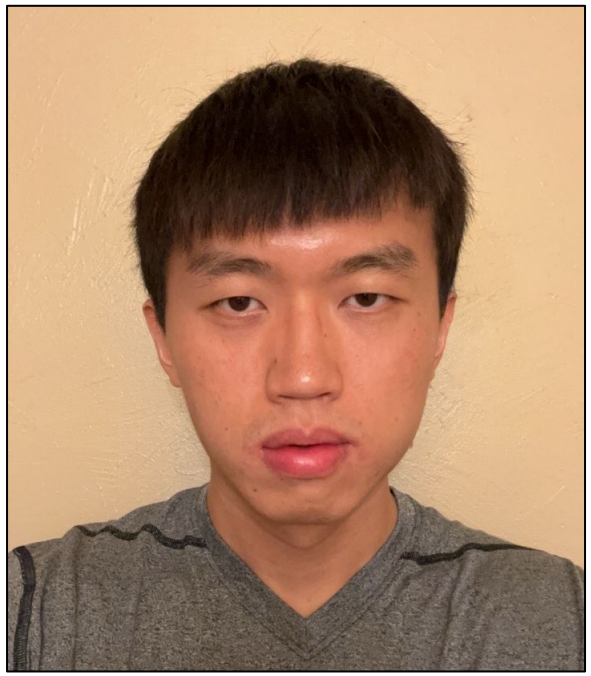
P-38 | Assessing Volume Delay Function Accuracy through Multi-source Traffic Data: Insights from Connected Vehicle Data and Traffic Simulation Data

COA SHOWCASE



Quan Sun

Traffic congestion is an essential issue in urban areas worldwide, leading to increased travel time, fuel consumption, and air pollution. Accurate modeling of traffic delays in urban transportation systems is critical for effective traffic management and infrastructure planning. Most transportation departments and Metropolitan Planning Organizations (MPOs) leverage the travel demand model to assess the performance of urban traffic systems based on historical traffic data and household survey data. The model contains many essential functional parts to simulate the urban traffic systems, such as trip generation, trip distribution, and trip assignment. For the trip assignment, Volume Delay Functions (VDFs) are the significant component representing the relationship between traffic volume and travel time on road segments. As one of the variants of VDFs, the Bureau of Public Roads (BPR) function is commonly used and accepted by transportation agencies and MPOs due to its simplicity in computing and flexibility in different types of roads. Transportation planning agencies generally assign empirical coefficients to BPR functions to achieve acceptable modeling results.

Meanwhile, some historical traffic data are used to calibrate these coefficients in the BPR function to improve the performance of congestion estimations. Many studies and projects use traffic historical data or synthetic/simulation data to calibrate the VDFs and BPR function. However, few studies focus on assessing the impacts of multi-source traffic data on BPR function calibration. In this study, we systematically analyze the effects of different data sources on VDF calibration using connected vehicle data (Wejo) and traffic simulation data (Replica) in San Antonio. This study finds that connected vehicle data provides more accurate VDF calibration due to its high-resolution, real-time nature. In contrast, simulation data may not capture real-world variabilities as effectively. Similar trends in traffic delay parameters were observed for both data types on expressways and arterial roads but not on other road types. These findings underscore the importance of integrating multi-source data for precise travel demand modeling and traffic management while highlighting the potential limitations of relying solely on simulation data for traffic analysis.