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Study of Machine Learning based applications on OBD-II Port by using Internet of Vehicles

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Abstract: ***The survey conducted in 2017, around 464,000 road accidents were reported in India, nearly 150,000 people are died and 471,000 people are injured, which means there are 407 deaths and 1,290 injuries happening each day from 1,274 accidents. To reduce these numbers we are proposing a real time alert system for the drivers for drive security. In today's world the internet is a necessity. In this world everyone and everything is getting connected with IOT (Internet of Things). We used same connection network known as IOV (Internet of Vehicles) through which we are connecting the vehicles to their drivers phone to provide real time alerts. We used OBD II (On Board Diagnostic) port for gathering the sensor data from the vehicles. This data is then transferred to cloud using Raspberry Pi through a working internet connection. Then the Machine learning algorithms will execute on gathered data and the monitoring of the drive is done. And also the driver will be updated with the real time data and features like gear shift alerts, rash driving alerts.***

Keywords: Drive Monitoring, Drive Security, Machine Learning, Internet of Vehicles, On Board Diagnostics (OBD).

I. BACKGROUND

The survey conducted in 2017, around 464,000 road accidents were reported in India, nearly 150,000 people are died and 471,000 people are injured, which means there are 407 deaths and 1,290 injuries happening each day from 1,274 accidents. This also corresponds to 16 killed and 53 people are injured every hour in India due to accidents. And these numbers represent just the reported accidents. Actual number may not be anywhere near to this number. Over-speeding No. 1 cause for road fatalities. In all the main causes of accidents, over-speeding is first in the list and which corresponds to 70.4% of total number of accidents, which leads to 66.7% death causalities and 72.8% minor causalities. There are total of 327,448 reported cases which includes over-speeding accidents where the death count is 98,613 and people injured are 343,083. To reduce this number we built this system called as Real Time Monitoring System for Drive Security through Machine Learning on IOV.

Mercedes provides Mercedes-Benz Driver Assistance Package in which they provide Diatomic Plus which is a radar controlled technology that adjusts speed accordingly to the moving traffic. BMW offers an autonomous driving system which has semiautomatic driving. It has a cabin camera which tracks the driver's movements and ensures that the driver pays attention to the road.

Connected cars is the most popular and widely increasing technology across the world in recent time. A connected car is a car that is equipped with Internet access, and usually also with a wireless local area network. This allows the car to share internet access with other devices both inside as well as outside the vehicle. Currently there are automobile companies like Tesla, BMW, Mercedes who are working on connected cars technology but which is offered at a very high cost. Our System is affordable and has a very low cost and maintenance and if manufacturing companies could integrate this system into their cars then cost is even reduced.

II. AIM

Our aim is to provide a real time drive assistance system with fuel economy guide, safety alerts, crash response, maintenance alerts at an affordable price to the user.

III. QUESTIONS

A. What can we do to reduce the number of accident?
B. How much effective is the driver analysis algorithm?
C. How to provide real time assistance to the driver.
D. How to make this overall system independent.
E. Working with OBD-II parameters, real-time data and cloud.

IV. LITERATURE SURVEY

This paper [1] explains the driver behavior which is modeled using the data which includes parameters such as wheel angle, brake states, acceleration and vehicle speed. The model named Hidden Markov is used for the driver behavior analysis. Gaussian mixture model is used to record the series of characteristics which define the driving behavior. These records are gathered from Controller Area Network (CAN) bus. J48, J48 graft, J48 consolidated, Random tree are the algorithms used for driver behavior analysis, J48 algorithm provides the higher precision among all the other algorithms.

This paper's [2] main focus is on providing the real time driving instructions to the driver, a system is designed and developed which continuously monitors the driver and with the help of real time data provides appropriate feedback to the driver, The real time data is obtained from mobile sensors and On Board Diagnostic (OBD-II) system Bluetooth/WIFI/Wired adapters. Author suggests that to get the maximum efficiency, Car should be driven at optimum RPM i.e. the RPM should be as low as possible.

This paper [3] use the remote service processing approach, this approach describes how the data is Collected, Analyzed and Stored on Database. The data is stored on Cloud and user needs to register in order to have the access to the real-time data, Programmable system on the chip processor (PSOC) is used as an embedded processor.

