ABSTRACT

In today’s world the production of automobile vehicle are immense and the companies producing the vehicle are numerous, because of this situation the identification of best vehicle based on the performance is difficult. To make this easy for every people we attempt to make a performance analyzer which will help people to find the best vehicle based on the performance as key feature. This is achieved by using machine learning algorithms on the exisisting datasets. In this the datasets of vehicle are collected for training model from various resources. The dataset describes the various characteristics and features of the vehicle which are used for training the model. The trained model in this project is used for the purpose of classification of vehicle based on the performance.The model obtained from the project aid the normal people to select the right vehicle based ontheir own requirement.

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The vehicles are the major source of transportation in todays world. The production and usage of the vehicle is increased in recent years, because of this there are numerous vehicle is found in the market. The identification of best suited vehicle becomes difficult for the Customer. The performance analysis of the vehicle can help the Customer to aid this process.

The performance can be calculated by some features of the vehicle like number of cylinders, displacement, horsepower, acceleration. These features are the data used for the performance calculation of a vehicle. With the help of this analysis the customer can plan their journey accordingly. They have the option to view a suggestion for the ride based on the performance.

1.2 PURPOSE

To help the Customer by analyzing the vehicle performance using the features of the vehicle and give a suggestion to the customer to find the best vehicle. The performance of the vehicle is calculated as the mileage of the vehicle. The mileage is one of the main feature to be considered for buying the vehicle. This vehicle performance analysis system is made for general purpose to just predict the mileage roughly using the features of the vehicle.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING SYSTEM

Emphasize of the value of risk and analysis in all aspects of the features of the vehicle to get the performance. Once the performance of vehicle is predicted using the model, it helps the customer to identify the potential vehicles. The identification of theright vehicle is difficult because there are numerous vehicle in the market which make hardfor people in choosing right vehicle. In world, around 60% usage of vehicle is using the carwhich is used for the transportation, in this process sometimes the customers meet uncertain situation like breakdown of vehicle, inadequate fuel for the travel. This is affected by the performance of the vehicle. This can be reduced with the analysis of the vehicle.

Most research articles use the features of vehicle to calculate the performance. The features of the vehicle include number of cylinders, displacement, horsepower, weight of the vehicle, acceleration of the vehicle, model year, origin. This application was created to measure the performance and aid the customer to have a safe journey.

2.2 REFERENCES

1. “Machine Learning-Based Energy Management in a Hybrid Electric Vehicle to Minimize Total Operating Cost”,Xue Lin, Paul Bogdan, Naehyuck Chang, Massoud Pedram , in 2016 .

2. “Machine learning based real-time vehicle data analysis for safe driving modeling”,Pamul Yadav, Sangsu Jung, Dhananjay Singh, in 2019 .

3. “Performance of Motor Vehicle based on Driving and Vehicle Data using Machine Learning”,Punith Kumar, Nagaraje Gowda, in 2019.

4. “Vehicle Acceleration Prediction Based on Machine Learning Models and Driving Behavior Analysis”,Yajie Zou, Lusa Ding , Hao Zhang in 2022.

2.3 PROBLEM STATEMENT DEFINITION

Predicting the performance level of cars is an important and interesting problem. The main goal is to predict the performance of the car to improve certain behaviors of the vehicle. This can significantly help to improve the system's fuel consumption and increase efficiency. The performance analysis of the car is based on the engine type, no of engine cylinders, fuel type, horsepower, etc. These are the factors on which the health of the car can be predicted. It is an ongoing process of obtaining, researching, analyzing, and recording health based on the above three factors. The performance objectives like mileage, dependability, flexibility and cost can be grouped together to play a vital role in the prediction engine and engine management system. This approach is a very important step towards understanding the vehicle's performance

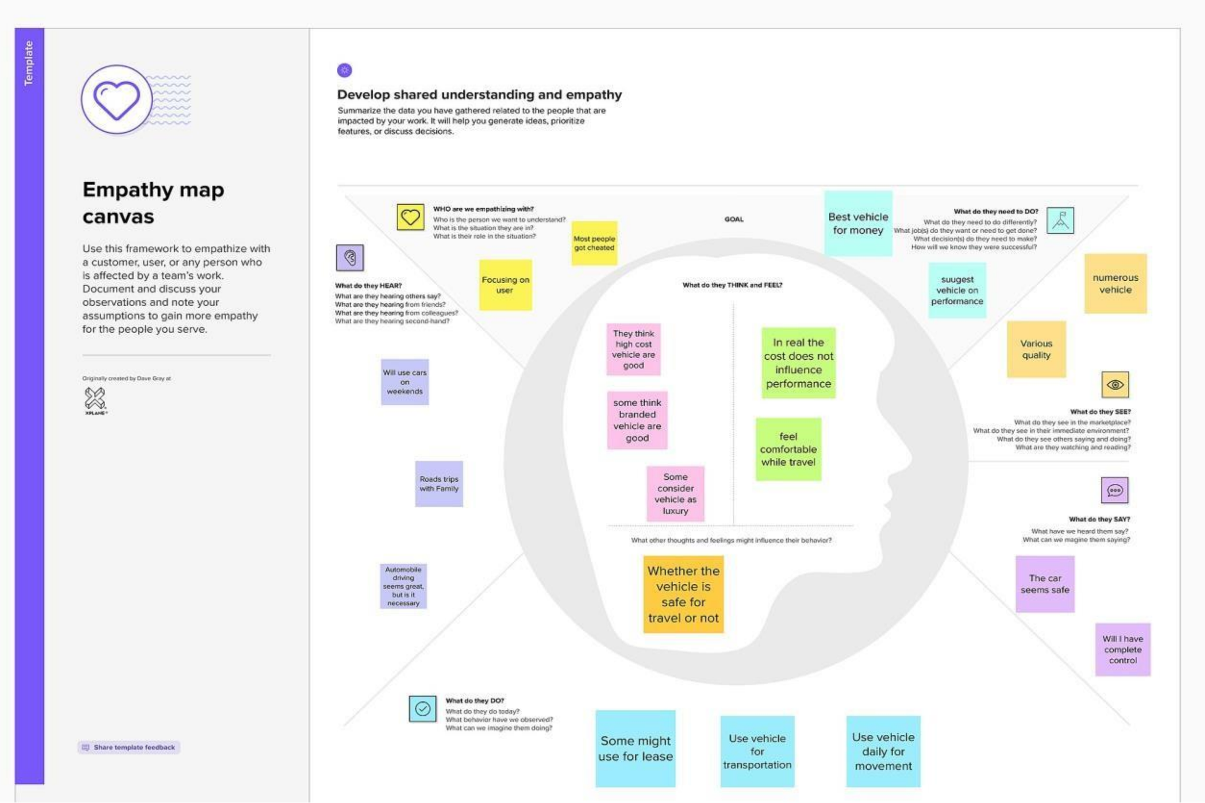
I am	The consumer who is trying to buy a vehicle for my own personal use. This use is mainly for travel involved in the job.
I’m trying to	Buy a best suited vehicle for my preference based on the performance of the vehicle.
But	I am unaware of the performance measures and standards of the vehicle in the market, this is because there are several brands and type of vehicle in the market.
Because	I don’t wantto spoil the money by investing on low performing vehicle.
Which makesme feel	I’m not capable of buying the right vehicle of my own requirement because of less knowledge about the vehicle in the market.

Table 2.1 - Problem statement definition

CHAPTER 3

IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



Empathy map canvas

Use this framework to empathize with a customer, user, or any person who is affected by a team's work. Document and discuss your observations and note your assumptions to gain more empathy for the people you serve.

Originally created by Dave Gray at XPLANE

Develop shared understanding and empathy

Summarize the data you have gathered related to the people that are impacted by your work. It will help you generate ideas, prioritize features, or discuss decisions.

WHO are we empathizing with?
Who is the person we want to understand?
What is the situation they are in?
What is their role in the situation?

What do they HEAR?
What are they hearing others say?
What are they hearing from friends?
What are they hearing from colleagues?
What are they hearing second-hand?

What do they need to DO?
What do they need to do differently?
What job(s) do they want or need to get done?
What decision(s) do they need to make?
How will we know they were successful?

What do they SEE?
What do they see in the marketplace?
What do they see in their immediate environment?
What do they see others saying and doing?
What are they watching and reading?

What do they SAY?
What have we heard them say?
What can we magine them saying?

What do they DO?
What do they do today?
What behavior have we observed?
What can we imagine them doing?

