel type, etc.

### **1.2 PURPOSE**

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.

This resale value prediction system is made for general purpose to just predict the amount that can be accurately acquired by the user. We try to predict the amount of resale by best 90% accuracy so the user can get an estimated value before he resales the car and doesn't make a deal in loss.

## **2. LITERATURE SURVEY**

### **2.1 EXISTING PROBLEM**

#### **1.Car Price Prediction using Machine Learning**

This proposed system helps to study car price detection and resale prediction. The results showed that there is a positive correlation between price and kilometers traveled, year of registration and kilometers traveled and a negative correlation between price and year of registration.

## **2.Used Car Price Prediction using K-Nearest Neighbor Based Model**

This paper proposed a supervised machine learning model using KNN algorithm to analyze the price of used cars. We trained our model with data of used cars which is collected from the Kaggle website.

## **3.Prediction of Prices for Used Car by using Regression Models**

This proposed approach aids in the investigation of a pricing evaluation model based on big data analysis. Given time itself could have a significant impact on the pricing of cars, the data was gathered over a shorter period of time than a month

## **4.Prediction of Used Car Price Based on Supervised Learning Algorithm (2021)**

Extra Trees Regressor, Random Forest Regressor was used. The algorithm was optimized by using the hyper parameter function.

## **5.Car resale value prediction using quantify qualitative data and knowledge-based system**

The difficult procedure has been the main method for acquiring knowledge. Explore different data types of car data.

## **6.Vehicle Price Prediction using SVM Techniques**

The study sector has seen a rise in the popularity of car price forecasting, which calls for significant effort and knowledge of the subject matter specialists. This the merit as follows, distinct machine learning algorithms of varying performances.

## **7.Car resale value prediction using quantify qualitative data and knowledge-based system**

In this paper which is titled Doan Van thai(2019) quantify qualitative data and knowledge-based systems. The primary technique for knowledge acquisition has been the time-consuming process.

## **8.Used Car price prediction (2021)**

The data in the data set are used to train the system, which then creates a model. The inputs are sent to the system, which is then tested to see how it functions.

## 2.2 REFERENCES

- [1].M. Antonakakis, T. April, M. Bailey, M. Bernhard, E. Bursztein, J. Cochran, Z. Durumeric, J. A. Halderman, L. Invernizzi, M. Kallitsis, D. Kumar, C. Lever, Z. Ma, J. Mason, D. Menscher, C. Seaman, N. Sullivan, K. Thomas, and Y. Zhou, "Understanding the mirai botnet," in Proc. of USENIX Security Symposium, 2017.
- [2].Iman Sharafaldin, Arash Habibi Lashkari, and Ali A. Ghorbani,—Toward Generating a New Intrusion Detection Dataset and Intrusion Traffic Characterization, 4th International Conference on Information Systems Security and Privacy (ICISSP), Portugal, January 2018
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- [8].Friedman, Jerome H. Greedy function approximation: A gradient boosting machine. Ann. Statist. 29 (2001), no. 5, 1189--1232

