MACHINE LEARNING BASED VEHICLE PERFORMANCE ANALYZER

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1.INTRODUCTION

a. PROJECT OVERVIEW

2. obtain the solutions by observing the blind-spots accurately and

Automotive Technologies are providing improvised services to the driver's safety and vehicle security under the umbrella of Intelligent Transportation System (ITS). In the development of ITS, advanced Automotive Technologies shall play a crucial role in determining the overall experience of users by making it much at ease in terms of reducing the risk of road accidents, risk of cybercrime in the vehicle, buying a used car etc. It is often noted that judging the driver's driving skill is subjective and is difficult to set a standard for driver's skills [1]. The modern approach to transportation system is focusing on rapidly evolving with the intelligent vehicles. High rise in recorded traffic density, road accidents and crisis faced in regulating the effective management of traffic control in urban and rural areas have concerned us to develop a smart solution in context to ITS [2]. The automotive industry has great expectations from these futuristic solutions to improve the safety of people and security of vehicles. It is observed that the users are shifting from individualistic approach to the data-centric approach based on OBD-II scanner to avail the augmented driving experience. In spite of the modern command, control, communication, computers and intelligent systems, we are still facing numerous calamities in which thousands of precious human lives are lost in accidents. Therefore, it should be an immediate need to tackle the small scale yet serious issues using the state-of-the-art techniques. We are mainly focusing on analyzing the data which is collected from the vehicle using the OBD-II scanner and eventually providing the driver's safety solutions. We aim to obtain the solutions by observing the blind-spots accurately and efficiently using pattern recognition techniques from supervised

1.2 PURPOSE

We will be able to understand the problem to classify if it is a regression or a classification kind of problem.

● We will be able to know how to pre-process/clean the data using different data pre-processing techniques.

● We will be able to analyse or get insights into data through visualization.

● Applying different algorithms according to the dataset and based on

visualization.

● We will be able to know how to build a web application using the Flask framework.

2.literature survey

2.1 EXISTING PROBLEM

The results of the research made by S. Salih and R. Olawoyin titled "Intelligent Performance Analysis of Automated Steering Systems for Autonomous Vehicles" showed that the proposed network control system had trained and validated more than 96.5% steering system behavior patterns and adapted large random disturbances of the steering controller commands. It is, therefore, necessary to develop artificial intelligence methodologies in automated steering systems of autonomous vehicles with neural network representing the main topology blocks of the control system architecture and utilize ANN abstraction in the control system of autonomous vehicle steering control system. The study's findings demonstrated that the suggested network control system had successfully trained and validated more than 96.5% of steering system behaviour patterns and had successfully responded to significant random disturbances of steering controller commands. Therefore, it is essential to design artificial intelligence techniques for automated steering systems of autonomous vehicles that use ANN abstraction in the control system of the steering control system and neural networks as the basic topology building blocks of the control system architecture.

2.3 problem statement definition

The consumer who is trying to buy a vehicle for my own personal use. This use is mainly for travel involved in the job. Buy the most suitable vehicle for my preference of Vehicle performance.

Problem Statement

There are many different suggestions . It takes more time and I do not have awareness 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.I'm not capable of

buying the right vehicle of my ownrequirement because of less knowledge about vehicle