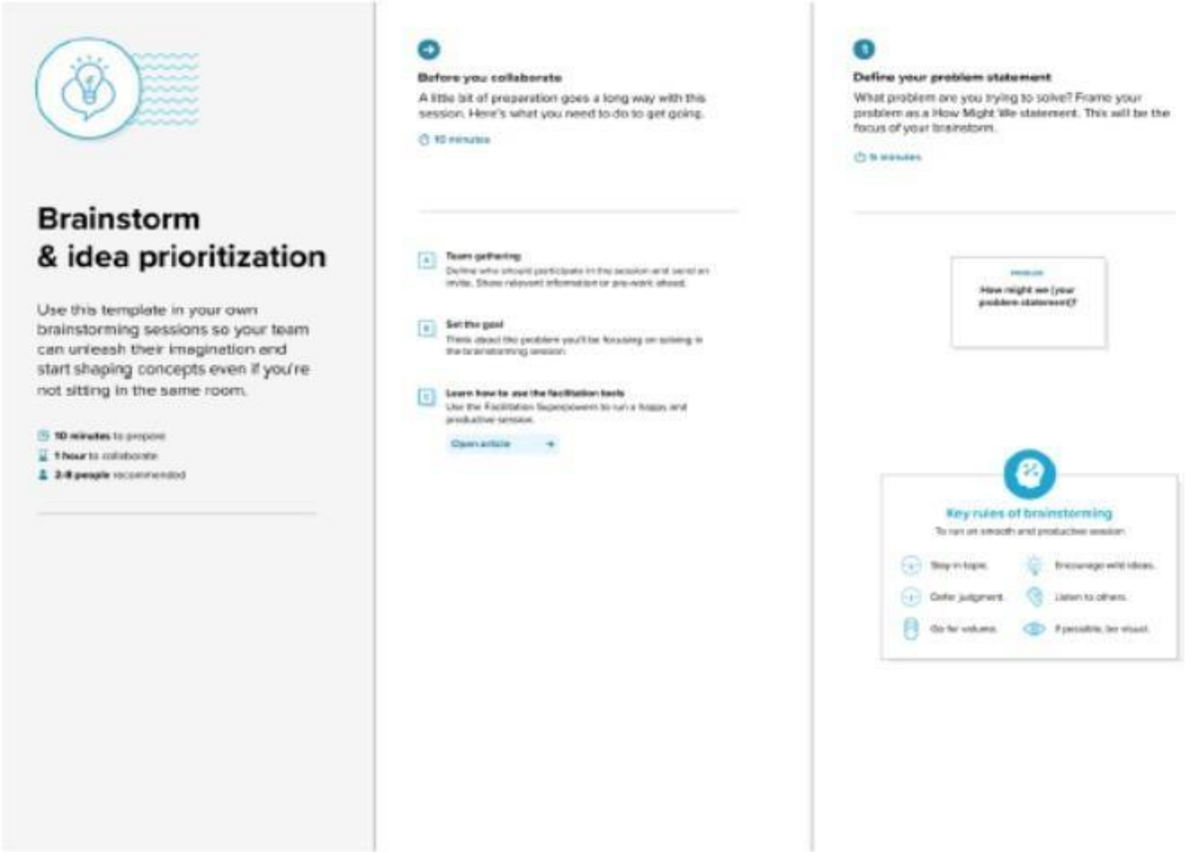
Template
GOAL
What do they THINK and FEEL?
What other thoughts and feelings might influence their behavior?
Most people got cheated
Focusing on user
Will use cars on weekends
Roads trips with Family
Automobile driving seems great, but is it necessary
They think high cost vehicle are good
some think branded vehicle are good
Some consider vehicle as luxury
In real the cost does not influence performance
feel comfortable while travel
Whether the vehicle is safe for travel or not
Best vehicle for money
suugest vehicle on performance
numerous vehicle
Various quality
The car seems safe
Will I have complete control
Some might use for lease
Use vehicle for transportation
Use vehicle daily for movement
Share template feedback

Figure 3.1 - Empathy Map Canvas

An empathy map is a collaborative tool, teams can use to gain a deeper insight into their customers. Much like a user personal, an empathy map can represent a group of users, such as a customer segment. The empathy in here describe about the customer requirement, problems, advantages involved in the project.

3.2 BRAINSTORM & IDEA PRIORITIZATION

Step 1: Team Gathering, Collaboration and Select the Problem statement



Brainstorm & idea prioritization

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.

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

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

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
How might we [your problem statement]?

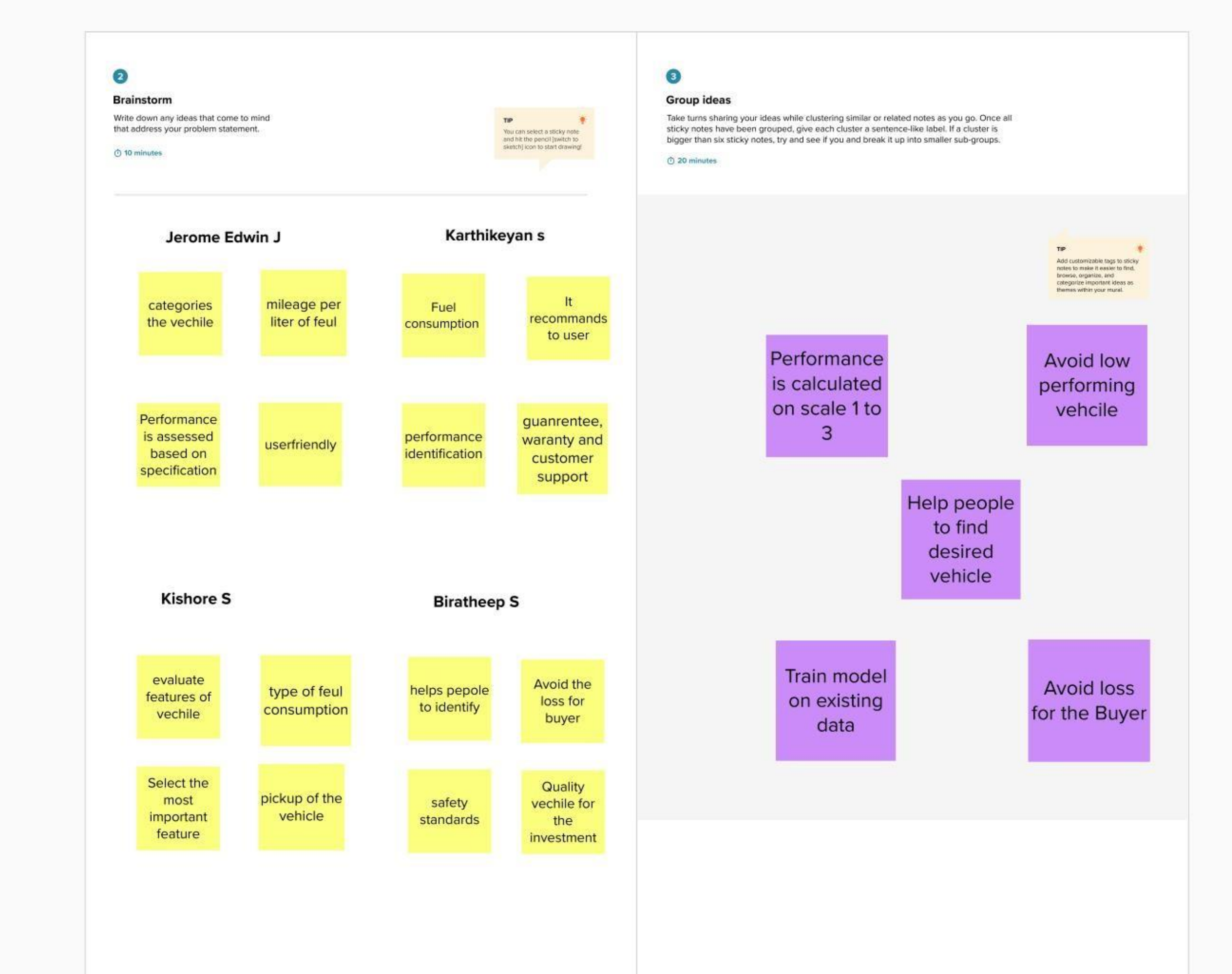
Key rules of brainstorming
To run an smooth and productive session

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

Figure 3.2 - Team Gathering

The team gathering is a meeting conducted among the team members after selecting the project. The team gathering is done to finalize the idea selected for project and to find the problem statement for the project. The problem statement is the main step in building the project.