## 2.3 PROBLEM STATEMENT DEFINITION

### Customer Problem Statement

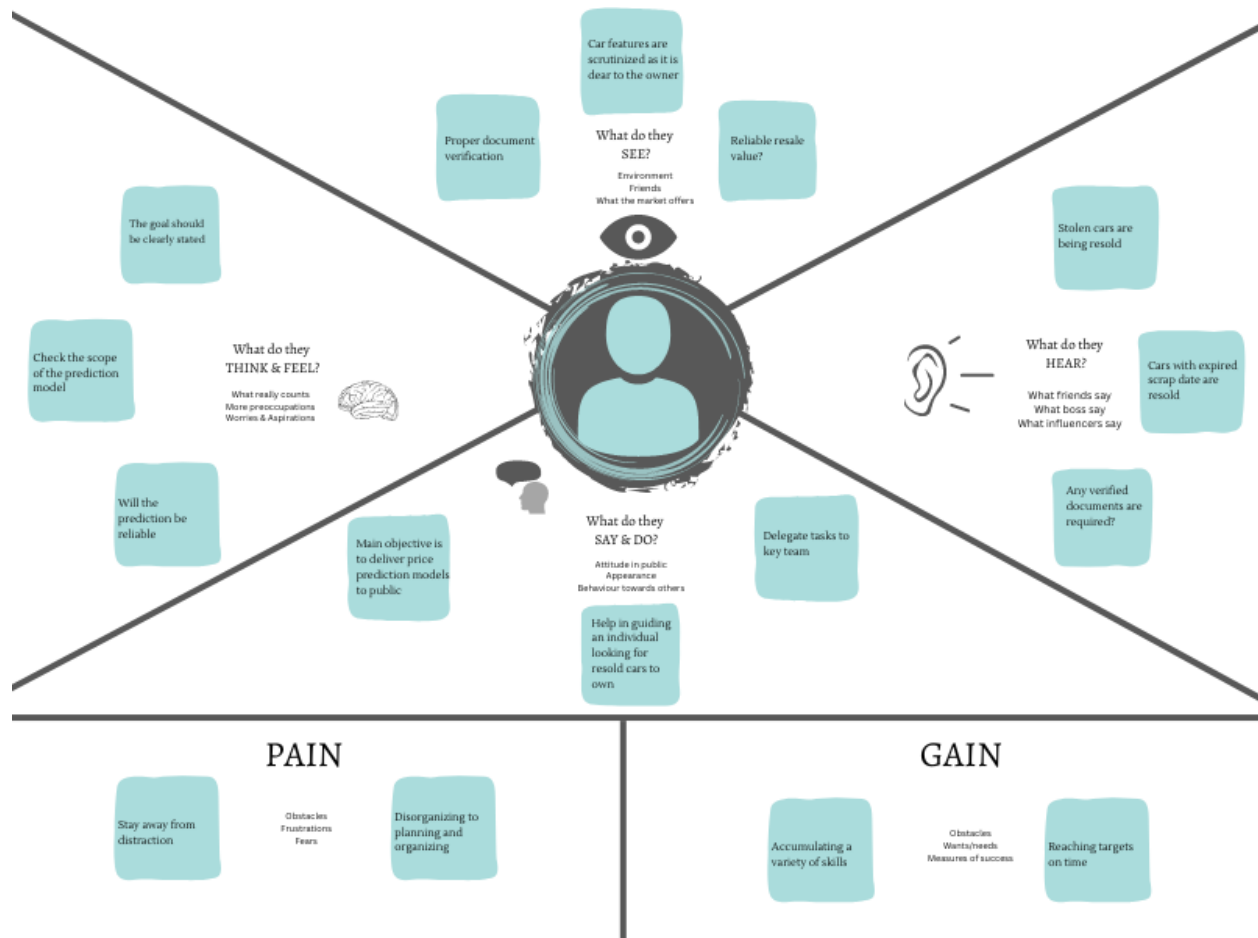
There is a critical need to close the gap between sellers and buyers due to the enormous demand for used cars and the shortage of professionals who can evaluate the proper valuation. This project focuses on developing a system that can impartially and accurately forecast the resale value of cars based on simple features like miles driven, the year of purchase, fuel type, etc. In this research, we have developed automotive resale value prediction systems using machine learning approaches while taking into account various car attributes. Only a few features are currently used to forecast a car's resale value. This can be expanded to include more features and input sets.

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Entrepreneur	Buy a used car	I am unaware of the varieties available	I don't have correct guidance	Exhausted
PS-2	Normal man	Find a good second hand car	I am unaware about the price and other factors	I am unable to know the current updates	Stressed
PS-3	Owner of a car	Sell	I don't know about its current value	Of its ear and tear	Confused

### 3. IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP CANVAS


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



## 3.2 IDEATION & BRAINSTORMING

### Step 1: Team Gathering, collaborating & selecting the problem statement

Template



## Brainstorm & idea prioritization

Brainstorming ideas for the project named Car resale value prediction along with the team and ideas of each member is stored in this brainstorm. Unleash their imagination and start shaping concepts.

- 10 minutes to prepare
- 1 hour to collaborate
- 2-8 people recommended

1


**Define your problem statement**

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

Resale value of an used car varies greatly. We as a team aim to provide a platform containing a large dataset of resale values, features and more to provide a profitable resale value for seller and affordable one for buyer without much of a brokerage



**Key rules of brainstorming**

To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

2

**Brainstorm**

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

10 minutes

HARIPRIYA R

Registration	Comfort	Economic conditions
Car marks the words of trust	Brand value	Accurate information
Branding check on car selling to meet	Kilometers covered	Car features

JEEVA H

Performance	Reasonable Price	Car safety
Maintenance	Intuitive	Minors
Exquisite car goods	Consistent with trend changes in the field	Always available accessories

KUBERA PRJESH D

Account history	Tuning	Personal
More value addition	Research and development	Wider net net
Support, Training, Sales, After Sales Support	Real trusted data	Accurate advice

SNEHA N S

Car budget of the buyer	Push a range of seller	Mileage
Efficiency	Minors need of an new requirement and needs	Fuel consumption
Support of car selling company	Unreliable dealer	Top speed

