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Data Driven Recommendation for Fort Worth Based Mediterranean Restaurant

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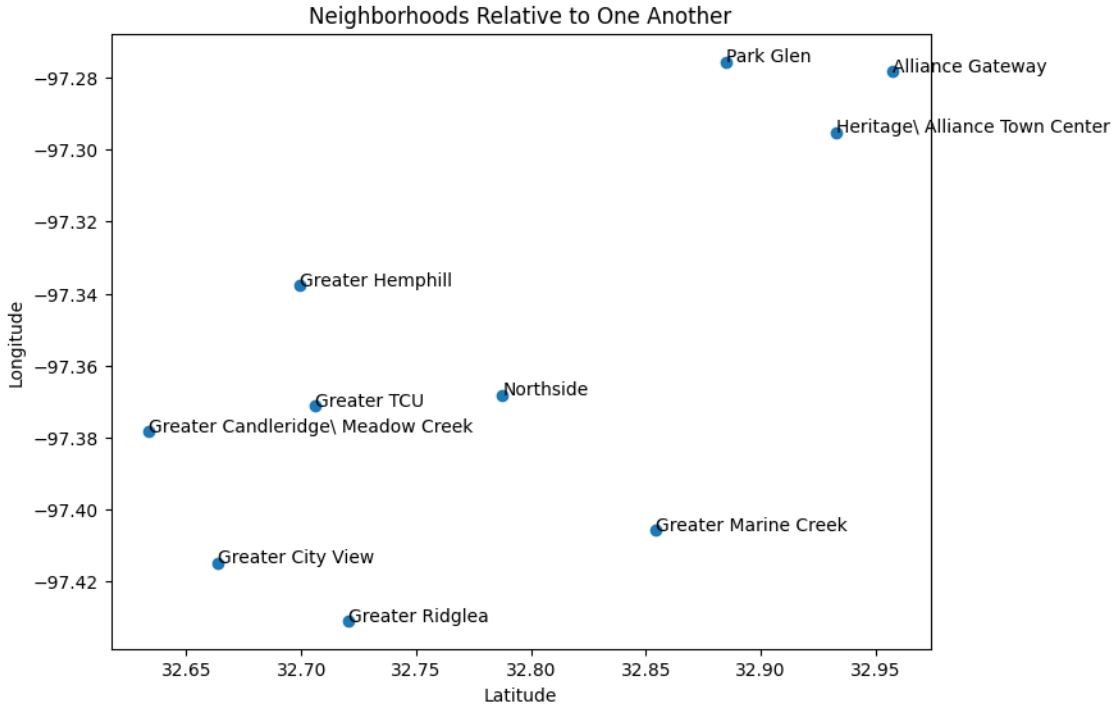
Introduction

This is a location recommendation for a Fort Worth based Mediterranean Food Restaurant. This recommendation is based off many different factors, including economic, demographic, and strategic situations. The areas in Fort Worth are based off the areas that have been defined and outlined in the neighborhood housing data set provided by the Fort Worth open data portal. Below are the findings of this research.

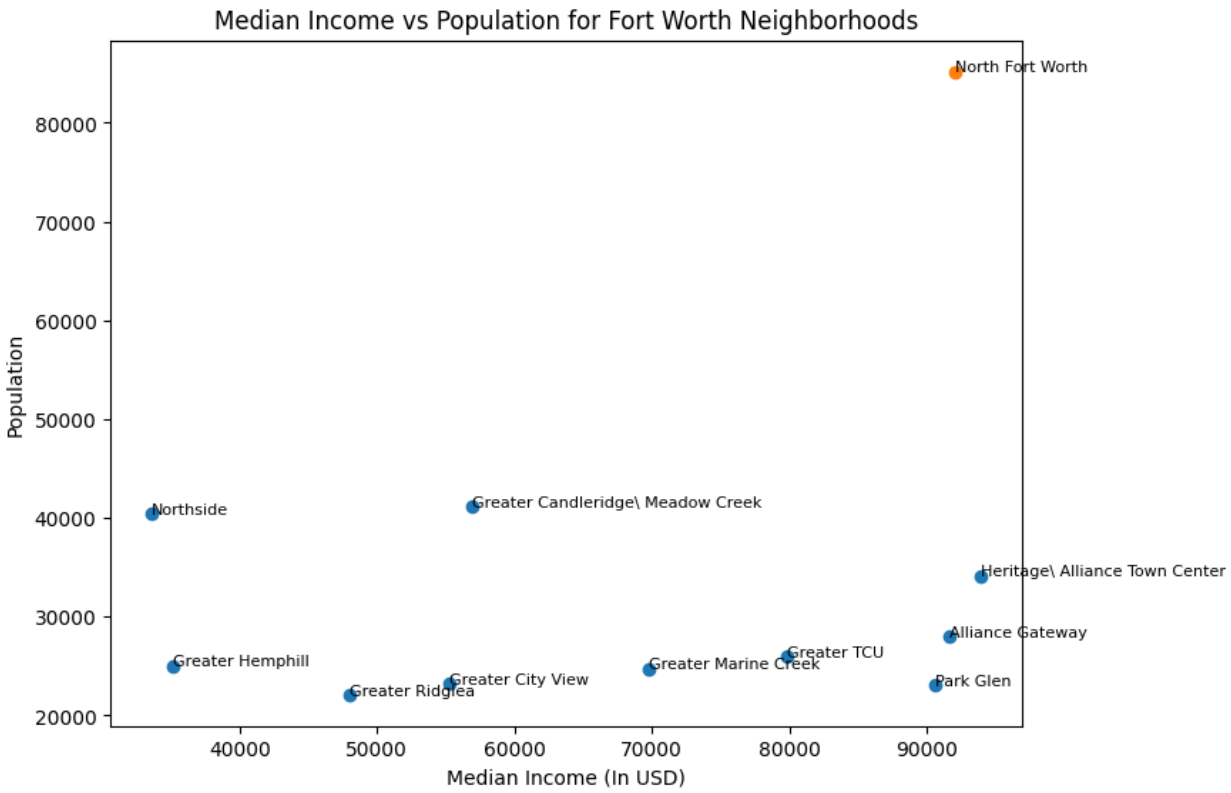
Location Analysis

To get started, a neighborhood population data set was imported from the Fort Worth Open Data Portal website. After being cleaned and refined, it was grouped by the neighborhood to isolate the areas in question. The neighborhoods were then ranked by population, and only the top 10 were taken into consideration, to cut down on all the minor areas that would not be of interest for this research. Out of curiosity, the locations of these neighborhoods were plotted relative to each other to see where they are in relation to one another. This is to see if there are any neighborhoods that could be potentially grouped together going forward.