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!

Jerome Edwin J

categories the vechile

mileage per liter of feul

Performance is assessed based on specification

userfriendly

Karthikeyan s

Fuel consumption

It recommands to user

performance identification

guanrentee, waranty and customer support

Kishore S

evaluate features of vechile

type of feul consumption

Select the most important feature

pickup of the vehicle

Biratheep S

helps pepole to identify

Avoid the loss for buyer

safety standards

Quality vechile for the investment

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 and break it up into smaller sub-groups.

20 minutes

TIP

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

Performance is calculated on scale 1 to 3

Avoid low performing vehcile

Help people to find desired vehicle

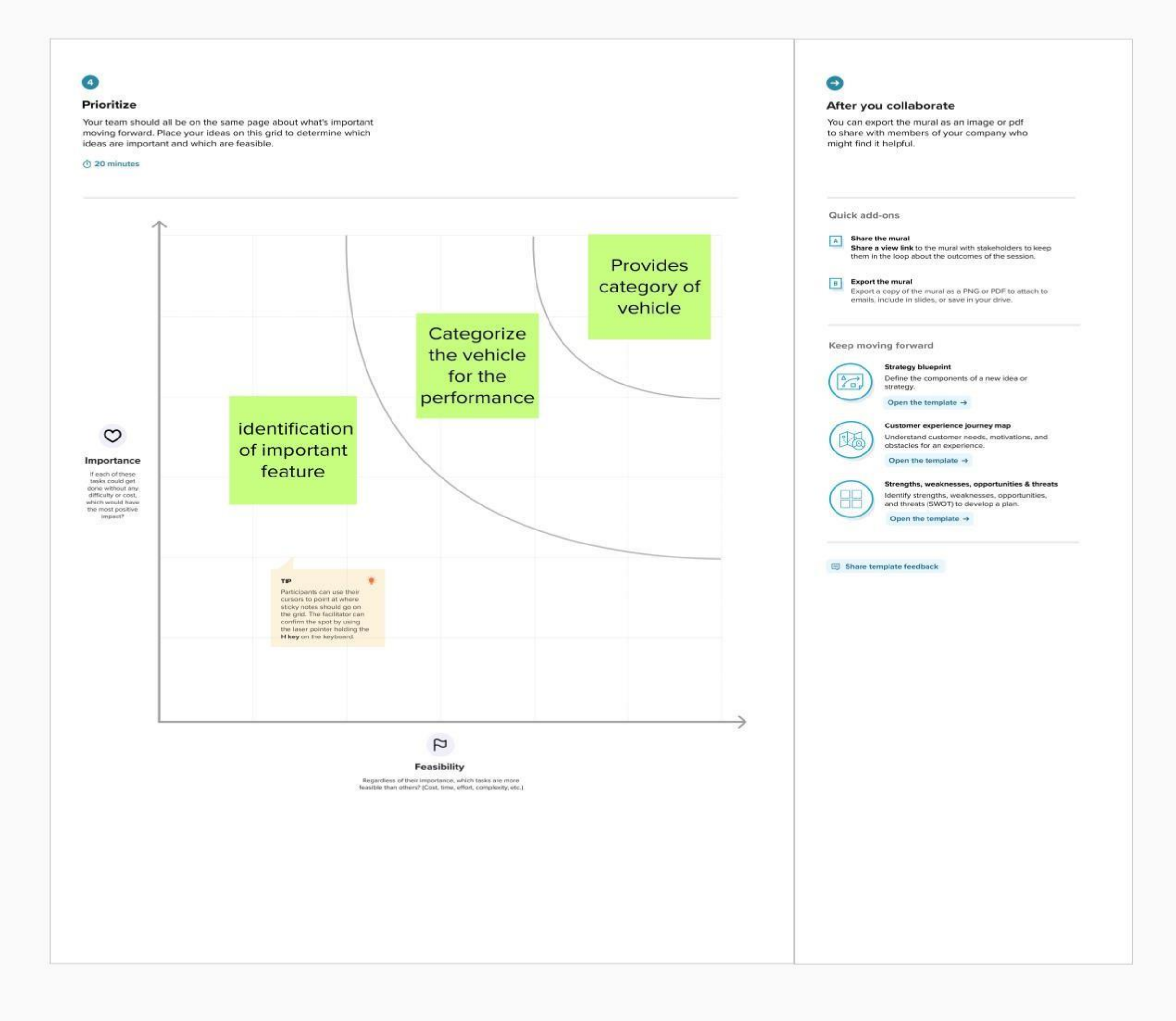
Train model on existing data

Avoid loss for the Buyer

Figure 3.3 - Brainstorming

Brainstorming is a technique where in team members are free to express ideas about a certain topic in a group session. In this Brainstorming session we have discussed the ideas of each, with respect to project. We able to come up with several new ideas and collected the ideas for developing the project.

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

Importance

If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?

TIP

Participants can use their cursors to point at where sticky notes should go on the grid. The facilitator can confirm the spot by using the laser pointer holding the **H key** on the keyboard.

Feasibility

Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

A **Share the mural**
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

B **Export the mural**
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.

Provides category of vehicle
Categorize the vehicle for the performance
identification of important feature
Open the template →
Open the template →
Open the template →
Share template feedback

Figure 3.4 - Idea Prioritization

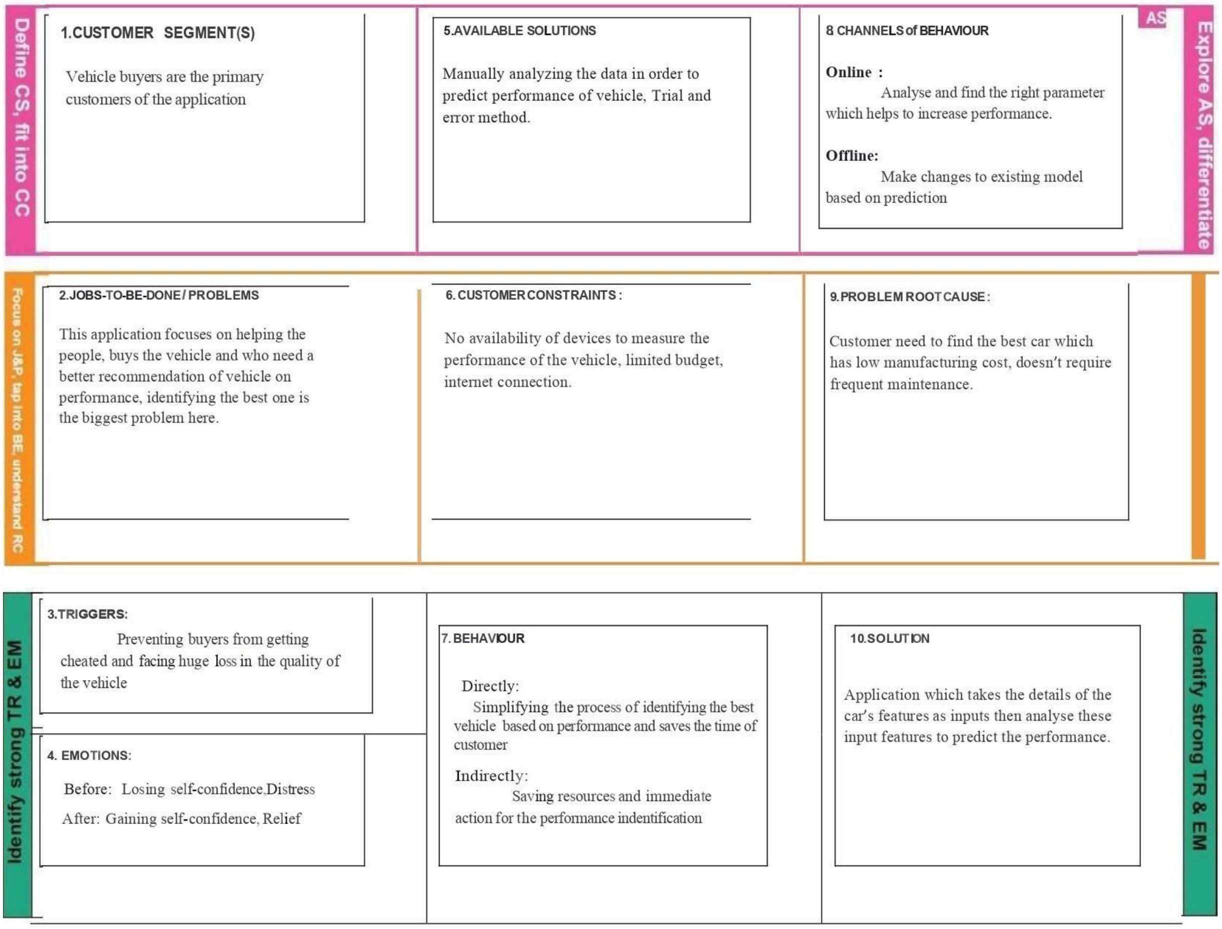
The ideas for the project is collected from the brainstorming session which is conducted prevously. The ideas is not in a proper sequence to develop the project. So there is a need for sequencing of ideas into phases which helps in easy development of the project.