3.IDEATION & PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS
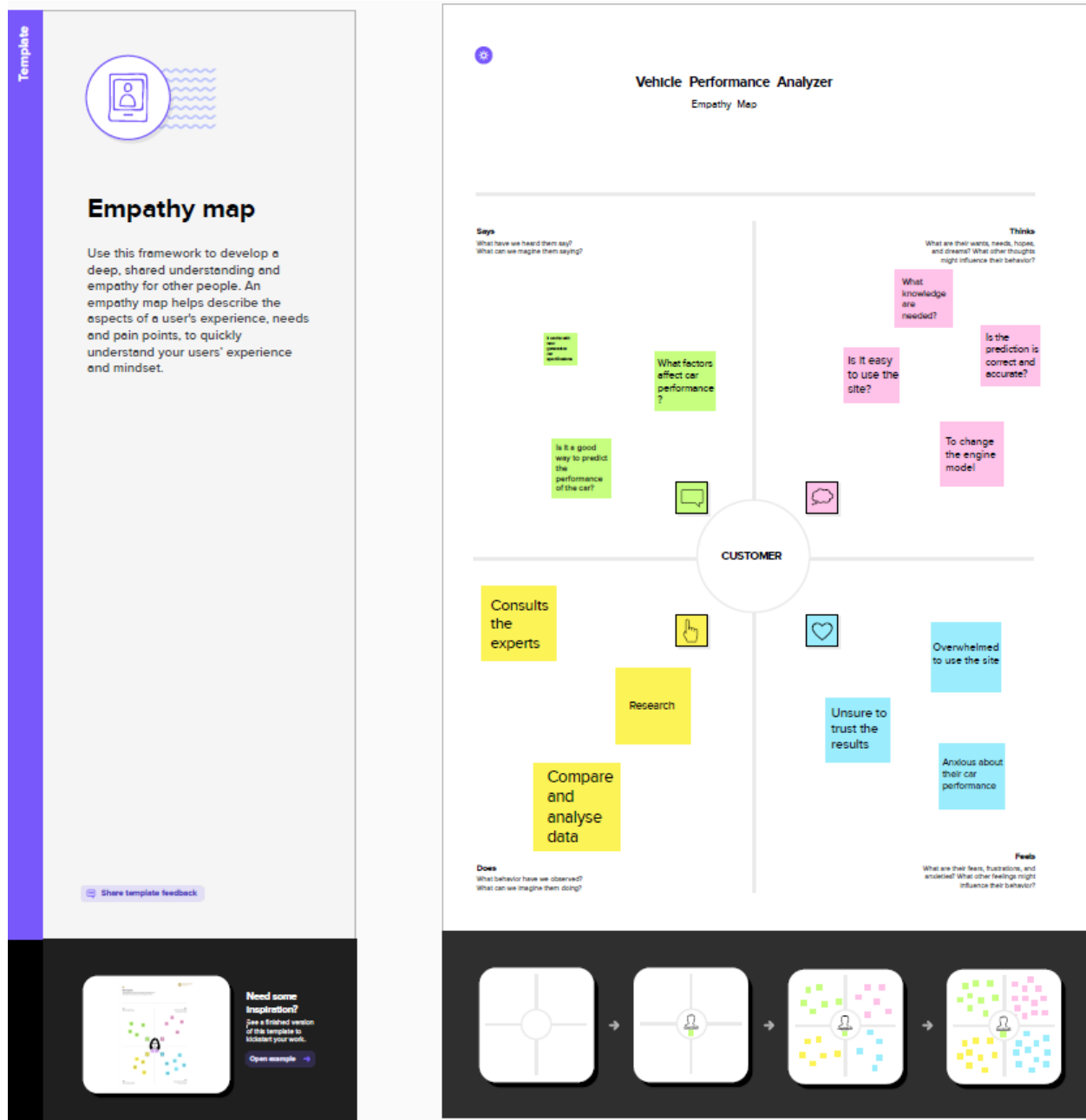
3.2 IDEATION AND BRAINSTORMING

3.3 PROPOSED SOLUTION

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	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 on-going process of obtaining, researching, analysing, 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.
2.	Idea / Solution description	To train the system with the dataset using a regression model and it will be integrated to the web-based application where the user is notified with the status.
3.	Novelty / Uniqueness	Giving the public and the manufacturer the feature to analyse their vehicle's performance.

4.	Social Impact / Customer Satisfaction	The petrol/diesel cost can become lower due to a better mileage performance and the existing vehicle parts can be reused which increases the reusability thus decreases the cost on new products and the physically abled people have better seat comfort because of accessories work. Better mileage and better engine maintenance provides complete combustion thus emitting less harmful gases.
5.	Business Model (Revenue Model)	The web-based application has a friendly UI for the customer to enter their vehicles detail and the system predicts the value within few seconds.
6.	Scalability of the Solution	The project will be scalable when the parts used to measure data in vehicles is feasible and the ML model is fast in processing data.

3.4 PROBLEM SOLUTION FIT

1 CUSTOMER SEGMENTS

Automobile Manufacturers

3 TRIGGERS

Keeping customers waiting too long for services to be completed.

