

# Learning System for Efficient Driving in Fleet Management

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**ABSTRACT:** Higher fuel consumption by vehicles is one of the issues that the transport companies face nowadays. Efficient driving is one of the most employed and effective solution for reducing vehicle fuel consumption. Each driver has different driving styles. Drivers with different driving behavior patterns results in varying fuel consumptions. Efficient driving results in reduced fuel consumption, whereas inefficient driving leads to increased fuel consumption. The factors that affects driving patters includes dynamic nature of the driving environment, physical characteristics of the driver, driver experience and vehicle type. Drivers driving interest decreases if the driving environment is more dynamic and the drivers age is also more. This prompts the increase of fuel consumption. So, identifying efficient drivers and incorporating such efficient features among other drivers is an important issue in saving fuel and economy. Several learning systems are designed to predict the driving behavior pattern of drivers. In this paper, the a survey on the literature involving various learning systems proposed for identifying driving behavior and their impact on fuel consumption.

**KEYWORDS:** Fuel efficiency, Driver performance, vehicles, Mobile Phone, Public transportation.

## I.INTRODUCTION

Nowadays, the efficient fuel utilization is one of the major concerns for public and private transportation sectors as they highly impact on their economy. The government and private companies are focusing on modifying the vehicle technology rather than finding solutions with the existing resources. The other way to reduce fuel consumption is to make a more use of the existing modern technologies effectively in the transportation services, by conducting awareness program among the drivers about the efficient driving techniques. These solutions can be used for vehicles of any type and thereby one can reduce the investment to save fuels.

The driving styles of drivers may vary from one person to other. A professional driver shows better performance than inexperienced driver. An inexperienced driver may also suffer from stress under dynamic road and traffic conditions. The professional drivers with higher age group may also suffer from the same problem. Driver's personal characteristics are also one of the factors to be considered for reducing the fuel consumption. The reaction of drivers during traffic conditions may vary. The professional drivers show smooth reaction by slowing down gradually. But the inexperienced driver shows aggressive reaction by applying the break strongly at the spot line. This aggressive reaction may cause stress in them and decreases their interest towards driving. The aggressive driver with higher age group will be affected severely compared to lower age groups. These driving patterns of different drivers should be identified and necessary training must be provided in order to improve their driving efficiency. Drivers speed change behavior is measured and can be used to avoid the accidents that are increasing over time periods. Drivers can control the vehicle movement by applying acceleration, break, etc. Driver's efficiency varies with their driving styles and this leads to varying levels of fuel consumption. Beyond the vehicle and drivers personal characteristics the driving behaviours vary with environmental factors such as traffic volume, road, route and weather conditions. The government transportation systems are in situation to consider the investment in fuels in order to offer optimal bus fare for their travels. Even though new vehicle technologies could be adopted, the most effective method with less investment for reducing fuel consumption is providing proper safe behaviour raining for drivers. The results obtained after the trainings shows only short term changes among the drivers, and it does not reflect long term effect in fuel consumption and smooth driving behaviours. This reveals that training programs are very ineffective in relative with the motive of reducing fuel consumption. This is because the drivers could not able to change their regular driving habits. So, continuous monitoring and training is required for efficient driving.

Recent advancement in mobile computing technology made smart devices like Smartphone's to possess various features. On one hand, these devices are operating at constrained resources like limited battery power and processing power compared to personal computers. On the other hand, they have the ability to process mobile applications with simple user interface to receive input, display the output and store the results in the local and remote databases. A survey on usage of mobile phones shows that 23% of mobile consumers are having smart phone. The mobile application enables the mobile devices to provide instant feedback about the driving behaviour of the driver and helps to improve it.

## II. RELATED WORK

Fuel-Efficient driving is one of the factors that influence the fuel consumption by vehicles in public transportation sectors. Recent studies focus on finding efficient driving behavior patterns of the drivers and conducting driving programs for inefficient drivers. In most of the studies, the driving efficiency is evaluated by identifying the driver behavior patterns. These patterns are analyzed to derive set of recommendations. The public transport sectors can use these recommendations to encourage the inefficient drivers. Reward programs are also arranged to motivate the drivers for improving their performance.

Sullman et. al. proposed a learning methodology that reveals these learning programs increase the drivers performance and achieve good results in fuel consumption. Catarina Rolim et. al. proposed a model for collecting real time feedback on the driving behaviour of Lisbon Urban Bus Drivers. Feedbacks are analyzed to identify the strategies to improve the driver performance. The outcome of this study shows that feedback provided to the drivers has greater impact on fuel consumption reduction. The results also indicate that the performance of the driver is reduced leading to higher fuel consumption as the feedback is removed.

Vagg et. al. developed a monitoring system to obtain information about the drivers behavior and providing recommendation to the drivers. The indicators used for analyzing the driver's behaviour are acceleration and speed. The drivers are motivated through efficient driving programs. This technique is applied to a test fleet of 15 commercial vehicles and a reduction of 7.61% of fuel consumption is obtained.