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To predict the performance of the vehicle approximately using the given datasets.
2.	Idea / Solution description	One of the solution of the problem is to consider the performance metrics like mileage, horsepower, acceleration.
3.	Novelty / Uniqueness	This application can suggests better vehicle based on the performance of the vehicle for the user requirement.
4.	Social Impact / Customer Satisfaction	It helps the people to identify the best vehicle in no time and get the quality vehicle .
5.	Business Model (Revenue Model)	The application categories the vehicle based on the performance so that the process of finding the vehicle will be easy process.
6.	Scalability of the Solution	The application can be improved by introducing this in the website all over the world so that the people are easy to access this application.

Table 3.1 - Proposed Solution Table

3.4 PROBLEM SOLUTION FIT



1.CUSTOMER SEGMENT(S)

Vehicle buyers are the primary customers of the application

5.AVAILABLE SOLUTIONS

Manually analyzing the data in order to predict performance of vehicle, Trial and error method.

8 CHANNELS of BEHAVIOUR

Online :

Analyse and find the right parameter which helps to increase performance.

Offline:

Make changes to existing model based on prediction

2.JOBS-TO-BE-DONE / PROBLEMS

This application focuses on helping the people, buys the vehicle and who need a better recommendation of vehicle on performance, identifying the best one is the biggest problem here.

6. CUSTOMER CONSTRAINTS :

No availability of devices to measure the performance of the vehicle, limited budget, internet connection.

9.PROBLEM ROOT CAUSE :

Customer need to find the best car which has low manufacturing cost, doesn't require frequent maintenance.

3.TRIGGERS:

Preventing buyers from getting cheated and facing huge loss in the quality of the vehicle

4. EMOTIONS:

Before: Losing self-confidence,Distress

After: Gaining self-confidence, Relief

7. BEHAVIOUR

Directly:

Simplifying the process of identifying the best vehicle based on performance and saves the time of customer

Indirectly:

Saving resources and immediate action for the performance indentification

10.SOLUTION

Application which takes the details of the car's features as inputs then analyse these input features to predict the performance.

Figure 3.5 - Problem Solution Fit

The problem solution fit is process of finding or understanding the customers needs or the requirement for the customers that is need to be satisfied. It means the solution developed actually helps the customers to solve the problem.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Vehicle Data Collection	User input through form Sending the data to server
FR-4	Prediction	Predict the performance of the vehicle based on the already existing data of the vehicle.
FR-5	Report Generation	Show the expected output to the user based on the trained data and give a better suggestion to the user.

Table 4.1 - Functional Requirements

4.2 NON-FUNCTIONAL REQUIREMENT

Following are the non-functional requirement of the proposedsolution

NFR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This application does not require any instrument and specialized tool to measure performance. It tries to classify the vehicle based on performance.
NFR-2	**Security**	The site is protected against any kind of cyber threats. It provides maximum security to the user by securing the data.
NFR-3	**Reliability**	This application provides almost better classification of the vehicle based on thefactors influencing the performance
NFR-4	**Performance**	This application perform well even when a large set of people try to access the site at the same time, without affecting the performance.
NFR-5	**Availability**	Ensuring the availability of the application by making it accessible to everyone, minimizing the downtime of the services
NFR-6	**Scalability**	This application can be developed for every kind of vehicle, not only for the cars.

Table 4.2 - Non-Functional Requirements

CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

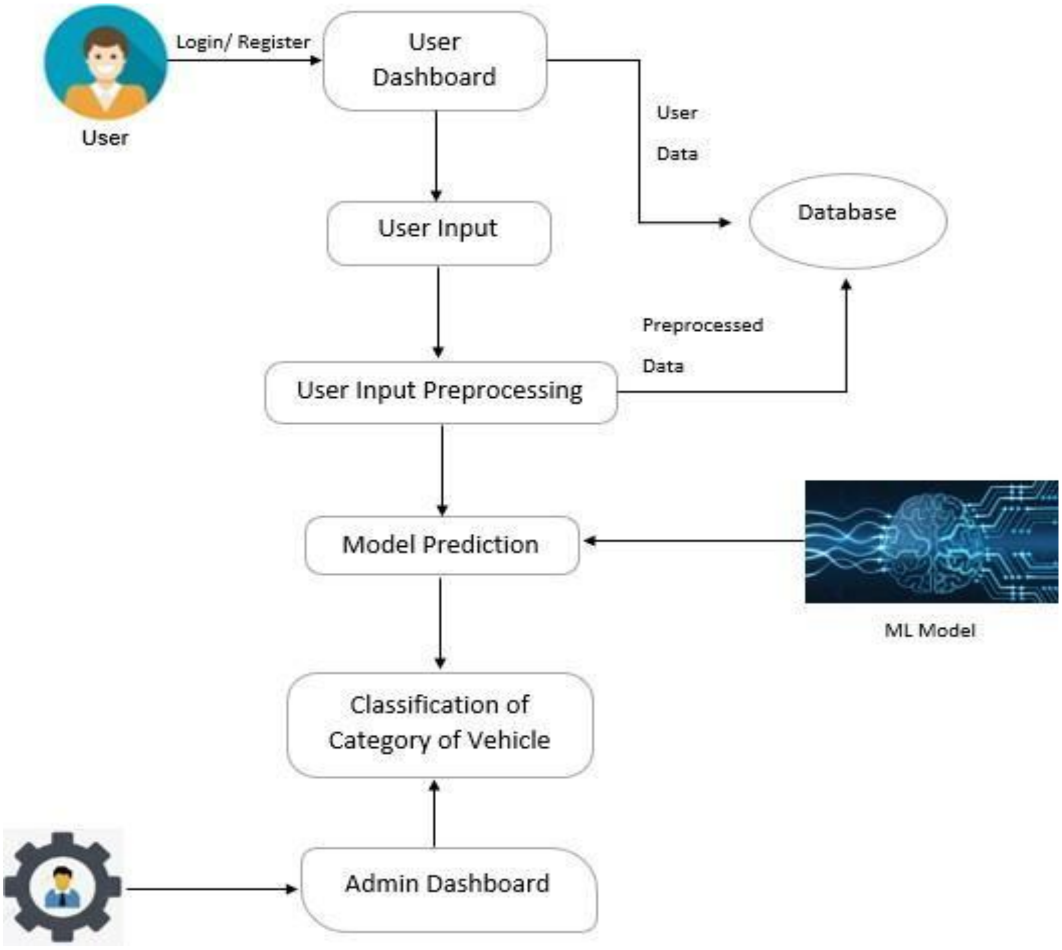


Figure 5.1 - Data Flow Diagram

The Data Flow Diagram is a visual representation of the working of project from the user interaction to final output given for the user. Here the diagram describes the flow from the login to final output displayed

