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### On Hackettstown Businesses Map Matrix

In brief, my project, an analysis of all of Hackettstown's businesses and locations analyzed in distance matrix format, is used for leverage in the understanding of past development and future development of Hackettstown Businesses. It all started with the idea of my friends and I wanting to make a business together, although just a dream, it allowed me to conceive the idea to make a 'stress analysis' as I called it at the time of the Hackettstown businesses to determine, what the highest demand business could be. Furthermore, I never enacted this idea as one where it was inconceivably impractical for a child to run any business, and I also lacked the appropriate skills. Without further ado, is the analysis produced of my insights on how distance and classification could promote potential development to be pursued in Hackettstown.

To start I needed data, and with non-lengthy research I discovered that the Hackettstown Business Improvement District website provided exactly the information I was looking for. In an interactive Python notebook, I used BeautifulSoup4, to scrape the data from the website. From this web scrape, I was able to retrieve the names of all the businesses and their short URL links to the google map's location. Following that was the most difficult part of the project, which was using Python's Requests package to get the extended URLs from google maps. This is because, although legal and considered public information, Google Maps, does not like when users web-scrape their data, and in the processes of receiving the extended URL's I was consistently and abruptly blocked by their bot detection system. To overcome this, I utilized python's built in Pickle package and stored the data for later, and instead of attacking their website, I collected the data in batches over a period.

Following that came answering the questions from my exploration analysis. First, I wanted to determine the popularity of businesses based on their category by quantifying which businesses were the most frequent within their category and which were least likely to appear. Answering questions 1 and 2, I discovered that the businesses that catered towards services were the most populated in town, and that entertainment were considered the least populated. Honestly, I felt that these questions could have been answered far better if I were to compare Hackettstown business population of categories compared to neighboring towns. Without comparison it is hard to determine if there could be demand for these businesses as one business of a category could be the only demand a town needs, but if I were to compare it to a town such as Randolph Township, and noticed

for example that there was a significant lack of Game stores in Randolph, than it would be appropriate to determine that Game stores are popular in Hackettstown, but in might be in demand in Randolph.

Third I answered which businesses of each category were closest to each other. I felt this was an appropriate question to answer, because although we might know what businesses are in demand, a contracting company might want to know where to build the new business. Using matrices to determine location distance from one another, I clustered which businesses perform well next to each other, determined by survivorship' and which businesses do well far away from others. The businesses that did the best next to each other were IHOP and Berry Bowl's; Both desserts turned meal restaurants, and the businesses that did well away from others was the Department of Public Works. Which is likely due to its non-public relevance. To answer the last question, which is like the previous, I used the same distance matrix, but this time I analyzed the distance between businesses that were within the same category. I determined the average distance between each of these locations and deciphered how likely certain businesses were to be within the distance of one another. To conclude this research, I selected a location that had previously been a shut-down rite-aid for sale, and I determined that the best business to put in that vacant lot was likely entertainment/gaming or a restaurant like Wendie's or McDonalds.

Finally, If I was presenting this information to a client I would recommend that they should open up a Entertainment at the rite-aid, this is because through my analysis I was able to determine that entertainment could potentially be in demand in Hackettstown, and that entertainment is likely to perform well according to the far distance it is from other locations. In the future I would like to expand my database to other towns to compare them to one another. Having this would be a useful asset in determining which towns could have an unseen demand for businesses that perform well in other locations. I would compare their information to Hackettstown to improve the overall business culture of Hackettstown.