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→

### Step 2: Brainstorming, Idea Listing & Grouping

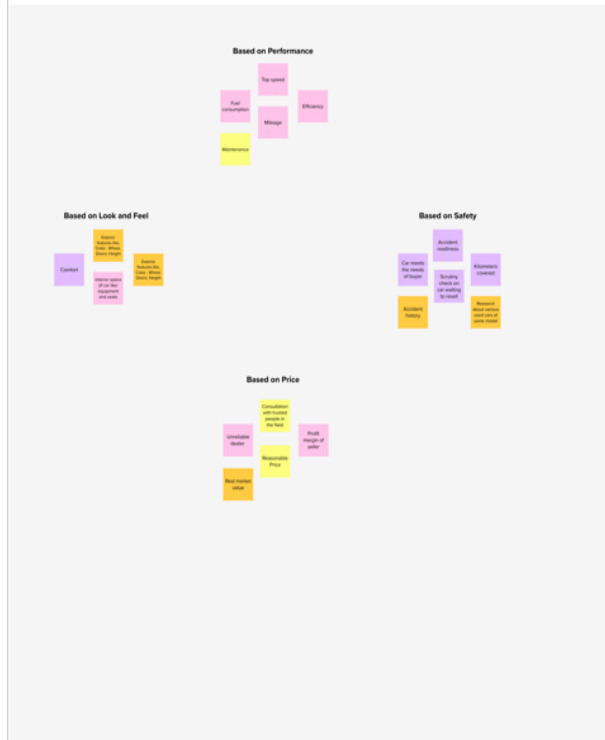


3

### Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

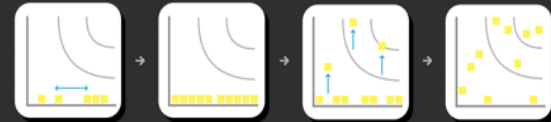


4

### 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













## 3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Therefore, anyone who wants to sell their car must bring it to the appropriate corporate workshop or schedule an appointment with the business to acquire a price estimate. It takes a lot of time and energy to complete this process.
2.	Idea / Solution description	A used buy is more economical as well as more practical, especially for first-timers. A used automobile may easily accommodate practically all types of consumers, as long as you don't absolutely need the newest model on the market or just want the fragrance of a new car.
3.	Novelty / Uniqueness	For a higher car resale value, appearance matters. Good car resale value is guaranteed by a service. Keep all documents organised. Reselling cars is novel. Find Novelty Tata's Phone Numbers, Address, Photos, and Maps.
4.	Social Impact / Customer Satisfaction	Became obsessed with customer feedback, Create a sense of convenience, Deliver fast responses, satisfaction is a company –wide focus. Customer Satisfaction Look and Style Fuel consumption Pulling Power Seating Capacity Riding Comfort Safety Features Speed Shock Absorbs & transmission Tyre mileage Braking Efficiency
5.	Business Model (Revenue Model)	How to start a car merchant business. Generally, it is considered that if you want to start a car merchant business, you need a huge capital to invest. Dealer license.

		Location of the business. Keep a watch on the market. Make your catalog. Use a perfect marketing strategy.
6.	Scalability of the Solution	The size of the used car market in India was over 4.4 million units in 2020, according to Statista. The startup has managed to strive ahead by leveraging a robust managed marketplace business model, while proving that it is economically viable and independent of scale due to the use of technology, economy of scale, economy of scope, asset light, and network effects.

### 3.4 PROBLEM SOLUTION FIT

Define CS, fit into CC	1. CUSTOMER  <ul style="list-style-type: none"> <li>Common people</li> <li>Business Women</li> <li>Entrepreneur</li> <li>First time car buyer</li> </ul>	6. CUSTOMER CONSTRAINTS  <p><b>Anxiety</b>-customer began to get anxious when they still no idea about what they have found</p> <p><b>Mysteries</b>-they might Called it mysteries which they can't able to do.</p>	5. AVAILABLE  <ul style="list-style-type: none"> <li>By searching in online websites.</li> <li>By gathering the information from the peoples and come to understanding.</li> </ul>	Explore AS, differentiate
	2. JOBS-TO-BE-DONE /  <ul style="list-style-type: none"> <li>Giving the necessary information for particular thing which needs for customer</li> <li>Solving customer doubts</li> </ul>	9. PROBLEM ROOF  <ul style="list-style-type: none"> <li>Lack of study in the sequence of things</li> <li>Unaware of the object</li> <li>New to environment</li> </ul>	7.  <ul style="list-style-type: none"> <li>Leased car need to be retained in good condition to avoid wear and tear penalties.</li> <li>Watch out for selling scams</li> </ul>	
	3. TRIGGERS  <p>When it comes to motor vehicles, all the time people are posting pictures of the car as they do their Sunday drive or even just because it has had a wash. We have all seen the slamming cars get online when they break down! We trust these people to lead us to the right vehicle and to give us advice to help our buying decisions.</p>	10. YOUR SOLUTION  <p>This system is built by Machine learning and regression model. By using this model we can predict the resale value of the car at any time anywhere.</p>	8. CHANNELS of BEHAVIOUR  <p>8.1 ONLINE</p> <p>When researching, customers don't look for information on auto brand websites alone, they visit comparison sites to check prices and user reviews.</p>	
	4. EMOTIONS: BEFORE / AFTER  <p>Before buying a car they experience a state of elation, joy, delight etc.,</p> <p>After buying a car the sense of achievement they feel when they drive it home is linked to the fact that you are now the owner of the car.</p>		8.2 OFFLINE <p>When customer wanted to buy a car they would visit one auto dealership after another, talking with salespeople and seeing where they could get the best price.</p>	

