# SIMULATING GAS STATION CUSTOMERS

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# CUNY SPS
# DATA 604
# SUMMER 2024
# FINAL PROJECT

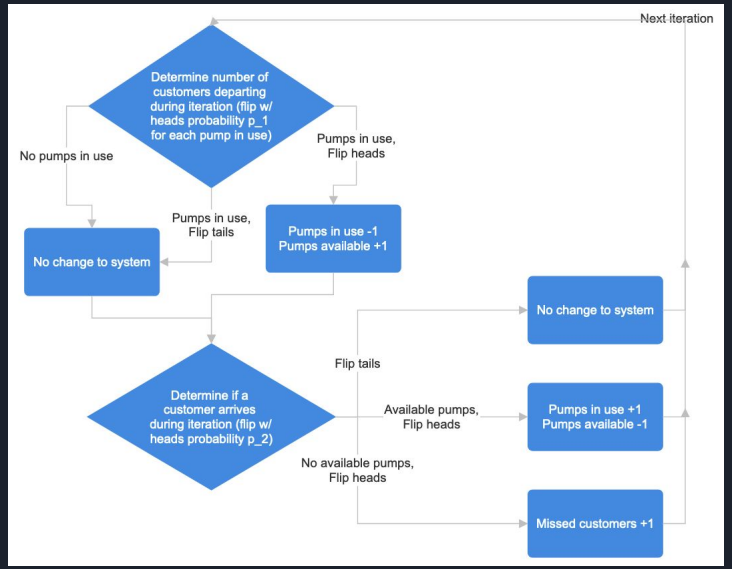
# HERE'S THE DEAL

The image to the right shows a gas station near my apartment. The station is located on a main road, and cars maneuvering around each other and into and out of the station create annoying traffic consequences for the neighborhood. I believe that the station could remove one set of its gas pumps (going from 12 to 8) to create additional space for cars to maneuver inside the station, limiting the traffic issues. However, I understand that the owners might be worried that having fewer pumps would result in the station being at capacity more often, causing customers to go to other stations. In this project I simulated the effect of going down to 8 gas pumps.

# FLOW CHART

The flow chart for this simulation is as follows:

1) Determine how many customers leave the gas station during the iteration (duration - 1 minute). Update the number of available pumps accordingly.
2) Determine whether a new customer arrives at the gas station during the iteration. Update the number of available pumps accordingly.
3) Proceed to the next iteration.



# PARAMETERS

The following assumptions were made for the simulation:

- ➔ Approximately 54 customers arrive at the station every hour (resulting in a probability of 0.9 each minute of a customer arriving).
- ➔ Customers remain at the station for an average of 5 minutes (resulting in a probability of 0.2 for each customer each minute that they depart the gas station).

These values were validated by observing the station and recording the arrival and departure times of vehicles for 30 minutes.

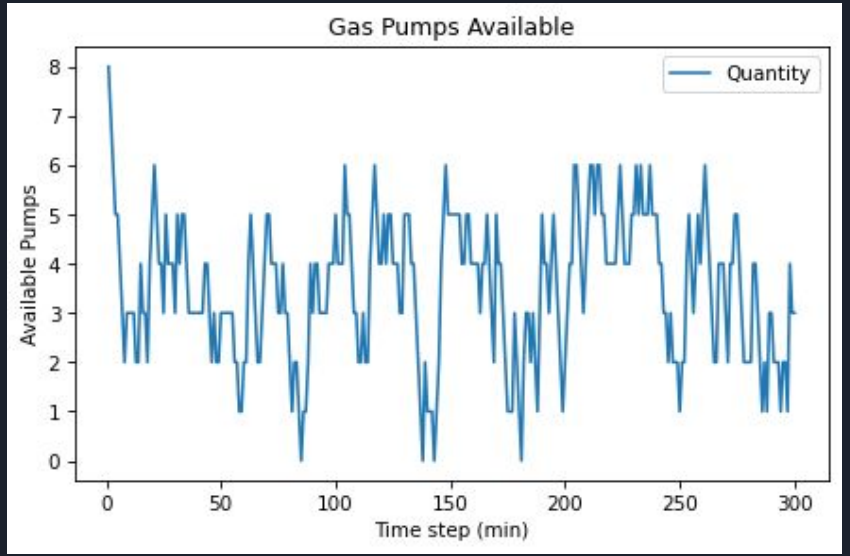
# ADDITIONAL PARAMETERS

The following assumptions were made for the simulation:

- ➔ Potential customers do not stop at the station (or leave immediately) if there are no available pumps when they arrive. The simulation takes this as a given because the goal is to determine whether the conditions for this to occur exist.
- ➔ The time window necessary to test is a period of 5 hours (300 iterations). This was selected as the duration of “rush hour” because HOV lanes in the NYC area are open from 3:00 PM to 8:00 PM on weekdays.

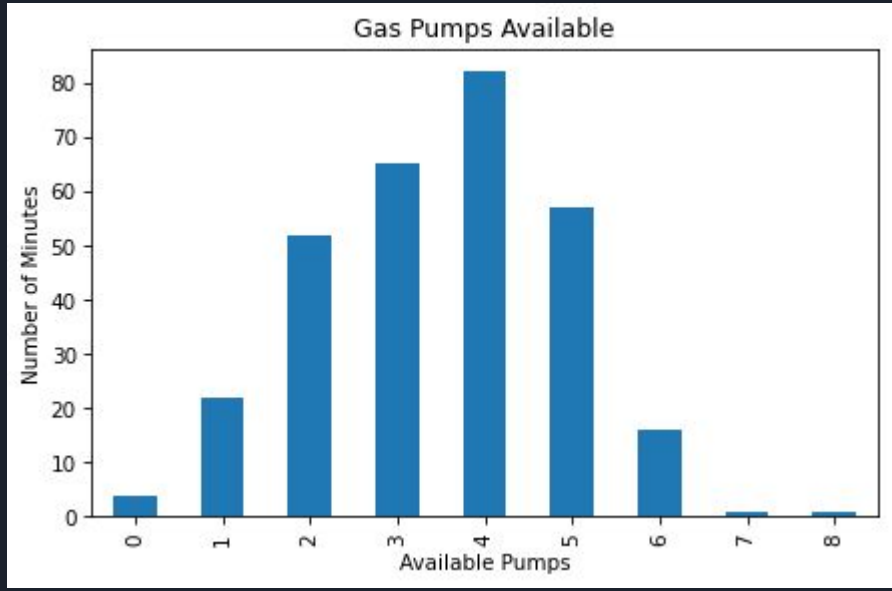
# RESULTS (PART 1)

The results of the simulation clearly show that even with only 8 pumps instead of 12, the gas station is only ever briefly “at capacity”. There are no extended periods during which no pumps are available and prospective customers might drive off in search of a less crowded station.



# RESULTS (PART 2)

In fact, even with its reduced capacity, the station is still only about half-utilized. The most common number of available pumps is 4 (half of the pumps), and the next most common are 3 and 5. Together, these three values (3, 4, and 5 pumps available, collectively representing the station being at about half capacity) account for almost two-thirds of the duration of the simulation.



# CONCLUSIONS

It is clear from this simulation that the gas station can reduce its number of pumps to 8 without customers taking their business elsewhere when no pumps are available. Even with only 8 pumps, the station will mostly operate at around half capacity during peak hours. Unless there is a sudden increase in customer arrival or the duration of the average customer's visit to the station, there should be no negative impact on the station's revenue from such a change.

# THANK YOU!