

TFTC Webinar Series Next Generation Transportation Systems Seminar





"A hybrid modelling framework for the estimation of dynamic origin-destination flows"

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Abstract:

The dynamic origin-destination flow estimation (DODE) problem requires scalable methods for large scale traffic networks and robust techniques for capturing both uncongested and congested traffic conditions. Despite numerous efforts on incorporating multifold data sources and developing manifold mathematical models, the DODE problem remains a challenging problem in terms of both scalability and robustness. To fill this gap, we propose a novel hybrid DODE framework that integrates region-level (macro) and centroid-level (micro) traffic dynamics. The region-level traffic flows are described by the macroscopic fundamental diagram, while the centroid-level traffic flows are represented by the linear mapping of origin-destination flows onto link counts. This hybrid approach enables us to i) incorporate region-level traffic measures into the problem, addressing scalability issues arising in large scale traffic networks, and ii) capture non-linear behavior of traffic in the regional context, enhancing robustness of the estimation results with respect to traffic conditions. The proposed methodology is experimented in a large-scale traffic network, which is benchmarked for DODE problems. The results indicate an outstanding performance of the hybrid DODE particularly in congested traffic conditions and highlight the effectiveness of aggregated (regional) traffic models in enhancing DODE methods with minimal computational burden.

Bio:

Sakitha Kumarage is a doctoral researcher who is interested in traffic flow theory and intelligent transportation systems. In 2016, he earned a B.Sc. in Civil Engineering from the University of Moratuwa in Sri Lanka, a B.Sc. in Mathematics and Economics from the University of London in the United Kingdom in 2017, and an M.Sc. in Civil Engineering from the University of Moratuwa in 2018. His master's thesis centered on the use of crowdsourced travel time data in traffic engineering applications. He is currently a PhD candidate at the University of Queensland's School of Civil Engineering, where he studies demand management and demand estimation in large-scale transportation networks. He is a professional member of Engineers Australia and an Associate Fellow in Higher Education Academy United Kingdom.