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APPLICATION OF MACHINE LEARNING IN ROAD TRANSPORTATION – A LITERATURE SURVEY

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ABSTRACT

One of the most difficult factors to account for into Transport is the time to reach destination in right time. Buses, trains and carrier may be late for any number of reasons, from traffic congestion, to bad weather, to vehicle failures. Late buses can cause riders to opt for other forms of transit, losing revenue for the transit authority and encouraging car usage.The rate of increasing the number of vehicles is at points even more than the overall population increase rate, which leads to more congested and dangerous roadwaysMachine learning techniques can be used here to accurately predict time oft transport arrivals based on real-times transport position data and factors like traffic congestion, expected operational delays, as well as the time it takes to load passengers at different stops.Few machine learning techniques applied and compare this machine learning filtering algorithm.

KEYWORDS: Transportation, Road Accidents, Machine Learning

1. INTRODUCTION

Every year the lives of approximately 1.35 million people are cut short as a result of a road traffic crash. Between 20 and 50 million more people suffer non-fatal injuries, with many incurring a disability as a result of their injury.

India, however ranks 1 in the number of road accident deaths across the 199 countries reported in the World Road Statistics, 2016 followed by China and US. As per the WHO Global Report on Road Safety 2016, India accounts for almost 11% of the accident related deaths in the World. A total of 4,67,044 road accidents have been reported by States and Union Territories (UTs) in the calendar year 2016, claiming 1,51,417 lives and causing injuries to 4,69,418 persons.

The total road length in India is about 56 lakh km (as on 31st March 2016) consisting of 1.01 lakh km of National Highways, 1.76 lakh km of State Highways and the remaining 53.26 lakh km consist of district roads, rural roads, urban roads and project roads. In percentage term, National Highways constitute 1.8 per cent, State Highways 3.1 per cent and other roads 95 per cent, respectively of the total road length in the country. Though the percentage share of these three broad categories of roads in the total road length is highly uneven, the distribution of the number of road accidents, fatality and injury in 2017 among these road categories was much less skewed. .

Machine learning which is sub-branch of artificial intelligence supplies learning of computer taking advantage of data warehouses. Assumption abilities of computer systems have advanced in the event of machine learning. Utilization of machine learning is a widespread and functional method for taking authentic decisions by using experience. Machine learning is able to attain extract information from data and use statistical method.

2. EFFECT OF ROAD ACCIDENTS

Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries, and for family members who need to take time off work or school to care for the injured. Road traffic crashes cost most countries 3% of their gross domestic product. The concern of affording the travel safety on the road network in the urban and suburban is one of the primary ethics which leads the engineering, traffic and transportation development. WHO functions with partners - governmental and nongovernmental - around the globe to elevate the report of the inevitability of road traffic injuries and support high-quality trainings associated to helmet and seat-belt wearing, drunk and drive, rash riding and being noticeable in traffic [2]. On the other hand, the accident is predictable, specified the definition, “an incident is distinct as the rapid accidental release of or the spotlight to a

dangerous substance that marks in or might logically have brought about the injuries, deaths, considerable possessions or ecological harm, evacuation or sheltering in place [3]". The expense of these accidents can be serious trouble to the government. Therefore, the road accidents are a severe threat to public transportation. In particular, the colossal economic toll of road accidents on human societies inflict, recuperating road safety needs awareness to three effective features: human, the road and the vehicle [4]. The bureaucrats of the transport system also require stabling the road safety wants through inadequate resources to lessen the accidents and augment the road conditions. In fact, the p is as primary objective is as conceivable in reducing accidents that can be loomed to this target by managing the traffic engineering, driver training and implementation.

3. LITERATURE REVIEW

Halim, Zahid, et al [5] presented a study on the existing approaches for the detection of unsafe driving patterns of avehicle used to predict accidents. AI techniques are surveyed for the detection of unsafe driving style andcrash prediction. A number of statistical methods which are used to predict the accidents byusing different vehicle and driving features are also covered in this paper. The approachesstudied in this paper are compared in terms of datasets and prediction performance.

Wang, Jingyuan, et al [6] proposed a deep learning method with an ErrorfeedbackRecurrent Convolutional Neural Network structure(eRCNN) for continuous traffic speed prediction. By integratingthe spatio-temporal traffic speeds of contiguous road segmentsas an input matrix, eRCNN explicitly leverages the implicitcorrelations among nearby segments toimprove the predictiveaccuracy.By further introducing separate error feedbackneurons to the recurrent layer, eRCNN learns from predictionerrors so as to meet predictive challenges rising from abrupttraffic events such as morning peaks and traffic accidents.

