Machine Learning Based Vehicle Performance Analyser

IBM-Project-27361-1660054556

NALAIYA THIRAN PROJECT BASED LEARNING ON PROFESSIONAL READLINES FOR INNOVATION, EMPLOYMENT AND ENTERPRENEURSHIP

A PROJECT REPORT

SARAN RAJ IT	**950819104066**
SOWNDHARYS S	**950819104076**
VIJAYA KUMAR G	**950819104087**
VINITHA R	**950819104088**

BACHELOR OF ENGINEERING

IN

ERODE SENGUNTHA ENGINEERING COLLEGE

APPLIED DATA SCIENCE

MACHINE LEARNIING BASED VEHICLE PERFORMANCE ANALYZER

1.Introduction

1.1 Project Overview

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 behaviours 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.

1.2 Purpose

This identifies a necessity to evaluate the Meta features of vehicles which could be helpful in improving the vehicle driver's skill to prevent accidents and also evaluate the change in the quality of cars over passing time.

2. Literature Survey

2.1 Existing Problems

The main problem is to know the performance of car. Because, nowadays the need of car increases with the increase in population race and increases with the brand name.

2.2 References

- Data-Driven Urban Traffic Accident Analysis and Prediction Using Logit and Machine Learning-Based Pattern Recognition Models

Authors:
Vahid Najafi Moghaddam Gilani, Seyed Mohsen Hosseinian, Meisam Ghasedi*, Mohammad Nikookar*

Abstract

Modeling the severity of accidents based on the most effective variables accounts for developing a high-precision model presenting the possibility of occurrence of each category of future accidents, and it could be utilized to prioritize the corrective measures for authorities. The purpose of this study is to identify the variables affecting the severity of the injury, fatal, and property damage only (PDO) accidents in Rasht city by collecting information on urban accidents from March 2019 to March 2020. In this regard, the multiple logistic regression and the pattern recognition type of artificial neural network (ANN) as a machine learning solution are used to recognize the most influential variables on the severity of accidents and the superior approach for accident prediction. Results show that the multiple logistic regression in the forward stepwise method has R_2 of 0.854 and an accuracy prediction power of 89.17%. It turns out that the accidents occurred between 18 and 24 and KIA Pride vehicle has the highest effect on increasing the severity of accidents, respectively. The most important result of the logit model accentuates the role of environmental variables, including poor lighting conditions alongside unfavorable weather and the dominant role of unsafe and poor quality of vehicles on increasing the severity of accidents. In addition, the machine learning model performs significantly better and has higher prediction accuracy (98.9%) than the logit model. In addition, the ANN model's greater power to predict and estimate future accidents is confirmed through performance and sensitivity analysis.

- A Survey on Machine Learning-Based Mobile Big Data Analysis: Challenges and Applications

Authors:
Jiyang Xie Zeyu Song, Yupeng Li, Yanting Zhang, Hong Yu, Jinnan Zhan, Zhanyu Ma*, Yuanyuan Qiao,* Jianhua Zhang*, Jun Guo*

Abstract

This paper attempts to identify the requirement and the development of machine learning-based mobile big data (MBD) analysis through discussing the insights of challenges in the mobile big data. Furthermore, it reviews the state-of-the-art applications of data analysis in the area of MBD. Firstly, we introduce the development of MBD. Secondly, the frequently applied data analysis methods are reviewed. Three typical applications of MBD analysis, namely, wireless channel modeling, human online and offline behavior analysis, and speech recognition in the Internet of Vehicles, are introduced, respectively. Finally, we summarize the main challenges and future development directions of mobile big data analysis.

- Angle-of-Arrival Estimation for Vehicle-to-vehicle Communications based on Machine Learning

Authors:
Mi Yang; Bo Ai; Ruisi He; Huang Chen; Zhangfeng Ma; Zhangdui Zhong

Abstract:
For vehicular communications, angle-of-arrival (AOA) estimation plays an important role in smart antenna, beamforming, and assisted driving. Although there are a series of high-performance spectral- or parametric-based AOA estimation methods, they are difficult to realize real-time AOA estimation. In order to solve this problem, this paper proposes a machine-learning-based AOA estimation approach. The proposed method includes off-line training and on-line estimation processes. In the off-line training process, an estimation model is obtained by using the support vector machine (SVM) based on a large number of actual measurement data of vehicular communication scenarios. Then, in the on-line estimation process, the obtained model is used to realize AOA estimation in real-time according to the array snapshot data collected by the antenna array. Experimental results show that the proposed method can achieve real-time and accurate AOA estimation under reasonable configuration. This achievement has the potential for further application in vehicular communication systems.

