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ROAD ACCIDENT SEVERITY AND HOSPITAL RECOMMENDATION USING DEEP LEARNING TECHNIQUES

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Abstract:
Highway traffic accidents continue to be a leading cause of mortality, even with advancements in traffic safety measures. For developing nations, the toll of road accidents in terms of lives lost and property damaged is disproportionately high. There are several variables that might lead to traffic accidents, and some of these elements have a greater impact on the severity of these occurrences than others. When it comes to predicting important details related to accident severity, data mining techniques might be useful. Using Random Forest, this research identifies critical aspects that are significantly linked with the severity of highway accidents. Disturbance intensity is most affected by factors such as distance, temperature, humidity, visibility, and wind direction. In this study, we present an RFCNN model for traffic accident prediction that combines Random Forest and Convolutional Neural Network. Various fundamental learning classifiers are evaluated to see how well the suggested method performs. The research makes use of data such as US accident records from 2016 to 2020. The RFCNN provided a much better approach to decision making than other models using the top 20 features to predict crash severity with an accuracy of 0.991, a precision of 0.974, a recall of 0.986 and an F-score of 0.980

Keywords: Traffic accidents, Severity Prediction, Hospital Recommendations, Convolutional Neural Networks.

Introduction:

Road accidents continue to be a big global hazard, killing numerous lives and causing enormous agony and suffering every year. Despite developments in car safety technologies and improved awareness efforts, the rising population and expanding automobile traffic have contributed to an increase in road accidents globally. Tragically, many of these accidents result in severe injuries, underlining the vital need for rapid and accurate assessment of injury severity and timely access to adequate medical care. In response to this critical need, our study focuses on harnessing deep learning techniques to address two essential areas of post-road accident management: injury severity diagnosis and hospital recommendation. By harnessing the potential of Convolutional Neural Networks (CNNs) – a family of deep learning algorithms recognized for their success in picture categorization and object recognition – we seek to transform the way road accident victims are assessed and treated. Our project's major purpose is twofold: first, to precisely assess the type and severity of injuries received in traffic accidents, and second, to select the most suitable hospital depending on the severity of these injuries. We understand the crucial significance that quick medical intervention plays in improving accident outcomes and saving lives. Therefore, our strategy focuses the quick and precise diagnosis of injury severity, enabling emergency responders and healthcare providers to make educated judgments immediately. To fulfil these objectives, we have compiled a comprehensive dataset of photos exhibiting all sorts of road accident injuries, including injuries to the head, hand, and leg. These photos serve as the base for training and testing our deep learning models, allowing us to evaluate their performance across diverse injury kinds and severities. In addition to CNN-based classification, we assess the performance of various machine learning models, such as Support Vector Machine (SVM), Random Forest, and Decision Tree, in handling road accident data. By conducting a detailed study of these algorithms' performance indicators – including accuracy, recall, confusion

matrix, precision and F- score – we intend to verify the superiority of deep learning approaches in this domain.

Literature Survey:

Saeid Pourroostaei Ardakani et al. Being one of the top fatalities on a global scale, car accidents pose a serious threat. Reducing the number of occurrences is crucial to saving lives and developing sustainable cities and communities. ML and data analysis tools explain the causes of accidents and provide strategies to minimize them. However, since the quantity and pace of traffic data continues to expand and accelerate, this demands the usage of big data. This article investigates traffic accident trends and presents prediction models by considering critical variables such as collision severity, number of casualties, and vehicle. Therefore, a preliminary model was built to replace the original data by eliminating missing and useless values, general behavioural data, and quartiles. Four classification approaches, including decision tree, multiple logistic regression, Naive Bayes and Random Forest were applied and examined to determine the performance of collisions in prediction. The findings illustrate the acceptance level of traffic accident prediction as contrasted to Naive Bayes.

Alkheder et al. employed Neural Network approaches for severity prediction (minor, moderate, severe, fatality) of road incidents in Abu Dhabi. The investigation was based on 5740 traffic accident reports that happened between 2008-2013. The total accuracy of the model for the training and testing data were 81.6% and 74.6%, respectively. Furthermore, Zeng and Huang introduced a training algorithm and network structure optimization approach to predict injury severity. They found that the new training method was more effective than the usual back-propagation technique. Optimized NN's, which contains fewer nodes than the fully linked NN, exhibited respectable prediction accuracy. Also, the fully connected and optimized NN models outperformed the ordered logit model. Their findings also demonstrated that the improvement of the NN structure might increase the overall performance of model prediction.

Zheng, Ming, et al. employed Prediction-Convolutional Neural Network (TASP-CNN) model for traffic accident's severity prediction is presented that consists of combination relationships among traffic accident's characteristics. The TASP-CNN model is contrasted with other models utilized like KNN, Logistic Regression, Decision Tree, Gradient Boost, SVC, ConvID, Neural Networks, LSTM-RNN.The average precision and recall of TASP-CNN are of 0.893 and 0.093 for slight injury, 0.248 and 0.167 for serious injury, 0.063 and 0.063 for fatal injury respectively. TASP-CNN has shown the highest recall in slight injury and highest precision in both serious and fatal injuries.

Conclusion:

In conclusion, the "Road Accident Severity & Hospital Recommendations using Deep Learning Techniques" project shows a significant improvement in exploiting deep learning for road safety and emergency response. The integration of advanced technologies aims to predict accident severity accurately, recommend suitable hospitals, and ultimately improve the overall efficiency and effectiveness of emergency medical services. The road accident severity and hospital recommendation project represent a significant step forward in harnessing technology to improve emergency response and healthcare delivery in the context of road accidents. Using deep learning techniques such as Convolutional Neural Networks (CNNs) for injury severity assessment and hospital referral, we have developed a robust system capable of automating important portions of post-accident treatment. Through the application of our system, we solve various flaws of the existing manual assessment methods, including subjectivity, inconsistency, and time-consuming processes. By automating injury severity detection, we ensure rapid and accurate assessment, enabling emergency responders and healthcare professionals to make informed decisions promptly. Additionally, our system delivers consistent and objective hospital recommendations based on the severity of injuries, ensuring that

accident victims receive quick access to appropriate medical care.

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