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Transportation Systems-Planning and Analysis

UCI Samueli School of Engineering | Department of Civil and Environmental Engineering

Transportation Seminar

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Shared-use Autonomous Vehicle Mobility Services: Operational Control and Transit Impacts

Fully-autonomous vehicles (AVs) have the potential to fundamentally alter urban passenger transportation systems. My research focuses on shared-use AV mobility services (SAMSs), which are similar to existing taxi, ridesharing, and paratransit services, except that the vehicles are driverless. As AVs eliminate the labor costs associated with human drivers, SAMSs should be able to compete with the personal vehicle in terms of cost and convenience for nearly all trip purposes.
In this talk, I will define an on-demand SAMS, conceptualize the underlying problem associated with operating this service, describe the framework used to model the online problem, and then present and compare solution algorithms (i.e. control policies). I will highlight the uniqueness of the on-demand SAMS operational problem relative to the existing literature.
Additionally, I will present a systems-level modeling framework I am developing to analyze the impacts of SAMSs on transit demand and transit network performance. The modeling framework incorporates a time-dependent integrated mode choice-traveler assignment problem formulation, a discrete-event transit simulation tool, and an agent-based SAMS simulation tool. This integrated simulation-based modeling framework is a powerful tool for understanding, forecasting, and planning for the potential impacts of SAMSs on existing transit systems.
Despite the potentially sizable impacts of SAMSs on urban transportation systems, research at both the operational level and systems level is in its infancy. As such, I will discuss potential future research avenues at both the operational level and the systems level.

Michael Hyland is a 5th year PhD candidate in Civil and Environmental Engineering (CEE) at Northwestern University studying transportation systems planning and analysis. He holds a B.S. and an M.Eng. in CEE from Cornell University where he studied transportation systems engineering. Michael's research focuses on modeling, optimizing, simulating, and analyzing multimodal transportation systems, with an emphasis on emerging mobility services such as bikesharing, carsharing, ridesharing, and shared-use autonomous vehicle (AV) mobility services. He is a two-time recipient of the Dwight David Eisenhower Transportation Fellowship, was named a Top 20 Future Leader in Transportation by the Eno Center for Transportation in 2016, and was awarded best student paper (runner-up) at the 2017 Transportation Research Forum Conference.