

Data Science Clinic Winter 2024 - Perpetual

Perpetual is a non-profit organization that aims to reduce plastic waste by implementing city-scaled reusable foodware distribution systems. Perpetual collaborates with local cities, reuse service providers, and various stakeholders to revolutionize the way we think about food containers, drinkware, and utensils.

For the past year and a half, the Data Science Clinic team has focused on two main tasks for designing these systems: first identifying potential foodware collection and drop-off locations and then crafting an optimal routing plan for visiting these locations by vehicle.

Building off the work done by previous students, the clinic team updated a city-specific model into a generalizable pipeline that can create a model for any given city with a few simple inputs. The team also updated ways of identifying bin locations that were previously done by clustering city zoning data, which required too many manual corrections. Now, bin locations are categorized using algorithms created from rules given to us by Perpetual.

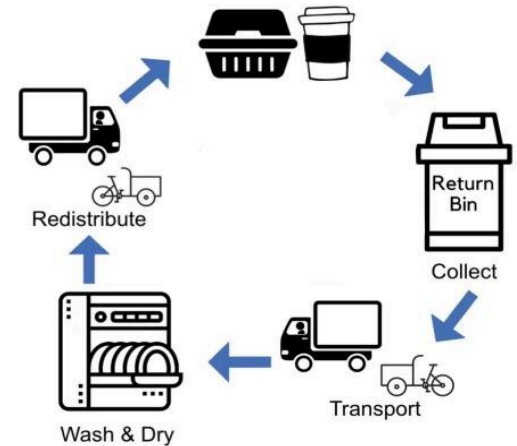


Figure 1. Perpetual's foodware reuse model

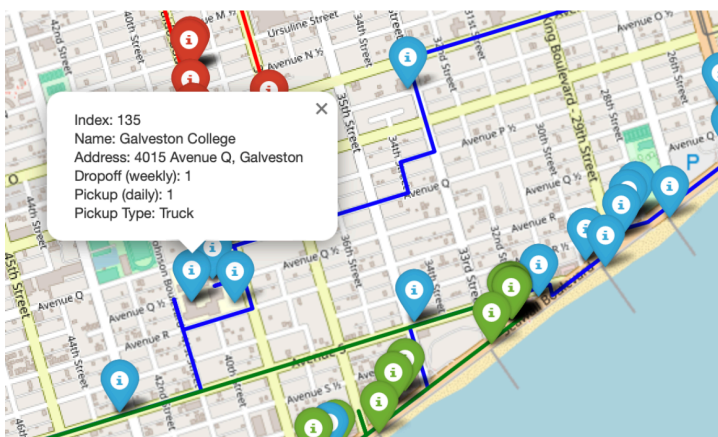


Figure 2. A map of pickup and dropoff routes generated by algorithm for Galveston, TX

The completed pipeline features a data collection script that uses APIs like Google Places and Yelp to collect relevant businesses within a given geographical area. After cleaning and sorting the locations into categories, they are routed for foodware distribution and collection. The pipeline can tailor a system to a city's specific needs, ensuring the perfect balance between efficiency and impact. The pipeline was run for one of Perpetual's first partner cities, Galveston, Texas, to produce 3 truck

routes covering a total distance of 205K meters and an average of 3.06 meters traveled per cup. Perpetual will use this information to calculate route costs and decide which routes are more efficient than others in order to implement the most cost effective model for each city they partner with.