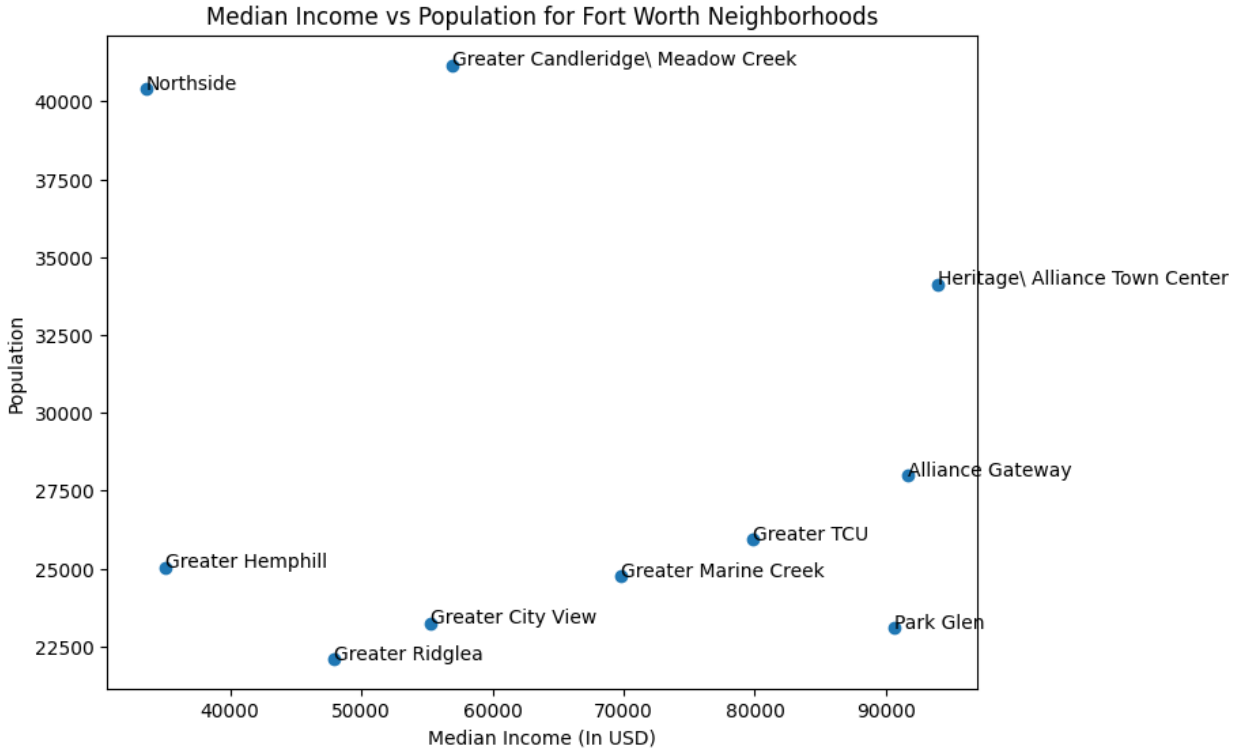


From the graph, it appears that all the neighborhoods seem to be separate from each other, besides Park Glen, Alliance Gateway, and Heritage/Alliance Town Center. Moving forward, these three neighborhoods will be clustered together and referred to as "North Fort Worth", not to be confused with "Northside."

The median income for each neighborhood was then plotted against their total population, as seen in the graph below.



