

AcciTracker: A Predictive Model for Road Accident Forecasting

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The importance of leveraging predictive analysis to enhance road safety is increasingly recognised as societies grapple with the growing issue of traffic accidents. “AcciTracker” is a novel method for predicting traffic accidents to improve preventive measures and support public safety. This study conducted an in-depth analysis of the intricate dynamics of accident prediction using a large-scale dataset from the United Kingdom (UK) Road Accidents and Safety Statistics, provided by the Department for Transport UK, spanning from 2005 to 2017. The dataset encompasses various features, including accident locations, time, weather conditions, and road surface conditions. The prediction model employs state-of-the-art machine learning algorithms, including Random Forest, Logistic Regression, and Density-Based Spatial Clustering of Applications with Noise (DBSCAN). Underpinning this approach is a robust framework for data gathering and preparation, ensuring the accuracy and applicability of the data fed into the machine learning models. Using these models, remarkable precision was achieved in forecasting accident counts for specific hours on particular days of the week, predicting accident hotspots, evaluating accident severity, and identifying road surface types susceptible to accidents. The accident count prediction model, utilizing the Random Forest algorithm, performs with 91% accuracy, while DBSCAN effectively predicts accident-prone areas. The accident severity model achieves 85% precision using both Logistic Regression and Random Forest algorithms, and the road surface prediction model performs with 74% validity using the Random Forest algorithm. One million data records were utilized for training and testing the models. “AcciTracker” integrates these models to assist road users, representing a significant advancement in road and public safety. This comprehensive approach to accident prediction and prevention has the potential to impact traffic management and safety policies greatly.

Keywords: Multivariate Model, Predictive Analysis, Road Accident Forecasting, Hotspot Prediction, Machine Learning.