

AcciPredict-AI-Based Road Accident Severity Prediction & Risk Hotspot Mapping

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Abstract

This research focuses on the construction of AcciPred, a weather and road-condition-based accident risk prediction system for the improvement of road safety with data-driven risk assessment. The system uses a combination of heterogeneous data parameters such as real-time weather parameters, road surface indicators, lighting conditions, traffic volume and historical accident records to estimate the likelihood of vehicular accidents. The data tractable from are processed through preprocessing, feature engineering and fusion to build a unified set of data to be used for predictive modelling. Machine learning algorithms like Logistic Regression, Random Forest, XGBoost for classifying accident risk into Low, Medium or High categories and arriving at probability based risk scores are taken into consideration. The system architecture consists of a Python-based backend with optional browser-based frontend and API for the retrieval of external data. The proposed workflow includes data acquisition, model training, model validation and penetration of these into a lightweight predictive interface. This research is intended to deliver a powerful, interpretable and deployable framework that can help drivers, traffic management authorities and intelligent transportation systems to make proactive safety decisions. The work calls for modularity and real-time applicability and adaptability depending on the availability of sources of environmental and infrastructural data.

Keywords

Accident risk prediction Weather data analytics Road condition analysis Machine learning Logistic regression Random forest XGBoost Accident probability estimation Intelligent transportation system Traffic safety prediction.