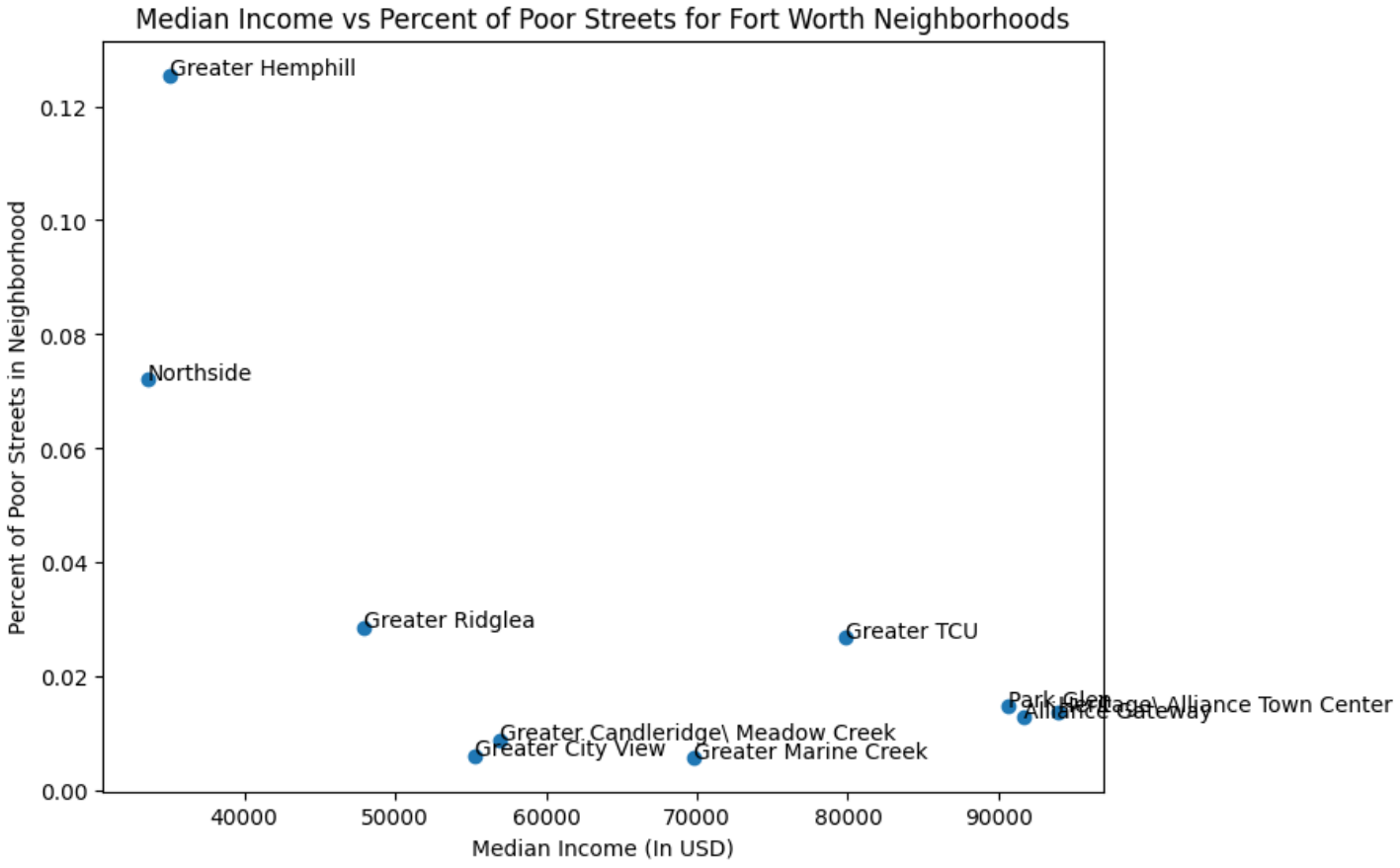
This graph makes it obvious that the combination of the North Fort Worth neighborhoods has a very high population. Below is the same graph, but without the combination of North Fort Worth.



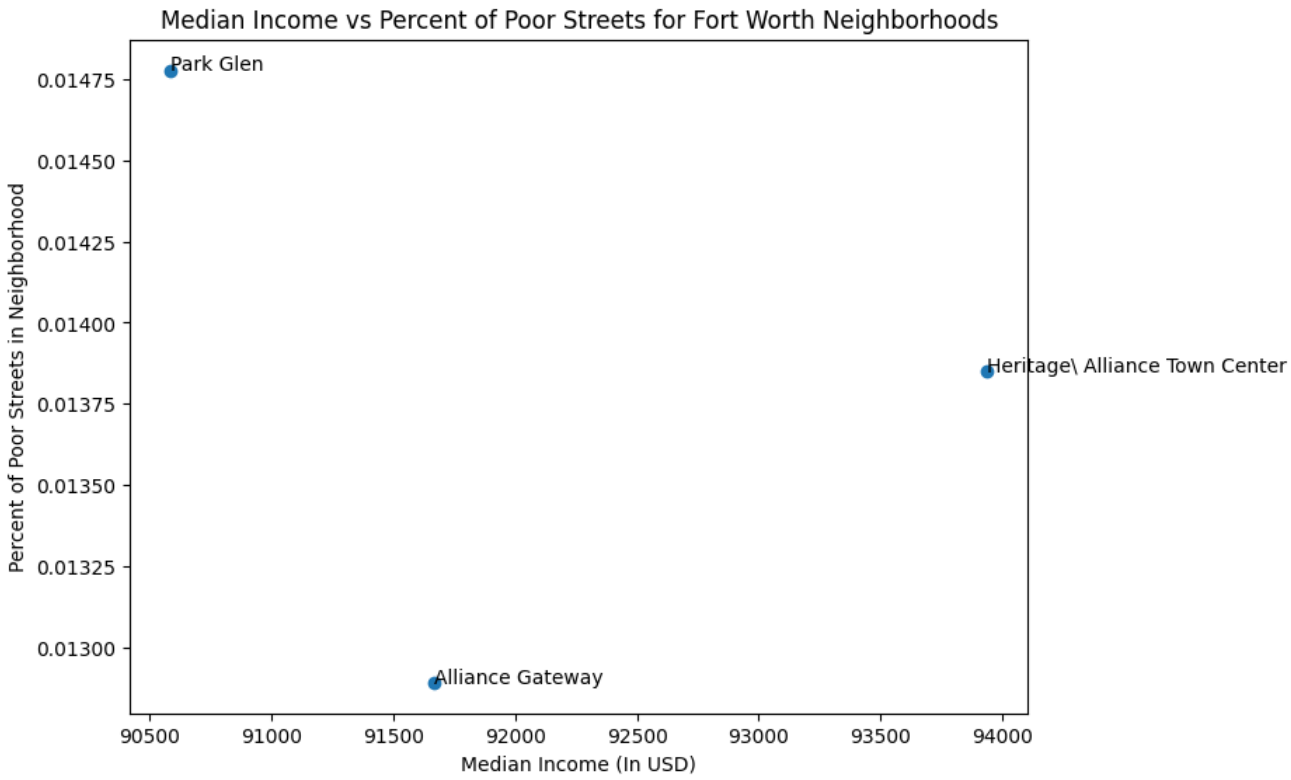
Now it shows a better idea of the other neighborhoods that would be good contenders for a restaurant location.

This graph shows that, based off this data, Heritage/Alliance Town Center would be a good ideal location for a Mediterranean restaurant, with other locations such as Alliance Gateway and Greater Candle ridge/Meadow Creek also being good options. It can also be noted that Heritage/Alliance Town Center is included in the North Fort Worth cluster. However, more categories of data are needed to know for sure if it is the best.