5 AVAILABLE SOLUTIONS

Investing in some other technology - But Vehicle Performance Analyser can give their customers the satisfaction of understanding their vehicle, improving its performance etc.

7 BEHAVIOUR

Manufacture new parts with embedded technology. Hire and form teams to program, deploy & maintain the application. Take feedbacks and improve the model performance in new data.

9 PROBLEM ROOT / CAUSE

Increase in fuel prices --> Better mileage --> Better maintenance --> Additional support for unskilled labourers and guidance for general public.

2 PROBLEMS AND PAINS

Lack of new of technology to survive in the new era of smart automobiles. Inability to assure durability and maintenance of automobiles.

4 EMOTIONS : BEFORE \AFTER:

Unsatisfied and Frustrated> Feeling comfortable and Happy

6 CUSTOMER LIMITATIONS

Change in existing manufacturing automobile model manufacturing process. Formation of new domain for the programming, installation & maintenance of the perform : analyser

8 CHANNELS OF BEHAVIOR

❖ Customers will book their service slots based on their availability and time schedule.
❖ Customers will also get live updates from the service center regarding the service completion incase owner vehicle is their time, need not stay in the service center for a longer period of time , it is easier for them to collect the vehicle from the service center once the service is done. 1> ONLINE When held in actions do customers leave online? ❖ Customers will stay drive the serviced vehicle to ensure that the problem/repair is rectified and will check whether the repair notification has disappeared after the service.

10 YOUR SOLUTION

❖ The vehicle performance analyser helps in monitoring the performance of the vehicle using machine learning. It take engine performance, braking performance and so on, as the main components and if any anomalous activities are found on the performance of the vehicle then it is immediately notified to the user and it ensure the safety of both user and the vehicle. The main contribution is that it in protecting the environment, as proper servicing of a vehicle will reduce the carbon emissions.

4. REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

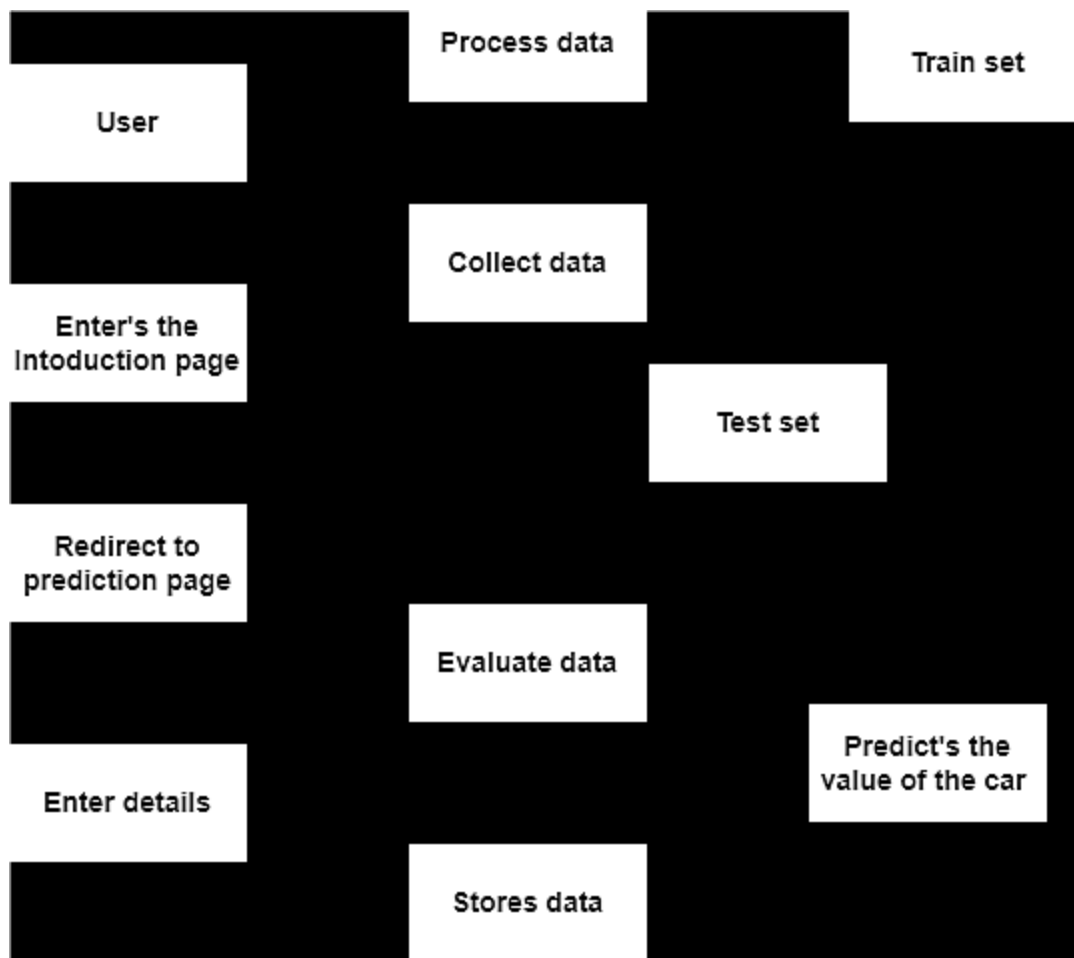| Fr no.	Functional requirement (epic)	Sub requirement (story / sub-task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Application	Apply to test their needs Apply 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 REQIREMENTS

