CAREER: Transformative mobility analysis: Mixed Methods framework

Synopsis: This CAREER award is about meeting the mobility needs of diverse populations with emerging transportation technologies. The focus is on using integrated analytic frameworks drawing on qualitative and quantitative data, theories and methods

Abstract

Advances in transportation systems, fueled by on-demand mobility-platforms, crowd-sourcing, ride-hailing and increasing automation, promise to enhance the livability and competitiveness of cities and rural areas globally. A fundamental question is whether these innovations will contribute to solving, or inadvertently exacerbate, critical challenges such as congestion, emissions and inequitable access to mobility. This Faculty Early Career Development Program (CAREER) research addresses a gap in current approaches by integrating quantitative and qualitative multi-disciplinary insights and developing methods to study how society adapts to evolving mobility technologies. Specifically, behavioral and social science foundations will inform existing models of mobility decision-making. Integrating insights from the social sciences with passenger and logistics system models will help understand how adoption behaviors are affected by diverse community beliefs and culture in rapidly changing mobility contexts. This framework will have far-reaching effects, delivering new tools to tailor transformative mobility solutions to citizens' needs, decongest urban networks and expand mobility to underserved communities. The impact of this research will be strengthened by an emphasis on education and outreach approaches that inspire, challenge and educate future civil engineers to address mobility challenges with technically informed and culturally sensitive designs. The project includes mentoring, undergraduate curriculum development and scalable class activities where students evaluate engineering solutions that align with human behavior and livability goals. The outreach plan will impact a broad audience by developing online educational material and training tools for Chicago high school teachers, to promote careers in engineering in diverse communities.

The highly complex and evolving nature of both mobility platforms and users' motivations calls for methodological advancement. The goal of this project is to establish a new foundation and develop methods to better understand and predict impacts of transformative freight and passenger mobility adoption. The failure to ground quantitative data and technical models in a framework that accounts for variation in beliefs, understanding and goals of diverse populations may lead to solutions that perform poorly in the real-world. This research establishes an analytical framework that integrates current quantitative theory, data and methods (i.e. formal surveys, discrete choice analysis and supervised learning) with qualitative social science perspectives (theory of social thresholds, ethnographic data on neighborhood-scale mobility behavior). The research will: 1) define a comprehensive mobility adoption threshold framework, which quantifies relationships among co-evolving individual and community behavior and their mobility environment; 2) investigate integrated methodological approaches fusing qualitative and quantitative data and models to gain insight into adoption processes at multiple scales; and 3) derive robust policy guidance tools from combining qualitative, participatory, multi-stakeholder research methods and formal policy scenario simulation. Results will produce ex-ante policy evaluation tools enabling all parts of society to benefit from disruptive socio-technical changes.