2.3 Problem Statement Definition

The main goal is to predict the performance of the car to improve certain behaviours of the vehicle and help to improve the system's fuel consumption and increase efficiency.

Whom does the problem affect?	Most of the Vehicles face traffic problem and Car drivers also facing some more unpredicted errors while driving lead to accidents. Vehicles become undetermined because of unknown prediction of their condition
What are the boundaries of the problem?	This problem lead most of the vehicles to deadline in earlier days. Traffic condition become the great impact due to this problem. Drivers unable to predict their vehicle's state.
What is the issue?	Insufficient data analysis for all the previous incidents and previous products. Lack of Vehicle performance issue leads to various analysis according to road-transport system.
When does the issue occurs?	Data varies according with these factors such as terrain, temperature, weather, trip length and environment, driving behaviour and load all affect the

	performance of a vehicle over time
Where is the issue occurring?	Occurs majorly in unorganized sectors, who are not able to maintain the proper data analysis.
Why is it important that we fix the problem?	Intense competition in higher education in many different countries mandates the need for assessments of customer-perceived service quality for differentiation purposes. Important role is to satisfy the Customers with vehicle's performance.

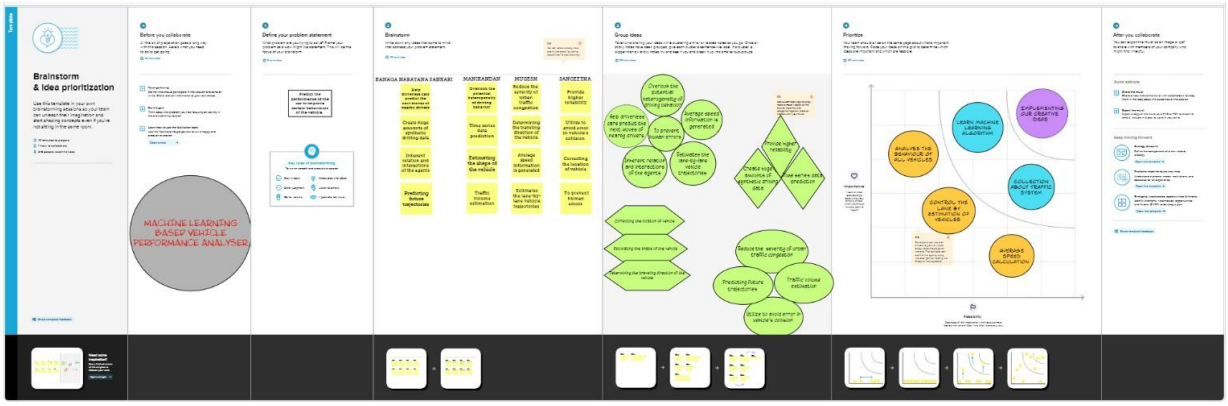
3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy map Canvas

What do you think and feel?	Approach to Isolate the deviating vehicle	Data leakage can be prevented	Lack of skills to find the right data
What do they see?	Multiple algorithms	Traffic analysis and control	Linkage between community outcomes and underlying social mechanisms
What do they hear?	Improve the productivity and Efficiency	Explore different domains	Lead to good career path
What do they say and do?	Mitigate unfavorable environmental impacts	Concern with developing programs	Overlap to minimise failure and ensure safety
Pain	Data acquisition	Large amount of domain knowledge required	Tedious task to run models with different algorithms
Gain	New approaches to perform these modelling tasks	Quality of the data	Automating recruitment

3.2 Ideation and Brainstroming

Brainstorm



Kanaga Narayana Sankari S	Predicting future trajectories	Inherent relation and interactions of the agent
Manikandan S	Time series data prediction	Traffic volume estimation
Mugesh S	Average speed information is generated	Reduce the severity of urban traffic congestion
Sangeetha S	Provide higher reliability	To prevent human errors

Group Ideas

- Correcting the location of vehicle
- Estimating the shape of vehicle
- Determining the travelling direction of vehicle
- Traffic volume Estimation
- Predicting future trajectories
- Create huge amount of synthetic driving data

