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Smart Vehicle Mileage and Expense Management System Using Artificial Intelligence

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Abstract—

The Smart Vehicle Mileage and Expense Management System Using Artificial Intelligence is designed to automate the tracking, analysis, and management of vehicle mileage and operating expenses. The system collects data such as distance travelled, fuel consumption, maintenance costs, toll charges, parking fees, and trip details through GPS, sensors, mobile applications, and digital receipts. Artificial intelligence techniques are used to categorize expenses, detect unusual fuel usage, predict maintenance requirements, estimate future costs, and recommend fuel-efficient routes and driving practices.

The system provides users with real-time dashboards, automated mileage calculations, expense reports, maintenance reminders, and alerts for abnormal spending or vehicle performance. Optical character recognition can extract information from fuel and service receipts, reducing manual data entry and errors. Machine-learning models analyse historical travel and expense data to identify patterns and improve cost predictions. The proposed solution is suitable for individual vehicle owners, transport companies, delivery services, and fleet-management organisations

I. INTRODUCTION

The Smart Vehicle Mileage and Expense Management System using Artificial Intelligence is developed to make vehicle management easier and more organized. Nowadays, people spend a considerable amount of money on fuel, servicing, repairs, and other vehicle-related expenses. Keeping track of all these expenses manually can be difficult and sometimes important details may be missed. This creates a need for a simple and intelligent system that can help users understand and manage their vehicle expenses. The proposed system keeps a record of important information such as the distance travelled, fuel used, fuel cost, mileage, servicing expenses, and repair costs. By maintaining this information in one place, users can easily check how much they are spending on their vehicle. The system can also show the mileage of the vehicle and help users understand whether the vehicle is giving good fuel efficiency or not.

Artificial Intelligence is used to make the system more useful than a normal expense-recording application. By studying the user's previous vehicle and expense data, the system can identify patterns and make predictions. For example, it can estimate future fuel expenses, identify an increase in fuel consumption, and provide suggestions for reducing unnecessary costs. It can also help in identifying when vehicle maintenance may be required based on previous records.

The main purpose of this system is to save time, reduce unnecessary expenses, and help users take better care of their vehicles. Instead of maintaining records in notebooks or

separate files, all information can be managed through a single system. The proposed system can be useful for individual vehicle owners as well as businesses that manage multiple vehicles. In simple terms, it combines vehicle information, expense tracking, and AI-based analysis to provide a smarter and easier way to manage vehicles. complete documents and helps users quickly find the information they need.

II. LITERATURE REVIEW

The management of vehicle mileage and expenses has become an important area of research because fuel prices, maintenance costs, and vehicle usage are continuously increasing. Traditional methods of recording fuel consumption and vehicle expenses usually depend on manual entries, paper records, or basic spreadsheet applications. These methods can be time-consuming and may lead to incorrect calculations or missing information. Researchers have therefore explored digital and intelligent systems that can automatically collect vehicle-related data and provide useful information to vehicle owners.

Several studies have focused on vehicle fuel consumption and mileage prediction using data such as distance travelled, fuel consumption, vehicle speed, driving conditions, and engine parameters. Machine learning techniques can analyze these factors and identify patterns in fuel usage. Such systems can help users understand their driving behaviour and estimate the expected mileage of a vehicle.

Another important area of research is vehicle expense management. Digital applications have been developed to record expenses such as fuel, servicing, insurance, repairs, and spare parts. These systems make it easier to maintain vehicle records and calculate the total cost of ownership. However, many existing applications mainly work as record-keeping tools and provide limited intelligent analysis or prediction.

Researchers have also studied Artificial Intelligence and Machine Learning techniques for predictive maintenance. AI-based systems can analyze historical maintenance data and vehicle usage patterns to predict when maintenance may be required. This can help vehicle owners identify possible problems at an early stage, reduce unexpected repair expenses, and improve vehicle reliability.

The use of IoT and real-time vehicle data has further improved vehicle monitoring systems. Sensors and GPS devices can collect information such as distance, location, speed, fuel level, and vehicle status. This data can be transferred to a software application for analysis. Combining IoT with AI can provide more accurate mileage calculations, expense tracking, and personalized recommendations.

Despite these developments, there is still a need for an integrated system that combines mileage monitoring, fuel expense tracking, maintenance records, and AI-based analysis in a single platform. Many existing systems focus on only one or two of these functions. The proposed Smart Vehicle Mileage and Expense Management System aims to address this gap by using historical vehicle data and AI techniques to analyze mileage, track expenses, identify spending patterns, and provide useful predictions and recommendations to the user.

Simple Flow

Vehicle details → Fuel/Expense data → AI analysis → Mileage & expense results → Reports/Recommendations.

III. RESULTS AND DISCUSSION

The proposed Smart Vehicle Mileage and Expense Management System Using Artificial Intelligence helps users track fuel consumption, mileage, maintenance, and other vehicle expenses in one place. The system analyzes the collected data to calculate mileage and identify spending patterns.

AI-based analysis can help predict future fuel expenses and detect unusual changes in vehicle performance. This makes vehicle management easier and helps users control unnecessary expenses. Overall, the system provides a simple and intelligent approach to monitoring vehicle performance and expenses.

