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Forecasting Congestion Severity for Smart City Traffic Management

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ABSTRACT

The future of smart city traffic forecasting is two-way communication between residents and the city infrastructure. Today, Intelligent Transportation Systems (ITS) are essential tools for traffic planning, analysis, and forecasting, which use sensor data to forecast traffic. The emergence of crowdsourced traffic reporting using mobile applications is adding new layers of rich data that can be used to improve ITS systems. Resident mobile applications and sensors are reporting traffic congestions, incidents, accidents, and more. However, utilizing this data in city ITS or processes is not common. There are few studies on how to use and integrate this new layer of data to improve ITS systems and increase its capability. More importantly, the study proposed a model that helps the city to forecast traffic congestion in urban roadways and arterials were there are no traffic sensors.

This study proposed several models based on Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) to forecast traffic severity without the need of traffic sensor data. The model used six months of Google/Waze traffic reports in the San Francisco Bay Area to forecast traffic congestions. The collected crowdsourced data included Waze incident reports, hourly weather, time, and location features. The model is designed to forecast hourly traffic congestion into five congestion levels. It included temporal and spatial dependencies learned using different types of layers.

The proposed model will help city traffic engineers and planners forecast urban roadways and arterials traffic where there are no traffic sensors without the need to install one. This innovation will help reduce costs while improving ITS traffic forecasting. Moreover, future autonomous vehicles may also provide more details that can be used to improve traffic conditions.

KEYWORDS: Deep Learning, Traffic Forecasting, Intelligent Transportation Systems, Smart Cities, data-driven.