This paper [4] describes the five communications protocols used for gathering the OBD-II data. In 1970, the first OBD standard was announced by the U.S government OBD-I standard faced many issues like each manufacturer having their own arrangement of diagnostic codes. OBD-II standard came in 1996 which has better standardization.

In this paper [5] the most developed countries are facing with abruptly change in climate, so that is why they are forcing to car companies to produce vehicles, eco-friendlier than vehicles with kindling engine. For collecting and injecting the CAN packets through OBD-II link layer ARM development board is used, to maintain the cost, handle easily and efficiently monitor data and collected android device. The first CAN bus which was introduced in 1991 for monitoring the motor vehicle in mass production.

In this paper [6] developed a hybrid unsupervised deep learning model for studying driving behavior and risk patterns. Hybrid method can easily detect and reduce the negative effect of defects and noise of the data, this approach contains two model components i.e. Auto encoder networks for feature learning designed and SOM (Self-Organized Mapping) networks for featuring clusters. Two methods are compared in this paper i.e. statistical and neural networks in driving behavior analysis, results of statistical analysis are monotonous and difficult to interpret as compared to neural network, five classification models have been compared Decision Tree, Bayesian network, random forest, naïve Bayesian and neural network for identifying the travel pattern.

To study driving characteristics on GPS data they prefer deep learning framework in unsupervised feature learning and classification architecture which is called AESOM (Auto encoder-Self Organizing Mapping) auto encoder networks read GPS data as inputs, and learn and extract low-dimensional driving behavior features. The advantage of deep learning approach is to reduce, manage the negative effects of defects during feature extraction.

This paper [7] consists of a driving analysis method which includes data from OBD-II port and adaboost algorithms. In this method the OBD-II parameters taken into consideration are, engine RPM, throttle position and calculated engine load via OBD-II port and then the AdaBoost algorithm is used to classify the data with respect to model which states that whether the driver is driving safe or recklessly. This algorithm has accuracy of 99.8% in different driving situations.

This paper [8] focuses on the obd2 parameters for finding reckless driving with cloud support. For finding the reckless driving pattern this paper uses lateral and longitudinal acceleration/deceleration, comparing it with the predefined threshold value of 4.5 ms-2. After finding reckless driving pattern in real time, the data is uploaded to the cloud and analysis of driving pattern is performed at the Smartphone or at server. This analysis includes a hidden Markov model to find the difference between past driving patterns and new driving pattern. This system provides quick results but those won't be sent percent accurate. Compared to our system we use 3 important parameters for finding driving behavior with the help of machine learning algorithms which provides 4 different outcomes for better accuracy.

V. RESULTS

The number of accidents can be reduced by watching the driver's behavior in real time and giving instructions as per need.

The algorithms mentioned in the above papers are not so accurate for recognizing reckless driving. These papers do not include all the parameters from OBD-II to predict the driving behavior. We can use more of these parameters and make the algorithm more efficient. We can provide real time driver assistance by continuously watching over the driving behavior and giving alerts accordingly. This system can be made independent by adding a raspberry pi to it. By adding raspberry pi the system can be able to collect and send the data to the cloud. And also this data can be analyzed and send back to the driver in the form of driving alerts.

There are many articles in the above papers which focus on the OBD-II parameters and how they are acquired from the OBD-II port. After getting the data we need to push it to a safer place where we can analyze that data and give output to the driver's phone.

VI. CONCLUSION

Hence as we conclude here that to reduce the number of accidents we are proposing a real time alert system for the drivers for drive security purpose. In which we studied about Gaussian mixture model which is used to record the series of characteristics which define the driving behavior also about the real time data which is obtained from mobile sensors and On Board Diagnostic (OBD-II) system Bluetooth/WIFI/Wired adapters. Moving on further we precisely researched about how the data is Collected, Analyzed and Stored on Database. The Communication between raspberry pie and OBD-II sensor and cloud server. We knew about changes in climate also causes a diverse effect, so that is why car companies should produce vehicles, eco-friendlier. We then studied about advantage of deep learning approach to reduce, manage the negative effects of defects during feature extraction and many more machine learning algorithms that can be used for finding out driving behavior. Lastly we studied about different types of machine learning algorithms like Naïve Bayes, Decision Tree, Neural Network etc. We also studied about the Adaboost algorithms.