FR No.	Non-Functional Requirement	Description

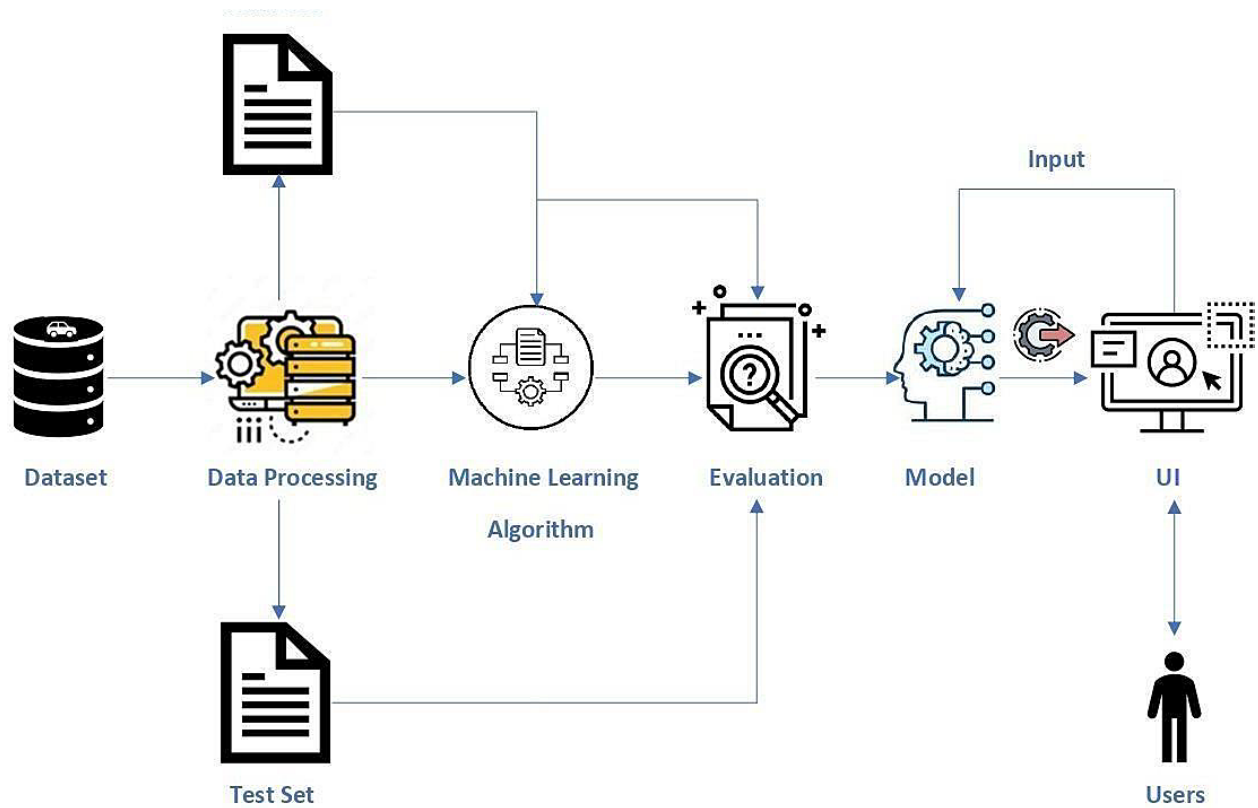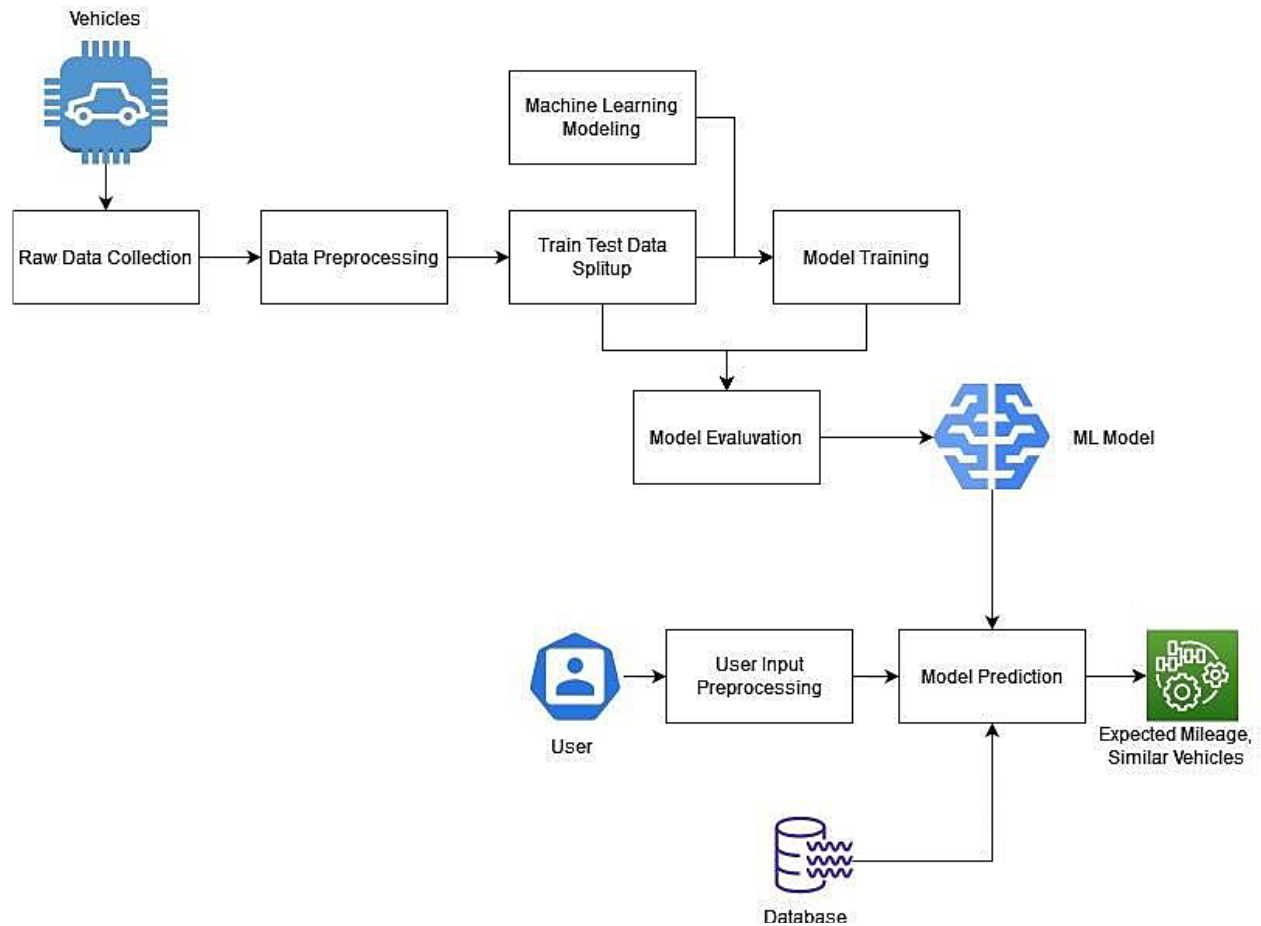|		
NFR-1	**Usability**	Using the developed phase of your application efficiently
NFR-2	**Security**	Providing security day-by-day to maintain secure data analysis
NFR-3	**Reliability**	Consistently give same level of approval towards consumers
NFR-4	**Performance**	Perform every task quickly and maintain 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 DIAGRAM