Harvey et. al. proved that the reward programs improve the driving efficiency of drivers. The performance of individual driver is analyzed and incentives are provided based on their performance in the reward programs. The idea of reward programs achieves reduced fuel consumption.

A. E. Wahlberg discussed about the effectiveness of complementing courses for the drivers and their impact on fuel consumption. The feedback describes about the drivers driving style and its impact on fuel consumption. Satisfactory driving experience depends not only on the static design of good ride-and- dealing with the arrangement of the vehicle but on the driver's dynamic interaction to operate and control the vehicle as well. Vehicle operation takes many tasks, such as steering, braking, and acceleration, as well as other auxiliary vehicle controls that are not required for routine driving. Yilu Zhang et. al. proposed a pattern- recognition approach to characterize drivers driving skill. The idea is to extract patterns that reflect the drivers driving skill from the measurements of the driver's behavior and the vehicle response. The outcome demonstrates the feasibility of using patterns recognition way to deal with a drivers handling skill. In future work we can address the array of research for driving skill recognition technique in practice.

Rui Araujo et. al. present a new smart phone application to drivers for reducing the fuel consumption in vehicles. This is done by using smart phones sensors and the state of particular vehicle is recorded to detect the driving pattern and suggest new behaviors in real time that will lead more efficient driving experience. The proposed driving coach application is capable of advising and teaching the driver to follow efficient driving patterns.

Laura Puzueco et. al. proposed a on-board tutoring system to make the driving more efficient. Previous researches were focused on improving the efficiency by analyzing the driver behaviour and providing recommendations during the training programs organized by the transport sectors. Instantaneous and continuous feedback is required for drivers to maintain their new driving behaviours. The new learning system provides instantaneous feedback to the drivers to maintain the new driving behaviours. The continuous monitoring system proves to be an efficient method to save fuel consumption. In all the above studies the learning process is based on driving behaviours such as speed, rpm and acceleration. These are viewed as a key performance indicators. The other indicators that influence the driving behaviours are personal characteristics of the drivers such as age and experience. These indicators help to characterize the efficient drivers in respect to age and experience. The experienced driver shows better performance and provides good recommendations for emerging and inexperienced drivers. As well as studies revealed that older drivers are likely to have less stress compared to young drivers. So these indicators combined with previous studies provide good suggestions and the tutor systems based on this will be very effective for improving the driver driving behaviours.

### III. METHODOLOGY

The proposed framework is implemented as Android application in a way. The driving characterization resides in a multitude of tasks associated with the driver and safety. The main objective of the project is to reduce fuel consumption by using driving technique such as driver behaviour, profiling and designing trip details. The driver has to register their details before login into the android application. A proper registration process is applicable for driver and in charge. After the proper registration all drivers have unique username and password. These details are displayed based on time and date of the corresponding driver. It improves efficient driving methodology to evaluate the individual driver's performance.