- Estimate the lane-by-lane vehicle trajectories

Prioritize

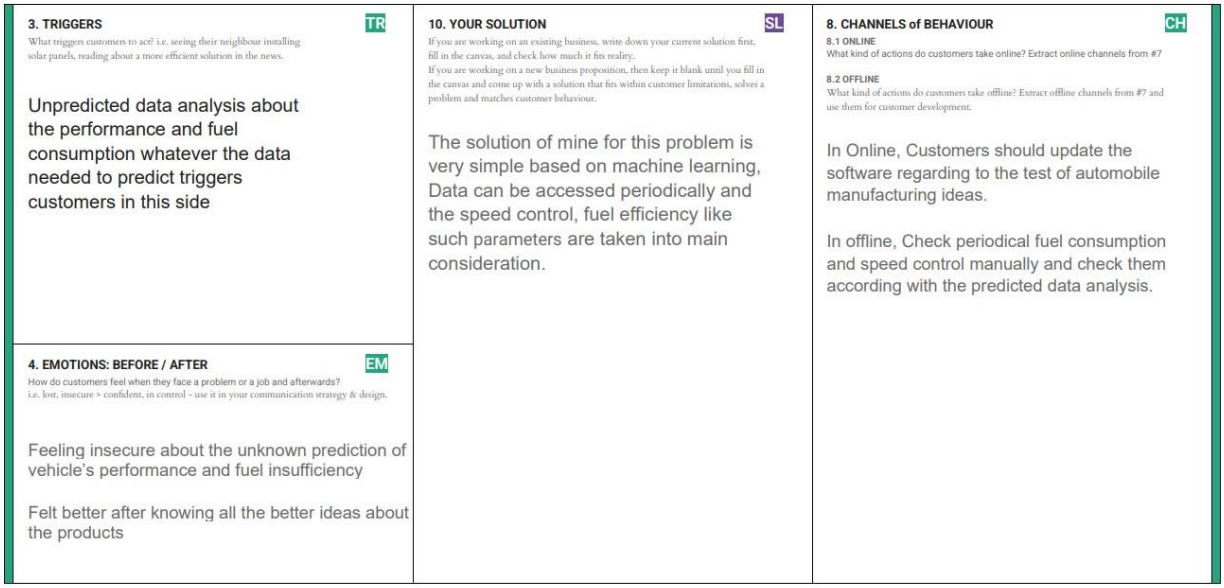
- Analyze the behaviour of all vehicles
- Control the lane by estimation of vehicles
- Average speed calculation
- Learn machine learning algorithms
- Collection about traffic system
- Implementing our creative ideas

3.3 Proposed Solution

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	Predict the performance of the car to improve certain behaviours of the vehicle and help to improve the system's fuel consumption and increase efficiency.
2	Idea / Solution description	Data analysis according to the performance of vehicles. Prediction about the traffic control system. Fuel consumption analysis also made.
3	Novelty / Uniqueness	Software testing are done here to check the reliability and check its for the intended purpose.
4	Social Impact / Customer Satisfaction	Organizations and individuals use the data analysis of vehicle performance and maintain the performance analyzer in an sustainable way. It helps customer to satisfy with their products. It gives positive social impacts.

5	Business Model (Revenue Model)	Proposed a Model to predict the performance of the vehicle during the motion of vehicle in lane-roads.
6	Scalability of the Solution	The design will be suitable and performs with fuel efficiency according to rising demands. The performance of model does not change with existing external situations

3.4 Problem Solution Fit



4. Requirement Analysis

4.1 Funtional Requirements

Fr no.	Functional requirement (epic)	Sub requirement (story / sub-task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN

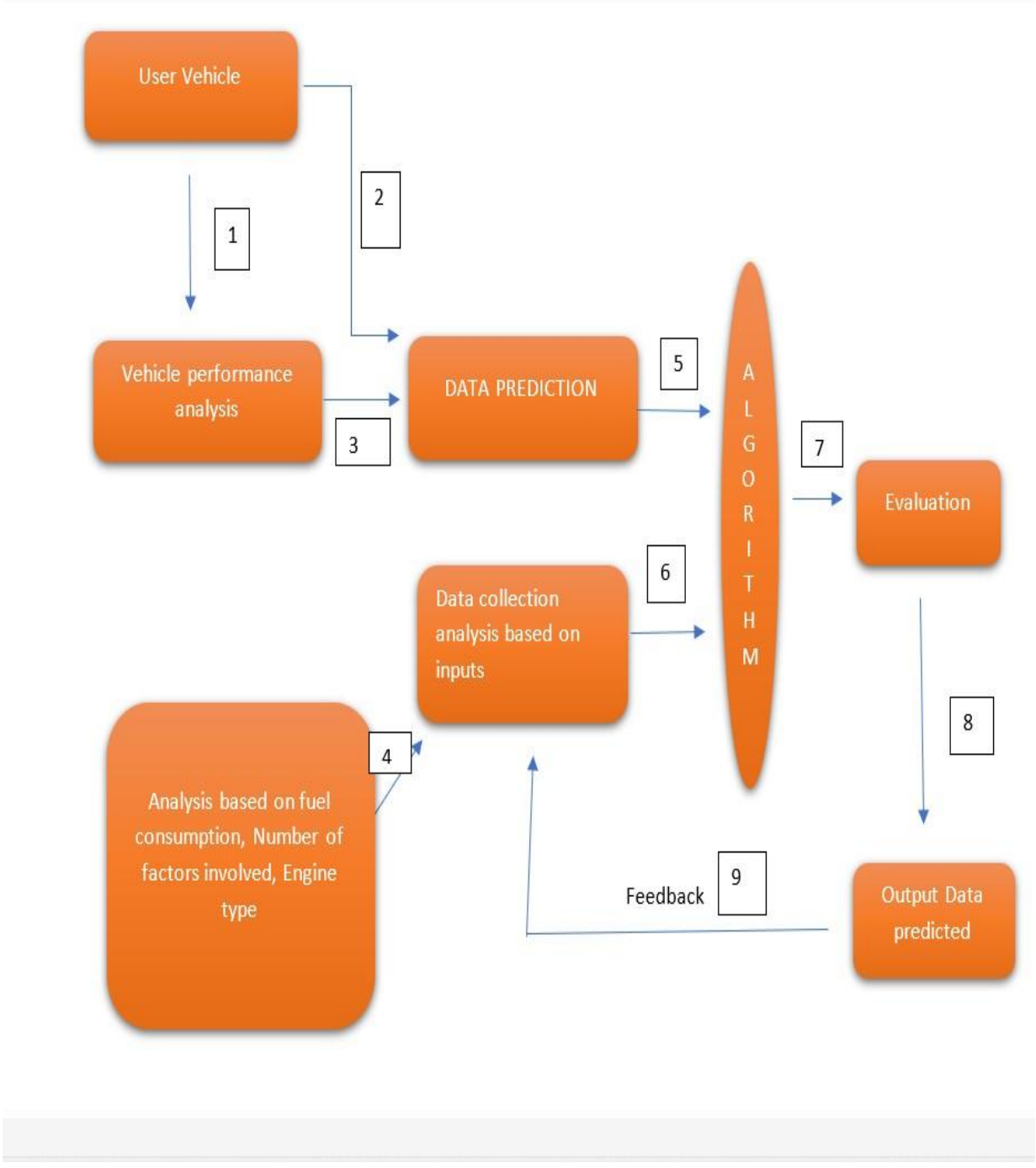
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Application	Apply to test their needs Apply all the modes available
FR-4	User modification	Modify according to the user feedback Modification can exists permanently
FR-5	User Finalization	Finalize them to ready for progress Finalize for better future use