Process data

Train set

User

Collect data

Enter's the
Intoduction page

Test set

Redirect to
prediction page

Evaluate data

Predict's the
value of the car

Enter details

Stores data

5.2 SOLUTION AND TECHNICAL ARCHITECTURE

SOLUTION ARCHITECTURE

| Dataset | Data Processing | Machine Learning Algorithm | Evaluation | Model | UI |

Input

Test Set

Users

TECHNICAL ARCHITECTURE

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint- 1	Data Preparation	USN-1	Collecting water dataset and pre-processing it	10	High	Karthick A
Sprint- 1	Model Building	USN-2	Create a ML model to predict water quality	5	Medium	Praveenkumar T
Sprint- 1	Model Evaluation	USN-3	Calculate the performance,	5	Medium	Mareeswaran K
Sprint- 2	Model Deployment	USN-5	Using flask and deploy model finally in IBM cloud	20	Medium	Valavantharaja M

| Sprint- 3 | Registration | USN-5 | As a user, I can register for the application by entering email, password, and confirm password | 10 | Medium | Valavantharaja M Karthick A Praveenkumar T |
| Sprint- 3 | Confirmation | USN-6 | As a user, I will receive confirmation email once I | 5 | Low | Mareeswaran K |

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Total story point	Duration	Sprint start date	Sprint end date	Story points completed	Sprint release date
Sprint-1	20	6 days	27-oct-2022	28-oct-2022	20	16-nov-2022
Sprint-2	20	6 days	02-nov-2022	05-nov-2022	20	16-nov-2022
Sprint-3	20	6 days	08-nov-2022	12-nov-2022	20	16-nov-2022
Sprint-4	20	6 days	14-nov-2022	16-nov-2022	20	16-nov-2022

7.RESULTS

7.1 PERFORMANCE METRICS

We will be able to understand the problem to classify if it is a regression or a classification kind of problem.

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8.CONCLUTION

challenge is achieving fast and efficient communication between many different vehicles called Vehicle-to-Everything (V2X). One of the vital questions that the researchers need to address is how to effectively handle the privacy of large groups of data and vehicles in IoV systems. Artificial Intelligence technology offers many smart solutions that may help IoV networks address all these questions and issues. Machine learning (ML) is one of the highest efficient AI tools that have been extensively used to resolve all mentioned problematic issues.
For example, ML can be used to avoid road accidents by analyzing the driving behavior and environment by sensing data of the surrounding environment.

Machine learning mechanisms are characterized by the time change and are critical to channel scenarios. This paper aims to provide theoretical foundations for machine learning and the leading models and algorithms to resolve IoV applications' challenges. This paper has conducted a critical review with analytical modeling for offloading mobile edge-computing decisions based on machine learning and Deep Reinforcement Learning (DRL) approaches for the Internet of Vehicles (IoV). The paper has assumed a Secure IoV edge-computing offloading model with various data processing and traffic flow

9. FUTURE SCOPE

Provide data to help in improving the efficiency of the vehicles in future designs.Understanding the effect of external environmental factors including user behavior, seasonal changes, etc. on performance metrics

10. APPENDIX

Python:

Python is an interpreted, high-level, general purpose programming language created by Guido Van Rossum and first released in 1991, Python's design philosophy emphasizes code Readability with its notable use of significant White space. Its language constructs and object oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

Python is dynamically type and garbage collected. It supports multiple programming paradigms, including procedural, object oriented ,and functional programming.

