WHICH NEIGHBORHOOD IN DOWNTOWN TORONTO IS BEST SUITED FOR SOMEONE COMING FROM MANHATTAN

Coursera/IBM

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PROBLEM

- US citizen want to move to Canada
- “Move to Canada” spiked in Google Trends
- Over 130,000 new COVID-19 cases reported on 11/15/2020
- Over 11 million COVID-19 cases and over 247,000 death as of 11/15/2020
- Political unrest
- Social unrest

INTEREST

- Canada is close by
- Only just a little over 4,000 new cases on 11/15/2020
- Just a little over 300,000 COVID-19 cases on 11/15/2020
- Less social and political unrests on the news

DATA

- Neighborhood data for Toronto is from Wikipedia, https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M.
- Geospatial data for both Toronto, https://cocl.us/Geospatial_data, and Manhattan and neighborhood data for Manhattan, https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs/newyork_data.json, are provided by the Coursera.
- Venue data are pulled from Foursquare API, https://developer.foursquare.com/.

SAMPLE NEIGHBORHOOD DATA - TORONTO

	Borough	Neighborhood	Latitude	Longitude
0	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636
1	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
2	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937
3	Downtown Toronto	St. James Town	43.651494	-79.375418
4	Downtown Toronto	Berczy Park	43.644771	-79.373306

SAMPLE VENUE INFORMATION - TORONTO

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Regent Park, Harbourfront	43.65426	-79.360636	Roselle Desserts	43.653447	-79.362017	Bakery
1	Regent Park, Harbourfront	43.65426	-79.360636	Tandem Coffee	43.653559	-79.361809	Coffee Shop
2	Regent Park, Harbourfront	43.65426	-79.360636	Cooper Koo Family YMCA	43.653249	-79.358008	Distribution Center
3	Regent Park, Harbourfront	43.65426	-79.360636	Impact Kitchen	43.656369	-79.356980	Restaurant
4	Regent Park, Harbourfront	43.65426	-79.360636	Body Blitz Spa East	43.654735	-79.359874	Spa

SAMPLE VENUE FREQUENCY TABLE - TORONTO

	Neighborhood	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	...	Theater	Rest
0	Berczy Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.(
1	CN Tower, King and Spadina, Railway Lands, Har...	0.000000	0.000000	0.058824	0.058824	0.058824	0.117647	0.117647	0.058824	0.000000	...	0.000000	0.(
2	Central Bay Street	0.014706	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.(
3	Christie	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.(
4	Church and Wellesley	0.026667	0.013333	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.013333	...	0.013333	0.(

SAMPLE TOP 10 MOST COMMON VENUE - TORONTO

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Berczy Park	Coffee Shop	Bakery	Cocktail Bar	Seafood Restaurant	Cheese Shop	Beer Bar	Farmers Market	Restaurant	Sandwich Place	Breakfast Spot
1	CN Tower, King and Spadina, Railway Lands, Har...	Airport Lounge	Airport Service	Bar	Harbor / Marina	Rental Car Location	Coffee Shop	Boat or Ferry	Historic Site	Sculpture Garden	Airport Terminal
2	Central Bay Street	Coffee Shop	Café	Italian Restaurant	Sandwich Place	Japanese Restaurant	Thai Restaurant	Department Store	Salad Place	Burger Joint	Bubble Tea Shop
3	Christie	Grocery Store	Café	Park	Athletics & Sports	Baby Store	Coffee Shop	Nightclub	Candy Store	Italian Restaurant	Restaurant
4	Church and Wellesley	Coffee Shop	Gay Bar	Japanese Restaurant	Sushi Restaurant	Restaurant	Yoga Studio	Hotel	Men's Store	Café	Bubble Tea Shop