Below, the Median Income is measured against the percentage of poor streets in the neighborhood. Poor streets are roads in poor condition, not the economic wellness of a population on a street. This will tell us more about the overall wealth and appeal of the neighborhoods. (North Fort Worth will not be combined in this graph, as the combined percentage data would not be accurate to reality since the number of roads in those neighborhoods is not available in this data set.)



To better analyze the three clustered values in the bottom right (sweet spot of this graph), a sub data frame is created and plotted on the same graph.



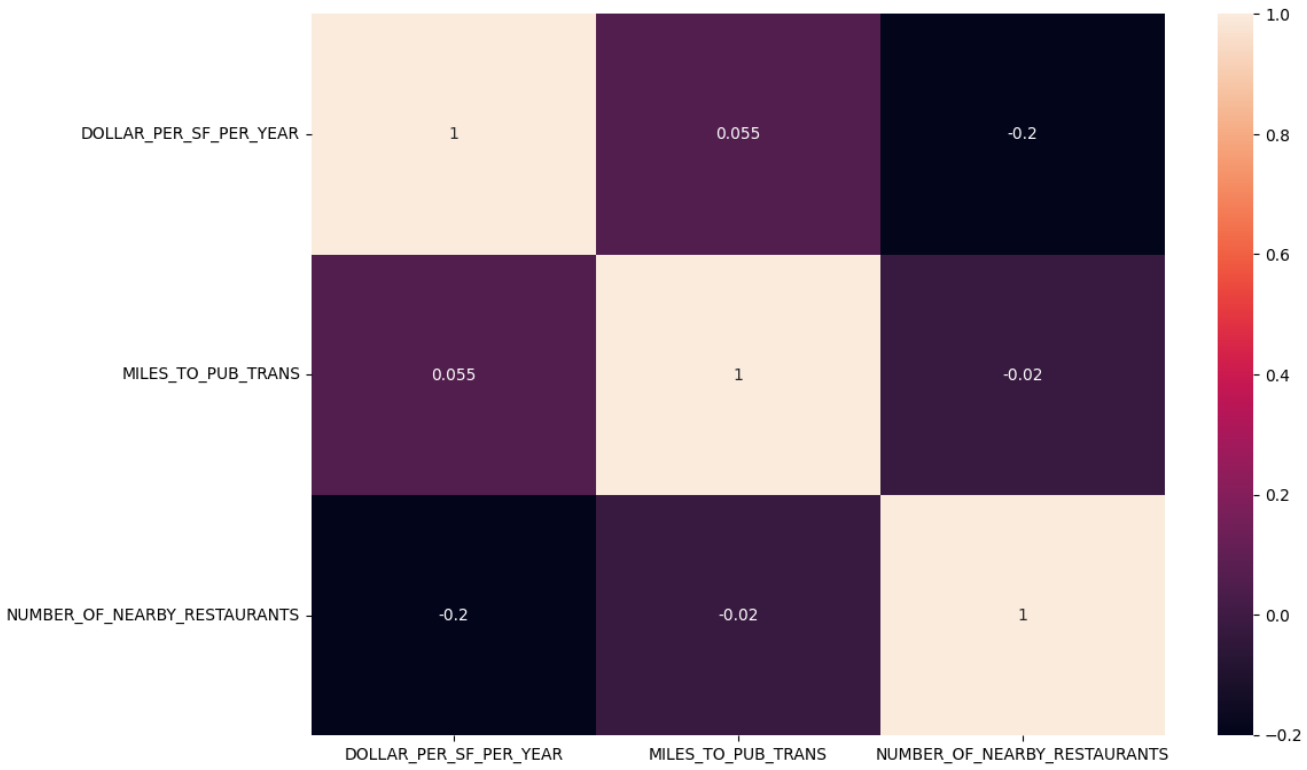
This blown-up version of the previous graph strengthens the argument for Heritage/Alliance Town Center as the best neighborhood to open a restaurant in terms of the economic stability of the area and its residents. It can be noted again that Heritage/Alliance Town Center and Park Glen are both included in North Fort Worth. Using the outcomes from the two graphs, the locations of interest can be narrowed down to a few areas in Fort Worth.

Neighborhood Economic Feasibility

Now, the economic feasibility will be analyzed for the different neighborhoods in Fort Worth. The data used in this analysis was received from two property realtor websites and put together into one .csv file. Each property address was associated with the closest neighborhoods in the area to align the data set with the previous one. Only the top 5 neighborhoods from the last data analyzation will be taken into consideration (Greater TCU, North Side, North Fort Worth, Greater Marine, Greater Candleridge/Meadow Creek). In choosing these five, population weighed heavier than Median Income, which is why neighborhoods like Northside and Greater Candleridge/Meadow Creek have been included. This is because this research takes the view that the amount of traffic and people in the area will dictate a restaurant's success more than the amount of money that they have, though both are important.

