

Abstract

Accidents, particularly road traffic incidents, remain one of the leading causes of injury and death worldwide. Traditional methods of accident prediction and prevention have primarily relied on historical data analysis, which, while useful, may not fully capture dynamic and location-specific factors. This paper presents a **Location-Based Accident Prediction Model** using **Machine Learning (ML)** techniques to predict accident-prone areas based on real-time and historical data. The model aims to provide valuable insights for policymakers, urban planners, and transportation authorities in developing targeted interventions to improve road safety. The proposed model leverages a combination of geographical, meteorological, and traffic-related data, including factors such as road type, weather conditions, traffic density, time of day, and accident history. Several machine learning algorithms, including decision trees, random forests, and support vector machines (SVM), are employed to build predictive models that estimate the probability of accidents occurring at specific locations. The performance of the models is evaluated using standard metrics such as accuracy, precision, recall, and F1 score. Incorporating spatiotemporal features allows the model to generate location-based predictions that can dynamically adapt to changing conditions. Additionally, by using real-time data from traffic sensors, GPS, and mobile applications, the model has the potential to continuously improve its predictions as new information becomes available. The results indicate that the ML-based approach significantly outperforms traditional statistical models in terms of prediction accuracy and reliability. This location-based prediction framework is a promising tool for enhancing road safety measures, enabling proactive accident prevention strategies, and optimizing resource allocation for emergency services. Future work will focus on integrating real-time data streams and improving model interpretability to better understand the underlying factors contributing to accidents in specific locations.