

Statistical Efficiency of Travel Time Prediction

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Abstract: Travel time prediction on a given route is of key importance in modern mapping services. They are also complex geospatial inputs required for ridesharing platforms. For example, carpool matching methods require accurate predictions of the time required to travel between any two locations in the road network. We conduct the first theoretical analysis on the statistical efficiency of travel time prediction methods. Our main focus is to compare the segment-based approaches versus the route-based approaches that are commonly used in the literature and practice, yet not well understood from a theoretical lens. Under a Bayesian setting with general priors, we characterize the optimal estimator and compare their efficiencies under both finite-sample and asymptotic settings. We supplement our analysis with real data from a major ride-hailing platform.

Bio: Dr. Yan is an Assistant Professor of Operations Research in the Department of Industrial and Systems Engineering at the University of Washington, Seattle. Previously, he was a postdoctoral researcher and a senior data scientist at the marketplace optimization group at Uber where he designed the rider surge pricing algorithm. He received his Ph.D. from the Operations Research Center at MIT in 2017 and his undergraduate degree in Industrial Engineering from Tsinghua University in 2012. His research centers around transportation and logistics systems, with a recent focus on emerging problems in sharing economy and online platforms. He also has a particular interest in air transportation systems. His work aims to study fundamental properties of these problems and propose (data-driven) practical solutions for implementation. When analyzing these problems, he is broadly interested in tools from optimization, game theory, stochastic modeling and statistics.