ISSN 2277-2685
IJESR/july. 2023/ Vol 13/Issue-3/1-9

Traffic Accident Severity Prediction Based on Decision Level Fusion of Machine and Deep Learning

V.Victoria Rachel[1], V.Ravika[2], Y.Jasmine[3], Y.Sowmya[4]

B.Tech Student, Dept.of CSE, **MALLA REDDY ENGINEERING COLLEGE FOR WOMEN**, TELANGANA, India.

Guided By:
Mr.K.V.Rajesh
Assistant Professor, Dept.of CSE, **MALLA REDDY ENGINEERING COLLEGE FOR WOMEN**, TELANGANA, India.

Title: **Traffic Accident Severity Prediction Based on Decision Level Fusion of Machineand Deep Learning**

Abstract:

Traffic accidents on highways are a leading cause of death despite the development of traffic safety measures. The burden of casualties and damage caused by road accidents is very high for developing countries. Many factors are associated with traffic accidents, some of which are more significant than others in determining the severity of accidents. Data mining techniques can help in predicting influential factors related to crash severity. In this study, significant factors that are strongly correlated with the accident severity on highways are identified by Random Forest. Top features affecting accidental severity include distance, temperature, wind_Chill, humidity, visibility, and wind direction. This study presents an ensemble of machine learning and deep learning models by combining Random Forest and Convolutional Neural Network called RFCNN for the prediction of road accident severity.

KEYTERMS: Automation, Image recognition, Classification, Expression Detection.

Introduction:

Road traffic accidents are a major cause of injuries, deaths, permanent disabilities and property loss. It not only affects the economy it also affects the health care system because it puts a burden on the hospitals. Statistics shown by the ministry of public security of china from the years 2009 and 2011, traffic accidents caused an average of 65123 people to lose their life and 255540 got injuries annually [1]. Identifi- cationof primary

factors affecting road accident severity is required to minimize the level of accidental severity. Accidental Severity does not happen by chance; there are patterns that can be predicted and prevented. Accidental events can The associate editor coordinating the review of this manuscript and approving it for publication was Jinjia Zhou . be analyzed and avoided [2]. Being one of the major issues of accident management, accident severity prediction plays an important role to the rescuers in evaluating the level of severity in traffic accidents, their potential impact, and in implementing efficient accident management procedure.

Literature Survey:

Accidental trauma in general and traffic accidents in particular are discussed briefly within the framework of the host, agent, environment complex of conventional epidemiology. The rise of accidents is contrasted to the fall in infectious disease over the years, and then some of the basic characteristics of traffic accidents are reviewed. It is suggested that programmes which aim at behavioural modification are unlikely to produce startling improvements in the short run. Similarly the economic restrictions on environmental changes would seem to inhibit radical benefits from being achieved in the immediate future. The possibilities of injury reduction rather than crash avoidance are then discussed, and improvements in this area are suggested as having the greatest effect within the next few years. The emerging science of accident research is mentioned as an appropriate and distinctive field of study which should be encouraged.

We study the severity of accidents on the German Autobahn in the state of North Rhine-Westphalia using data for the years 2009 until 2011. We use a multinomial logit model to identify statistically relevant factors explaining the severity of the most severe injury, which is classified into the four classes fatal, severe injury, light injury and property damage. Furthermore, to account for unobserved heterogeneity we use a random parameter model. We study the effect of a number of factors including traffic information, road conditions, type of accidents, speed limits, presence of intelligent traffic control systems, age and gender of the driver and location of the accident. Our findings are in line with studies in different settings and indicate that accidents during daylight and at interchanges or construction sites are less severe in general.

Accidents caused by the collision with roadside objects, involving pedestrians and motorcycles, or caused by bad sight conditions tend to be more severe. We discuss the measures of the 2011 German traffic safety programm in the light of our results.. fusion techniques were used. SVM was used to classify the data. The CK+ was used in the experiment, and it was shown to be 98 percent accurate.

An RGB–D Microsoft Kinect camera was modified to record pupils' facial expressions in the classroom in order to recognize emotions. To train and categorize the expressions, researchers

employed the Adaptive-Network-Based Fuzzy Inference System machine learning technique. The system was trained using a combination of the EURECOM and Cohn Kanade datasets. The quality of the supplied photos determines the accuracy of biometric recognition systems. In the impact of image quality on accuracy was examined. In this investigation, the system provided good accuracy till the raw picture compression ratio of 30–40% and greater ratios had a detrimental impact on the system's accuracy. To extract the richer characteristics from macro pixels, included deep overlap and weighted filter principles into the macro pixel technique. The experiment results reveal that the proposed strategy outperformed the original macro pixel approaches in terms of accuracy.

Existing System:

- This paper makes use of an ensemble learning model that combines machine learning and deep

learning mod- els to accurately predict the severity of road accidents .

