Data Informed Modeling and Correct-by-Design Control Protocols for Personal Mobility in Intelligent Urban Transportation Systems

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Lillian Ratliff, University of Washington

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Principal Investigators

- Lillian Ratliff[1], Behcet Acikmese[1], Samuel Coogan[2], Juan Matute[3]

[1]University of Washington, Seattle; [2]Georgia Institute of Technology; [3]University of California, Los Angeles

Community Partners

- SDOT, LADOT, and Business Improvement Areas in Seattle, LA, Santa Monica

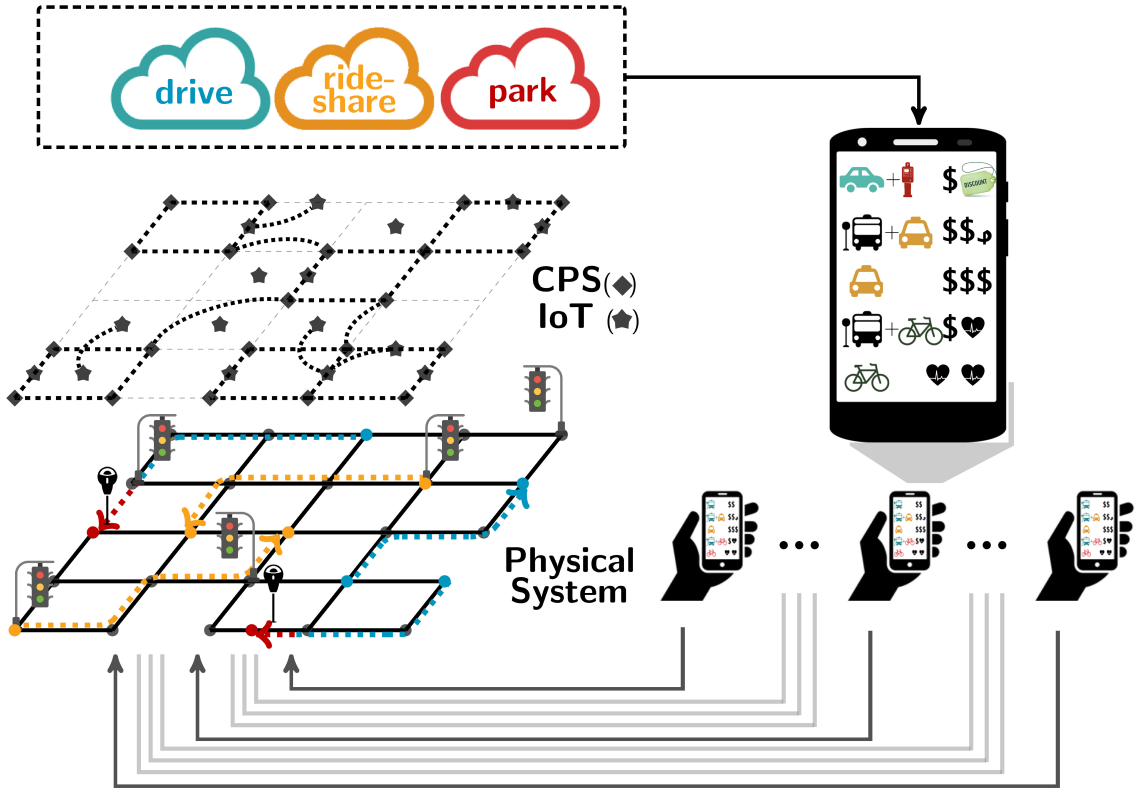
Project Overview: Unified Approach to Parking, Ride-Sharing, and Traffic Flow

Overview: Rich data streams available through collaborators are being leveraged to learn **data-informed models** and **correct-by-design policies** such as demand-based pricing for parking and traffic light control.

Data-informed stochastic dynamical system models of mobility including parking, ride-sharing, personal vehicles

Correct-by-design policy synthesis using formal methods, convex optimization, and certifiable learning algorithms

Formal verification and validation of algorithms via rigorous simulation and a series of living lab experiments.

