Data management plan:

Types of data

The process of measuring accessibility in a regional multimodal network involves three stages: designing the multimodal network, defining an edge cost function, and finding the least-cost path between selected origin-destination (O-D) pairs based on characteristics of travelers. The first step to construction the multimodal network is to model each single-mode transportation network as a graph consisting of road intersection nodes and road edges. These graphs are then connected to each other by transfer edges at relevant nodes where transfers are likely to take place, which results in a single multimodal supernetwork. Once the network topology is determined, a time-varying travel cost is assigned to each edge. In this work, the travel cost is given by the weighted sum of travel time, price, reliability, and risk. A time-dependent shortest path algorithm is subsequently used to find the least-cost path between selected O-D pairs for different departure times. For this process, the area's driving and biking networks are extracted from the Python package OSMnx, which downloads geospatial data from OpenStreetMap and then simplifies the network topology. Locations of bike share depots, bike lanes, parking meters, and parking rates are obtained from the Western Pennsylvania Regional Data Center. For simplicity, the parking nodes are consolidated into one representative node per parking zone, represented by the average location of a parking meter within a zone. The cost of parking is calculated as the product of the hourly parking rate and the number of parking hours, which is assumed to be eight hours in accordance with a full work day. Public transit stop locations and route information are provided by the General Transit Feed Specification (GTFS), and the locations of Zipcar depots are found by querying Google My Maps and downloading the coordinate pairs returned. While this method for extracting car share locations is not entirely accurate, it serves the purpose for testing the model. In the Pittsburgh region, Zipcar runs the car sharing service, POGOH operates the bike share system, Spin manages the scooter fleet, and Pittsburgh Regional Transit acts as the public transit agency.

Data and metadata standards

Metadata will include computational models in MATLAB, Python, and source code written in C, model descriptions, and assumptions. The model output will be a novel comprehensive multimodal network including all possible mobility options for the purpose of examining possible path choices for individual riders. With this network model, transportation planners can quantify the accessibility of relevant points of interest for different communities to gain insight into where network improvements can be made.

Ethics and legal compliance

Any ethical issues will be reported to the PI’s university and subject to the university’s Ethics policy.

Policies for access and sharing

The PI will communicate all intellectual contributions with the scientific community through journal publications, conference presentations/papers, and seminars. When sharing data, the PI will protect privacy, confidentiality, and security. Should the research findings lead to intellectual property, the PI will work with CMU’s Technological Transfer Office to protect proprietary data. The PI will not publicly post any raw data that the PI does not have permission to share.

Policies for re-use, redistribution

The aggregated data in this project are fully anonymous and do not contain any private or confidential information. The research results belong to the PI’s university. When not in violation of agreements made

with third parties in order to collect data from their systems, the project data will be made available to stakeholders and the research community.

Plans for archiving and preservation

All data will be stored and managed in a cloud-based server and backed up on a local server and external hard drive at CMU. All data will be regularly backed up to ensure full data recovery in the event of failure.