### 4. REQUIREMENT ANALYSIS

## 4.1 FUNCTIONAL REQUIREMENTS

The functional requirements for the suggested solution are listed below.

FR No.	Functional Requirement	Sub Requirement
FR-1	User Registration	Using a Form to Register using Gmail to sign up using LinkedIn to sign up
FR-2	User Confirmation	Email confirmation required Confirmation via OTP
FR-3	User Profile	User Details
FR-4	Database	Car Database Customer Database
FR-5	Features and technology	Performance of the car , fuel capacity , mileage etc.,
FR-6	Feedback	Feedback through Form Feedback through Gmail Feedback through LinkedIn

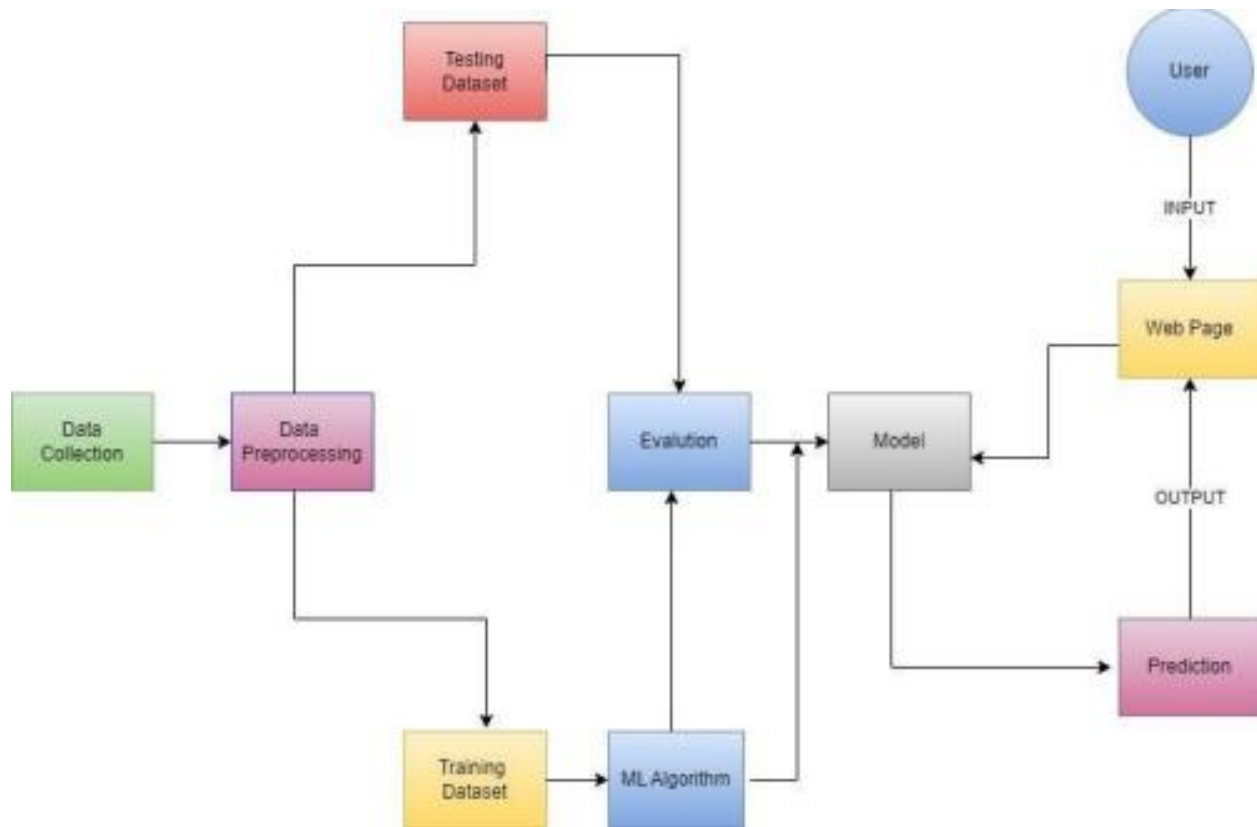
## 4.2 NON-FUNCTIONAL REQUIREMENTS

The non-functional requirements for the suggested solution are listed below.