5.2 SOLUTION & TECHNICAL ARCHITECTURE

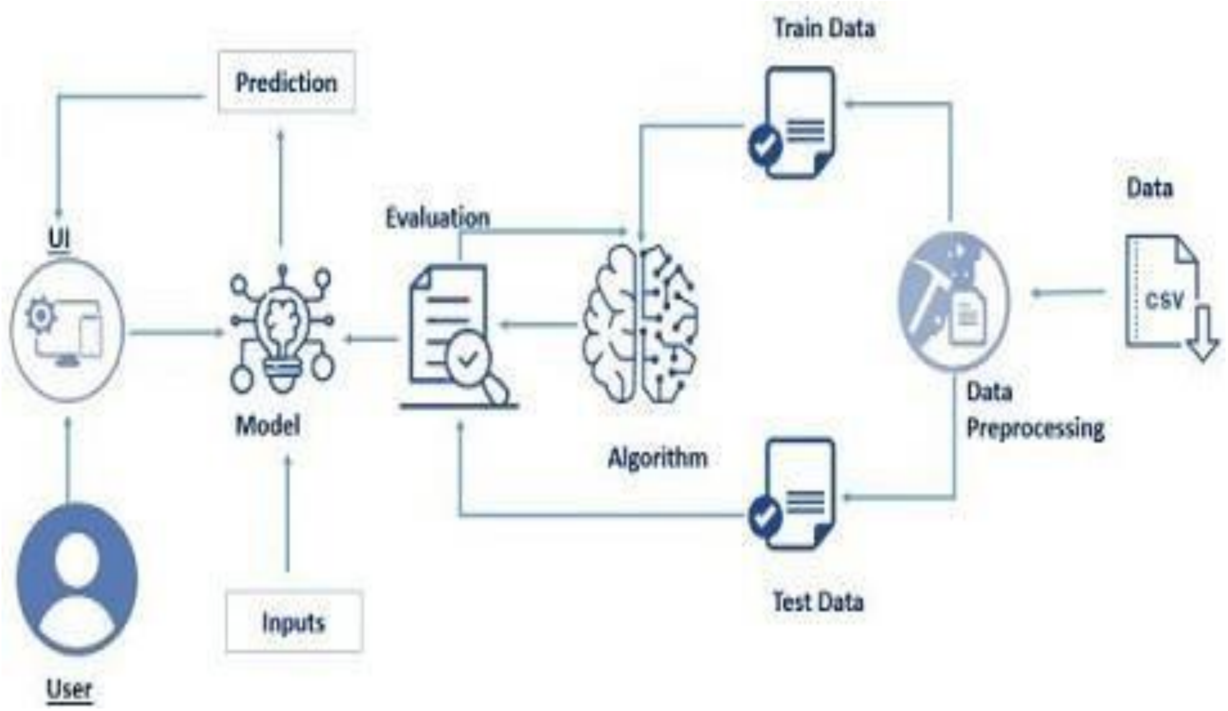


Figure 5.2 - Technical Architecture

The technical architecture is diagrammatic representation which gives details of the building blocks involved in the project which is mostly on the technical details. Here the technical architecture describes theworking of project which is based on machine learning model. The ML model is used to predict the performance of the vehicle.

5.3 USER STORIES

User Type	Functional 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 confirming my password.	I can access my account / dashboard	High	Sprint-1
Customer (Mobile user)	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
Customer (Mobile user)	Registration	USN-3	As a user, I can register for the application through Gmail	I can access the application after this process	Medium	Sprint-1
Customer (Mobile user)	Login	USN-4	As a user, I can log into the application by entering email & password	As a user whenever need can access the application	High	Sprint-1
Customer (Mobile user)	Dashboard	USN - 5	The User can access th application through it	The user interface for the End User	High	Sprint 3
Administrator	Admin	USN - 6	As an admin, I can log into the application by entering email & password	I can access my admin dashboard	High	Sprint-1

Table 5.1 - User Stories

CHAPTER 6

PROJECT PLANNING & SCHEDULING

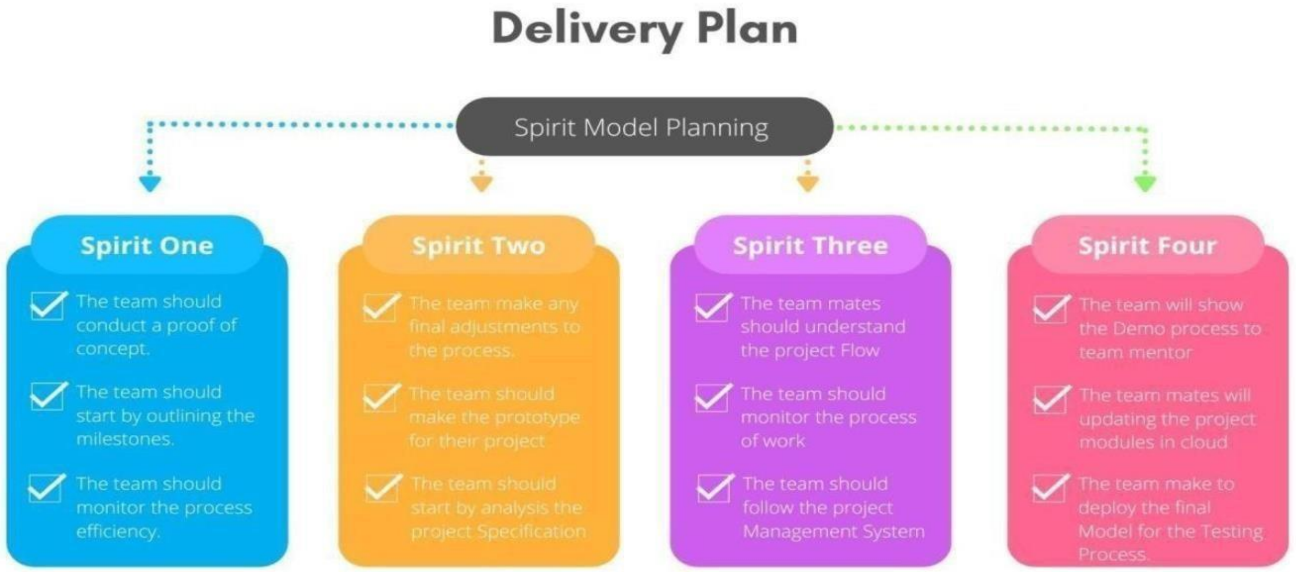
6.1 SPRINT PLANNING & ESTIMATION

To accomplish the above task,you must completethe below activities and tasks:

- Download the dataset.
- Classify the dataset intdo train and test sets.
- Import the suitable model
- Load the trained data and fit the model.
- Test the model.
- Save the model and its dependencies.
- Build a Web application using a flask that integrates with the model built.

6.2 SPRINT DELIVERY SCHEDULE

The delivery plan of project deliverables is a strategic element for every Project Manager. The goal of every project is, in fact, to produce a result that serves a specific purpose. With the word “Purpose “, we can mean the most disparate goals: a software program, a chair, a building, a translation. In Project Spirit, Delivery Planning is one of the processes of completing the project and Show Casing the Time Line of the Project Planning. This delivery plan help to understand the process and Work Flow of the Project working by the Team Mates. Every Single Module is assigned to the teammates to showcase their work and contribution to developing the Project.



Delivery Plan

Spirit Model Planning

Spirit One

- ✓ The team should conduct a proof of concept.
- ✓ The team should start by outlining the milestones.
- ✓ The team should monitor the process efficiency.

Spirit Two

- ✓ The team make any final adjustments to the process.
- ✓ The team should make the prototype for their project
- ✓ The team should start by analysis the project Specification

Spirit Three

- ✓ The team mates should understand the project Flow
- ✓ The team should monitor the process of work
- ✓ The team should follow the project Management System

Spirit Four

- ✓ The team will show the Demo process to team mentor
- ✓ The team mates will updating the project modules in cloud
- ✓ The team make to deploy the final Model for the Testing Process.