SAMPLE SCORED TOP 10 VENUE - TORONTO

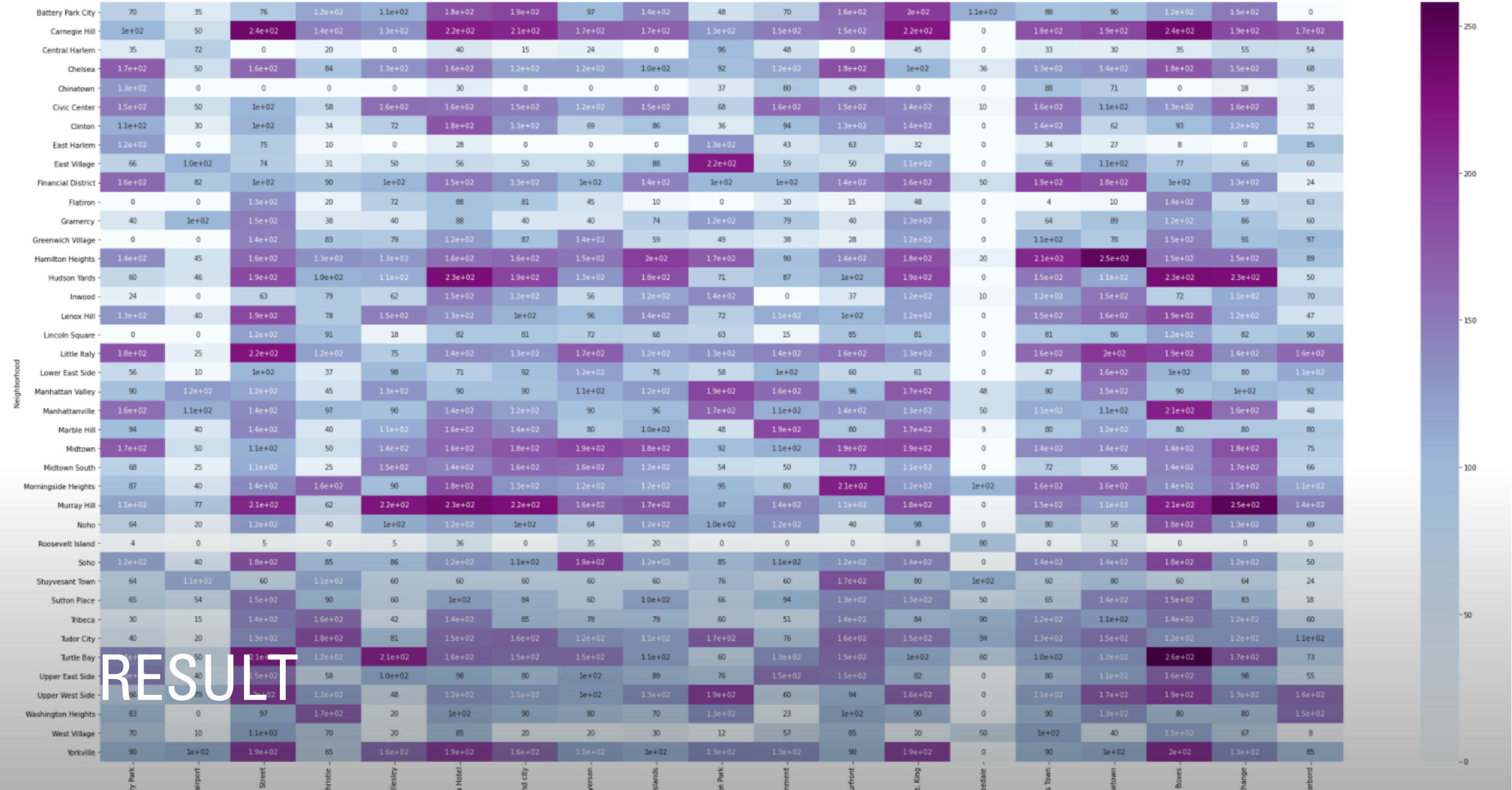
	Neighborhood	Park	Hotel	Gym	Coffee Shop	Memorial Site	Shopping Mall	Plaza	Burger Joint	Gourmet Shop	...	Heliport	Skate Park	Asian Restaurant	Dog Run	F
0	Berczy Park	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
1	CN Tower, King and Spadina, Railway Lands, Har...	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
2	Central Bay Street	0.0	0.0	0.0	10.0	0.0	0.0	0.0	2.0	0.0	...	0.0	0.0	0.0	0.0	
3	Christie	8.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	
4	Church and Wellesley	0.0	4.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	

DATA PROCESSING METHOD FOR MANHATTAN

- The same sets of data processing for Toronto was done for Manhattan
- The end product was also a table of scores of top 10 most common venue for each neighborhood

