**Abstract**

Traffic congestion in Ho Chi Minh City (HCMC) poses significant challenges, with annual economic losses estimated at $6 billion, alongside contributions to environmental pollution and public health issues, particularly during adverse weather conditions. Adverse weather conditions further exacerbate traffic flow issues, leading to increased delays and accidents. This study integrates traffic flow and weather data to develop predictive models, demonstrating the importance of multi-faceted data analysis in urban planning. Using datasets comprising traffic velocities and weather conditions, we performed data cleaning, feature engineering, and exploratory analysis. Key features included temperature, humidity, rainfall, and wind speed, which were used to predict daily mean traffic velocity. The XGBoost model outperformed Random Forest, achieving an R² score of 0.85, indicating high reliability in predicting traffic flow. Additionally, K-Means clustering revealed critical traffic bottlenecks during rainy periods, providing actionable insights for resource allocation in traffic management. Our findings demonstrate that integrating weather data into traffic flow prediction models enhances their accuracy and applicability. Future work will include integrating live traffic feeds and incident reports while expanding the model to account for infrastructure constraints, improving predictive accuracy and enabling real-time decision-making for urban traffic management.