CIVIL & ENVIRONMENTAL ENGINEERING
UNIVERSITY OF MICHIGAN

TFTC Webinar Series
Next Generation Transportation Systems Seminar

"Network inefficiency - Empirical findings for six European cities"

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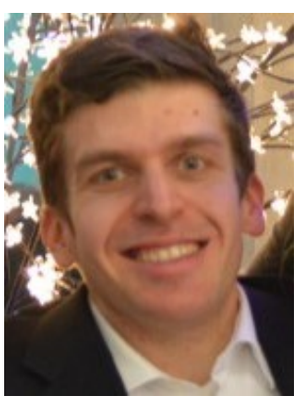
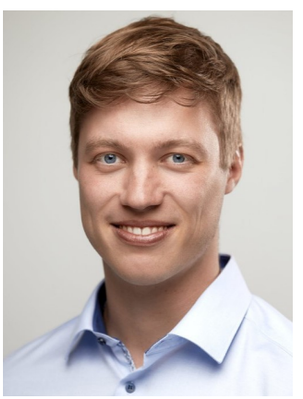
Thursday, February 3rd, 2022 — 3:00 PM (EST)
Meeting Link: https://umich.zoom.us/j/984444812424 (Passcode: NGTS)

Abstract:
When planning road networks, inhomogeneous traffic conditions and the effects of multi-modal interactions are often neglected. This can lead to a substantial overestimation of network capacities. Empirical macroscopic fundamental diagrams or volume delay relationships show considerable scatter, reflecting a reduction in network performance and an inefficient use of infrastructure. The implication is that the external costs of vehicular (car) traffic get underestimated, when planning traffic capacities and speeds based on optimal rather than on real estimates. In this paper, we contribute with an explorative and empirical approach to analyze network inefficiency and quantify its drivers. We propose to measure network efficiency by introducing the idea of excess delays for the macroscopic fundamental diagram. We define excess delays as the difference between the observed speed and the optimal network speed at a given density. We apply the concept on traffic data sets of six European cities that differ in the data collection method and use quantile regression methods for analysis. We find that excess delays are present in every data set and increase with the road network's traffic load. We further confirm the intuition that traffic signal control, network loading, and multimodality influence the level of network inefficiency. The excess delay formula allows quantifying this information in a simple way and provides additional insights apart from the standard MFD model. The approach supports planners to obtain better real-world and less optimistic speed predictions for traffic analyses and suggests shifting urban transport to more spatial and temporal efficient modes.

Bio:



Dr. Allister Loder is a postdoctoral scholar and research group leader at the Chair of Traffic Engineering and Control, Technical University of Munich (TUM). Before joining TUM in 2021, he was a mobility data and simulation consultant at the Swiss Federal Railways (SBB) where he advised research projects on the impact of COVID-19 on mobility behavior and on the potential of train stations to produce energy locally for the energy transition as well as using advanced transport planning methods (MATSim, choice modelling) for the company's long-term strategy formulation. He received a PhD degree in transportation from ETH Zurich in 2019 and holds a master's degree in Energy Science and Technology from the same institution. Dr. Loder's interest lies in the understanding and modelling of complex systems and networks where physics, regulation, and human behavior are interacting, in particular in energy and mobility. His expertise lies in optimization, systems theory, choice modelling, econometrics, machine learning and (geo) data science with application to traffic flow and travel behavior modelling and simulation at aggregated and disaggregated level. He received the ETH-Silver medal for his PhD thesis and was supported by the German Academic Scholarship Foundation.



Gabriel Tilg is a PhD student under the supervision of Prof. emeritus Fritz Busch and research assistant at the Chair of Traffic Engineering and Control, Technical University of Munich (TUM). Before joining TUM in 2017, he received a master's degree in civil engineering at the ETH Zurich. Both his master's thesis and his PhD research focus on theoretical concepts within traffic flow theory, macroscopic traffic flow phenomena, and traffic flow simulation. His master's thesis was awarded the ETH-Silver medal and the prize for outstanding master's thesis by the Swiss Association of Road and Traffic Professionals.