# Predictive Analytics in Traffic Flow Management: Integrating Temporal Dynamics and Traffic Characteristics to Estimate Travel Time

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**Abstract :** This paper introduces a predictive model for urban transportation engineering, which is vital for efficient traffic management. Utilizing comprehensive datasets and advanced statistical techniques, the model accurately forecasts travel times by considering temporal variations and traffic dynamics. Machine learning algorithms, including regression trees and neural networks, are employed to capture sequential dependencies. Results indicate significant improvements in predictive accuracy, particularly during peak hours and holidays, with the incorporation of traffic flow and speed variables. Future enhancements may integrate weather conditions and traffic incidents. The model's applications range from adaptive traffic management systems to route optimization algorithms, facilitating congestion reduction and enhancing journey reliability. Overall, this research extends beyond travel time estimation, offering insights into broader transportation planning and policy-making realms, empowering stakeholders to optimize infrastructure utilization and improve network efficiency.

**Keywords :** predictive analytics, traffic flow, travel time estimation, urban transportation, machine learning, traffic management

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