- The proposed ensemble combines Random Forest (RF) and Convolutional Neural Network (CNN) model called RFCNN

Disadvantages of existing system:

- Less accuracy
- low Efficiency

Statement:

Using grid search, a random forest Classifier was fitted with optimal parameters, resulting in 41.47% accuracy on test data. Conclusions: The random forest classifier model predicted traffic accident severity with 67% accuracy on the training set and 41.47% on the test set, suggesting possible bias or imbalance in the dataset. No clear patterns were found between the day of the week and accident occurrence or severity. Performance can be improved by addressing dataset imbalance and refining model hyperparameters. The model often underestimated accident severity, highlighting the influence of external factors. Adopting a sophisticated data recording system in line with MoRTH and IRC guidelines and integrating machine learning techniques can enhance road safety modeling, decision-making, and accidentprevention efforts.

Proposed System:

Ensemble models have been widely used to improve the accuracy and efficiency of classification results. Merging of classifiers canexhibit better performance as compared to the separate models. In order to achieve better results, this study employs two ensemble modelsto predict road accident severity. One is the ensemble of

two machine learning models and the other is the ensemble of one machine learning and one deep learning model.

Preprocessing:

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out.This is to ensure that the proposed system is not a burden to the company.

Feature Extraction:

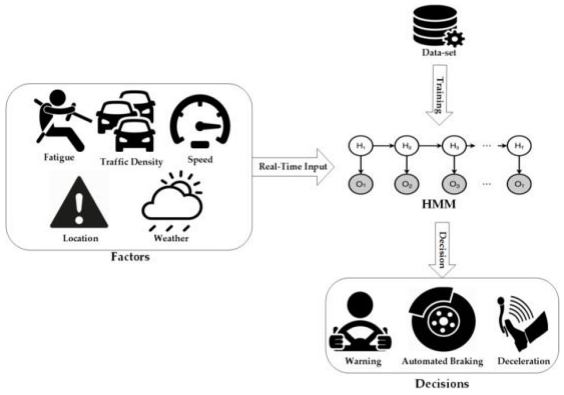
This study is carried out to check the economic impact that the system will have on the organization. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of thetechnologies used are freely available.

Classification:

Expression Detection:

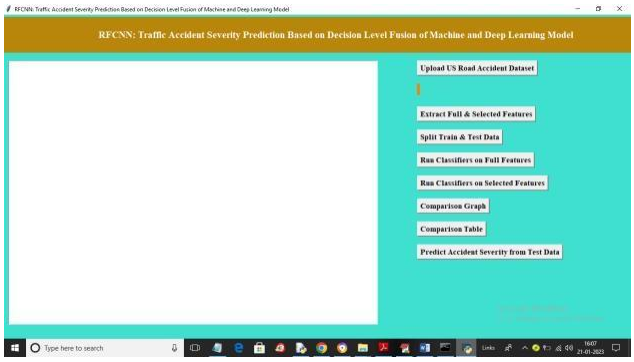
Thus SVM algorithm detects the expressionand provides the output.

System Architecture:



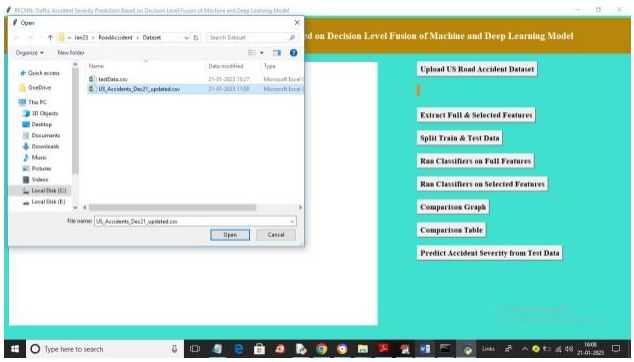
Result:

Screen 1



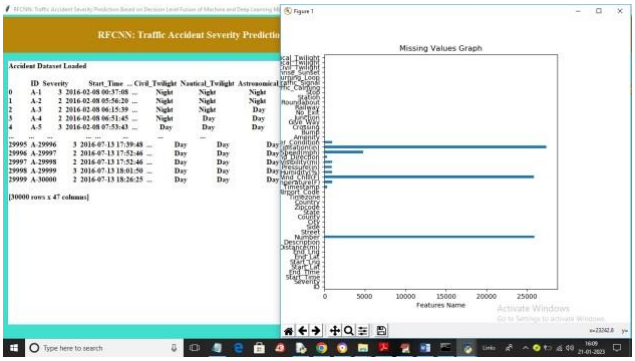
In above screen dataset loaded and in graph x- axis represents count of missing values and y- axis represents name of features. In above graph we can see dataset contains so many missing features and now click on ‘Extract Full & Selected Features’ button to replace missing values and then separate full and selected features dataset and get below screen

Screen 2



In above screen we can see dataset contains full column or features as 46 and then we selected 23as selected features and the in next lines we can see names of selected features and now click on ‘Split Train & Test Data’ button to split dataset into train and test and get below output

