Title: Autonomy and Control for Future Urban Mobility

[This talk will consist of an] overview of ongoing research in autonomy and real-time control techniques for future urban mobility. We will first focus on Mobility on Demand services that leverage recent advances in autonomous vehicle technology.

Consider a finite group of shared vehicles, located at a set of stations. Users arrive at the stations, pick up vehicles, and drive (or are driven) to their destination station where they drop-off the vehicle. When some origins and destinations are more popular than others, the system will inevitably become out of balance: Vehicles will build up at some stations, and become depleted at others. We propose a robotic solution to this rebalancing problem that involves empty robotic vehicles autonomously driving between stations. Control policies and performance bounds are developed and discussed. I will conclude the seminar with some recent work on distributed algorithms for adaptive traffic light scheduling. The proposed scheduling algorithms are provably maximally stabilizing, adaptive to traffic conditions, and significantly outperform state-of-the art systems in high-fidelity simulations.