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A Road Accident Prediction Model Using Data Mining Techniques

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ABSTRACT: Every day around the world, a large percentage of people die from traffic accident injuries. An effective approach for reducing traffic fatalities is: first building automatic traffic accident detection system, second, reducing the time between when an accident occurs and when first emergency responders are dispatched to the scene of the accident. Due to the exponentially increasing number of vehicles on the road, the number of accidents occurring on a daily basis is also increasing at an alarming rate. With the high number of traffic incidents and deaths these days, the ability to forecast the number of traffic accidents over a given time is important for the transportation department to make scientific decisions. In this scenario, it will be good to analyze the occurrence of accidents so that this can be further used to help us in coming up with techniques to reduce them. Even though uncertainty is a characteristic trait of majority of the accidents, over a period of time, there is a level of regularity that is perceived on observing the accidents occurring in a particular area. This regularity can be made use of in making well informed predictions on accident occurrences in an area and developing accident prediction models. In this paper, we have studied the inter relationships between road accidents, condition of a road and the role of environmental factors in the occurrence of an accident. We have made use of data mining techniques in developing an accident prediction model using Apriori algorithm and Support Vector Machines. Bangalore road accident datasets for the years 2014 to 2017 available in the internet have been made use for this study. The results from this study can be advantageously used by several stakeholders including and not limited to the government public work departments, contractors and other automobile industries in better designing roads and vehicles based on the estimates obtained.

KEYWORDS: Accident Prediction, Data Mining, Apriori algorithm, Rule Mining, Classification.

I. INTRODUCTION

The alarming rate of increase of accidents in India is now a cause for serious concern. According to some recent statistics [1], India accounts for roughly six percent of global road accidents while owning only one percent of the global vehicle population. There are a lot of accident cases reported due to the negligence of two-wheelers, whereas over-speeding is also another contributing factor. Accidents caused while under the influence of alcohol or during general traffic violations are also common. In spite of having set regulations and the highway codes, the negligence of people towards the speed of the vehicle, the vehicle condition and their own negligence of not wearing helmets has caused a lot of accidents. While the major cause of road accidents is attributed to the increasing number of vehicles, the role played by the condition of the roads and other environmental factors cannot be overlooked.

The number of deaths due to road accidents in India is indeed a cause for worry. The scenario is very dismal with more than 137,000 people succumbing to injuries from road accidents. This figure is more than four times the annual death toll from terrorism. Accidents involving heavy goods vehicles like trucks and even those involving commercial vehicles used for public transportation like buses are some of the most fatal kind of accidents that occur, claiming the lives of innocent people. Weather conditions like rain, fog, etc., also play a role in catalyzing the risk of accidents. Thus, having a proper estimation of accidents and knowledge of accident hotspots and causing factors will help in taking steps to reduce them. This requires a keen study on accidents and development of accident prediction models. To implement a well-designed road framework management system for looking into road security aspects, it is often desired to have an optimized accident prediction model which can analyze potential issues arising due to infrastructure fallbacks and to estimate the effect of existing models in reducing the occurrence of accidents. The main challenge involved in the creation of such a model include the evaluation of the weight that can be attributed to the impact of each variable in contributing to the accident and assessing how the model can be best designed to incorporate the effect of all such variables. Data mining techniques and models have in the past been found useful for the purpose of data interpretation in a variety of domains including but not limited to credit risk management, fraud detection, healthcare



informatics, recommendation systems and so on. Approaches involving artificial intelligence and machine learning have further helped to augment these studies. For this paper, we have investigated the inter-relationship between the occurrences of road accidents and the roles played by the underlying road conditions and environmental factors in contributing to the same. Since such a study requires us to cover several aspects affecting accidents, we can make use of data mining techniques to analyze this data to extract relevant details from them, as these huge volumes of data would otherwise be meaningless without the right interpretation applied to them.

In this paper, we are discussing the effects of such an accident prediction model in identifying the risks involved in road accident scenarios. The next section discusses the prior works done with respect to analyzing the different accidents that have taken place over the years. This is followed by a summarized description of the methodology used in this work. Further, the different components of implementation including the system architecture, software and languages used, simulation, user interface and screenshots of the developed application are discussed. Finally, the discussion and conclusions derived from the present study and the future scopes are outlined in the last two sections. The results from this study have been used to propose a model that can be used as a tool to estimate the possibility of road accidents in a particular area chosen by the user.

II. RELATED WORK

Literature survey is the most important step in any kind of research. Before start developing we need to study the previous papers of our domain which we are working on and on the basis of study we can predict or generate the drawback and start working with the reference of previous papers.

In this section, we briefly review the related work on accident detection system and their different techniques.

In the article [1], they implemented a device of this type that not only detects any accidents that occur in the car, but immediately informs the corresponding authorities as soon as the accident occurs. We have connected 8 digital sensors to μ c positioned in various positions of the vehicle. As soon as an incident is detected, a μ c pulse is applied. The μ c then activates a buzzer and sends an emergency SMS (using the AT commands) to the interested persons [1].

