Exhibit D

Research Project Requirement Template

A Pilot Experimental Project for Predicting Pedestrian Flows using Computer Vision and Deep Learning

Recipient/Grant (Contract) Number: The University of Texas at Austin; Georgia Institute of Technology / Grant # 69A3552344815 and 69A3552348320

Center Name: Center for Understanding Future Travel Behavior and Demand (TBD)

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Subhrajit Guhathakurta

Project Partners: N/A

Research Project Funding: $104,866 (Federal + non-Federal funding)

Project Start and End Date: 1/1/2024 - 5/31/2024

Project Description: Walking for transportation, health, and pleasure is an essential part of people's lives in most cities. Knowing where people linger, the destinations that attract them, and how those places are accessed could assist in optimizing business locations and providing better security. In addition, predicting and sharing congestion times and locations (perhaps in real-time as in Waze for cars) could also provide useful information to travelers who can then choose appropriate travel routes and improve travel efficiency. Yet, we know far less about the spatial and temporal variations in pedestrian volumes than we know about vehicular movement.

While pedestrian route choice has been an active area of research, few studies have attempted to predict pedestrian flows from unbiased pedestrian count data. Pedestrian route choice models assume that people choose their walking routes based on their perceived path attributes. Statistical path choice models identify people's behavior related to route attributes on the selected path. These models hypothesize that the fundamental utility attribute is path length or travel time, which pedestrians generally minimize. These models also consider that people are willing to deviate to longer routes if the preferred path is comparatively safe, comfortable, and aesthetically pleasing. Yet, these models are inefficient for pedestrian traffic planning since they require prohibitive amounts of information about individual walkers. In this research, we develop a graph convolutional network model (GCN) based only on pedestrian counts at various intersections and segments to predict pedestrian traffic flows.

US DOT Priorities: Transformation Research; **Data Science:** Harness advanced data collection and data processing capabilities to create timely, accurate, credible, and accessible information to support transportation operations and decision-making.

Outputs: We anticipate four broad forms of outputs from this research:

1. Annotated video datasets that can be used for pedestrian sensing in other locations and places using video footage.
2. Validated graph convolutional network algorithms that can be repurposed for pedestrian detection at other locations.
3. Two research articles that will be published in peer reviewed journals
4. Presentations at city and transportation departments for transferring knowledge about predicting pedestrian flows from video footages

Outcomes/Impacts: We expect several broader outcomes from this project including: (1) better alignment of pedestrian infrastructure to pedestrian volumes; (2) more efficient policing of venues that are prone to crowding; (3) better knowledge of pedestrian evacuation routes; (4) better planning to leverage the commercial potential of areas with high pedestrian traffic; and (5) better management of transportation infrastructure to avoid conflicts among modes and improve safety.

We expect our research will generate new knowledge to induce more active travel (walking), help reduce pedestrian-vehicle crashes, increase commercial value in parts of the city, and make travel more sustainable and safe.

Final Research Report: A URL link to the final report will be provided upon completion of the project.