ISSN (e): 2250 – 3005 || Volume, 09 || Issue, 7 || July– 2019 ||
International Journal of Computational Engineering Research (IJCER)

Preventing Road Accidents by Analysing Speed, Driving Pattern and Drowsiness Using Deep Learning

[1]Noorishta Hashmi, [2]Dr. M. Akheela Khanum
[1]*M.Tech Scholar, Department of Computer Science, Integral University, Lucknow, India.*
[2]*Professor, Department of Computer Science, Integral University, Lucknow, India.*
Corresponding Author: Noorishta Hashmi

ABSTRACT
As every day the rate of the population expands it likewise builds the rate of road accidents. There are a number of accidents took place daily. Main causes behind these road accidents are lack of training institutes, unskilled drivers, poor road conditions, use of cell phone during driving, consuming alcohol while driving overloading. Various Techniques are being introduced to reduce accidents. Many monitoring methods are come to analyze Driver behavior. In this project, we provide by means of accident prevention by analyzing the vehicle speed, pattern, and drowsiness of the driver. Drowsiness is recognized as an important factor in the vehicle accident. We are going to address two algorithms of deep learning. Naïve Bayes is used for classification of drowsiness While RNN is used for Prediction of driver behavior. Our Application is focused on the analysis of driver data, especially looking at driver behavior.
Keyword: *Accident, Driver behavior, GPS and RNN.*

Date of Submission: 07-07-2019 Date of Acceptance: 25-07-2019

I. INTRODUCTION

As the number of vehicles increasing on the road in the recent past has led to an increase in the number of accidents. Traffic safety has become one of the main issues for the government. A large number of accidents are taking place every day. Main causes behind these road accidents are lack of training institutes, unskilled drivers, poor road conditions, use of cell phone during driving, consuming alcohol while driving, overloading. One serious road accidents in the country occur every min. and 16 die on the Indian road every hour. 1214 road crashes occur every day in India, 377 people die every day, 2 people die every hour in UP. The death ratio increases continuously. There are a lot of factors leading to accidents in the cities Among them naturals factors, mechanical factors and human factors are dominating with the development of science and technology, there has been a Sharp decline in accidents rate caused by natural factors. Bad driving, lax traffic control, and poor road condition are the main reason for this. The main reason for the accident is the driver's errors in their driving style. There has been an Alarming statistic regarding the number of accidents per day. Earlier analyzing of different behavior of drivers are costly as it uses different devices for different parameters. Looking for a better framework which is not so costly and analyze much behavior of drivers in one device. In our framework Speed and Pattern are calculated using the Smartphone of the user and a camera for the detection of the drowsiness. The inbuilt GPS of the Smartphone is used to calculate the location and the speed of the driver. Different readings of the drivers are taken and classification is made. For classification, the Naive Bayes algorithm is used. And for prediction whether the driving of the drivers are rough or not. RNN algorithm is used for prediction. This framework is helpful to the driving companies to predict their driver's speed, pattern and drowsiness.

1.1. Objective

There is the number of accidents took place daily. Main causes behind these road accidents are lack of raining institutes, unskilled drivers, poor road conditions, use of cell phone during driving, consuming alcohol while driving, overloading. This research provides a solution for most of this problem with a vehicle. Preventing road accidents. By using a GPS sensor along with the cloud and deep learning are used in this. The objectives of this framework are to reduce accidents on the road and to deliver efficiency in road transport.

1.2. Driving Behaviour

- **DROWSINESS:** Feeling sleepy or tired during the day is known as drowsiness. It is due to – not getting enough sleep, working at night, depressions or sleep disorder, medications and drinking alcohol. Drowsiness is recognized as an important factor in vehicle accidents. Drowsy driving is a dangerous combination of driving and sleepiness. Many accidents occur during the night due to drowsiness. It makes drivers less able to pay attention to the road.
- **SPEED:** Speed is another factor in causing a road accident. The rate at which the drivers are driving the distance with respect to time is known as his speed.
- **DRIVING PATTERN:** Pattern is the path made by the vehicle on the road from one point anther point while driving.

II. LITERATURE SURVEY

Papers are surveyed in the following section:

Chen Z et al. [1] accurately predicting vehicle speed for an individual trip is a challenging topic because vehicle speed is subjected to various factors such as route types, route curvature, driver behavior, and weather and traffic condition. A big data based deep learning frame work is presented to address various factors such as driver behavior, route type, traffic and weather condition, while predicting vehicle speed. This BDDL-SP algorithm is applicable for trips with any route types. The input data for the trip of interest is extracted and structured by a big data management software, then this input information is used by a trained ANFIS model to predict vehicle speed.

