PROJECT BRIEF

UF Transportation Institute UNIVERSITY of FLORIDA STRIDE

Methods to Determine Market Opportunities for Public Transportation & TNC Hybrid Systems

(STRIDE Project F2: Discovering Potential Market for the Integration of Public Transportation and Emerging Shared Mobility Services)

PROJECT OVERVIEW

As Transportation Network Companies (TNCs), such as Uber and Lyft, have expanded, studies have revealed both positive and negative impacts on public transit systems. In order to create a hybrid system that benefits both public transit and TNCs (ridesharing), more needs to be understood about when and where to integrate them and who needs such services.

RESEARCH GOALS

The goal of the project was to identify potential demand and service gaps that would support a hybrid system. The research team developed and applied demand and supply models in two case study locations: Orlando, FL and Chengdu, China.

FINDINGS

Both the demand and supply models found that the first/last mile (FLM) gap of transit service provided an opportunity for hybrid systems.

1) First/last mile (FLM) trips to the airport or university, trips with longer distances to transit services, and trips made by persons with higher household income have the highest potential demand for TNCs.
2) Areas with a higher mix of employment and housing and/or higher employment rates showed a higher use of micromobility (bike share, bike, scooter, skateboard) and walking, and reduced the probability of using motorized modes, including TNCs, in the first mile. Higher land use diversity at the destination encouraged the use of TNCs in the last mile.
3) FLM gaps were identified where new micro-transit services, transit lines, and stations would improve ridership by connecting to ridesharing.
4) Researchers were able to predict when and where first/last mile services gaps would occur.

PRODUCT DESCRIPTIONS

1) Transit User Demand Models for First/Last Mile Trips

Several multinomial logit (MNL) models classified how passengers chose to arrive at their transit stop (first mile) and depart their transit stop (last mile) while also determining what factors may have influenced their choices. Mode choices were categorized as driving alone, TNC/Taxi, carpool, micromobility (bike-sharing, scooters, etc.), wheelchair, and walking. Factors that may have influenced users' choices included, trip attributes, density, land use diversity, accessibility, and personal and household attributes.

PRODUCTS

1) The **Transit User Demand Models** show what factors influence individuals' use of TNCs (ridesharing) in the first and last mile of travel.
2) The **Data-driven Approach for First/Last Mile Gaps** reveals when and where service gaps occur that would benefit from new transit stations or micro-transit hubs.

IMPACT

The products identify opportunities where hybrid systems can potentially increase transit ridership, address the first/last mile problem, and mitigate congestion and emissions.

WHO BENEFITS?

- Transit agencies and planners
- Transportation Network Companies (TNC)

RESEARCH TEAM

Lili Du, Ph.D. (Lead PI)
University of Florida

Xia Jian, Ph.D
Florida International University

Jinhua Qiu, Ph.D. student
University of Florida

2) Data-driven Approach for First/Last Mile Gaps

A multi-step data analysis method used ridesharing GPS trajectory data and bus trip data to identify service gaps that could be addressed through a hybrid transit system. The method, shown in Figure 1 and described below, has three main steps including statistical data analysis and machine learning and optimization approaches.

Step 1
Ridesharing GPS trajectory data and bus trip data was placed into a 3D grid with uniform cubes. Statistical and machine learning methods revealed complementary or competitive relationships between cubes over the entire 3D space.

Step 2
Bus or ridesharing service rate was collected from each cube to form heatmaps. Heatmaps revealed regions where ridesharing services were dominant, called a ridesharing swarm (RS). These RS regions attract significant ridesharing demand but have limited transit service. As such, they reveal opportunities for new transit stations or micro-transit hubs as well as areas with high first/last mile demand (FLM zones).

Step 3
Heatmaps were fed into an existing ConvLSTM deep learning model to make predictions about when and where service gaps would occur.

The model was validated using the second ring region of Chengdu, China as a case study.

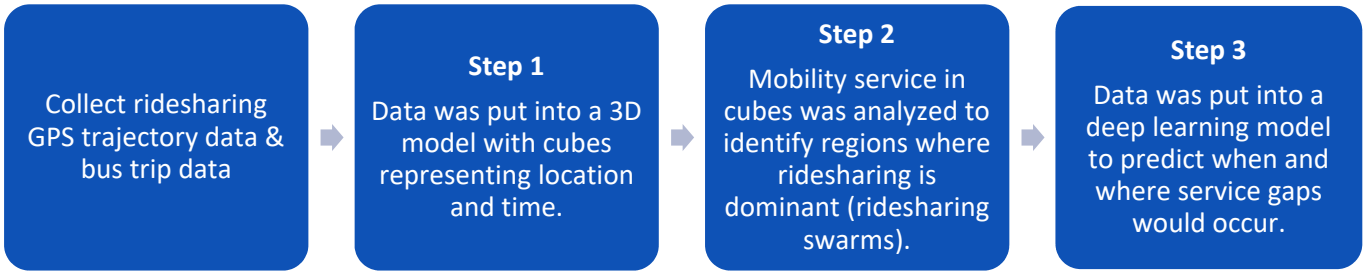

Figure 1: Steps of the Data-driven Approach for First/Last Mile Gaps

For more information on Project F2 (Discovering Potential Market for the Integration of Public Transportation and Emerging Shared-Mobility Services), visit the Stride Project website.

About STRIDE

The Southeastern Transportation Research, Innovation, Development & Education Center (STRIDE) is the 2016 Region 4 (Southeast) U.S. Department of Transportation University Transportation Center headquartered at the University of Florida Transportation Institute (UFTI).

UF Transportation Institute UNIVERSITY of FLORIDA
JSU JACKSON STATE UNIVERSITY
AUBURN UNIVERSITY SAMUEL GINN COLLEGE OF ENGINEERING
NC STATE UNIVERSITY
THE CITADEL THE MILITARY COLLEGE OF SOUTH CAROLINA
Tennessee TECH
FIU FLORIDA INTERNATIONAL UNIVERSITY
UAB THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Georgia Tech
THE UNIVERSITY of NORTH CAROLINA at CHAPEL HILL