4.2 Non functional requirements

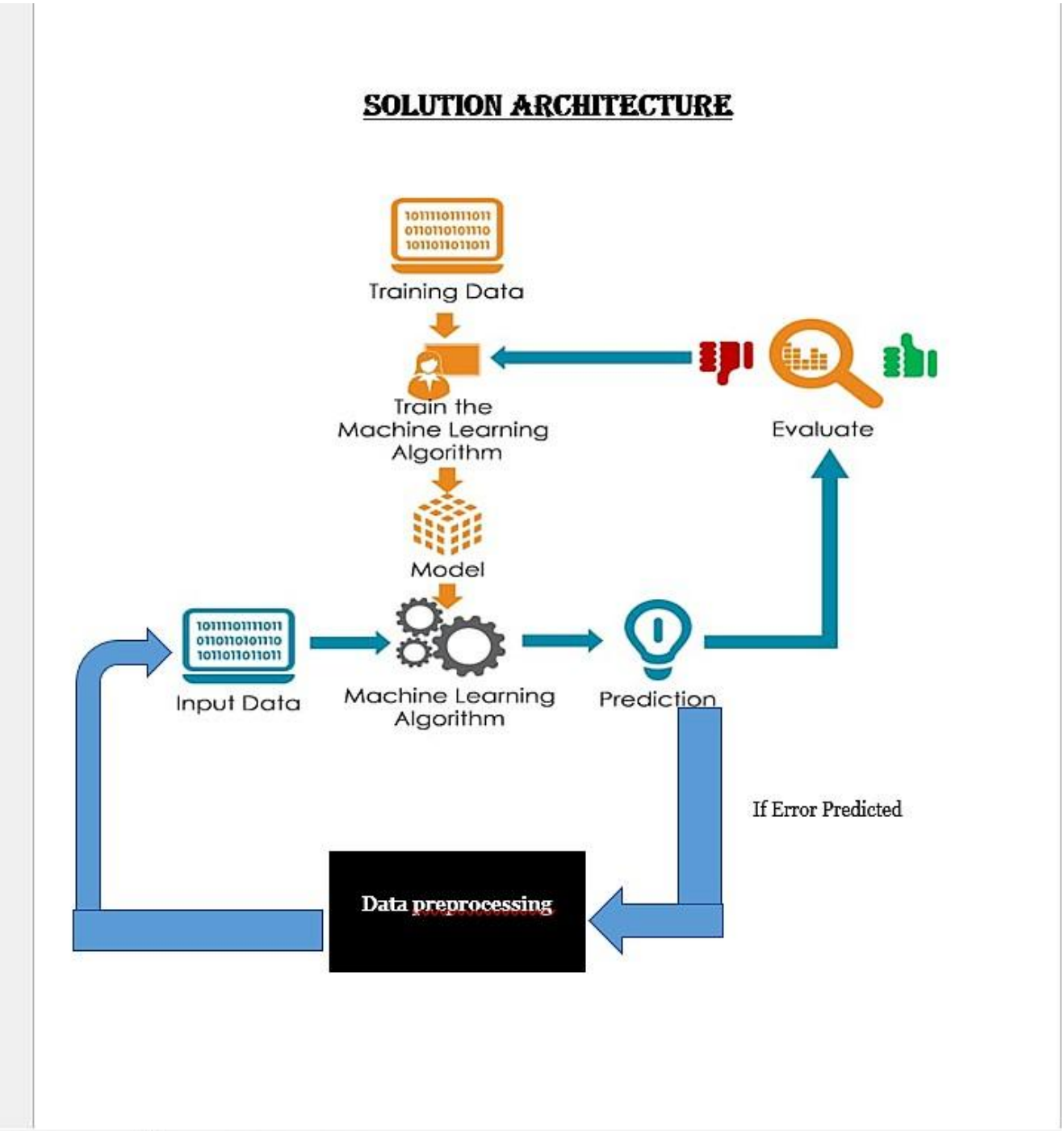
FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Using the developed phase of your application efficiently
NFR-2	**Security**	Providing security day-by-day to maintain secure data analysis
NFR-3	**Reliability**	Consistently give same level of approval towards consumers
NFR-4	**Performance**	Perform every task quickly and maintain their flow level in a standard manner
NFR-5	**Availability**	Availability of more data in the source outcome than what we expected
NFR-6	**Scalability**	Always in the trend to maintain their level of scalability

5.Project Design

5.1 Data flow diagrams



5.2 Solution Architecture



5.3 User Stories

Use the below template to list all the user stories for the product.

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
		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
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register and access using Gmail verification	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can just register by entering my email and password	High	Sprint-1
	Dashboard	USN-6	As a user, I can login in to the application and view dashboard	I can login and view the dashboard available with required resources	Medium	Sprint -1
Customer (Web user)	Login and Dashboard	USN-7	As a Web user, I can login and access all the settings in the dashboard	I can login and check all the settings in the dashboard	High	Sprint-1
Customer Care Executive	Login and Dashboard	CCE-1	As a CCE, I can login in to app and check if there is any queries to resolve	I can login and check all the credentials and basic queries from user	Medium	Sprint-1
Administrator	Login and Dashboard	A-1	As Administrator, I can login and check company directives	I can login using private Login Id and password to maintain and check the status	High	Sprint-1