Ou C et al. [2] A collision avoidance system employing embedded system with GPS receiver and Wi-Fi for inter-vehicle communication is proposed. The proposed project GP Sense Car is to use the Wi-Fi smart phone with the built-in GPS receiver to develop a collision avoidance support system for vehicle users The major advantage of the proposed CA system is its capability to sense the moving vehicles without suffering vision corner as some optical-based CA system has. This system is yet suffering the AP flooding problem caused by several APs appear in the receiving range of a client such that the client will have to decide which AP to connect with.

Bose et al. [3], a D&R sense System is proposed that helps in categorizing the driving style of drivers, access the road quality and also warned the driver in real time to make safe driving with the help of GPS, accelerometer and Smartphone sensor. An algorithm named SVM is used to do pattern recognition into different categories such as aggressive or calm driving, bumpy roads, etc. The result shows that the locally running fast DTW gives an accuracy of 86.36% and SVM gives 95.45% but when the same thing was tested on a threshold-based algorithm, accuracy decreases dramatically.

Khang et al. [4] the author proposed a Recurrent Neural Network (RNN) model was developed to predict the injury severity of traffic accidents on the An optimized network architecture was determined through a systematic grid search for the suboptimal network hyper-parameters. Several hyper-parameters of the RNN model were critical to achieve the highest validation accuracy.NSE, Malaysia. It can help road designers to optimize the geometric alignments of the roads based on the accident scenario. The significant constraint of the model is that the information factors are essential and if any of the missing, the yield probabilities can't be precisely assessed. Another requirement of the model is the arrangement length of the RNN demonstrates which for the most part relies upon the quantity of mishap records in the preparation informational index.

Tawari et al. [5] the author presents a distributed camera framework for head movement analysis, with emphasis on the ability to robustly and continuously operate even during large head movements. The proposed framework tracks facial highlights and breaks down their geometric arrangement to estimate the head pose utilizing 3-D demonstrate. We present two such arrangements that furthermore misuse the requirements that are available in a driving setting and video information to improve accuracy and calculation time. Moreover, we lead an exhaustive relative examination with various camera designs. For trial assessments, we gathered a novel head pose data set from naturalistic on-street driving in urban roads, with specific emphasis on occasions including spatially large head movements.

Necula et al .[6] the author predict driver's goal taking into record his past courses. These follows are educated and changed over into examples by a probabilistic HMM-based calculation. This forecast will be improved as far as exactness as the outing advances. Our examination depends on genuine information gathered from different neighborhood drivers and can be effectively connected in present day shrewd traffic frameworks. The framework accompanies a client interface that shows the GPS courses on the guide for a particular driver. These courses can be broke down utilizing parameters like time, separation, tallness and speed. Likewise we built up an instrument that figures out how to register the most extreme probability utilizing the Viterbi calculation so as to approve the following course portion decision for an examined street arrange This paper introduces a course expectation calculation that utilizes a adaptable Hidden Markov Model joined with a coordinating calculation that learns the client's prompt travel way. This is in light of drivers close to home travel history and continuous position. The outcomes got after the calculation tests effectively show the verification of-idea of the calculation

and outline. it is the more affordable technique than prior .the precision is likewise great.

Das et al . [7] the author describe system to reduce accidents to a vast extends by checking eye blinking of the driver which shows the drowsiness , obstacles situated in the road and the drunken condition of the drivers . by utilizing hardware platform comprising of Alcohol sensor MQ3, small scale controller, Li-Fi framework, GSM module, ECU of vehicle. The planned framework would complete the capacity of speaking with the base station by means of Li-Fi, GSM furthermore, control of different parameters. The entire Control framework has the advantage of little volume and high reliability.

Boyraz et al. [8] study, an accident avoidance strategy is outlined and a case study is examined considering road accidents caused by drowsiness and sleepiness. Drowsiness or driver vigilance in general can be monitored using a multi-sensor system to obtain estimates of the drowsiness level of the driver. the proposed design, drowsiness checking framework is joined with a versatile and robust lateral controller. Drowsiness is viewed as identified with the uncertainty in directing wheel directions for the vehicle lateral movement. Utilizing a robust control theory plot, the uncertainties from road vehicle powers and driver inputs are tended to bringing about a lateral controller. The controller is capable to re-shape the recurrence reaction of the vehicle in both side slip angle increasing speed and side-slip point, moving the reaction into additional stable regions in Nyquist diagram. An extra speed decrease concludes the total adjustment of the vehicle-driver framework. This examination has two essential contributions to the current examine inactive safety framework development. Initial, a driver observing framework is consolidated to a controller satisfying its ability for preventing the accidents or moderating the effect. Second, the framework design may establish a response to the issue of the expert progress between the controller and driver on account of imminent accidents.