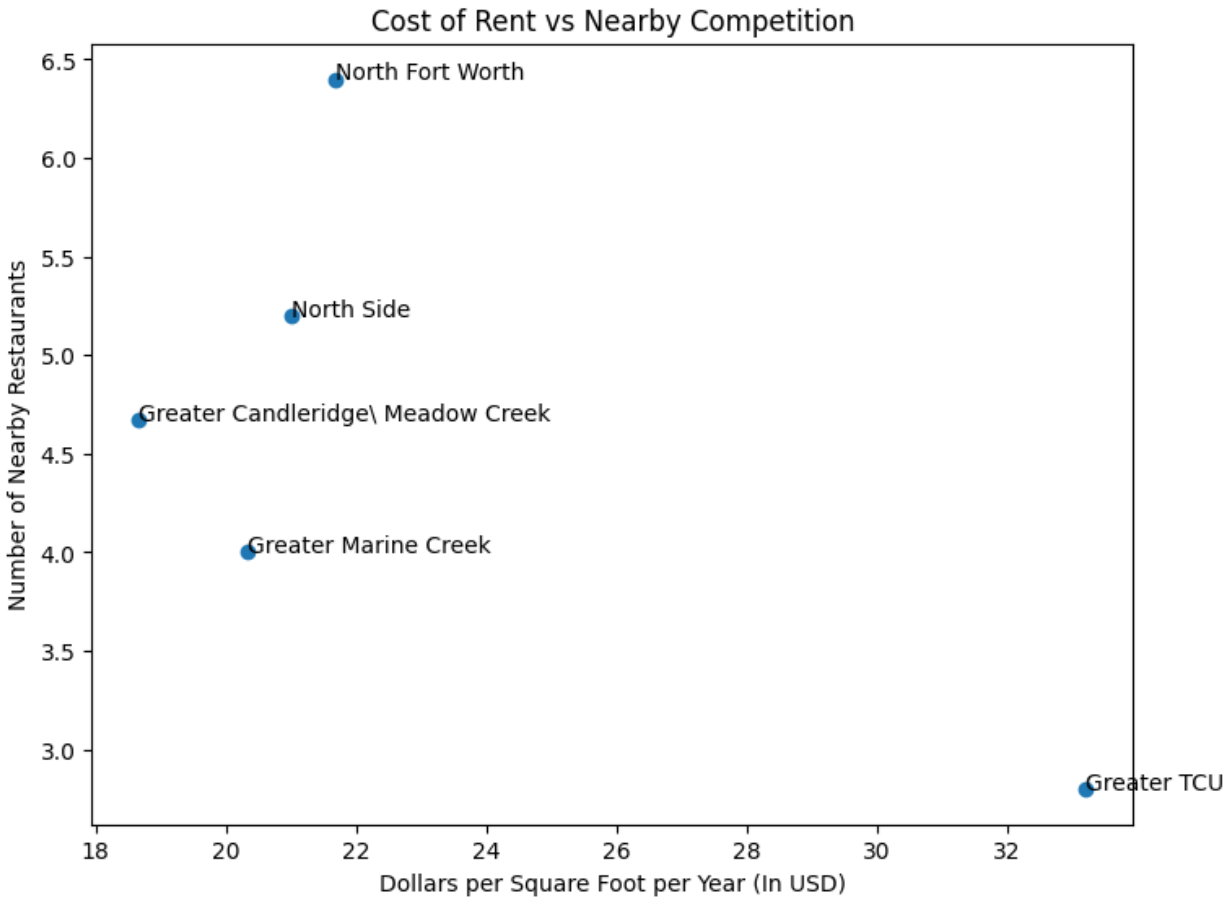
This data only consists of properties being sold at the moment the data was taken (2/8/2024). No information could be found about properties that are currently occupied, but data about properties on the market would be more beneficial either way.

A heat map is created to observe the potential correlations between categories. This is to see if there are any categories that seem to have a large effect on others, or if there are any negative connotations with any specific category.



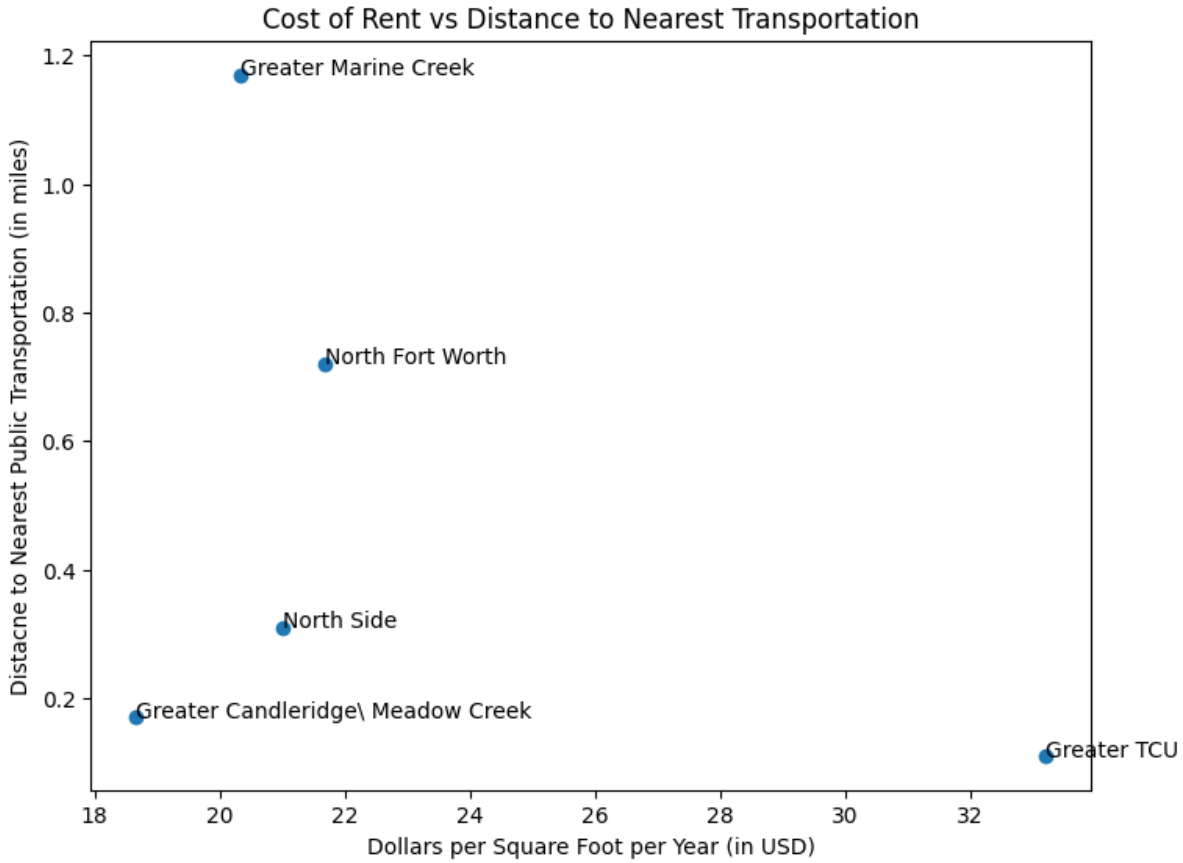
Not much can be taken away by this heat map, as the correlation values are very low. If any observation can be made, it would be that the higher rent is, the number of competitors in the area tends to be lower. It does not seem like the number of miles to public transportation has much of a preference to the other categories, so it will have to be considered relative to each location.