One of the major advantages of the proposed system is its ability to provide data-driven recommendations. Instead of simply displaying vehicle information, the system can identify unusual fuel consumption, increasing expenses, poor mileage, or possible maintenance requirements. Based on these patterns, it can provide useful alerts and suggestions to help users reduce unnecessary expenses and improve vehicle efficiency.

Table I: Data Required for the Proposed System

Information Collected	**Purpose**
Distance Travelled	To know how much distance the vehicle has covered.
Fuel used	To calculate fuel consumption and mileage.
Fuel Price and Cost	To calculate the total fuel expense.
Maintenance and Repair Expenses	To calculate the total fuel expense.
Previous Mileage and Expense Records	To help AI understand past data and predict future expenses.
Driving and Usage Patterns	To identify patterns that may affect fuel consumption and vehicle performance.

The data collected for the proposed system covers the main information required to understand vehicle usage, mileage, and expenses. Vehicle details provide basic information about the vehicle, while distance travelled helps in measuring its daily or monthly usage. Fuel used and fuel price are important for calculating fuel consumption, mileage, and total fuel expenses.

The system also collects maintenance and repair expenses to understand the overall cost of keeping the vehicle in good condition. Previous mileage and expense records are particularly useful for Artificial Intelligence because they allow the system to study past information and identify patterns. Driving and usage patterns can further help in understanding factors that affect fuel consumption and vehicle performance.

After collection, the data is organized and analyzed by the system. This information can be used to calculate mileage, monitor expenses, estimate future fuel costs, and provide useful maintenance suggestions. Thus, the collected data forms the basic foundation for making the proposed vehicle management system intelligent and useful.

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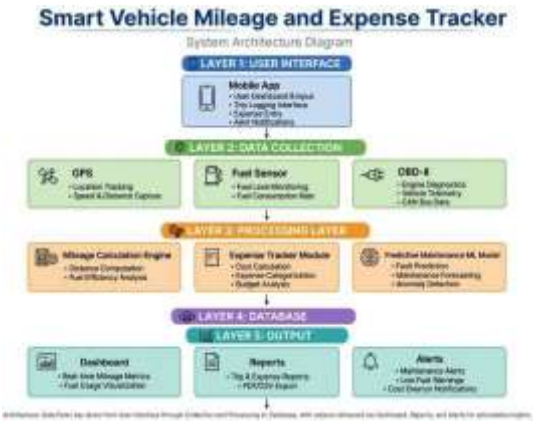
Figure 1: Performance of the Proposed System



The system architecture of the Smart Vehicle Mileage and Expense Management System Using Artificial Intelligence represents how different components of the system communicate with each other. The architecture is mainly divided into the Client (Frontend), Backend (Application Server), Database, and External Services.

The Client or Frontend provides an interface through which users can interact with the system. Technologies such as HTML, CSS, and JavaScript can be used to develop the web interface. Users can register, log in, enter vehicle details, record fuel expenses, view mileage, and check expense reports. The frontend sends user requests to the backend through HTTP/HTTPS.

The Backend or Application Server is responsible for processing the requests received from the frontend. It contains the main application logic, including user authentication, user management, vehicle and expense management, mileage calculation, business logic, and API endpoints. The backend acts as the central processing unit of the system and communicates with other components.

used not only for one specific document type but also for different kinds of information.

The API Layer, represented by a RESTful API, provides communication between the frontend, backend, database, and other services. It receives requests, processes them through the application logic, and returns the required response to the user.

The Database stores important information such as user details, vehicle information, fuel records, mileage data, maintenance expenses, and other vehicle-related expenses. A database such as MySQL can be used. The backend sends queries to the database and receives the required results for processing and reporting.

The system can also use External Services to provide additional functionality. An email service can be used for sending alerts or reports, file storage can be used to store bills and documents, and a notification service can send reminders related to fuel, maintenance, or expenses.

The AI component can be integrated with the backend to analyse historical mileage and expense data. It can help in predicting future expenses, identifying unusual spending patterns, estimating fuel efficiency, and providing maintenance-related recommendations.

Overall, the architecture provides a structured and scalable flow of data from the user interface to the backend and database, while AI and external services enhance the system's ability to provide intelligent vehicle and expense management.

VI. CONCLUSION

The Smart Vehicle Mileage and Expense Management System Using Artificial Intelligence is designed to make vehicle management easier, smarter, and more reliable. In the traditional method, vehicle owners often maintain fuel, mileage, maintenance, and other expense records manually. This can take time and may lead to mistakes or missing information. The proposed system provides a digital and intelligent solution to overcome these problems.

The system collects important information such as distance travelled, fuel consumption, mileage, fuel price, trip details, maintenance expenses, and other vehicle-related costs. This information can be stored

and analyzed to understand the vehicle's performance and spending patterns. AI and Machine Learning techniques can further analyze historical data to predict future mileage, fuel consumption, expenses, and possible maintenance requirements. This allows the user to understand not only the current condition of the vehicle but also its possible future requirements.

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