6. Project Planning and scheduling

6.1 Sprint Planning and Estimation

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

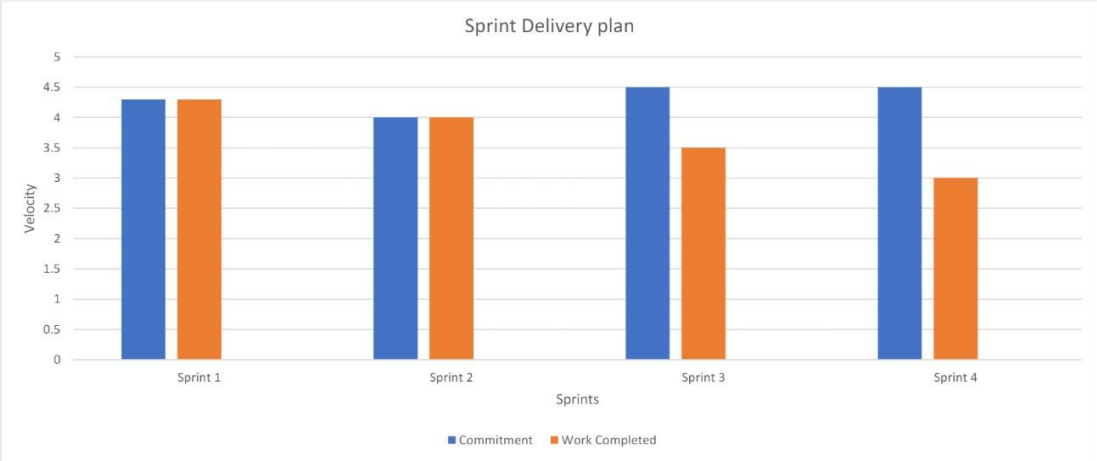
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	I can access my account / dashboard
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	I can receive confirmation email & click confirm
Sprint-2		USN-3	As a user, I can register for the application through Facebook	2	Low	I can register & access the dashboard with Facebook Login
Sprint-1		USN-4	As a user, I can register for the application through Gmail	2	Medium	I can register and access using Gmail verification
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	I can just register by entering my email and password

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-3	Dashboard	USN-6	As a user, I can login in to the application and view dashboard	2	Medium	I can login and view the dashboard available with required resources
Sprint-4		USN-7	As a Web user, I can login and access all the settings in the dashboard	1	High	I can login and check all the settings in the dashboard
Sprint-4	Login and Dashboard	USN-8	As Administrator, I can login and check company directives	2	High	I can login using private Login Id and password to maintain and check the status

Estimation

Velocity:
Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$



Burndown Chart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

6.2 Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart: (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	19	06 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	18	13 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	18 Nov 2022

6.3 Report from JIRA software

7. CODING & SOLUTIONING:

Feature

Implementing the RandomForestRegression Algorithm

```
In [17]: from sklearn.ensemble import RandomForestRegressor

In [18]: rf = RandomForestRegressor(n_estimators=30,random_state=0)

In [19]: rf.fit(x_train,y_train)

Out[19]: RandomForestRegressor(n_estimators=30, random_state=0)
```

- Random forest is used on the job by data scientists in many industries including banking, stock trading, medicine, and e-commerce.
- It's used to predict the things which help these industries run efficiently, such as customer activity
- It can perform both regression and classification tasks.
- A random forest produces good predictions that can be understood easily.
- It can handle large datasets efficiently.
- The random forest algorithm provides a higher level of accuracy in predicting outcomes over the decision tree algorithm.
- It takes less training time as compared to other algorithms.
- It predicts output with high accuracy, even for the large dataset it runs efficiently.

- It can also maintain accuracy when a large proportion of data is missing.

8. TESTING

8.1 Test cases

Car performance is the only testing case involved here. It based on several parameters like mpg, cylinders,weight,displacement,model year,origin.

8.2 User Acceptance Testing

9. Results

9.1 Performance Metrics

Project Development Phase Model

Performance Test

Date	10 NOvember 2022
Team ID	PNT2022TMID06520
Project Name	Project – Performance Testing
Maximum Marks	10 Marks

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
	Metrics	Regression Model: MAE -, MSE - , RMSE - , R2 score - Classification Model: Confusion Matrix - , Accuray Score- & Classification Report -	

Regression model

MSE

Mean Square Error

```
In [48]: from sklearn.metrics import r2_score,mean_squared_error

In [52]: r2_score(y_test,y_pred)
Out[52]: 0.8577931296398441

In [53]: mean_squared_error(y_test,y_pred)
Out[53]: 9.829249999999998

In [54]: np.sqrt(mean_squared_error(y_test,y_pred))
Out[54]: 3.1351634726119144
```

Linear Regression

```
In [58]: click to expand output; double click to hide output
mean_squared_error
r2_score(y_test,y_pred2)
Out[58]: 0.921450931811811

In [59]: mean_squared_error(y_test,y_pred2)
Out[59]: 5.429262500000002

In [60]: np.sqrt(mean_squared_error(y_test,y_pred2))
Out[60]: 2.330077788401066
```