Now, the 'dollars per square foot per year' for each neighborhood is graphed against the 'number of nearby restaurants'.



Before analyzing this plot, a consensus must be reached on the benefits of competition. In terms of choosing a neighborhood, it would be most beneficial to choose the one with the best population to competition ratio. But according to game theory, when choosing a specific location within that neighborhood, a restaurant would want to choose the area with the most competition. That being said, in this graph, the ideal neighborhood would be one with a low rent and low competition, which appears to be Greater Marine Creek and Greater Candleridge/Meadow Creek.

Now, the Dollars per Square Foot per Year is plotted against the Miles to Public Transportation. This Data is less important than the competition data since most of the population will be driving cars, especially in a wealthy area (which was previously analyzed), but it it's still another factor to take into consideration.



Looking at these two graphs, Greater Candleridge/Meadow Creek appears to stand out the most, as it is the cheapest, has an average amount of surrounding competition, and is very close to public transportation stops. If we were to go down the route of 'less competition in the area is better for customer density', the Greater TCU neighborhood would be a great location option, as it by has far the least amount of competition and is the closest to public transportation options. The largest downside to the Greater TCU area is the cost, with rent prices averaging $33.20 per square foot per year, which is $10 more than the next highest rent area, North Fort Worth.

Neighborhood Demographics and Consumer Trends

Next, the demographic data of the neighborhoods will be analyzed. This data was taken from the US Census website which only stores location data through zip-codes. To line up each neighborhood with its corresponding census data, the zip-codes for each neighborhood were found by plugging in their coordinates into Google Maps and recording the resulting zip-codes. The zip-codes found for each neighborhood are listed below.