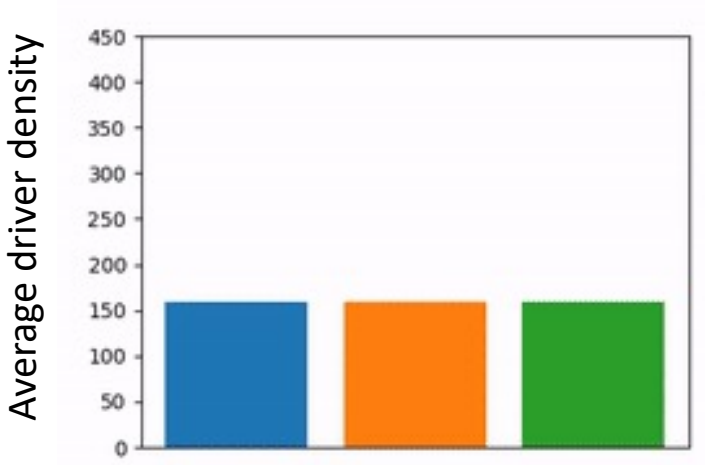


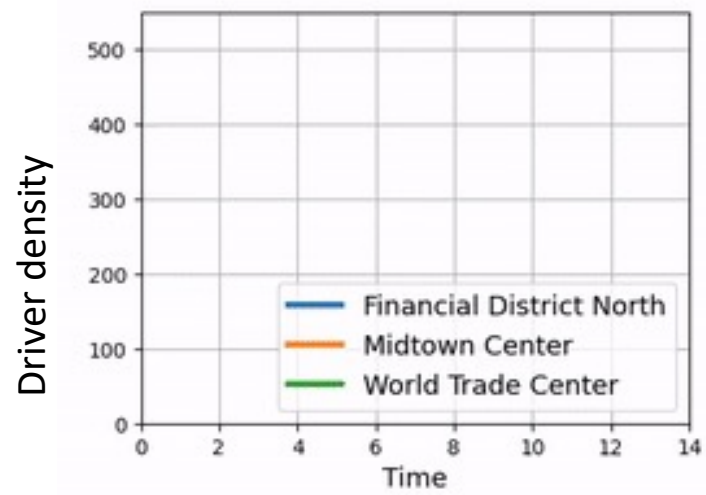
Project Update: Significant Accomplishments

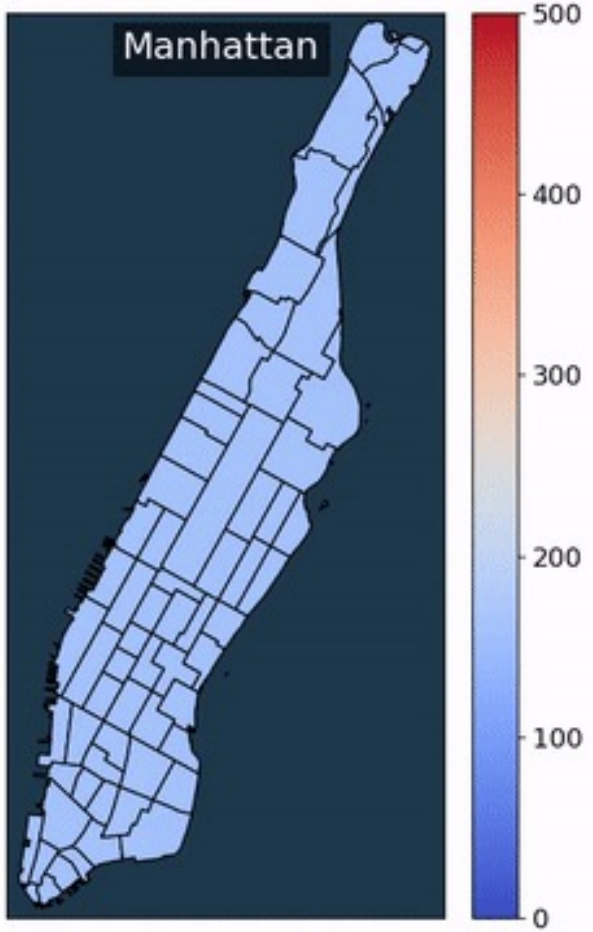
Intelligently incentivizing individual decision-making behavior to reach global objectives—e.g., demand-based tolls or variable ride-sharing pricing

- application: redistribution of ride-share drivers

- Modelling the competitive behavior and population trend of ride-share drivers.
- **Ride-share driver cost** = - fare earning + utility cost + congestion cost + toll/incentive.