Chen, Quanjun, et al [7] in this paper, the authors collected big and heterogeneousdata (7 months traffic accident data and 1.6 millionusers GPS records) to understand how human mobility willaffect traffic accident risk. By mining these data, we developa deep model of Stack denoise Autoencoder to learn hierarchicalfeature representation of human mobility. And thesefeatures are used for efficient

prediction of traffic accidentrisk level. Once the model has been trained, our model cansimulate corresponding traffic accident risk map with givenreal-time input of human mobility.

Ozbayoglu, Murat, GokhanKucukayan, and Erdogan Dogdu [8] the authors proposed a preliminary real-time autonomousaccident-detection system based on computational intelligencetechniques. Istanbul City traffic-flow data for the year 2015 fromvarious sensor locations are populated using big data processingmethodologies. The extracted features are then fed into a nearestneighbor model, a regression tree, and a feed-forward neuralnetwork model.

Park, Seong-hun, Sung-min Kim, and Young-guk Ha [9] The purpose of this paper is to build a predicting model that can resolveall these problems. This paper suggests using the Hadoop framework to process andanalyze big traffic data efficiently and a sampling method to resolve the problem of dataimbalance. Based on this, the predicting system first preprocesses the big traffic dataand analyzes it to create data for the learning system. The imbalance of created datais corrected using a sampling method.

Kim, Jiwon, and Guangxing Wang [10] This paper proposes a Bayesian network (BN) analysis approach tomodeling the probabilistic dependency structure of causes of congestionon a particular road segment and analyzing the probability of trafficcongestion given various roadway condition scenarios. The paper discusses applicationsof the proposed BN model in urban traffic congestion management,by focusing on identifying leading causes for congestion diagnosisand identifying critical scenarios for congestion prediction.

Alkheder, Sharaf, MadharTaamneh, and Salah Taamneh [11] In this paper, an artificial neural network (ANN) was used to predict the injury severity of traffic accidents based on5973 traffic accident records occurred in Abu Dhabi over a 6-year period (from 2008 to 2013).For each accidentrecord, 48 different attributes had been collected at the time of the accident.In this work, and in order to validate the performanceof the ANN model, an ordered probit model was also used as a comparative benchmark. The dependent variable(i.e. degree of injury) was transformed from ordinal to numerical (1, 2, 3, 4) for (minor, moderate, sever, death).

Fouladgar, Mohammadhani, et al [12] propose a decentralized deep learning-based method whereeach node accurately predicts its own congestion state in realtimebased on the congestion state of the neighboring stations.Moreover, historical data from the deployment site is not required,which makes the proposed method more suitable fornewly installed stations.

Sameen, Maher, and Biswajeet Pradhan [13] In this paper, a deep learning model using a Recurrent Neural Network (RNN) wasdeveloped and employed to predict the injury severity of traffic accidents based on 1130 accidentrecords that have occurred on the North-South Expressway (NSE), Malaysia over a six-yearperiod from 2009 to 2015. Compared to traditional Neural Networks (NNs), the RNN methodis more effective for sequential data, and is expected to capture temporal correlations among thetraffic accident records.

Tang, Jinjun, et al [14] proposes a new method in constructionfuzzy neural network to forecast travel speed for multi-step aheadbased on 2-min travel speed data collected from three remotetraffic microwave sensors located on a southbound segment of afourth ring road in Beijing City. The first-order Takagi–Sugenosystem is used to complete the fuzzy inference. To train theevolving fuzzy neural network (EFNN), two learning processesare proposed. First, a K-means method is employed to partitioninput samples into different clusters and a Gaussian fuzzymembership function is designed for each cluster to measurethe membership degree of samples to the cluster centers. Second,a weighted recursive least squares estimator is used to optimizethe parameters of the linear functions in the Takagi–Sugeno typefuzzy rules.

El Hatri, Chaimae, and JaouadBoumhidi [15] proposed a novel fuzzy deeplearning based TID method which considers the spatial and temporal correlations of traffic flow inherently. Parameters of the deep networkare initialized using a Stacked Auto-Encoder (SAE) model following a layer by layer pre-training procedure. To conduct the finetuning step, the back-propagation algorithm is used to precisely adjust the parameters in the deep network. Fuzzy logic is employed tocontrol the learning parameters where the objective is to reduce the possibility of overshooting during the learning process, increase theconvergence speed and minimize the error.