Greater Marine Creek: 76179

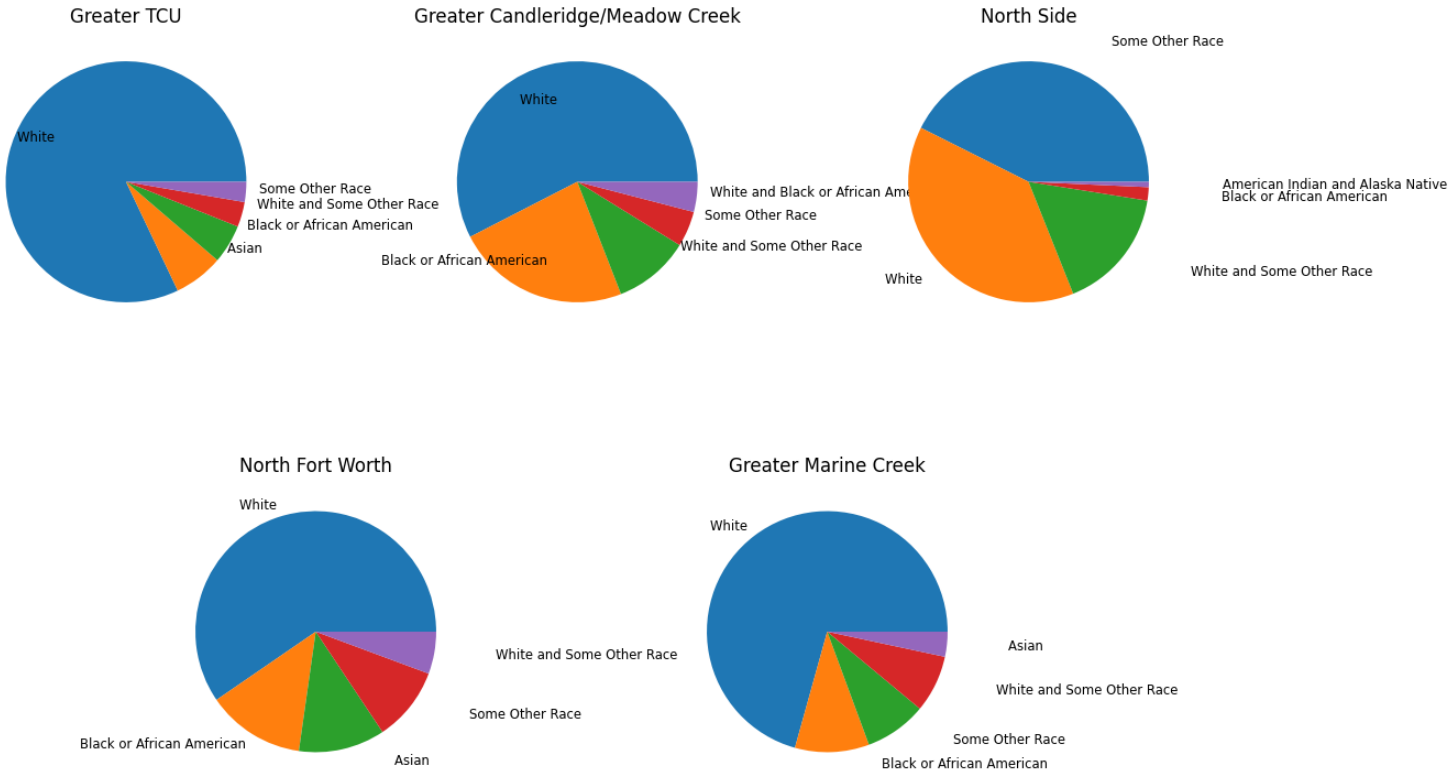
North Fort Worth: 76137

North Side: 76164

Greater Candleridge/Meadow Creek: 76133

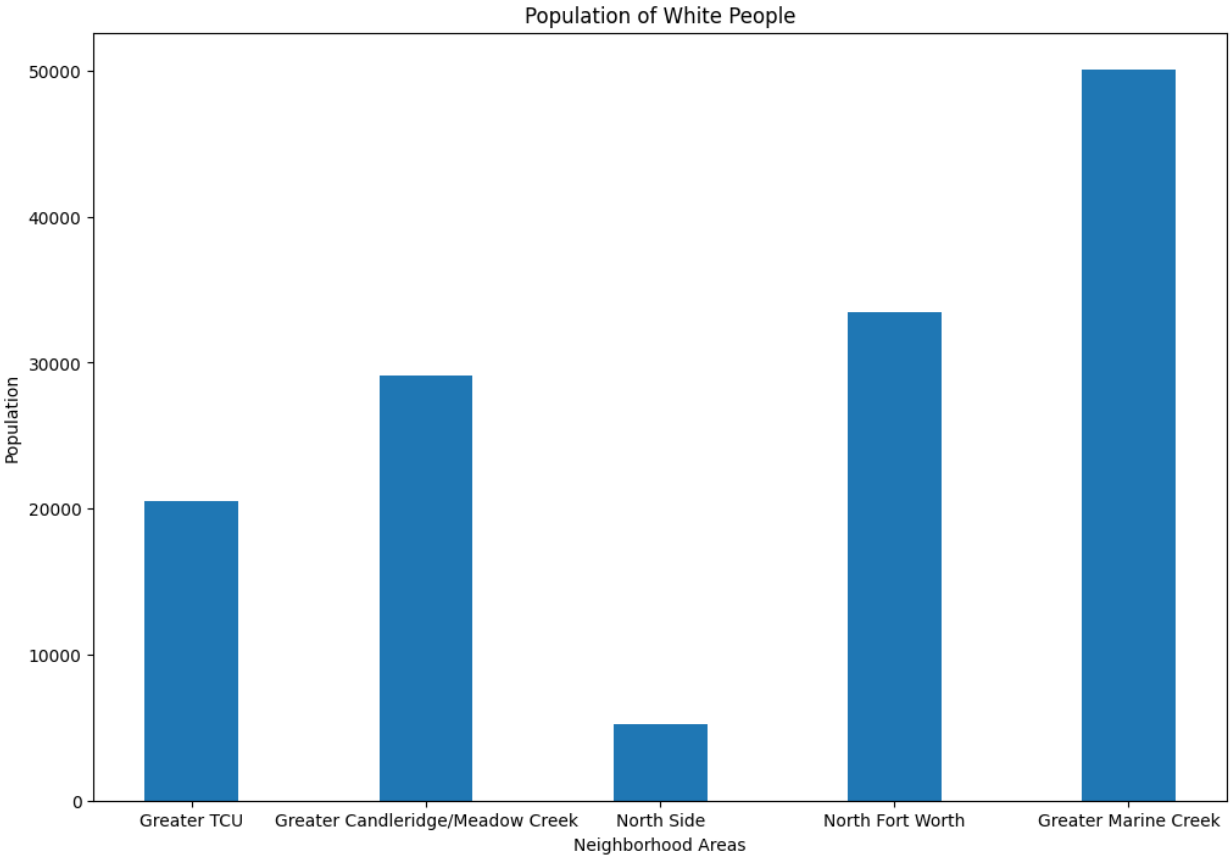
Greater TCU: 76109

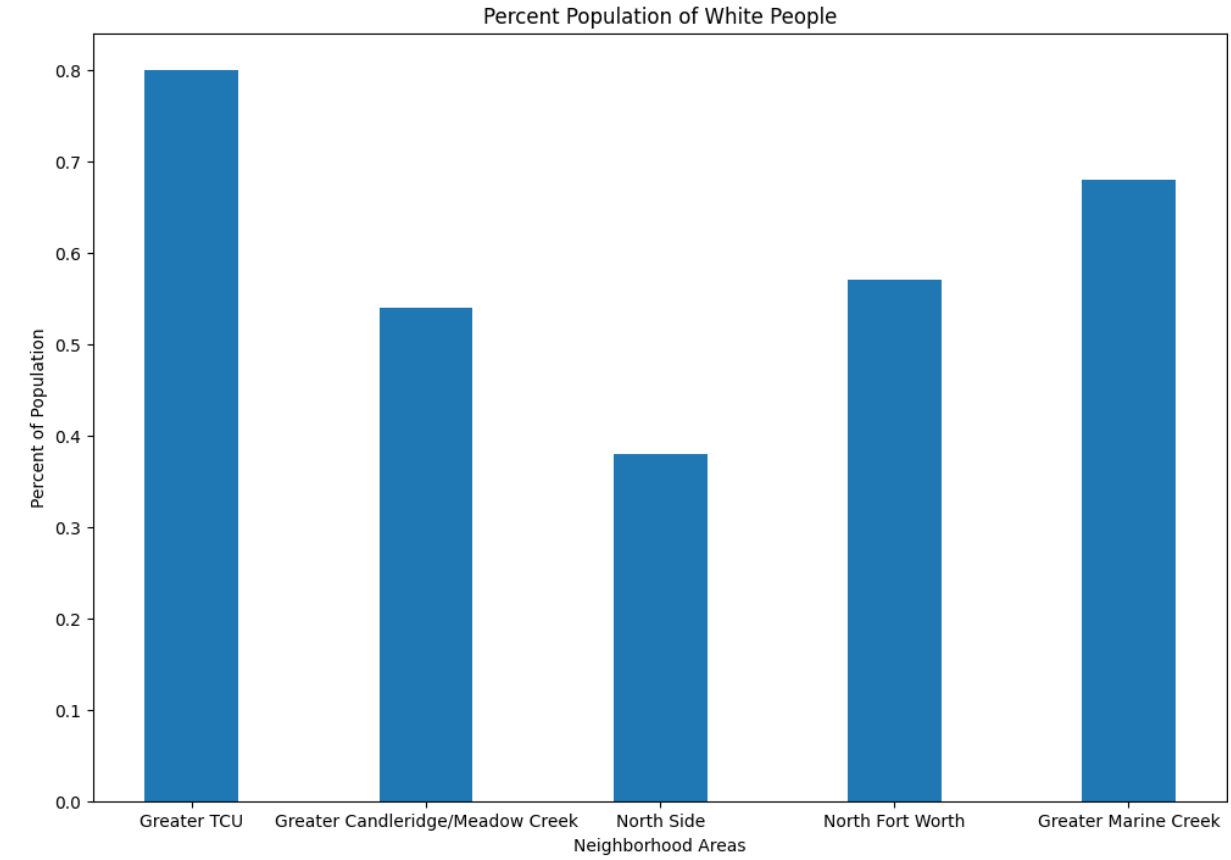
The resulting data did not format very well and has been significantly reduced and cleaned in excel. There was lots of extra data and information that was unnecessary for our purposes, and lots of formatting issues from the .csv file that the Census website provided. Data on sex, age, housing, and voting age population were deleted, and the titles for each column were better formatted to show up in python in a more legible manor. The POP_ESTIMATE and PERCENT columns were also changed from 'object' data types to 'float64' so that they could be delt with mathematically. The population values that were zero were also removed from the data set. Below are five resulting pie charts of the five different major neighborhoods and their ethnicities.