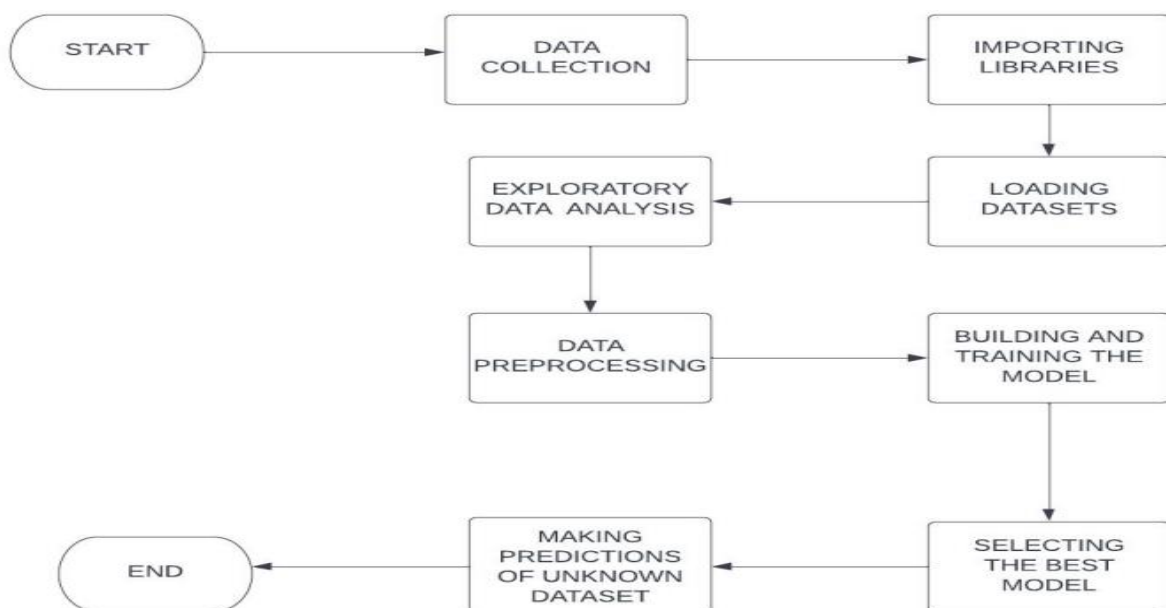
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Excellent user interface, Precise value prediction
NFR-2	Security	Securing user passwords and personal information
NFR-3	Reliability	Failure occurs less frequently and is failure free.
NFR-4	Performance	execute accurate prediction value, The landing page must accommodate multiple users and have a response time of no more than five seconds.
NFR-5	Availability	Services must always be available without interruption, with the exception of when servers are being updated.
NFR-6	Scalability	It can instantaneously serve millions of users located all over the world and manage any amount of data and computations in a time- and money- saving manner.

## 5. PROJECT DESIGN

## 5.1 DATA FLOW DIAGRAM



## 5.2 SOLUTION & TECHNICAL ARCHITECTURE



## 5.3 USER STORIES

User type	Functional requirement (epic)	User Story Number	User Story/Task	Acceptance criteria	Priority	release
Customer (mobile user)	Data entry	USN-1	I can add information about my car to the application as a user.	I can input the automobile information.	Medium	Sprint-1
Customer (mobile user)	Obtain output	USN-2	I will be given access to the application's car resale value as a user.	I'm able to get my car's resale value.	High	Sprint-1
Customer (mobile user)	Data entry	USN-1	I can enter the car's information into the application as a user.	I can enter the car details	Medium	Sprint-1
Customer (mobile user)	Obtain output	USN-2	I will be given access to the application's car resale value as a user.	I'm able to get my car's resale value.	High	Sprint-1

## 6. PROJECT PLANNING & SCHEDULING

### 6.1 SPRINT PLANNING & ESTIMATION

### 6.2 SPRINT DELIVERY SCHEDULE

### 6.3 REPORTS FROM JIRA

Chat with mentor | IBM-EPBL/IBM-Project-47160-1 | IBM-Project-2632-1658478541 | Car resale value prediction - ibm | New tab

team-16688615371780@lassian.net/jira/software/projects/CRVPBIM/boards/2/backlog

Profile - Candidate... | 192.168.253.22280... | Pitch | Collaborate... | Get into PC - Down... | Learn by Doing | M... | Major League Hack... | Brainstorming ideas... | Learn the Basics of... | Learn the Basics of... | IT8711-FOSS and CL... | Beautiful Indo Zimb... | Webinar Registratio...

