The lessons learned from prior microtransit failures suggest that we need a team that designs the algorithms using active learning approaches. We are developing algorithms using active learning approaches to address three key problems: (a) hyperparameter selection, (b) model selection, and (c) performance evaluation. A key aspect of the problem space is to combine the active learning algorithm with scenario specification to design simulation scenarios.

Broader Impacts
- The project will have a potential impact across a wide range of cities in the U.S., which do not have well-developed transit systems as it will not only provide them with a reusable operations system, but it will also show how to develop a community program.
- The approach pioneered in this project is crucial to showing how to design smart city projects with lasting community integration. We believe that the social relational approach to engagement is critical for success.
- The project will also address privacy concerns arising in smart-city projects due to multi-modal datasets.

Decision-Theoretic Formulation
- We frame the real-time dispatch problem as an MDP.
- We design the objective to minimize the number of vehicles used and the total distance traversed by the vehicles (while satisfying demand).
- We introduce constraints based on pickup and drop-off times, operational information, capacity of vehicles, and passenger-specific needs.
- Our MDP state captures all relevant information about existing demands, passengers on board, future demand, and environmental uncertainty.

Data and Computation Architecture
- Use custom data architecture with parallel view and structures to optimize both graph-based and time-based queries.
- We are also investigating distributing outsourced computation to provide cheaper and sustainable alternative to cloud computing.
- The key challenges are privacy considerations and computation sustainability.

Understanding the Problem
- Transit agencies are trying to respond to the changing dynamics of ridership in their communities while managing the expectation of providing wide coverage.
- The problem has been exacerbated by the shifting patterns of ridership due to gentrification and changing demographics, leaving many communities underserved by transit.
- Our solution is to develop a dynamic microtransit system that is integrated with fixed-line services and is managed considering (a) short-term demand forecast as well as (b) long-term expectations of the community.

Intellectual Merit
- We build on classical vehicle routing formulations to consider real-time requests and operational constraints.
- Our approach is decision-theoretic and inherently considers uncertainty in demand and environmental attributes like congestion and weather.
- We rely on a novel community engagement approach using the social relational approach pioneered in healthcare and election domains.

Community Engagement
- Social relationships are necessary for change.
- Citizens must come together collectively through formal organizations.
- Organizations are successful to the degree that they develop relationships among members within a community.
- We are working to leverage existing social networks through key organizations in the city to continually inform, disseminate, validate, and evolve microtransit technology and applications.