Where Should I Live in New York City?

I accepted an internship based in New York City for this summer, so I must find a place to live for 2-3 months. My main method of residence will be either subletting an apartment or residing in dorm-style living at a nearby university or private company. However, New York is a massive city with many different neighborhoods, and my housing location could either be the biggest convenience or inconvenience. My goal will be to find the most convenient and cost-efficient location to reside. The general framework behind the issue could be applied to numerous other areas given the right data, so addressing and solving this specific issue has some limited extensions.

The data will include the distance to various locations, frequency of travel, total travel time, cost of transportation, and a rating for each location based on priority. The distance data will largely come from independent google maps searches from location to location. The total distance, travel time for each mode of transportation, and the cost of a ride-sharing platform (such as Uber) will then be recorded. This will be done for known locations such as my place of work, a physical fitness center, a grocery store, etc. The data for other transportation costs such as walking will be zero (since it is free) and the subway will be a flat monthly fee found on New York's MTA website. The frequency of travel and rating will largely be determined by the individual, so I will determine each location's travel frequency and priority. I will record the data manually, but I am also hoping to find this data for a larger variety of locations on Kaggle.

The optimization aspect of this project is to determine the optimal location to live based on the data noted above that will minimize travel time and transportation costs. The project follows a mixed-integer programming problem, specifically related to a facility location optimization model. Just as a facility location model determines the optimal location for a facility, this project model will determine the optimal location for me to live. Solving such a problem by hand would be extremely tedious since there are thousands of feasible travel times and costs, and therefore thousands of feasible locations to live. However, modeling this problem based on a facility location model will determine the optimal solution and take far less time.

The end deliverable for this optimization problem is to give the most optimal location to live by minimizing the cost and transportation time given specific constraints. Additionally, the model will give the expected amount of spend on transportation, which can give budgeting insights. The model will also describe the expected amount of time spent traveling from location to location. Finally, it will give the most optimal form of transportation to and from each location.

It should be noted, this model will not generate a budget or exact transportation schedule for you, but it can give you useful information when creating these. If I have more time, I could take the cost to rent an apartment or other place of residence in a specific location into account when determining the optimal location, which would be incorporated into the cost-minimizing formulation.