Keras :

Keras is a powerful and easy-to-use free open source Python library for developing and evaluating **deep learning** model .It wraps the efficient numerical computation libraries **Theano** and **TensorFlow** and allows you to define and train neural network models in just a few lines of code. It uses libraries such as Python, C#,C++ or standalone machine learning toolkits. Theano and TensorFlow are very powerful libraries but difficult to understand neural network.Keras is based on minimal structure that provides a clean and easy way to create deep learning models based on TensorFlow or Theano. Keras is designed to quickly define deep learning models. Well, Keras
is an optimal choice for deep learning applications.

Steps for creating a keras model:

1)First we must define a network model.
2)Compile it, which transforms the simple sequence of layers into a complex group of matrix operations.
3)Train or fit the network.
To import: from keras.models import Sequential
From keras.layers import Dense, Activation, Dropout

TensorFlow:

TensorFlow is a Python library for fast numerical computing created and released by Google. It is a foundation library that can be used to create Deep Learning models directly or by using wrapper librarie sthat simplify the process built on top of **TensorFlow.** TensorFlow tutorial is designed for both beginner and professionals. Our tutorial provides all the basic and advanced concept of machine learning and deep learning concept such as deep neural network, image processing and sentiment analysis. TensorFlow is one of the famous deep learning frameworks, developed by **Google** Team. It is a free and
open source software library and designed in **Python** programming language, this tutorial is designedin such a way that we can easily implements deep learning project on TensorFlow in an easy andefficient way. Unlike other numerical libraries intended for use in Deep Learning like **Theano**,**TensorFlow** was designed for use both in research and development and in production systems. It canrun on single CPU systems, GPUs as well as mobile devices and largescale distributed systems ofhundreds of machines.

Numpy:

NumPy is a Python library used for working with arrays. It also has functions for working in domain oflinear algebra, Fourier transform, and matrices. Numpy which stands for Numerical Python, is a libraryconsisting of multidimensional array objects and a collection of routines for processing those arrays.Using NumPy, mathematical and logical operations on arrays can be performed. This tutorial explains
the basics of NumPy such as its architecture and environment. It also discusses the various array functions, types of indexing, etc. It is an opensource project and you can use it freely.
NumPy stands for Numerical Python. NumPyaims to provide an array object that is up to 50x faster than traditional Python lists. The array object inNumPy is called **ndarray**, it provides a lot of supporting functions that make working with **ndarray** very easy. Arrays are very frequently used in data science, where speed and resources arevery important.

Pillow:

Pillow is a free and ope nsource library for the Python programming language that allows you to easily create &s manipulate digital images. Pillow is built on top of PIL (Python Image Library). PIL is one of the important modules for image processing in Python. However, the PIL module is not supported since 2011 and does n't support python 3.
Pillow module gives more functionalities, runs on all major operating system and support for python
3. It supports wide variety of images such as "jpeg", "png", "bmp", "gif", "ppm", "tiff". You can do almost anything on digital images using pillow module. Apart from basic image processing functionality, including point operations, filtering images using built-in convolution kernels, and color space conversions.

Tkinkter:

Tkinter is the standard **GUI library** for Python. Python when combined with Tkinter provides a fast and easy way to create **GUI applications**. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit.We need to import all the modules that we are going to need for training our model. The Keras library already contains some datasets and MNIST is one of them. So we can easily import the dataset through Keras. The mnist.load_data() method returns the training data, its labels along with the testing data and its labels.

Jupyter Notebook:

Jupyter Lab is a web-based interactive development environment for Jupyter notebooks, code, and data. JupyterLab is flexible: configure and arrange the user interface to support a wide range of workflows in data science, scientific computing, and machine learning.JupyterLab is

extensible and modular: writeplugins that add new components and integrate with existing ones.

Machine Learning:

Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

Deep Learning:

Deep learning is an artificial intelligence (AI) function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. Deep learning is a subset of machine learning in artificial intelligence that has networks capable of learning unsupervised from data that is unstructured or unlabeled. Also known as deep neural learning or deep neural network.

Neural Networks:

A neural network is a series of algorithms that endeavors to recognize underlying relationships in a set of data through a process that mimics the way the human brain operates. In this sense, neural networks refer to systems of neurons, either organic or artificial in nature.

GitHub link

https://github.com/IBM-EPBL/IBM-Project-36551-1660295968