Quan Y et al . [9], the author analysis the habits and characteristics of drivers speed observation. Then he concluded a correlation analysis between the factors and drivers speed cogitations patterns. Different factors like gender factor, driving year factor and eyesight factor of driver are selected. And then analysing is done on driver's observation on speedometer and cogitations on the vehicles speed to provide depth analysis of traffic accidents. As compared to the male, female have poor sensitivity of speed but they give more attention on speedometer. Experience driver are more sensitive. Result given by this paper shows that some drivers think that observing the speed is important. Some think it is burden. This framework also provides basic information for design and improvement of display device.

Li X et al. [10], the investigation was the first that tried the adequacy of an in-vehicle eco-safe HMI. Drivers' look practices were analyzed among various traffic circumstances and under various states of eco-safe data show. The investigation exhibited that drivers could adjust their visual checking methodologies to various traffic circumstances. This test system examined drivers' look practices as markers of driver diversion when utilizing our Eco-Safe Human-Machine-Interface (HMI). Four sorts of eco-safe data show conditions (gauge, counsel just, input just, both guidance also, input) were tried on various traffic circumstances with changed street traffic multifaceted nature. Results demonstrated that the eco-safe HMI framework did not cause visual diversion. Conversely, the counsel just or criticism just data improved forward looking on the roadway. The discoveries demonstrated that our eco-safe driving framework improved drivers' eco-safe practices and in the mean time upgraded their visual consideration some limitations of the study should be noted. In order to increase the diversity of the driving scenario and the realism of driving experience, various traffic situations were included but the complexity of traffic situations was not strictly controlled, and it was hard to identify how each driver perceived the difficulties in these situations.

Smith et al. [11] illustrates the use of pattern matching methods on time series data for risky

Behaviour classification as well as asset failure predictions. A combination of DTW and LCSS with SAX is proposed to represent real time data and compare with behaviour or fault signatures. Developed a systematic framework for scoring of driving behaviour. In the second use case, pattern matching algorithms are used for the real detection furthermore, finding of deficiencies in transformer frameworks. The developing danger profile is used as lead. Pointer of approaching failure. This feature is integrated into the condition observing framework furthermore, designed to issue support work orders.

Liu X et al . [12] the author propose a strategy which can identify T&D (Texting-while-driving) naturally. The system does not need any extra devices installed in vehicle and utilize only the user's Smartphone. The idea is very simple: at the point when a driver is forming messages, the cell phone installed sensors (i.e gyroscopes, accelerometers, and GPS) gather the related data, for example, touch strokes, holding introduction and vehicle speed. This data will at that point be broke down to see whether there exists a few explicit T&D designs. Broad tests have been led by diverse people and in various driving situations. The outcomes appear that our methodology can accomplish decent identification exactness with low false positive rate. Other than being without foundation and with high accuracy reliability.

Selvathi et al. [13] gives an intelligent framework for bike accidents prevention and detection for human life safety. The counteractive action part includes, Smart Helmet, which naturally checks whether the individual is wearing the helmet and has non-alcoholic breath while driving. The rely does not ON the engine if these two

conditions are not fulfilled. The microcontroller controls the capacity of hand-off and in this manner the start. The framework additionally empowers recognition of a accidents at wherever and reports about the accidents to predefined numbers with GSM module. The Microcontroller persistently records every one of the parameters of vehicle for prevention and identification of accident.

Leonhardt et al [14] a complete approach to predict situations of upcoming lane changes was presented. It is based on three optimized feature sets describing the availability of alternative lanes and the occupancy of the lanes, the position and movement of the driver's head and the motion of the vehicle. It is proposed to fuse all these features by means of two artificial neural networks. They have a compact design by making use of only a limited number of neurons to preserve the networks' capability for generalization.

Arbabzadeh et al . [15] proposed a novel data-driven approach to predict traffic safety risk that can be customized for individual drivers by including driver specific variables. Specifically, we have used the flexible net regularized multinomial strategic regression and data from the Second Strategic Highway Research Program (SHRP 2) naturalistic driving examination to construct the prescient models. This paper thoroughly analyzes the factors in the informational collection and performs information planning and highlight designing strides to improve the forecast execution as for model indicators. The display delivers great outcomes, and model adjustment/augmentations for further enhancements are examined in the end area.

Two adaptations of the model are displayed by the dimension of alerts that the model can produce dependent on driving conditions. This paper gives a concise diagram of the potential uses of the work.

III. PROPOSED APPROACH

There are a few steps to be followed in this paper.