Figure 6.1 - Sprint Delivery Plan

6.3 REPORTS FROM JIRA

Burndown Chart

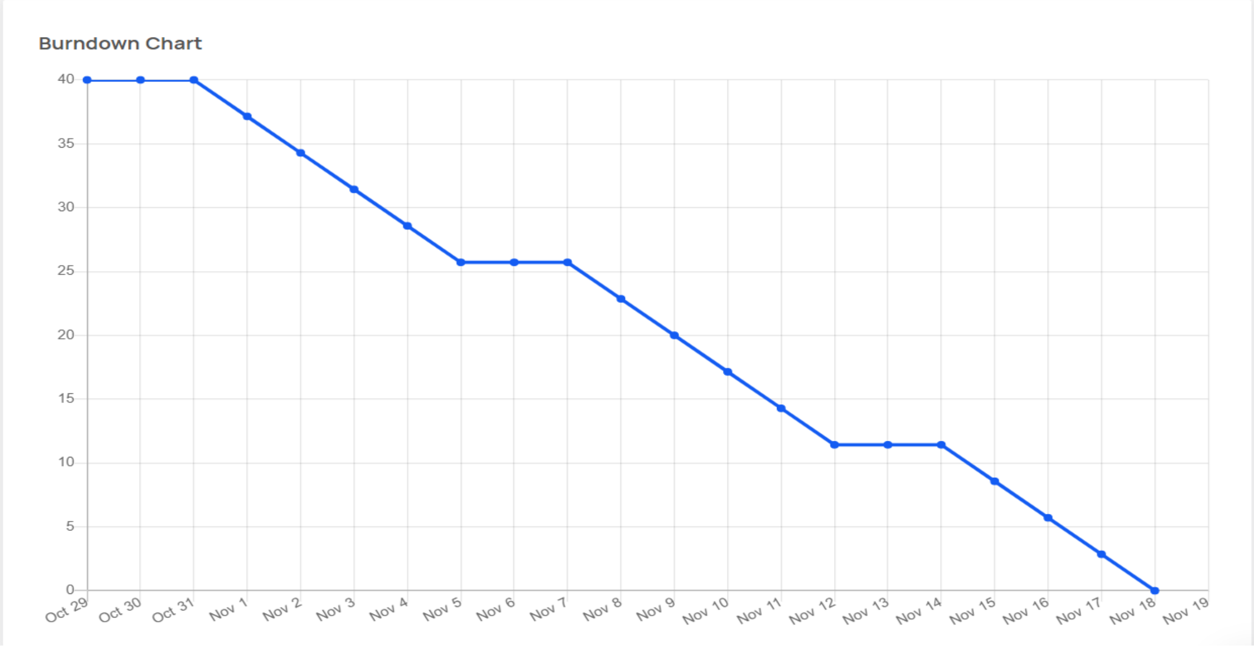


Figure 6.2 - Burndown chart

It shows work that has been completed in an sprint,and the total work remaining

Burnup Chart

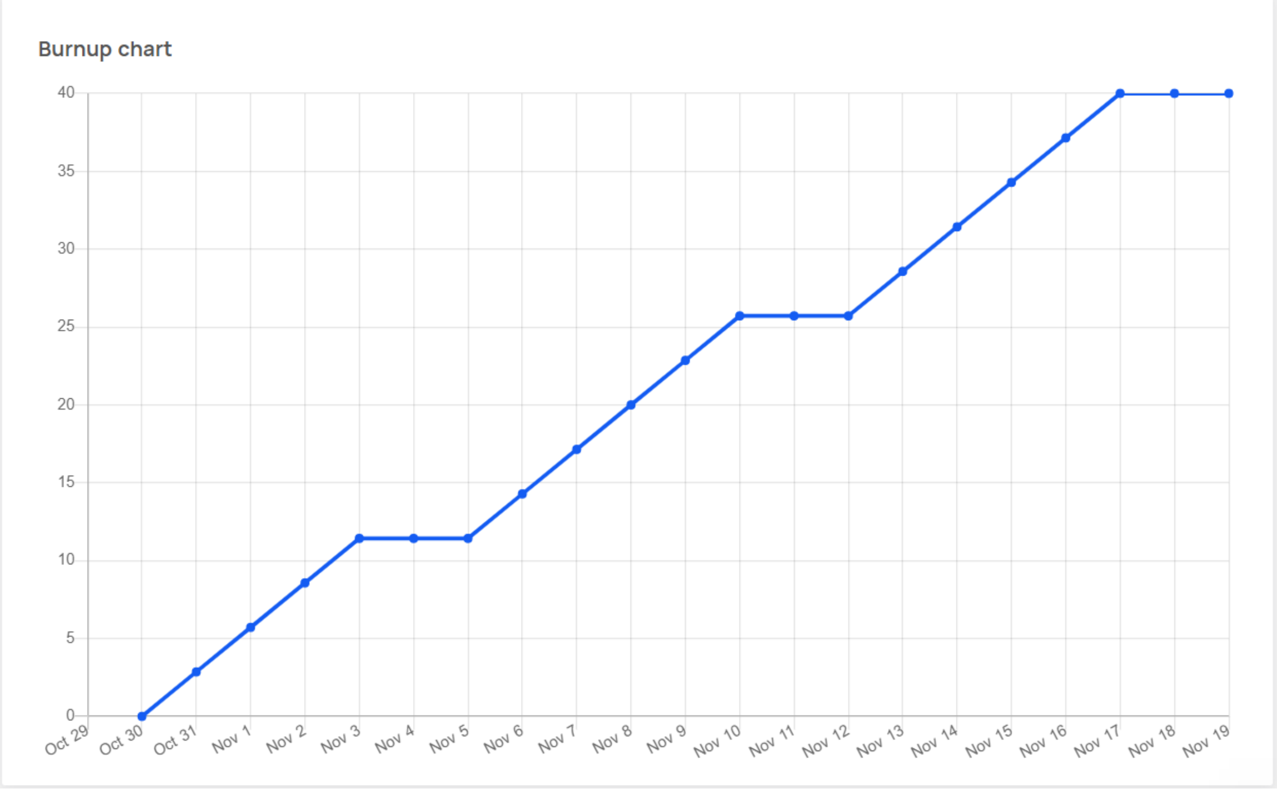


Figure 6.3 - Burnup chart

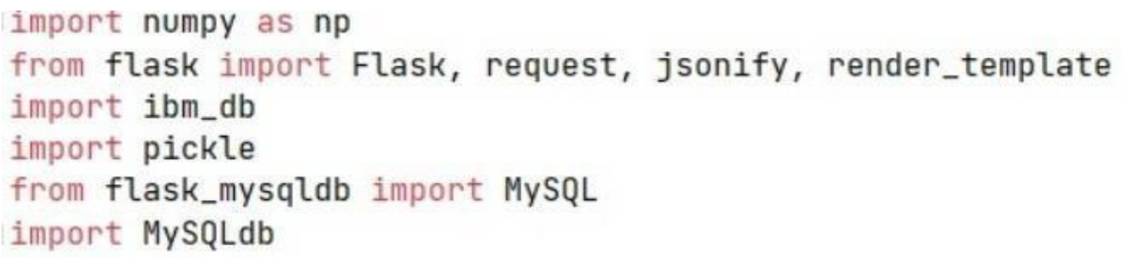
It displays the scopeof a project and the work completed

CHAPTER 7

CODING & SOLUTION

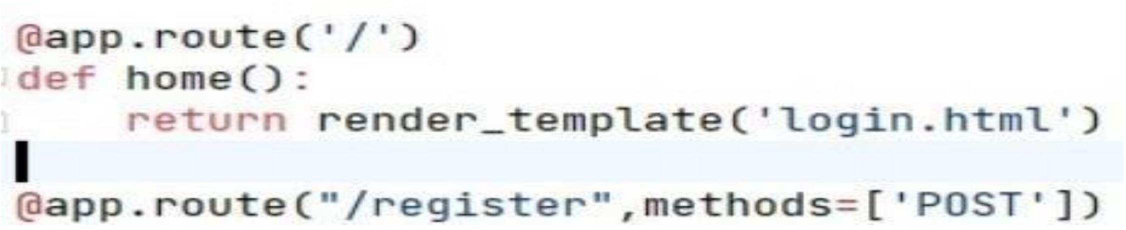
7.1 Feature 1: Python Flask

Python flask is the first feature that helps to complete this project. It allows the user tocreate local server and host the website in a local machine



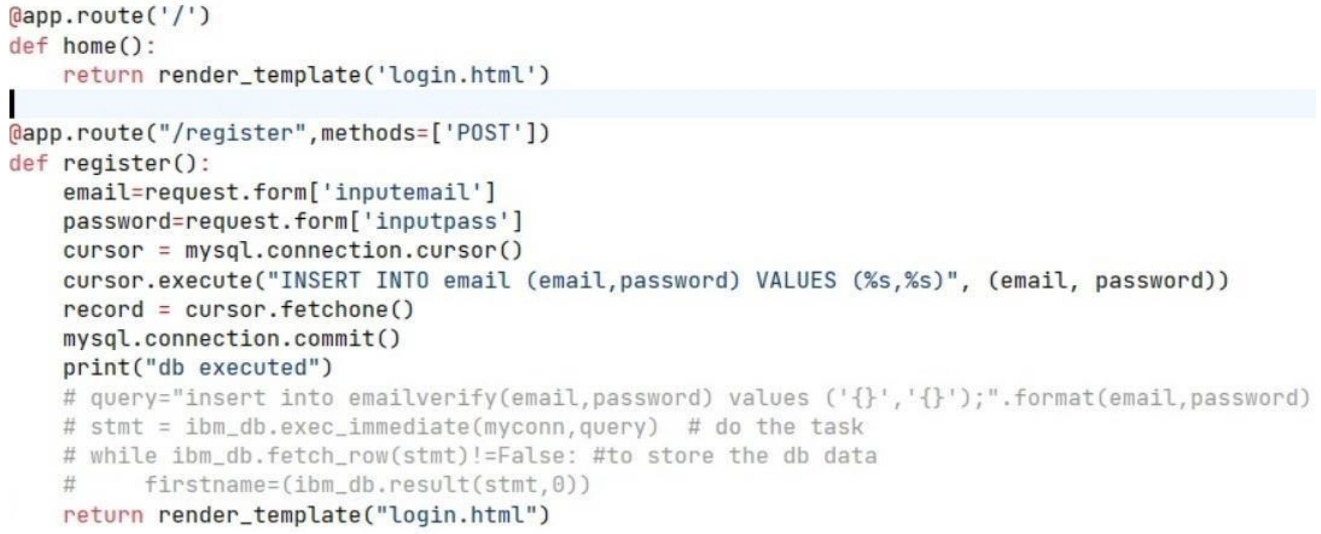
```
import numpy as np
from flask import Flask, request, jsonify, render_template
import ibm_db
import pickle
from flask_mysqldb import MySQL
import MySQLdb
```