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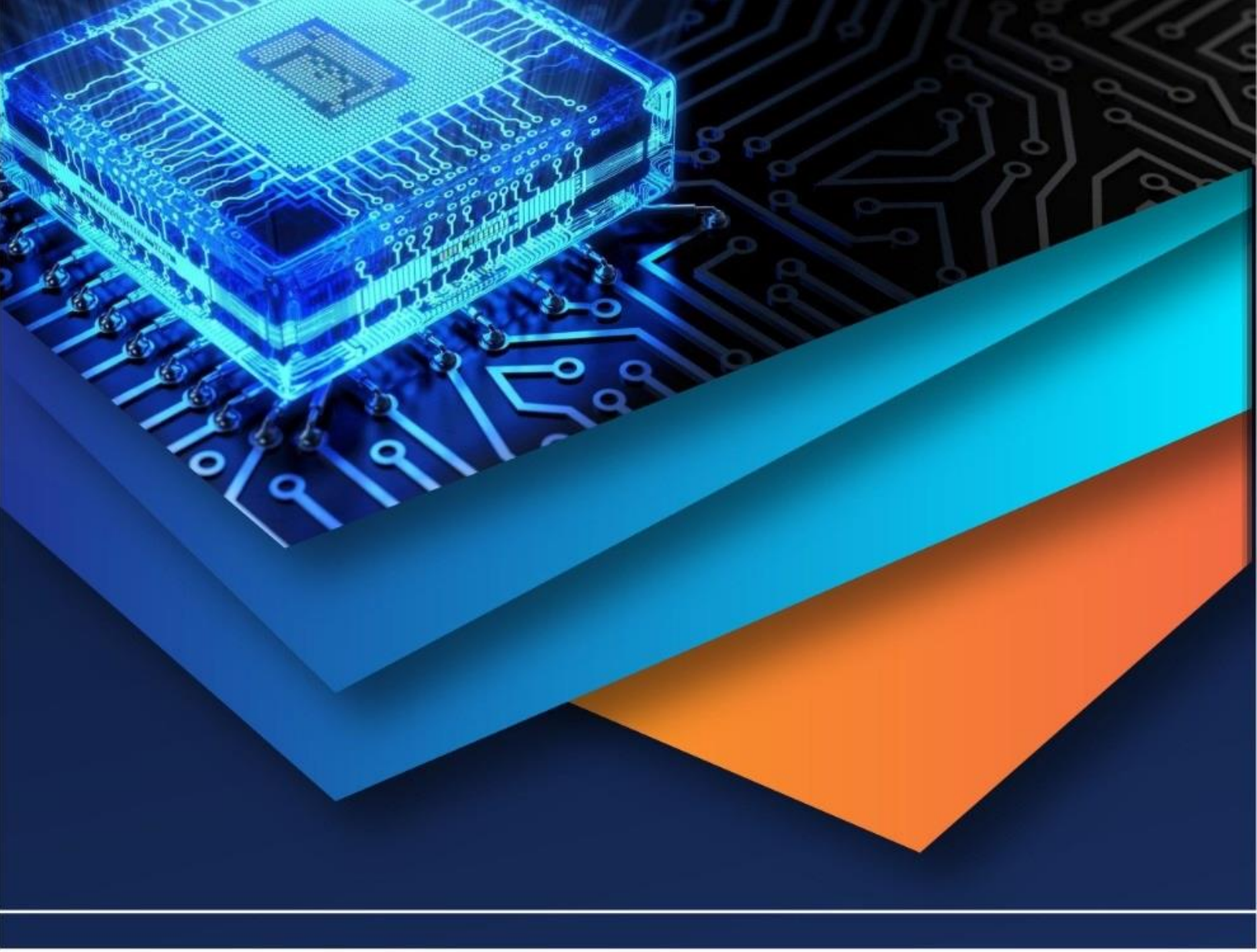

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