Random forest regression

```
In [64]: from sklearn.metrics import r2_score,mean_squared_error
r2_score(y_test,y_pred3)
Out[64]: 0.8519031381502014

In [65]: mean_squared_error(y_test,y_pred3)
Out[65]: 10.236362530519429

In [66]: np.sqrt(mean_squared_error(y_test,y_pred3))
Out[66]: 3.199431594911732
```

Evaluation metrics
Accuracy score

Model Evaluation

```
In [21]: from sklearn.metrics import r2_score,mean_squared_error
         acc = r2_score(y_test, y_pred)
         acc

Out[21]: 0.8807558531490456

In [22]: err=np.sqrt(mean_squared_error(y_test,y_pred))
         err

Out[22]: 2.792722785303896
```

10. Advantages

➢ Performance characteristics that can be studied are maximum and minimum speeds, rate of climb, take-off time and distance etc.

➢ Asymmetric motions are motions that cause the vehicle plane of symmetry to change its angular position, or to cause it to move laterally.

➢ They enable you to analyze the root cause of noise and vibration problems, optimize vehicles to improve brand image, and increase the perception of quality.

➢ We are able to calculate the distance covered by the vehicle. Moreover the speed of the vehicle is calculated in kilometer /hour by using some mathematical calculation.

➢ Here we use thermister to sense temperature

➢ It has negative temperature co-efficient.

Disadvantages

➢ They enable you to analyze the root cause of noise and vibration problems, optimize vehicles to improve brand image, and increase the perception

➢ Factors such as terrain, temperature, weather, trip length and environment, driving behavior and load all affect the performance of a vehicle

➢ Moreover, the competitive pressures on cost, quality, performance and manufacturability of the vehicles today are bigger than ever.

➢ If the number of vehicles keeps on increasing it would lead to many problems like; **increased traffic on the road, air pollution, noise pollution, accidents**

11. Conclusion

Finally we concluded that the performance of the vehicle can be predicted with the major given parameters.It leads to give the ouput characteristics of the vehicle performance mileage and give the feedback about the ride performance of the vehicle.Therefore the prediction of performance of vehicle can be attained.

12.FUTURE SCOPE

- ✓ Soon hybrid, electric hybrid, and electric cars may be used by people. Therewithal, using all-electric and fuel cell of car design is possible future.
- ✓ Cars of the future are going to be more autonomous than the cars of today. They will be made of lighter materials, even possibly with plastic engines. The 'brain' of the car will be able to read the road conditions and hopefully improve driver safety as a result.
- ✓ In future, Automobiles will mostly dependable on all the machine learning algorithms and automated based system

13. APPENDIX

Source Code:

Html Code
Index model:

```
<!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>Vehicle Performance</title>
```

```
</head>
<body>
<div class="main">
<div class="main1">
<h1 class="head1">VEHICLE PERFORMANCE PREDICTION</h1>
<h2 class="head2" id="head2">ENTER THE BELOW DATA TO FIND THE VEHICLE
PERFORMANCE</h2>
</div>
<div class="main2">
<form action="/predict" method="post"> <div class="inp1">
<h3>Enter mpg</h3>
<input type="search" name="mpg" id="" placeholder="in count" required>
</div>
<h3>Enter no of Cylinders</h3>
<input type="search" name="cylinders" id="" placeholder="in count" required>
</div>
<div class="inp2">
<h3>Enter Displacement</h3>
<input type="search" name="displacement" id="bs" placeholder="in miles" required>
</div> <div class="inp3"> <h3 clour="">Enter Horse Power</h3>
<input type="search" name="horsepower" id="bs" placeholder="power" required>
</div>
<div class="inp4">
<h3>Enter Weight</h3>
<input type="search" name="weight" id="bs" placeholder="weight" required>
</div>
<div class="inp6">
<h3>Enter Modal Year</h3>
<input type="search" name="model_year" id="bs" placeholder="year" required>
</div>
<div class="inp7">
<h3>Enter Origin</h3>
<input type="search" name="origin" id="bs" placeholder="1,2,3" required>
</div>
```

```
<div class="btn"><button class="btn1" type="submit">
Submit</button></div></span>
</form><span>
</div>
</div>
<style> body { background-image:
url('https://wallpapercave.com/wp/wp9353427.jpg'); background-size:
cover; opacity: 1;
}
.main { position: relative; text-
align: center; padding: 1% 0%
1% 0%;
-webkit-box-shadow: 15px 20px 125px 45px rgba(0, 0, 0, 1); -moz-box-shadow: 15px 20px 125px
45px rgba(0, 0, 0, 1); box-shadow: 15px 20px 125px 45px rgba(0, 0, 0, 1);
}
.main2 { position: relative; padding-top: 1% 0% 0% 0%;
}
.btn { position: relative;
padding-top: 4%;
}
.btn1 { top: 50%;
left: 50%;
transform: translate(-50%, -50%); -ms-transform:
translate(-50%, -50%); background-color: #f1f1f1;
color: red; font-size: 20px; padding: 16px 30px;
border: none; cursor: pointer; border-radius: 10px;
text-align: center;
}
.btn1:hover { background-color: rgb(47, 175, 197);
color: white;
}
main3 { padding: 2% 10% 3% ex;
}
```

```
.head1 { color: white;
font-size: 400%;
text-shadow: 4px 4px 2px rgba(107, 187, 213, 0.7); -webkit-box-shadow: 9px 7px 63px 14px rgba(0,
0, 0, 0.75);
-moz-box-shadow: 9px 7px 63px 14px rgba(0, 0, 0, 0.75);
 box-shadow: 9px 7px 63px 14px rgba(0, 0, 0, 0.75);
}
input { width: 15%; padding: 9px 1px; box-sizing:
border-box; border: 1px solid rgb(126, 132, 133);
outline: none;
}
input:focus { background-color:aqua;
} h2 {
   color:yellow;
   font-size: 25px;
} h3 { color: white;
}
</style>
</body>
</html>
```