None of the top five ethnicities for any of the neighborhoods consist of mediterranean ethnicities (from countries bordering the Mediterranean Sea), so the analysis of the demographics will have to look to another customer demographic to target. Due to lack of data sets on demographics of food preferences, previously existing research was used to find the race that prefers Mediterranean food. A study was done showing how, especially in America, the Mediterranean diet has been adopted by and become very popular among white people. During this search for demographic preferences, another study was discovered showing that people with college educations are much more likely to adhere to a Mediterranean diet than those without. Because of this information, more weight will be put on the median income of an area (college educated people make more on average than those without), the Greater TCU area (high density of college students), and areas with a high percentage of white people. The links to the studies referenced are listed in the citation section at the end of this study.

Below are graphs of the neighborhood areas by population of white people, and percent of white people out of their total population.





Conclusions

Based on all of the information gathered, my recommendation would be to open in the ***North Fort Worth area*** (zip-code 76137). This area has by far the largest population, and the second highest median income, which means there is a large customer base who, on average, have lots of money to spend. A high median income also means there are lots of college educated people in the area, who have been shown to prefer Mediterranean food more than others as discussed in the previous paragraph. While less significant but worth mentioning, there is also a low percentage of poor streets in the neighborhoods contained in North Fort Worth. The rent in North Fort Worth is about average when compared to the other top 5 areas, making it very economically feasible, but does have lots of competing restaurants in the area. This can be seen as an upside however, because it proves that this area is a hotspot for commercial dining venues and will have a large customer base looking for food there. North Fort Worth does tend to be further from public transportation, but that data is also less significant than the other data sets. And finally, North Fort Worth has a large white population, in both raw size and percent of the population. This shows that the consumer trend would be leaning towards Mediterranean food in this area more than others, especially with the high median income. Overall, the data has shown that North Fort Worth possess many of the qualities that a good Mediterranean Food restaurant location would have, which is why it is my recommendation.

An argument can also be made for the ***Greater TCU area*** (zip-code 76109). This area has the 4th highest population out of Fort Worth neighborhoods (counting North Fort Worth as a combined area) and the 3rd highest median income. The Greater TCU area is the middle of the pack when it comes to the percentage of poor roads, but it has been concluded that not as much emphasis will be put on that statistic. The Greater TCU area also has the highest population of white people in the area, along with an abundance of college students with TCU, a major D1 university, also located here. TCU being located in the neighborhood also means that there will be many large events held in the area, including major sports games such as basketball, baseball, and, most notably, football games. TCU averaged 46,562 people per game two seasons ago (source cited), which would dramatically increase the number of customers a restaurant in the area would see on a given weekend. The main problem with this area is the economic feasibility, as it has by far the highest rent of any of the areas, averaging over $32 per square foot per year. This is the main reason the Greater TCU area is not the main recommendation, but I believe that the benefits of being in such close proximity to TCU's campus will even out this downside. I will also mention that there is very little competition in the area, and lots of nearby public transportation. Both upsides would be extremely beneficial on days of major events and football games. All of this to say that the Greater TCU area would make an excellent choice for a restaurant location, but its downsides may make the North Fort Wort area a better location.

Citations

Fort Worth Neighborhood Population Data:

https://data.fortworthtexas.gov/Property-Data/Neighborhood-Profile-Area-Data/ruhd-2sjc/about_data

Restaurant Real Estate 1:

https://www.loopnet.com/search/restaurants/fort-worth-tx/for-lease/?sk=ace9de2b8dd0b21ec85081c4dcd24a91&bb=9ppn_mo-1Jm2lyt3H

Restaurant Real Estate 2:

https://www.crexi.com/lease/properties/TX/Fort_Worth/Restaurants?showMap=true&placeIds%5B%5D=ChIJrQfILRJuToYRvaxp3fiLr6Q&types%5B%5D=Restaurant&mapZoom=13&mapCenter=32.86582999555816,-97.36429051869838

Fort Worth Race and Ethnicity Data (By Zip-Code):

https://data.census.gov/table

College Students Mediterranean Preferance:

https://thedo.osteopathic.org/2019/03/education-gender-may-affect-adherence-to-mediterranean-diet-study-finds/#:~:text=People%20with%20a%20college%20education,to%20follow%20the%20Mediterranean%20diet.

White People Mediterranean Preferance:

https://sites.bu.edu/debiasse/files/2021/03/Burt_MedDiet.pdf

TCU Football Attendance:

https://collegefootballnews.com/rankings/college-football-attendance-rankings-2023-five-year-program-analysis

Link to GitHub repository with .csv files (not including the neighborhood population file):

https://github.com/fletcht13/ECEN360/tree/0a276451e62b14f79987182c52599ae3fae23cb2/Assignment_1