- Monitoring vehicles Speed and location by using a GPS sensor in a mobile application.GPS sensor sent the current location to the cloud after every 10 sec.
- It creates a line of drivers driving pattern.
- We then create the Google Map Activate it and get the Key and Google Map Platform an Android for live Location Tracking.
- Live location is then sending on the cloud Platform with their time. By Google Distance calculator API we found the distance between two points.
- By taking the time difference between both points, we get our first parameter speed.
- Then draw the line in sorted order between two points according to the time.We get the line straightness using the Open CV tool it gives the reading between 1 to 10. I got my second parameter i.e., pattern
- In the next step, we calculate the eyes opening and closing ratio and if the ratio increases greater than 25 then it will be dangerous. This way we get the third parameter drowsiness.
- The accident rate can be reduced by calculating this behavior of the driver.

The flow diagram and system architecture are shown in Figures 1 and 2.

IV. EXPERIMENTAL EVALUATION

For implementing our proposed approach we used TensorFlow (version: 1.12.0)by using OpenCV (version:4.0.0)and python (version 3.6.7). We also used dlib to make my work more efficient. Smartphone is used for GPS (pattern) .OOOwebhost.com (cloud) is used for storing .Snapshots of our experimentation are shown in figure 3 and 4

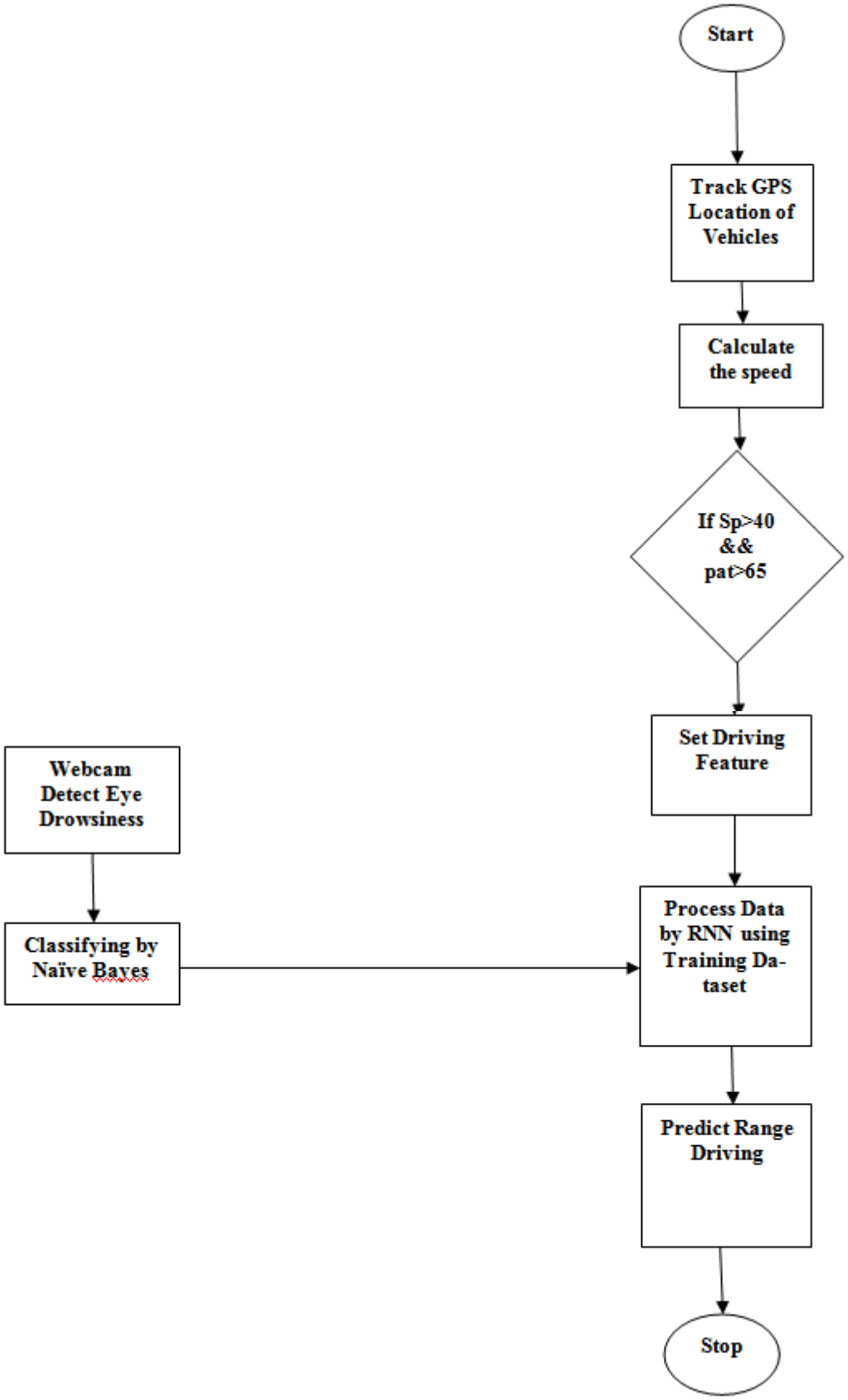

Figure 1: Flow diagram of the proposed approach

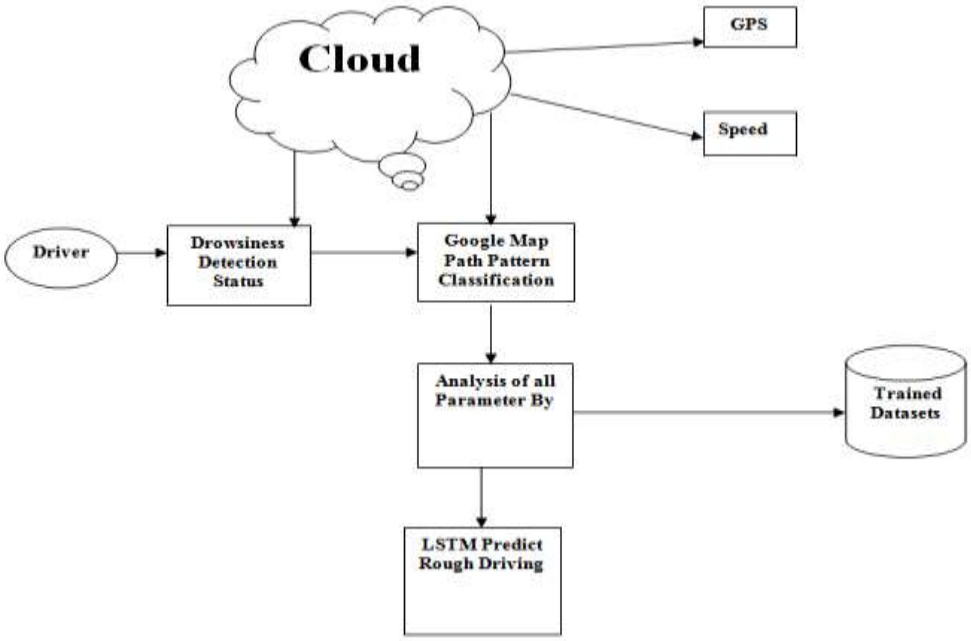

Fig 2: System Architecture

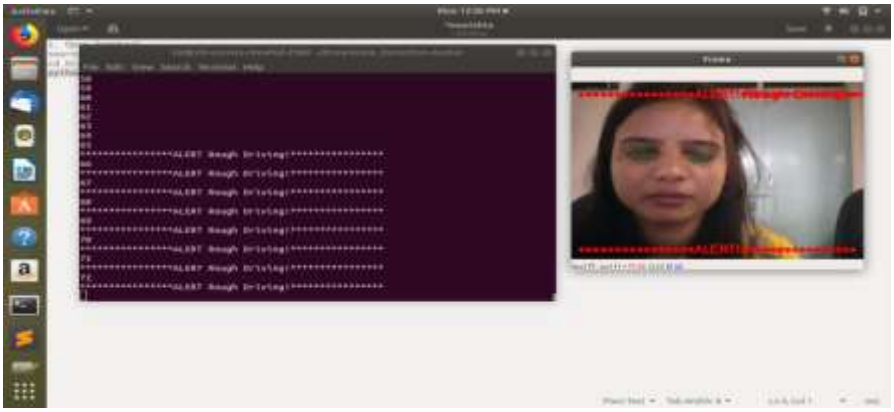

Figure 3: Screenshot of Drowsiness in the proposed approach

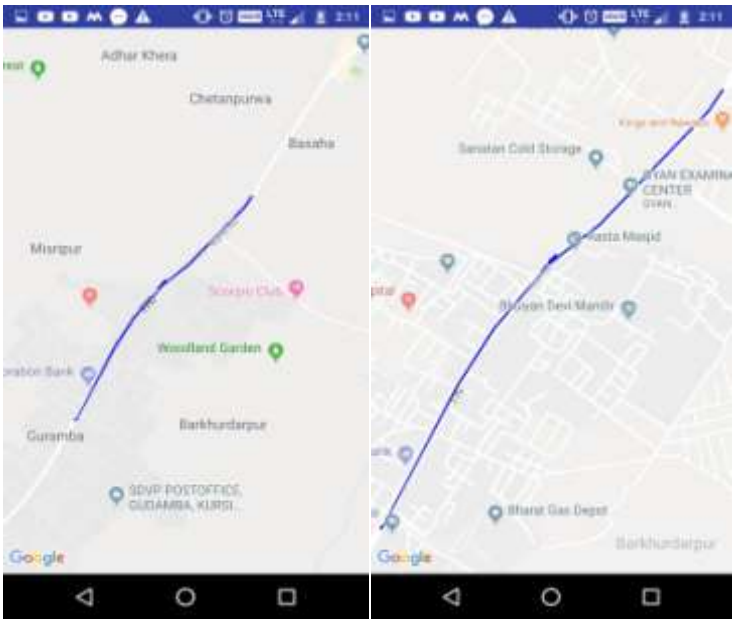

Figure 4: Screenshot of Pattern in the proposed approach

V. COMPARATIVE ANALYSIS

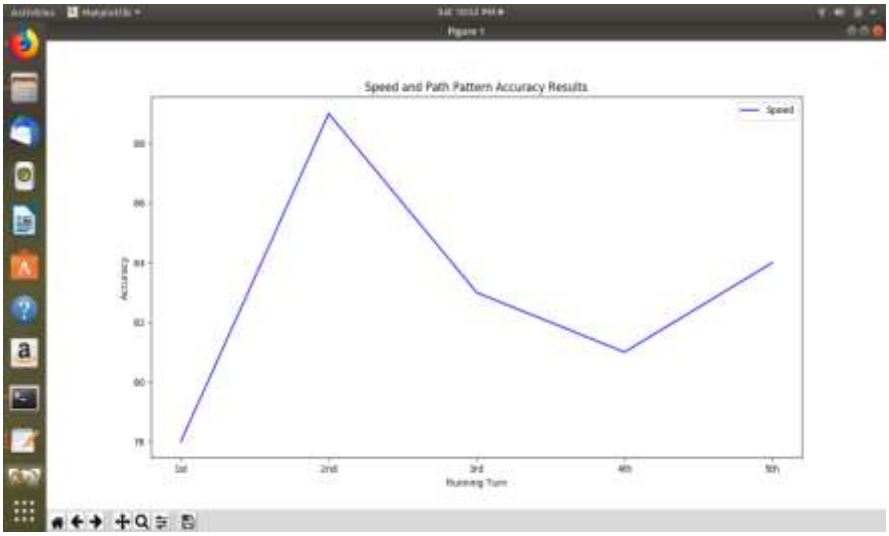

Figure: 5. Speed and Path Accuracy Results

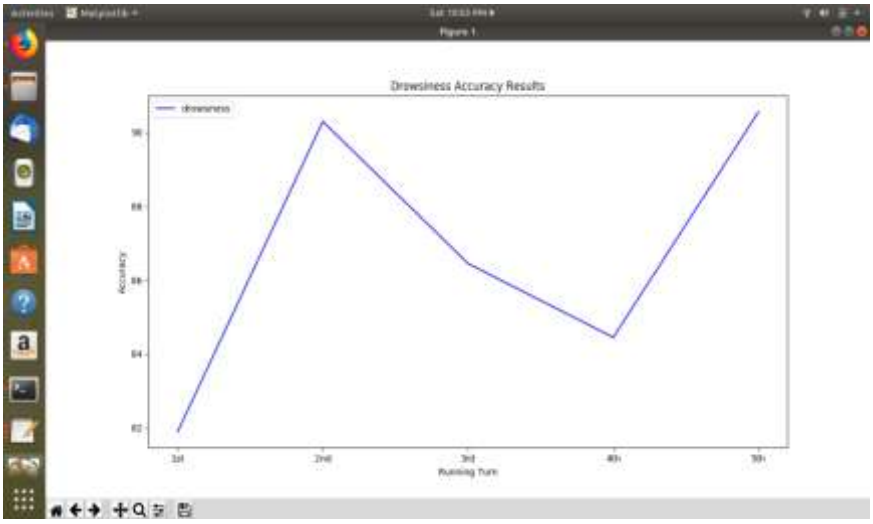

Figure: 6. Drowsiness Accuracy Results

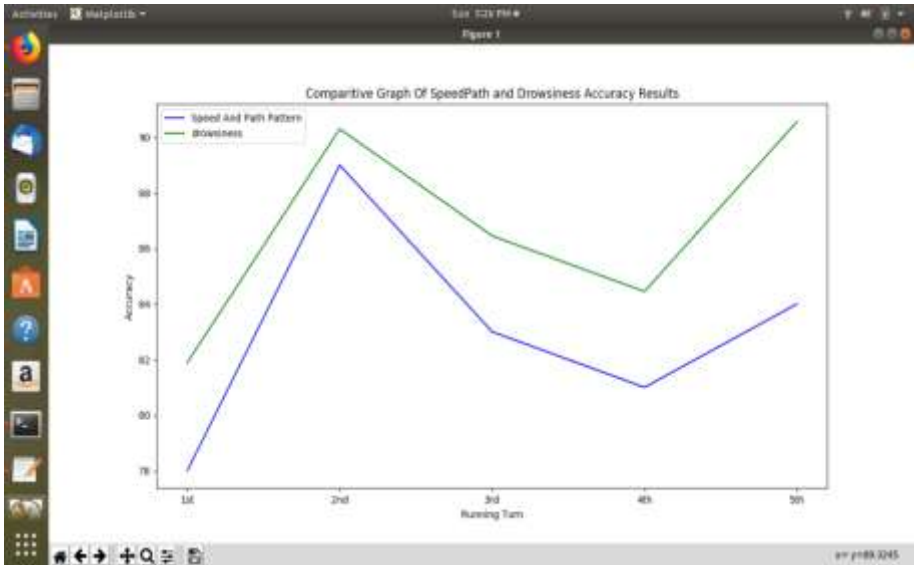

Figure: 7. Comparative Graph of Speed, Path and Drowsiness Accuracy Results

The comparison between speed pattern and drowsiness:

- Different data are taken in this and check. The live readings of the driver driving are taken and the camera is detecting the driver all the time. The reading of drossiness is taken then.
- From the above Graph, it is clear that the Drowsiness is more accurate in this project than speed and pattern. The result and readings of drowsiness are more accurate.

VI. RESULT ANALYSIS