Dogru, Nejdet, and Abdulhamit Subasi [16] this paper presented an intelligent traffic accident detection system in which vehicles exchange their microscopic vehicle variables with each other. The proposed system uses simulated data collected from vehicular ad-hoc networks (VANETs) based on the speeds and coordinates of the vehicles and then, it sends traffic alerts to the drivers.

Yuan, Zhuoning, Xun Zhou, and Tianbao Yang [17] performed a comprehensive study on the trafficaccident prediction problem using the Convolutional Long Short-Term Memory (ConvLSTM) neural network model. A number ofdetailed features such as weather, environment, road condition,and traffic volume are extracted from big datasets over the state ofIowa across 8 years. To address the spatial heterogeneity challengein the data, we propose a Hetero-ConvLSTM framework, where afew novel ideas are implemented on top of the basic ConvLSTMmodel, such as incorporating spatial graph features and spatialmodel ensemble.

Zhang, Zhenhua, et al [18] employed deep learning in detecting the traffic accident from social media data. First,we thoroughly investigate the 1-year over 3 million tweet contents in two metropolitan areas:Northern Virginia and New York City.Second, two deep learning methods: Deep Belief Network (DBN) andLong Short-Term Memory (LSTM) are investigated and implemented on the extracted token.The classification results from DBN outperform those ofSupport Vector Machines (SVMs) and supervised Latent Dirichlet allocation (sLDA).

Das, Subasish, et al [19] This paper investigated five years (2010–2014) of Louisiana at-faultmotorcycle rider-involved crashes by using deep learning, which is a competent tool for mapping a high-multidimensionalinput into a smaller multidimensional output. The current study contributes to the existing injury severity modeling literatureby developing a deep learning framework, named as DeepScooter, to predict motorcycle-involved crash severities.

Cui, Henggang, et al [20] presented amethod to predict multiple possible trajectories of actors whilealso estimating their probabilities. The method encodes eachactor's surrounding context into a raster image, used as inputby deep convolutional networks to automatically derive relevantfeatures for the task.

Yuan, Jinghui, et al [21]attempted to predict real-time crash risk by considering time series dependency with the employment of a long short-termmemory recurrent neural network (LSTM-RNN) algorithm. Also, the synthetic minority over-sampling technique (SMOTE)was utilized in this study to generate a balanced training dataset for algorithm training. In comparison, a conditional logisticmodel was developed based on matched case control design. Both models were evaluated based on the real-world unbalancedtest dataset rather than an artificially balanced dataset.

Nallaperuma, Dinithi, et al. [22] proposed an expansive smart traffic management platform (STMP)based on the unsupervised online incremental machine learning,deep learning, and deep reinforcement learning to address theselimitations. The STMP integrates the heterogeneous big datastreams, such as the IoT, smart sensors, and social media,to detect concept drifts, distinguish between the recurrent andnon-recurrent traffic events, and impact propagation, traffic flowforecasting, commuter sentiment analysis, and optimized trafficcontrol decisions.

Sumit, SakhawatHosain, and Shamim Akhter [23] Intelligent traffic management system (ITMS) is used to improve traffic flow by integrating information from different datarepositories and online sensors, detecting incidents, and taking actions on traffic routing, and thus helps to reduce both fuelconsumption and associated emission of greenhouse gases. Deep-neurofuzzyclassification can help to improve the performance of the classification as well as remove the weight overlappingburdens. Thus, in this paper we are proposing a python-based compact model with c-means clustering and deep-neuro-fuzzyclassification for road weight measurement in ITMS.

Kong, Yan, and Shuzhen Pan [24] proposed a prediction model based onbackpropagation neural network (BPNN) learning-based resource requirement prediction andlinear programming, which address the resource requirement and the cooperation of resources,respectively. Evaluation results proved that the proposed prediction-based model was efficientfor applications in resource utility.

4. FUTURE RESEARCH DIRECTION

The future research trend by this literature survey characterized as intention of the study area:

- To ease the number of accidents by investigating into the chronology of the accidents using Data Mining techniques.
- To limit the traffic congestion by using Machine Learning algorithms.
- To enhance shipment movements with optimization algorithms.
- To guarantee the road safety

5. CONCLUSION

Through this survey paper, the paper pooled different researcher opinions on the accident, road traffic analysis using Machine Learning techniques. This presents investigation depicts the numerous methods were employed for examining the accident, road traffic congestion. It distributes a lot in perceptive the conditions and source of the accident. This current survey is an intelligent traffic Machine Learning is established to be precious in a large quantity of traffic information. Data driven technique is employed to evaluate the traffic situations.

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