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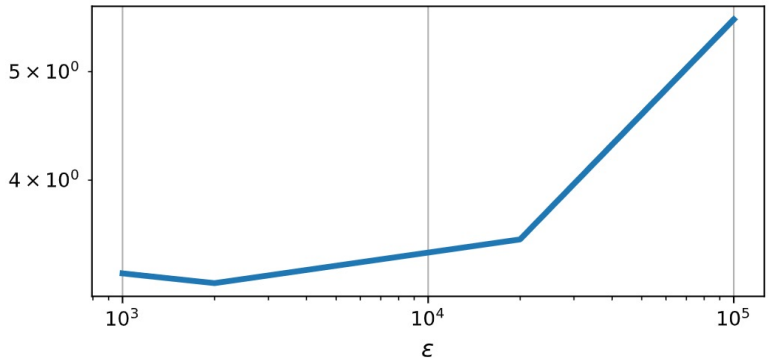
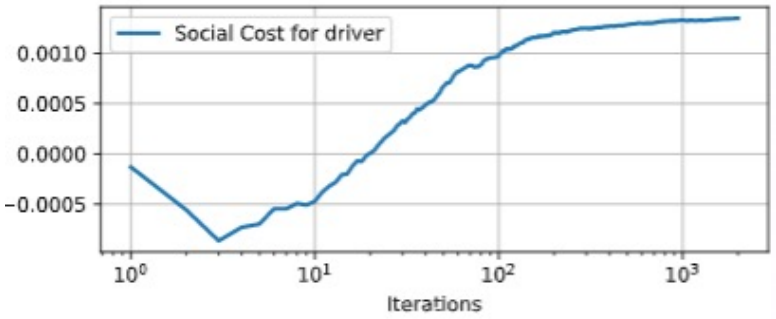
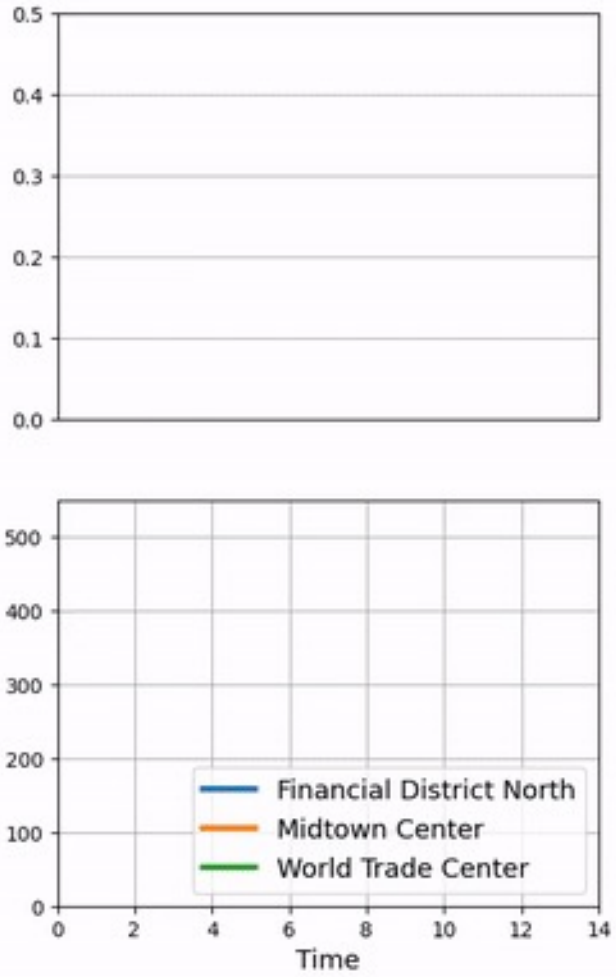
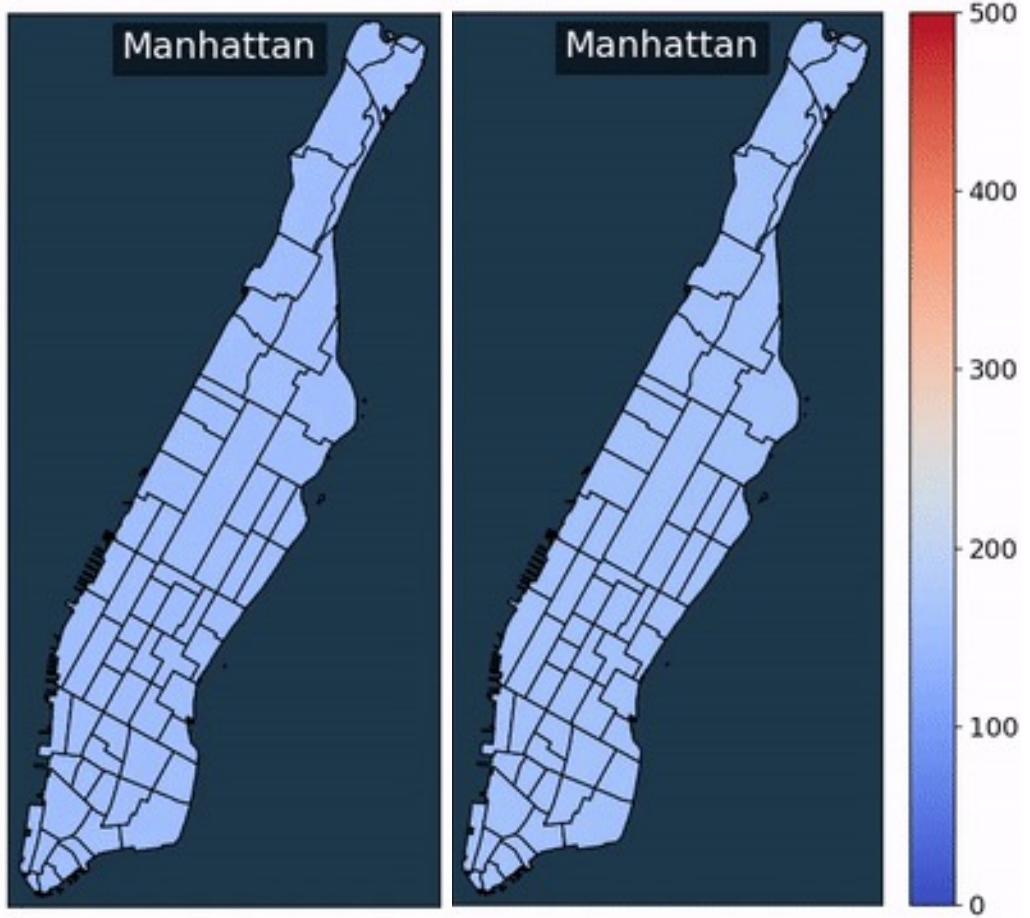