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### Backlog

HP H J Epic

CRVPBIM Sprint 2 31 Oct - 5 Nov (3 issues)

- CRVPBIM-5 Select the training Model type TO DO
- CRVPBIM-6 Train the model TO DO
- CRVPBIM-7 Enhance Parameters TO DO

+ Create issue

Backlog (0 issues)

Your backlog is empty.

+ Create issue

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Chat with mentor | IBM-EPBL/IBM-Project-47160-1 | IBM-Project-2632-1658478541 | CRVPBIM board - Agile board | New tab

team-16688615371780@lassian.net/jira/software/projects/CRVPBIM/boards/2

Profile - Candidate... | 192.168.253.22280... | Pitch | Collaborate... | Get into PC - Down... | Learn by Doing | M... | Major League Hack... | Brainstorming ideas... | Learn the Basics of... | Learn the Basics of... | IT8711-FOSS and CL... | Beautiful Indo Zimb... | Webinar Registratio...

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### CRVPBIM Sprint 2

4 days remaining Complete sprint

GROUP BY None Insights

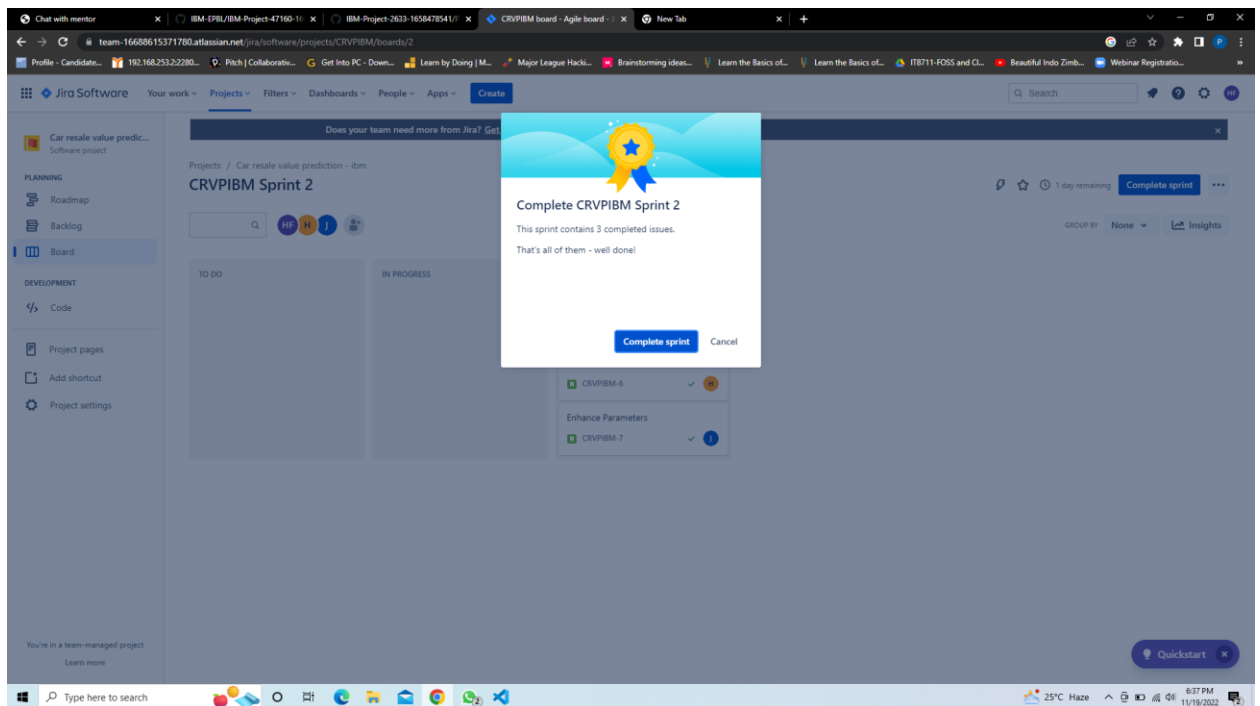
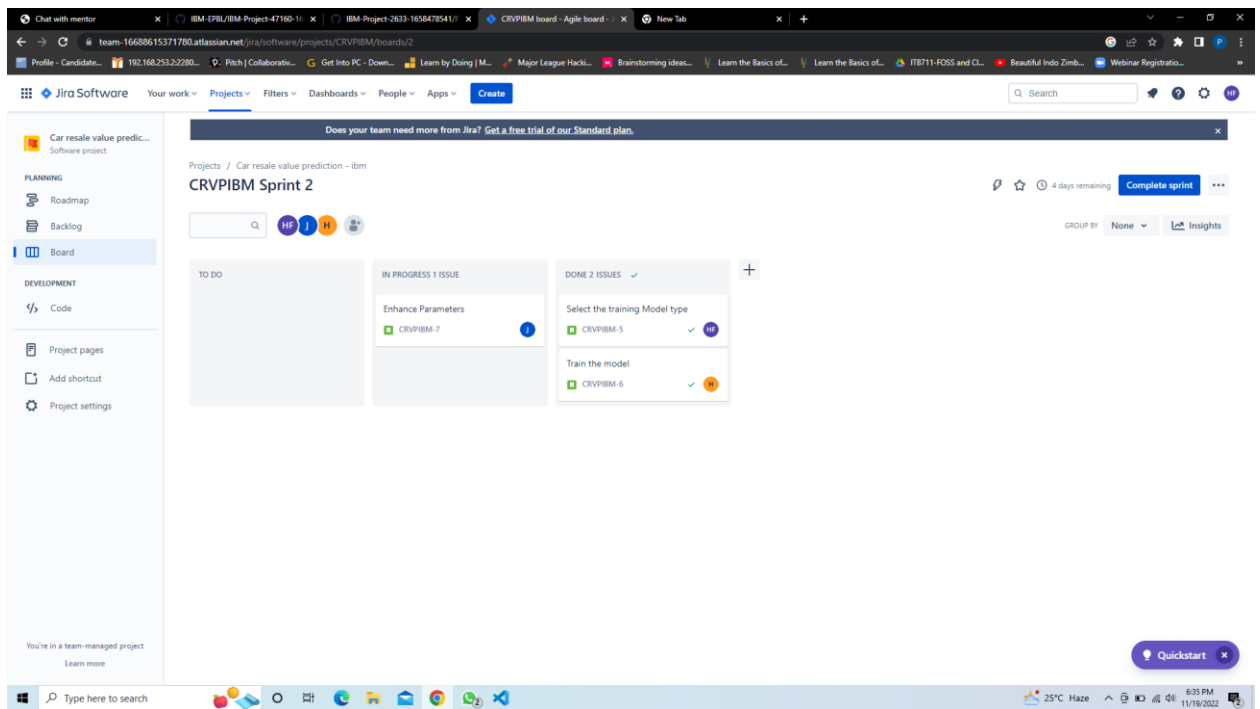
TO DO	IN PROGRESS 3 ISSUES	DONE
	<ul style="list-style-type: none"><li>Select the training Model type<ul style="list-style-type: none"><li>CRVPBIM-5</li></ul></li><li>Train the model<ul style="list-style-type: none"><li>CRVPBIM-6</li></ul></li><li>Enhance Parameters<ul style="list-style-type: none"><li>CRVPBIM-7</li></ul></li></ul>	