The result of my proposed approach by using Naive Bayes and RNN algorithms to detect & analyze the speed, pattern, and drowsiness is 76%. Drowsiness is there if the reading goes above the threshold value i.e 22. And the speed reading goes above 40 and the pattern reading above 65. An alert is given to the driver and the authority of the vehicle that the driving is Rough, The of this framework is 76%.accuracy

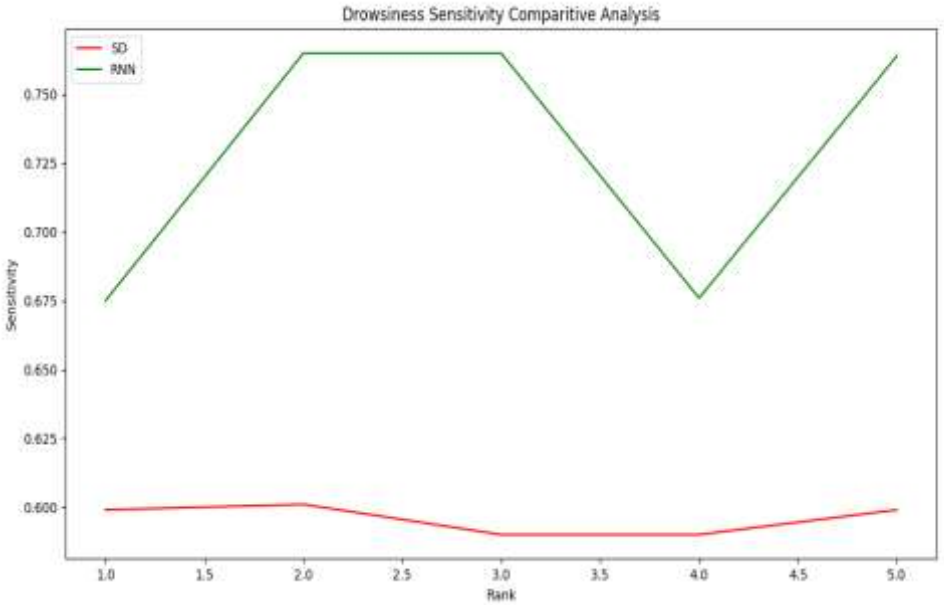

Figure 5: Drowsiness finding analysis

The result of my proposed approach by using drowsiness of 76%.accuracy

VII. CONCLUSION

As the number of vehicles increasing on the road in the recent past has led to an increase in the number of accidents. The main reason for the accident is the driver's errors their driving style it is clears that although the vehicles increase on road but by analyzing speed and pattern we can prevent the accidents. Our main objective is to analyze the Speed, Pattern, and Drowsiness of the Driver. Drivers who drive in the Night or Feel sleeping problems while driving may cause the accident. And the Drivers who drive in high speed and taking many turns in a very short time may cause the accident. So for analyzing these factors of drivers we came up with a framework that can calculate the speed and pattern of the drivers driving and drowsiness is also measure if the driver feels sleepy. This framework is cheaper as it not require any extra devices for calculating speed and drowsiness. Many vehicles have GPS devices (Speedometer) to measure the location and speed. This Framework uses the Smartphone of the driver for calculating speed and pattern. And for drowsiness, a camera is there in a vehicle that monitors the driver's eyes. If the drivers are driving at high speed and if he feels sleepy the phone calculates the speed and pattern. And drowsiness is also measured and the owner of the vehicle can easily find and predict whether his driver driving is rough or not. The RNN algorithm is used for prediction and for classification Neive Bayes is used. In this way, we can prevent the accident. This framework will help driving companies. As many advantages, one disadvantage is also there. This framework requires a camera and Smartphone of the user if there is no network this framework will not work. It will not works when the driver turns any side. This project is promising with regard to the development of drowsiness detection. This framework gives 76% accuracy. In the future, further improvement method could potentially include some more parameters of drivers to get a more accurate result and more information of driver.