Screen 3

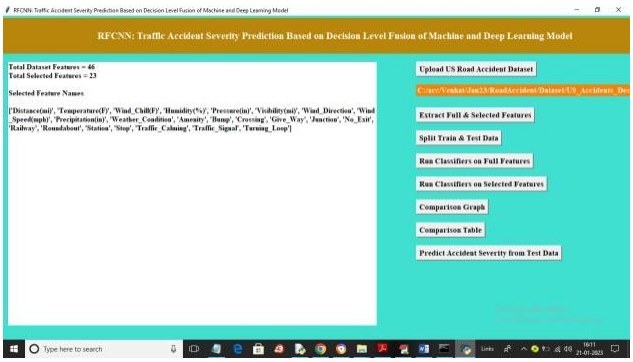


Screen 4

In above screen we are using 5000 records from dataset and application using 4000 records for training and 1000 for testing and now click on 'Run Classifiers on Full Dataset' button to train all machine learning classifiers on training dataand test on testing data and get below output

Screen 5

In above graph x-axis represents algorithm names on full and selected features and y-axis represents accuracy and other metrics in different colour bars and in all we can see selected features algorithm got high performance and now click on 'Comparison Table' button to get below output



Conclusion:

To improve the efficiency of the transport system, there is a need to manage accidents by investigating related factors. In this paper, road accident severity level is predicted by combining machine learning and deep learning model namely RFCNN. In this paper, experimental results explained that classification results of RFCNN are higher than RF,AC, ETC, GBM, and voting classifier (LR+SGD). Significant features are identified by RF and top features include top features affecting accidental severity include distance, tem- perature, wind_Chill, humidity, visibility, and wind direction. Most significant features identified by RF are also used as input to the ensemble

models and also promote accuracy, precision, recall and f- score of all ensemble models but RF again outperformed with a significant difference. Therefore it can be said that RF is the most ..

References:

[1] World Health Organization, Global Status Report on Road Safety 2015, World Health Org., Geneva, Switzerland, 2015.

[2] W. Gissane, ‘‘Accidents—A modern epidemic,’’ J. Inst. Health Educ., vol. 3, no. 1, pp. 16–18, 1965.

[3] H. Manner and L. Wünsch-Ziegler, ‘‘Analyzing the severity of accidents on the German autobahn,’’ Accident Anal. Prevention, vol. 57, pp. 40–48, Aug. 2013.

[4] J. C. Milton, V. N. Shankar, and F. L. Mannering, ‘‘Highway accident severities and the mixed logit model: An exploratory empirical analysis,’’ Accident Anal. Prevention, vol. 40, no. 1, pp. 260–266, 2008.

[5] N. V. Malyshkina and F. L. Mannering, ‘‘Markov switching multinomial logit model: An application to accident-injury severities,’’Accident Anal. Prevention, vol. 41, no. 4, pp.829–838, Jul. 2009.

[6] K. Haleem, P. Alluri, and A. Gan, ‘‘Analyzing pedestrian crash injury severity at signalized and non-signalized locations,’’ Accident Anal. Pre- vention, vol. 81, pp. 14–23, Aug. 2015.

[7] M. Bedard, G. H. Guyatt, M. J. Stones, and J. P. Hirdes, ‘‘The independent contribution of driver, crash, and vehicle characteristics to driver fatalities,’’ Accid Anal. Prevention, vol. 34, no. 6, pp. 717–727, 2002.

[8] S. S. Zajac and J. N. Ivan, ‘‘Factors influencing injury severity of motor vehicle– crossing pedestrian crashes in rural connecticut,’’ Accident Anal. Prevention, vol. 35, no. 3, pp. 369–379, May 2003.

[9] W.-H. Chen and P. P. Jovanis, ‘‘Method for identifying factors contributing to driver- injury severity in traffic crashes,’’ Transp. Res. Rec., J. Transp. Res. Board, vol. 1717, no. 1, pp. 1–9, Jan. 2000.

[10] S. Sarkar, S. Vinay, R. Raj, J. Maiti, and P. Mitra, ‘‘Application of optimized machine learning techniques for prediction of occupational accidents,’’ Comput. Oper. Res., vol. 106, pp. 210–224, Jun. 2019.

[11] K. Rumar, ‘‘Transport safety visions, targets and strategies: Beyond 2000,’’ First Eur. Transp. Saf. Lecture, Brussels, Eur. Transp. Saf. Council, pp. 6–8, 1999.

[12] T. Hummel, ‘‘Land use planning in safer transportation network planning,’’ Leidschendam, Inst. Road Saf. Res., Citeseer,2001

Authors:

First Author:

V.Victoria Rachel pursuing her B.Tech degree in computer science and engineering from Malla Reddy Engineering College for Women.

Second Author:

V.Ravika pursuing her B.Tech in computer science and engineering from Malla Reddy Engineering College for Women.

Third Author:

Y.Jasmine pursuing her B.Tech in computer science and engineering from Malla Reddy Engineering College for Women.

Fourth Author:

Y.Sowmya pursuing her B.Tech in computer science and engineering from Malla Reddy Engineering College for Women.