Elucidate the connection between the propagation of error in individual routing decisions to deviation in population-level traffic outcome from optimal traffic equilibrium

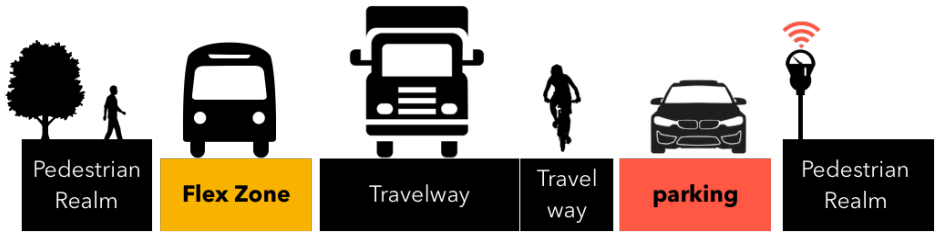


- Alleviating Manhattan ride-share-induced congestion through adaptively tolling driver fares.



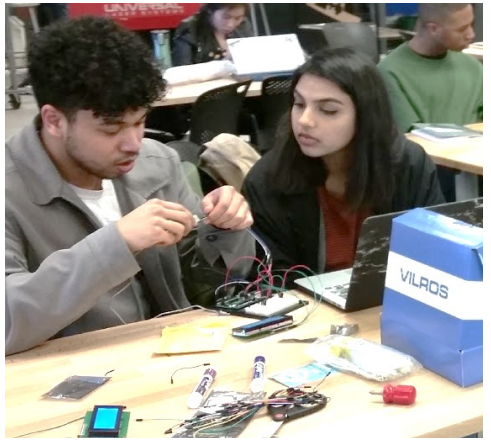


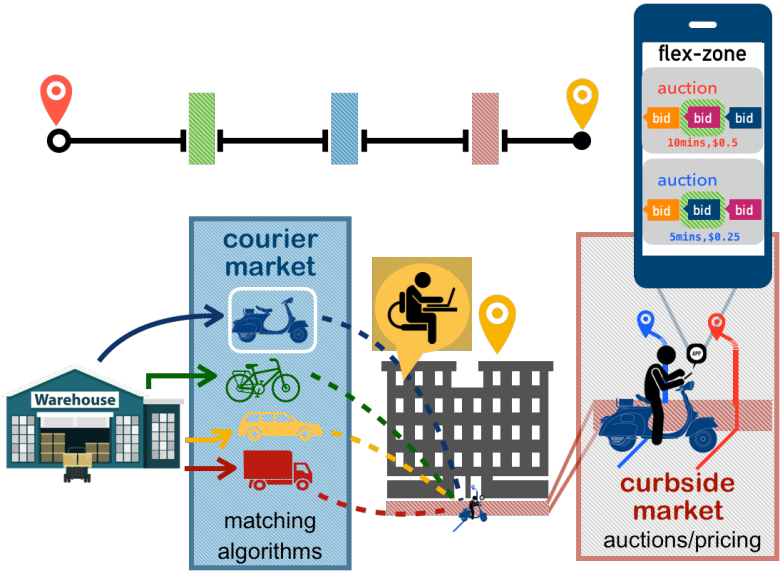
Anticipated outcomes and successes in the next year



Expected research outcomes:

- Leverage existing data sets and machine learning machinery to develop multi-agent learning algorithms.
- Apply incentive design techniques to improve average efficiency in highly congested traffic networks.
- Work with PNNL to develop auction mechanisms for flex zones in curbside markets.





Broadening participation outcomes:

- Undergrad researchers from the NSF funded UW STARS program for under-represented and minority students
- REU students developing augmented reality visualization tool