Here we import all thenecessary features of this projectinvolving in Python flask.



```
@app.route('/')
def home():
    return render_template('login.html')

@app.route("/register",methods=['POST'])
```

Here we created a local client’s own server which serves the .html pages to the users.



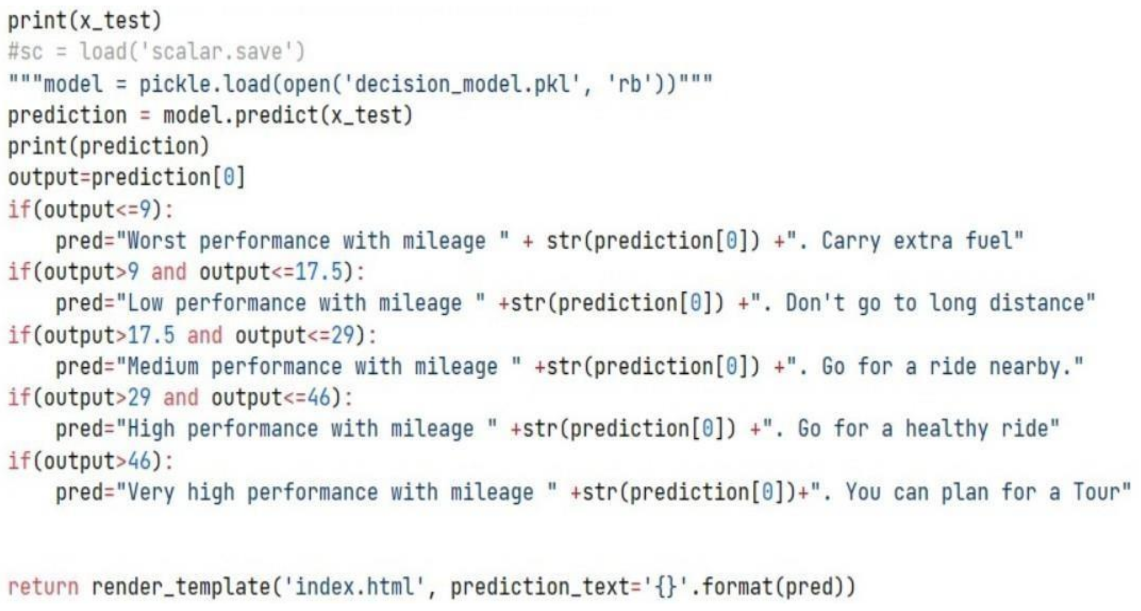
```
@app.route('/')
def home():
    return render_template('login.html')

@app.route("/register",methods=['POST'])
def register():
    email=request.form['inputemail']
    password=request.form['inputpass']
    cursor = mysql.connection.cursor()
    cursor.execute("INSERT INTO email (email,password) VALUES (%s,%s)", (email, password))
    record = cursor.fetchone()
    mysql.connection.commit()
    print("db executed")
    # query="insert into emailverify(email,password) values ('{}','{}');".format(email,password)
    # stmt = ibm_db.exec_immediate(myconn,query)  # do the task
    # while ibm_db.fetch_row(stmt)!=False: #to store the db data
    #     firstname=(ibm_db.result(stmt,0))
    return render_template("login.html")
```

Here we use the inputs from the html pages which has to be get by using request methodin Python Flask.By validating the values from the database,we allow the user to accessthe home page.

Render_template: Used for rendering html pages on browser. url_for: Passing the control of the program to another function. session: Creates a separate session for the individual user.

7.2 Feature 2: Model Prediction

Model Prediction , In this Phase we Train and Test the Model using the algorithm, according to the model prediction output we can give a conclusion that with 5 stage of performance, if the model output is less then or equal to 9 then the model is Worst Performance with mileage, then if model output is greater then 9 and less then 17.5 then the the modal is Low Performance with mileage, if the model is greater then 17.5 and less then 29 then the model has Medium Performance with mileage, if the model out has greater then 29 has less the 46 then the model is Hhigh Performance with mileage. If the model output has greater then 46 the the model is Very High Performance with mileage.



```
print(x_test)
#sc = load('scalar.save')
"""model = pickle.load(open('decision_model.pkl', 'rb'))"""
prediction = model.predict(x_test)
print(prediction)
output=prediction[0]
if(output<=9):
    pred="Worst performance with mileage " + str(prediction[0]) +". Carry extra fuel"
if(output>9 and output<=17.5):
    pred="Low performance with mileage " +str(prediction[0]) +". Don't go to long distance"
if(output>17.5 and output<=29):
    pred="Medium performance with mileage " +str(prediction[0]) +". Go for a ride nearby."
if(output>29 and output<=46):
    pred="High performance with mileage " +str(prediction[0]) +". Go for a healthy ride"
if(output>46):
    pred="Very high performance with mileage " +str(prediction[0])+". You can plan for a Tour"


return render_template('index.html', prediction_text='{}'.format(pred))
```

CHAPTER 8

TESTING

8.1 User Acceptance Testing

Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the Vehicle Performance Analyzer using Machine Learning project at the time of the Release to user acceptance testing (UAT).

Test cases Analysis

This report shows the number of test cases that have passed, failed, and untested.

Section	Total Cases	Not Tested	Fail	Pass
Worst Performance	20	0	0	20
Low Performance	43	0	2	41
Medium Performance	18	0	1	17
High Performance	52	0	0	52
Very High Performance	24	0	3	21

Table 8.1 - Test case analysis

CHAPTER 9

RESULT

Home Page:

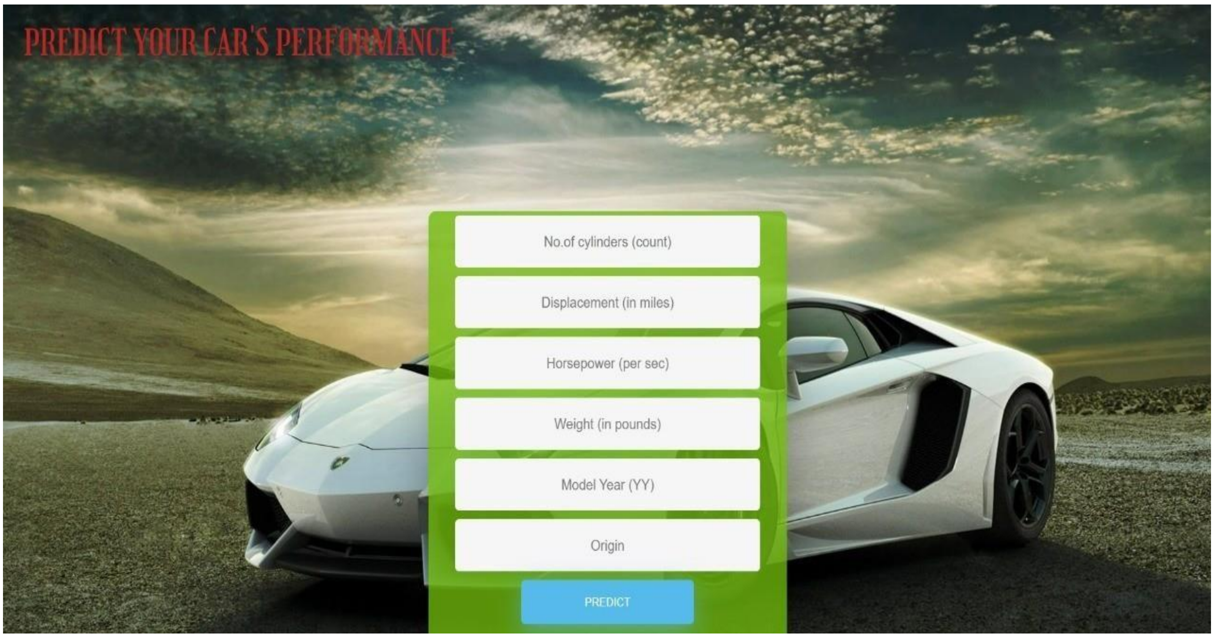
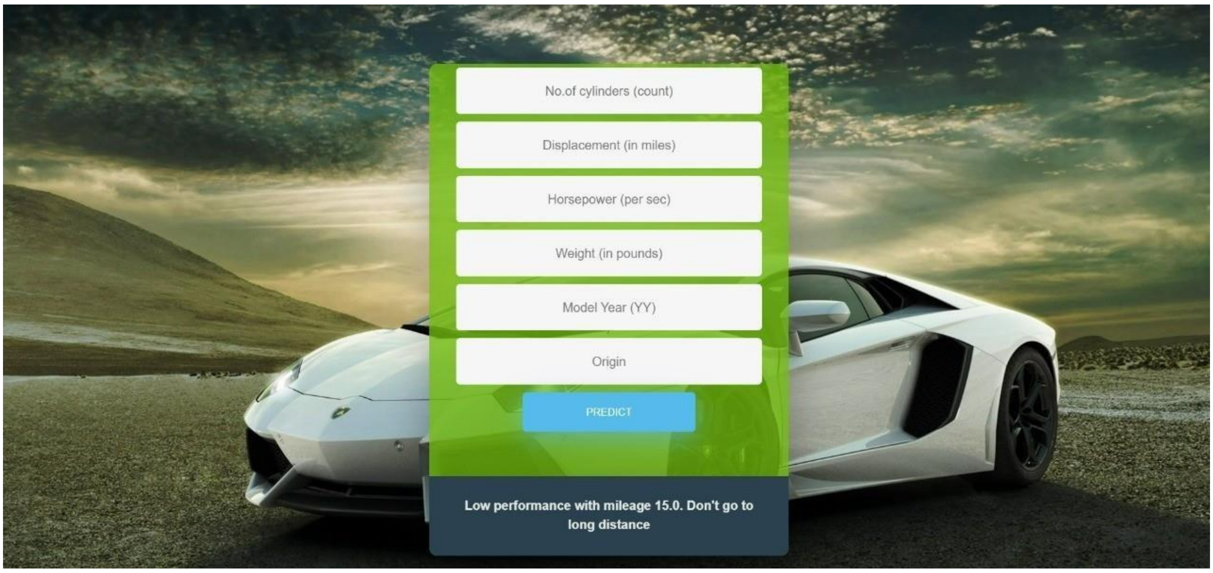


Figure 8.1 - Vehicle performance analysis Home Page

Prediction Page:



Low performance with mileage 15.0. Don't go to long distance

Figure 8.2 - Vehicle Performance Prediction page

CHAPTER 10

ADVANTAGES & DISADVANTAGES

9.1 ADVANTAGES

- The Proposed model could predict the performance of the vehicle from the input features of the vehicle.
- Simplified UI.
- Model has some good accuracy in Predicting the performance of vehicle into different categories.
- This web application can be used by users to predict the performance and classify the vehicle based on performance with a suggestion

9.2 DISADVANTAGES

- For training and testing, the proposed model requires very high computational time.
- The final Predicted performance is a approximate value which is calculated from the features of the vehicle

CHAPTER 11

CONCLUSION

The vehicle is the most important means of transportation in the modern world. The process of finding the right vehicle depends on the performance mainly. This identification becomes a difficult process when it is calculated manually. This process can easily be achieved with the help of the machine learning model.

CHAPTER 12

FUTURE SCOPE

The project can be extended to all kind vehicle and can help the customers or the users to predict the performance of the vehicle. This can be achieved by using the deep learning instead of machine learning.

CHAPTER 13

APPENDIX

SOURCE CODE:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns



df=pd.read_csv("C:/Users/Edwin/Dropbox/PC/Downloads/3.car performance.csv")
df.head(10)

df.drop('car name',axis=1,inplace=True)

df

plt.boxplot(df["horsepower"])

sns.heatmap(df.corr(),annot=True)

sns.pairplot(df)

df.isna().sum()

x=df.drop('origin',axis=1)
y=df['origin']

from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=0)

from sklearn.tree import DecisionTreeClassifier
clf = DecisionTreeClassifier(random_state=0)
```

```
clf.fit (x_train,y_train)
y_pred=clf.predict(x_test)

from sklearn.metrics import accuracy_score,confusion_matrix,classification_report
accuracy_score(y_test,y_pred)

from sklearn.ensemble import RandomForestClassifier
model=RandomForestClassifier()
model.fit(x_train,y_train)
y_pred=model.predict(x_test)

accuracy_score(y_test,y_pred)

from sklearn.ensemble import AdaBoostClassifier

adaboost_clf = AdaBoostClassifier(
    base_estimator=RandomForestClassifier(max_depth=3, class_weight='balanced'),
    #base estimator is decision trees by default
    n_estimators=300,
    learning_rate=0.5)

adaboost_clf.fit(x_train, y_train)

def accuracy(model, data, labels):

    predictions = model.predict(data)
    acc = accuracy_score(labels, predictions)

    return acc

accuracy(adaboost_clf,x_train,y_train)

from sklearn.ensemble import AdaBoostClassifier
```

```
adaboost_clf = AdaBoostClassifier(
    base_estimator=DecisionTreeClassifier(max_depth=3, class_weight='balanced'),
    #base estimator is decision trees by default
    n_estimators=300,
    learning_rate=0.5)

adaboost_clf.fit(x_train, y_train)

accuracy(adaboost_clf,x_train,y_train)

data=[[16,8,304,150,3433,12,70]]
model.predict(data)

data=[[32,6,100,110,3000,12,72]]
model.predict(data)

Y = pd.DataFrame(df['mpg'])

X = df.drop('mpg',axis = 1)

X.head()

X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size = 0.3, random_state = 1)

# check the dimensions of the train & test subset for
# print dimension of predictors train set
print("The shape of X_train is:",X_train.shape)

# print dimension of predictors test set
print("The shape of X_test is:",X_test.shape)

# print dimension of target train set
print("The shape of y_train is:",y_train.shape)
```

```
# print dimension of target test set
print("The shape of y_test is:",y_test.shape)

from sklearn.ensemble import RandomForestRegressor

#intantiate the regressor
rf_reg = RandomForestRegressor(n_estimators=100, random_state=10)

# fit the regressor with training dataset
rf_reg.fit(X_train, Y_train)

# predict the values on test dataset using predict()
Y_pred = rf_reg.predict(X_test)

from sklearn import metrics

# Calculate MAE
rf_reg_MAE = metrics.mean_absolute_error(Y_test, Y_pred)
print('Mean Absolute Error (MAE):', rf_reg_MAE)

# Calculate MSE
rf_reg_MSE = metrics.mean_squared_error(Y_test, Y_pred)
print('Mean Squared Error (MSE):', rf_reg_MSE)

# Calculate RMSE
rf_reg_RMSE = np.sqrt(metrics.mean_squared_error(Y_test, Y_pred))
print('Root Mean Squared Error (RMSE):', rf_reg_RMSE)

dm=[[8,100,50,3000,12,72,1]]
rf_reg.predict(dm)

import pickle

with open('model_pkl', 'wb') as files:
    pickle.dump(rf_reg, files)

with open('model_pkl' , 'rb') as f:
    lr = pickle.load(f)

from sklearn.tree import DecisionTreeRegressor
dtr = DecisionTreeRegressor(random_state=0)
dtr.fit (X_train,Y_train)

with open('Decision', 'wb') as files:
    pickle.dump(dtr, files)
```

Github and Project Video Demo Link

GitHub Link :
https://github.com/IBM-EPBL/IBM-Project-21241-1659775769

Demonstration Link:
https://drive.google.com/drive/folders/1nuJNNZE3lgs0n1VUa6ffzY0f-zV9O9lG?usp=sharing