REFERENCES

[1]. Cheng, Z., Chow, M. Y., Jung, D., & Jeon, J. (2017, June). A big data based deep learning approach for vehicle speed prediction. In 2017 IEEE 26th International Symposium on Industrial Electronics (ISIE) (pp. 389-394). IEEE.

[2]. Ou, C., Ouali, C., Bedawi, S. M., & Karray, F. (2018, July). Driver Behavior Monitoring Using Tools of Deep Learning and Fuzzy Inferencing. In 2018 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE) (pp. 1-7). IEEE.

[3]. Bose, B., Dutta, J., Ghosh, S., Pramanick, P., & Roy, S. (2018, February). D&RSense: Detection of Driving Patterns and Road Anomalies. In 2018 3rd International Conference On Internet of Things: Smart Innovation and Usages (IoT-SIU)(pp. 1-7). IEEE

[5]. Kang, H. B. (2013). Various approaches for driver and driving behavior monitoring: a review. In Proceedings of the IEEE International Conference on Computer Vision Workshops (pp. 616-623).

[6]. Tawari, A., Martin, S., & Trivedi, M. M. (2014). Continuous head movement estimator for driver assistance: Issues, algorithms, and on-road evaluations. IEEE Transactions on Intelligent Transportation Systems, 15(2), 818-830.

[7]. Necula, E. (2014, September). Mining GPS data to learn driver's route patterns. In 2014 16th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing(pp. 264-271). IEEE.

[8]. Das, A., Ray, A., Ghosh, A., Bhattacharyya, S., Mukherjee, D., & Rana, T. K. (2017, August). Vehicle accident prevent cum location monitoring system. In 2017 8th Annual Industrial Automation and Electromechanical Engineering Conference (IEMECON) (pp. 101-105). IEEE.

[9]. Boyraz, P., & Hansen, J. H. (2008, September). Active accident avoidance case study: integrating drowsiness monitoring system with lateral control and speed regulation in passenger vehicles. In 2008 IEEE International Conference on Vehicular Electronics and Safety (pp. 293-298). IEEE.

[10]. Quan, Y., Shenjun, T., Kaifeng, L., & Yibing, L. (2013, January). Investigation and Analysis of Drivers' Speedometer Observation and Vehicle-Speed Cognition. In 2013 Fifth International Conference on Measuring Technology and Mechatronics Automation (pp. 667-670). IEEE.

[11]. Li, X., Vaezipour, A., Rakotonirainy, A., & Demmel, S. (2019). Effects of an in-vehicle eco-safe driving system on drivers' glance behaviour. Accident Analysis & Prevention, 122, 143-152.

[13]. Smith, J. G., Ponnuru, S. K., & Patil, M. (2016, September). Detection of aggressive driving behavior and fault behavior using pattern matching. In 2016 International Conference on Advances in Computing, Communications and Informatics (ICACCI) (pp. 207-211). IEEE.

[14]. Liu, X., Cao, J., Tang, S., He, Z., & Wen, J. (2017). Drive now, text later: Nonintrusive texting-while-driving detection using smartphones. IEEE Transactions on Mobile Computing, 16(1), 73-86.

[15]. Selvathi, D., Pavithra, P., & Preethi, T. (2017, June). Intelligent transportation system for accident prevention and detection. In 2017 International Conference on Intelligent Computing and Control Systems (ICICCS) (pp. 442-446). IEEE.

[16]. Leonhardt, V., & Wanielik, G. (2017, October). Neural network for lane change prediction assessing driving situation, driver behavior and vehicle movement. In 2017 IEEE 20th International Conference on Intelligent Transportation Systems (ITSC) (pp. 1-6). IEEE.

[17]. Arbabzadeh, N., & Jafari, M. (2018). A data-driven approach for driving safety risk prediction using driver behavior and roadway information data. IEEE transactions on intelligent transportation systems, 19(2), 446-460.

Noorishta Hashmi" Preventing Road Accidents by Analysing Speed, Driving Pattern and Drowsiness Using Deep Learning" International Journal of Computational Engineering Research (IJCER), vol. 09, no.7, 2019, pp 44-52