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## 7. CODING

### 7.1 FEATURE 1

### 7.2 FEATURE 2

## 8. TESTING



### **8.1 TEST CASES**

### **8.2 USER ACCEPTANCE TESTING**

## **9. RESULT**

### **9.1 PERFORMANCE METRICS**

## **10. ADVANTAGES & DISADVANTAGES**

## **11. CONCLUSION**

## **12. FUTURE SCOPE**

## **13. APPENDIX**

### **13.1 SOURCE CODE**

app.py:

```
import pickle
import numpy as np
import pandas as pd
from flask import Flask, render_template, request

app = Flask(__name__)

model = pickle.load(open(r'LinearRegressionModel.pkl', 'rb'))
car = pd.read_csv('Cleaned_dataset.csv')

@app.route('/')
def index():
    companies = sorted(car['Brands'].unique())
    car_models = sorted(car['Car_names'].unique())
    year = sorted(car['year'].unique(), reverse=True)
    fuel_type = car['fuel_type'].unique()

    companies.insert(0, 'Select Company')
    return render_template('index.html', companies=companies,
car_models=car_models, years=year, fuel_types=fuel_type)

@app.route('/predict', methods=['POST'])
def predict():
    company = request.form.get('company')

    car_model = request.form.get('car_models')
    year = request.form.get('year')
    fuel_type = request.form.get('fuel_type')
    driven = request.form.get('kilo_driven')

    prediction = model.predict(pd.DataFrame(columns=['name',
'company', 'year', 'kms_driven', 'fuel_type'],

data=np.array([car_model, company, year, driven,
fuel_type]).reshape(1, 5)))
    print(prediction)
```

```
    return str(np.round(prediction[0], 2))

if __name__ == '__main__':
    app.run()
```