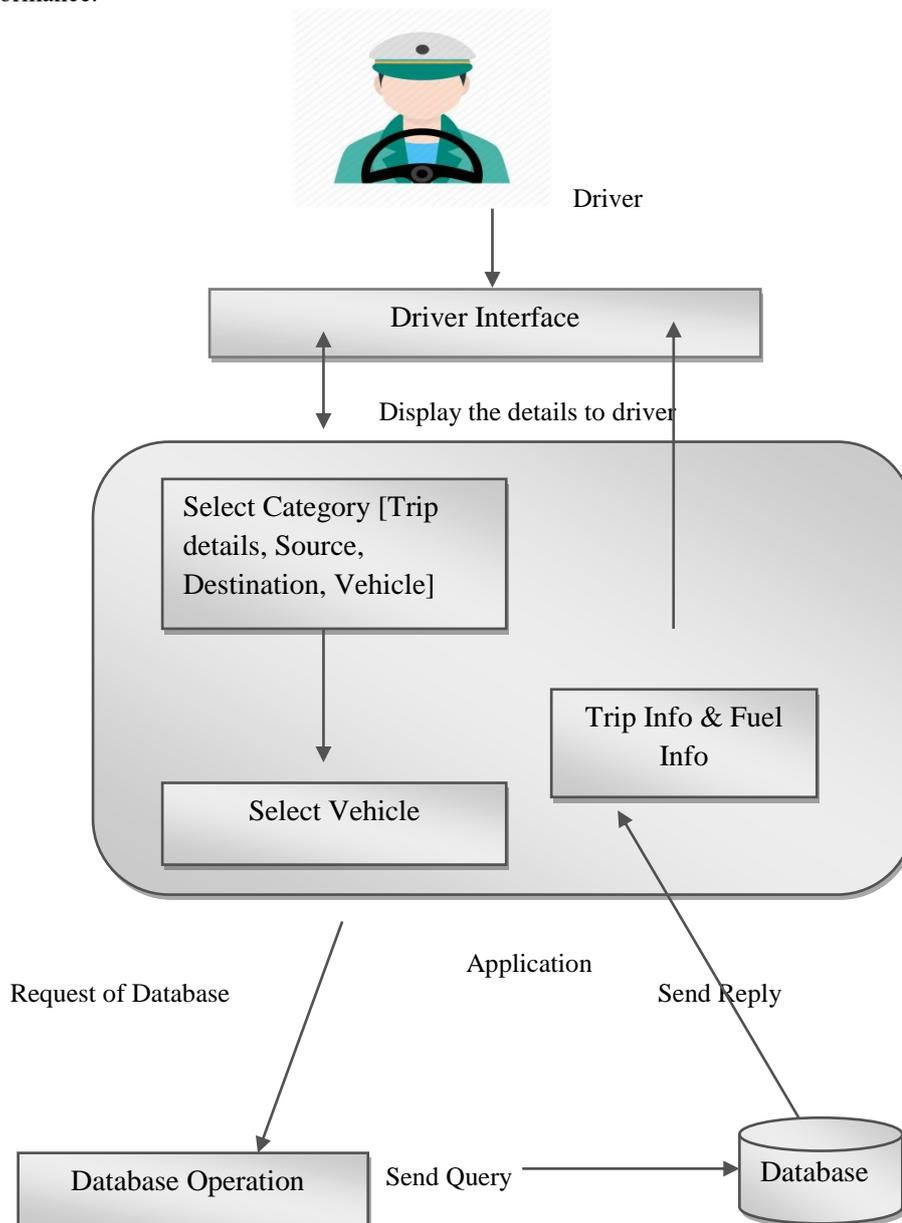


Fig 1 System Architecture

#### A. Admin

Admin is the person who deal with all the information's and procedure. Admin can alone check the driver details and if the match the models they will give a registration id. This entity is basic for driver details here everything needs to interact with the system. This is the basis of the application as one need to know the requester and drivers of the service and one detail feed in the database and validated and needs when need to login or make some enquiry about the progress of the requests.

### **B. Profile Module**

This module consists of driver details to create a profile of the driver. In order to complete the driver information, driver should fill the details such as name, mobile no, license no, age, address, experience. Once the details is filled that should be added to the database. The driver database was maintained by the admin itself. The purpose of this module is to maintain the driver information for further requirements for any organization.

#### **Date-of-birth:**

For age verification date of birth according to the certificate of birth or matriculation certificate should be given as further this will lead to verify the authenticity of the user.

#### **Address:**

In this field, the user needs to enter his full address with a pin code. It should correct and accurate as one can vary on this basis by physical visit or by different methods for verification like matching address on multiple proofs.

#### **Adhaar Number:**

It is also a very important number as the government has made this a very important proof as we can say this mandatory and must be supplied wherever demanded.

#### **License Number:**

It is also mandatory to upload as needed to verify from matching one and another document to which it concern and on the name of the request is done.

### **C. Trip Details**

This module particularly has the type of vehicles. It consists of source, destination, start time, end time and total distance covered by the vehicle. The source and destination explain about the place where they start and end trip. Start and end time helps in maintaining the current trip at given time. Total distance covered is for describing distance covered by the vehicle.

### **D. Fuel Details**

In this module, the first is to select the vehicle based on the trip. Based on fuel details such as type of fuel filled in vehicles, capacity of tank. It provides continuous monitoring the usage of fuel prevents unauthorized use of fuel and gives measurement of fuel level in fuel tank. It also helps in calculating the total distance travelled by vehicle and how much fuel is consumed by the vehicle at each trip.

### **E. Vehicle Details**

This module explains the activity of vehicle details. Based on the type of vehicle, it displays the details like vehicle type, Vehicle Company, vehicle model, insurance no, registration no. This will added to the database and maintained by admin itself.

#### **Vehicle detail:**

Here admin needs to upload all the details of the vehicle from engine number and body parts of the vehicle. This is a very important perspective as one need to know which vehicle is going to be registered and so one must have to show it clearly and every part.

#### **Vehicle type:**

The main purpose of this module is to offer functionality related to vehicle type. It contains all the information and details of the vehicle types.

### **F. View Fuel Info**

This module helps in viewing all the details such as fuel filled, consumed by a vehicle at each trip. The time and data are displayed at the time of filling fuel. It helps in calculating over all fuel consumed for each trip.

### G. View Trip Info

This module particularly has the trip details. The distance which they travel along with start and end time, driver can view the details of trip information will be display by the particular trip. This module helps in recollecting all the trip details by a particular driver in their period of time.

## IV. CONCLUSION

Using a mobile smart phone, it will include differentiating between more people and implementing a system to verify such classification accuracy. It can be extended to differentiate how each driver vary in their style of driving from day-to-day. In this application, easily find the drivers and recommend it. With the experience drivers we can easily reach the desired place to predict the best drivers and this promotes for the particular concern. This will generate profiles for drivers, which can help to offer the best possible information to reduce dangerous driving and fuel savings.

## V. FUTURE ENHANCEMENT

Being fuelled by demand, future enhancement in IOT hardware will yield the smart phone and its sensor to be powerful devices in terms of processing, sensitivity and accuracy, the way for many more in application. We intend to evaluate the analysis of the road conditions, driving information and vehicle fuel consumption in real-time. Unlocking in intelligent transportation system seems only logical as there are numerous of applications that can help reduce safety concerns on the road.

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