Prediction model:

```
<!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>Output</title>
</head>
<body>
<!-- <div class="btn"> <button class="btn1"><a href="./index.html"></a>
Home</button></div> -->
```

```
<div class="btn"> <button class="btn1"><a href="./index.html">Home</a></button></div></span>
<h2>{{ prediction_text }}</h2>
</body> <style> body { position: relative; background-image:
url('https://wallpapercave.com/uwp/uwp1215918.jpeg'); background-size: cover;
} a { text-decoration: none;
}
.btn { position: relative;
padding-top: 4%; padding-
left: 10%;
}
.btn1 {
transform: translate(-50%, -50%); -ms-transform: translate(-50%, -
50%); background-color: rgb(170, 224, 226); color: black; font-size:
20px; padding: 8px 30px 8px 30px; border: none; cursor: pointer;
border-radius: 10px; text-align: center;
}
.btn1:hover {
   background-color: rgb(255,255,255);
   color: rgb(0,0,0);
} h2 {
   margin: 10% 0% 0% 6%;
   font-size: 52px;
   color: white;
   text-shadow: -1px -1px 30px rgba(255,68,61,1);
}
</style>
</html>
```

Python code for app creation:

```
from flask import Flask, request, render_template import pickle app =
Flask(__name__)  model= pickle.load(open('RFregression.pkl','rb'))
@app.route('/', methods=['GET'])  def intro():
```

```
   return render_template('index.html') @app.route('/predict',
methods=['POST']) def predict():
   if request.method =="POST":
      MPG=request.form['mpg']
      CYLINDERS = request.form['cylinders']        DISPLACEMENT = request.form['displacement']
      HORSEPOWER = request.form['horsepower']        WEIGHT =
request.form["weight"]
      MODEL_YEAR = request.form['model_year']
      ORIGIN = request.form['origin']
      prediction = model.predict([[int(MPG),int(CYLINDERS), int(DISPLACEMENT), int(HORSEPOWER),
int(WEIGHT), int(MODEL_YEAR),int(ORIGIN)]])
      output=prediction[0]
   if(output<=9):
      return render_template('predict.html', prediction_text="Worst performance with mileage"+
str(prediction[0])
      +". Carry extra fuel")
   if(output>9 and output<=17.5):
      return render_template('predict.html', prediction_text="Low performance with
mileage"+str(prediction[0])
      +". Don't go to long distance")
   if(output>17.5 and output<=29):
      return render_template('predict.html', prediction_text="Medium performance with
mileage"+str(prediction[0])
      +",Go for a ride nearby.")
   if (output>29 and output<=46):  return render_template('predict.html',
            prediction_text="High
performance with mileage " +str(prediction[0])
      +". Go for a healthy ride")
   if(output>46):
      return render_template('predict.html', prediction_text="Very high performance with mileage
"+str(prediction [0])+". You can plan for a
Tour")
   else:
      return render_template('index.html')
```

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