### **car\_resale\_value\_prediction.ipynb:**

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib as mpl
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn.preprocessing import *
from sklearn.model_selection import *
from sklearn.ensemble import *
from sklearn.feature_selection import *
from sklearn.metrics import *
from sklearn.tree import *
from sklearn.svm import *
from sklearn.preprocessing import LabelEncoder
import pickle
import warnings

warnings.filterwarnings('ignore')
%matplotlib inline
mpl.style.use('ggplot')
data = pd.read_csv('Datasets_of_cars.csv')

data.head()
data.shape
data.info()
```

```

backup=data.copy()
data['year'].unique()
data['Price'].unique()
data['kms_driven'].unique()
data['fuel_type'].unique()
data['Car_names'].unique()
#year has many non-year values
data=data[data['year'].str.isnumeric()]
#year is in object. Change to integer
data['year']=data['year'].astype(int)
#Price has Ask for Price
data=data[data['Price']!='Ask For Price']
#Price has commas in its prices and is in object
data['Price']=data['Price'].str.replace(',','').astype(int)
#kms_driven has object values with kms at last
data['kms_driven']=data['kms_driven'].str.split().str.get(0).str.replace(',','')
#It has nan values and two rows have 'Petrol' in them
data=data[data['kms_driven'].str.isnumeric()]
data['kms_driven']=data['kms_driven'].astype(int)
#fuel_type has nan values
data=data[~data['fuel_type'].isna()]
data.shape
data['Car_names']=data['Car_names'].str.split().str.slice(start=0,stop=3).str.join(' ')
#Resetting the index of the final cleaned data
data=data.reset_index(drop=True)
data
data.to_csv('Cleaned_datasets.csv')
data.info()
data.describe()
data['Brands'].unique()
data.hist(figsize=(8,8))
sns.pairplot(data)
sns.boxplot(data.Price)
Extracting Training Data
X=data[['Car_names','Brands','year','kms_driven','fuel_type']]
y=data['Price']
X

```

```

y.shape
#Encoding Techniques
le=LabelEncoder()
data.head()
plt.figure(figsize=(10,8))
sns.heatmap(data.corr(),annot=True)
# dependent variable
y=data['Price']
y
#independent variable
X=data.drop(columns=['Price'],axis=1)
X.head()
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2)
X_train.shape
y_train.shape
X_test.shape
y_test.shape
X = data.drop(columns='Price')
y = data['Price']
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.2)
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import OneHotEncoder
from sklearn.compose import make_column_transformer
from sklearn.pipeline import make_pipeline
from sklearn.metrics import r2_score
enc=OneHotEncoder()
enc.fit(X[['Car_names','Brands','fuel_type']])
column_trans=make_column_transformer((OneHotEncoder(categories=enc.categories_),['Car_names','Brands','fuel_type']),
                                     remainder='passthrough')
# Linear Regression model
mod=LinearRegression()
# Making a pipeline
pipe=make_pipeline(column_trans,mod)
# Fitting the model

```

```

pipe.fit(X_train,y_train)
#Predicting the values to test
y_pred=pipe.predict(X_test)
y_pred
#printing the accuracy
r2_score(y_test,y_pred)
scores=[]
for i in range(1000):

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.1,random_state=i)
    mod=LinearRegression()
    pipe=make_pipeline(column_trans,mod)
    pipe.fit(X_train,y_train)
    y_pred=pipe.predict(X_test)
    scores.append(r2_score(y_test,y_pred))

np.argmax(scores)

scores[np.argmax(scores)]

pipe.predict(pd.DataFrame(columns=X_test.columns,data=np.array(['Maruti
Suzuki Swift','Maruti',2019,100,'Petrol']).reshape(1,5)))

X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.1,random_state=np.
argmax(scores))

lr=LinearRegression()

pipe=make_pipeline(column_trans,lr)

pipe.fit(X_train,y_train)

y_pred=pipe.predict(X_test)

#R2score
r2_score(y_test,y_pred)

```

### **# Saving the Model to a Pickle File**

```
pickle.dump(pipe,open('LinearRegressionModel.pkl','wb'))  
pipe.predict(pd.DataFrame(columns=X_test.columns,data=np.array(['Maruti  
Suzuki Swift','Maruti',2019,100,'Petrol']).reshape(1,5)))  
pipe.steps[0][1].transformers[0][1].categories[0]
```

## **13.2 GITHUB & PROJECT DEMO LINK**