

CSCI 2951-O Project 3 Report

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For this project, I had three main arrays of decision variables, numVehicles, open, and facilUsed. The first consisted of the number of vehicles we have at each location, the second “how open” a facility is (on a scale of 0 to 1) and the last was a matrix, where for each customer, the corresponding facility entry was “how much” of facility i the customer used. This “how much” corresponded to how much of their demand was satisfied by that facility in specific. In the end, there were really only 3 main constraints I needed to apply to get a desirable result.

The first was making sure that the number of vehicles for a given facility satisfied the facility usage. For each facility, I looped over the customers and summed up the “percent” a customer was using that facility, multiplying by the round trip distance to get the proportional distance. I then made sure that this divided by the number of vehicles was greater than the max distance a given vehicle can drive to satisfy the constraint.

For the second, I used a similar procedure to the first constraint, to make sure that a given facility wasn’t over capacity. For each facility I looped over the customers and multiplied the “percent” they were using that facility by their total demand to get the amount they were getting from that facility in specific. I then summed up these amounts for all of the customers and ensured that this number was less than the capacity for that facility in specific.

The third constraint I used was to make sure that each customer got the necessary demand. Since the amount they were receiving is equal to the the sum of the proportions to facilities used for all of the facilities multiplied by the demand, I simply needed to ensure that this sum was greater than one (I experimented with greater than 1 and equal to 1 and got the same answer, probably because this is a minimization problem.)

For calculating the cost, I got the opening cost by multiplying the opening cost for a given facility by the proportion of its capacity it was actually using, essentially getting “how open” it was, and summing this up for all facilities. The alloc cost was obtained by multiplying how much of each facility a customer was using and summing this up for all

customer-facility pairs and the truck usage cost was obtained by getting the total number of trucks in all facilities and multiplying this number by the truck usage cost.

I didn't end up needing to tweak this design too much. I started a little late, so by the time I submitted to Gradescope, there were plenty of results to compare to, and my numbers were pretty consistent with what others in the class were getting.