

Data Science Clinic Autumn 2023 - Perpetual

Perpetual is a nonprofit whose mission is to promote sustainability in large cities by reducing waste caused by single-use foodware disposables. Perpetual's project currently focuses on replacing single-use cups with reusables in large urban spaces. Because individual restaurants might be reluctant to change from disposable to reusable foodware due to potentially higher costs and time, Perpetual plans to establish minimal-cost systems that start with collecting reusables from customers, then cleaning the reusables at an established cleaning facility and finally distributing them back to participating Foodware Using Establishments (FUEs).



Currently, Perpetual has launched its first system in Galveston, TX. The team working with Perpetual this quarter was responsible for creating the first system for the collection and distribution process in Galveston and generalizing the pipeline for building models in future participating cities.

The pipeline takes data on participating FUEs, such as location and capacity, calculates distances between locations, searches for optimal vehicle routing under capacity constraints, and creates interactive visualizations of the resulting routes. For every model generated, a feasibility report records all input parameters (aggregate distance, truck/bike numbers, and load constraints) and output results (total distance, trip duration, and fuel cost) so Perpetual can determine the model's optimality. For Galveston's model, totes will need to be collected from 255 total locations four days out of the week and dropped off at 133 locations on one day of the week. Three trucks (traveling 194 km total) and seven bikes (traveling 21 km total) will pick up dirty foodware totes, while two trucks (traveling 200 km total) will drop off clean foodware totes.

The next step for the project is to monitor how Galveston's model performs and refine the system where needed. Perpetual is also ready to launch its second operation in Hilo, HI, where the project pipeline can help implement a distribution system for its second pilot.