In the article [2], Automatic detection of Intelligent Accidents (ASAD) is a self-detection unit system that immediately notifies you Emergency contact via a text message when a moment changes in acceleration, rotation and impact force at one end of the vehicle is detected by the system, specifying the position and the moment of the accident. The idea is that as soon as an accident is detected by the system, authorities should be immediately notified to avoid further car congestion and to allow passengers who will be escorted to the hospital in a timely manner. The system involves the use of fuzzy logic as a decision support integrated into the smartphone application that analyses the data coming from the sensors and makes a decision based on a set of rules. The simulated results show an accuracy of 98.67% of the system with failures resulting from the "gray regions" of the variable values.

In the article [3], presents HDyCopilot, an Android application for integrated incident detection with multimodal alarm dissemination, both through eCall and IEEE 802.11p. The proposed incident detection algorithm receives the vehicle entries, through OBD-II and smart phone sensors, or the Accelerometer, magnetometer and gyroscope. The Android the smartphone is also used as a human-machine interface, therefore the driver can configure the application, receive the danger on the road warnings issued by other vehicles nearby and cancel Countdown procedures for detecting false incidents. A prototype the implementation was validated through laboratory tests

In the article [4], the results prove it Algorithm improves the estimate of the risk of an accident compared to the estimated risk based only on the historical records of accidents. It was found that the algorithm is more efficient, especially in the case of analysis of fatal and pedestrian accidents. Impact on industry: the result of the proposal the algorithm can help authorities effectively identify areas with a high risk of accidents. Furthermore, you can to serve as a reference for urban planners who consider road safety.

In the article [5], they present a new method for automatic traffic incident detection, based on the hydrodynamics of the softened particles (SPH). In our method, we obtain a movement flow field of video through the dense optical flow extraction. So a thermal diffusion process (TDP) is exploited to activate the movement flow field in a coherent motion field. Approximation particles moving towards individuals, their forces of interaction, represented as endothermic reactions, are calculated using the measurement of enthalpy, thus obtaining potential particles of interest. Furthermore, we use SPH that accumulates contribution of each particle in a weighted form based on a function of the kernel

Experimental evaluation is performed in a series of video sequences compiled by YouTube and the results obtained are compared with a state of the art technique.

III. EXISTING APPROACH

Lot of work has been done in this field because of its extensive usage and applications. In this section, some of the approaches which have been implemented to achieve the same purpose are mentioned. These works are majorly differentiated by the algorithm for detection systems.

As my point of view when I studied the papers the issues are related to accident detection systems. The challenge is to addressing interoperability from positive examples is based on the detection of co-clusters between users and items with similar patterns.

IV. PROPOSED MODELLING

Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Browse DataSets and Train & Test, View Trained and Tested Accuracy in Bar Chart, View Trained and Tested Accuracy Results, View All Road Accident Prediction, Find Road Accident Prediction Type Ratio, View Road Accident Ratio Results, Download Predicted Data Sets, View All Remote Users.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like PREDICT ROAD ACCIDENT STATUS, VIEW YOUR PROFILE.

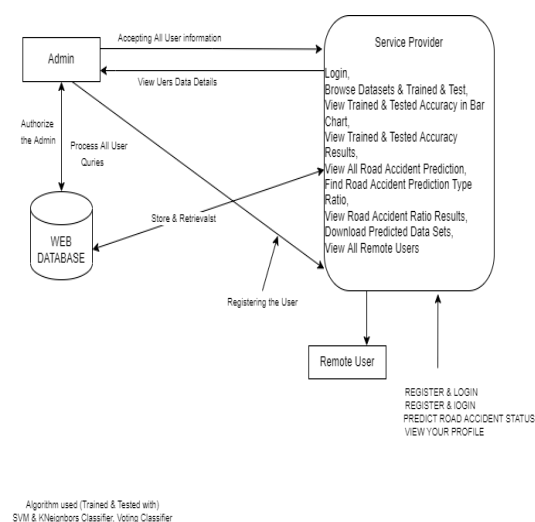


Fig. System Architecture



V. CONCLUSION

An accident can change the lives of many people. It is up to each of us to bring down this increasing number. This can be made possible by adopting safe driving measures to an extent. Since all instances of accidents cannot be attributed to the same cause, proper precautionary measures will also need to be exercised by the road development authorities in designing the structure of roads as well as by the automobile industries in creating better fatality reducing vehicle models. One thing within our capability is to predict the possibility of an accident based on previous data and observations that can aid such authorities and industries. This project was successful in creating such an application that can help in efficient prediction of road accidents based on factors such as types of vehicles, age of the driver, age of the vehicle, weather condition and road structure. This model was implemented by making use of several data mining and machine learning algorithms applied over a dataset for Bangalore and has been successfully used to predict the risk probability of accidents over different areas with high accuracy.

The model can be further optimized in future to include several constraints that have been left out in the current study. These optimized models can be efficiently utilized by the government to reduce road accidents and to implement policies for road safety. Another scope of this work would be to develop a mobile app that will help the drivers in choosing a route for a ride. A call out to the driver through the maps service can also be implemented that would also announce the risk probability in a chosen route along with the directions. This can then be implemented by service provider companies such as Uber, Ola and so on in future. This will also be useful in having a better surveillance of accident prone areas and providing emergency services in the event of an accident. Better road safety instructions can also be installed along the highways taking into account the risks obtained from this model.

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