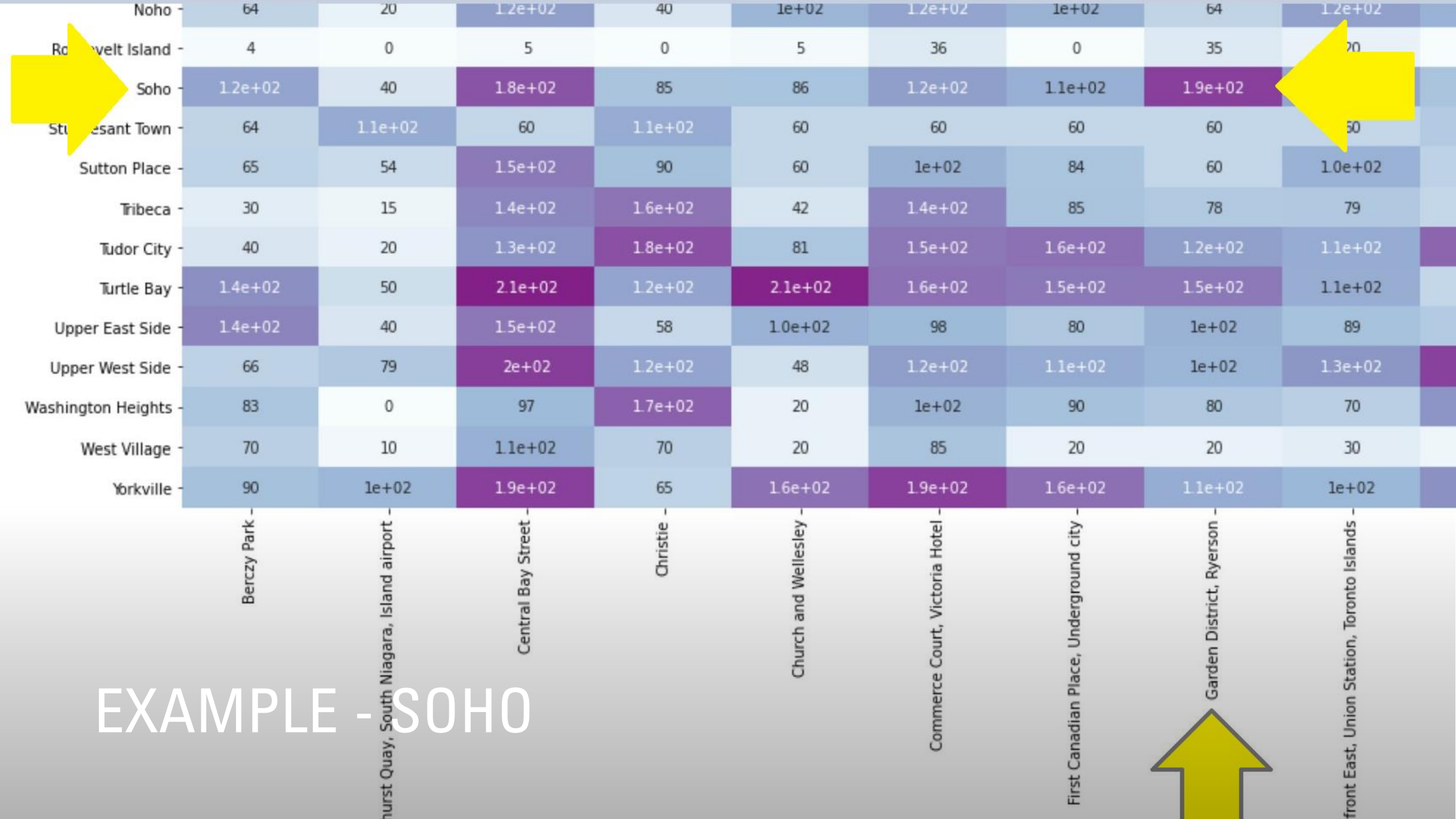
FINAL RESULT METHODOLOGY

- A set of unique venue from the Manhattan dataset was parsed
- The total scores for each and all pair of neighborhoods was calculated
  - each Manhattan neighborhood, or each row, was multiplied column-wise with all the dataset in Toronto dataset.
  - each row of the product was summed row-wise to produce a single score for each neighborhood pair.


Neighborhood
Battery Park City 70 35 76 1.2e+02 1.1e+02 1.8e+02 1.9e+02 97 1.4e+02 48 70 1.6e+02 2e+02 1.1e+02 88 90 1.2e+02 1.5e+02 0
Carnegie Hill 1e+02 50 2.4e+02 1.4e+02 1.3e+02 2.2e+02 2.1e+02 1.7e+02 1.7e+02 1.3e+02 1.5e+02 1.5e+02 2.2e+02 0 1.8e+02 1.9e+02 2.4e+02 1.9e+02 1.7e+02
Central Harlem 35 72 0 20 0 40 15 24 0 96 48 0 45 0 33 30 35 55 54
Chelsea 1.7e+02 50 1.6e+02 84 1.3e+02 1.6e+02 1.2e+02 1.2e+02 1.0e+02 92 1.2e+02 1.8e+02 1e+02 36 1.3e+02 1.4e+02 1.8e+02 1.5e+02 68
Chinatown 1.3e+02 0 0 0 0 30 0 0 0 37 80 49 0 0 88 71 0 18 35
Civic Center 1.5e+02 50 1e+02 58 1.6e+02 1.6e+02 1.5e+02 1.2e+02 1.5e+02 68 1.6e+02 1.5e+02 1.4e+02 10 1.6e+02 1.1e+02 1.3e+02 1.6e+02 38
Clinton 1.1e+02 30 1e+02 34 72 1.8e+02 1.3e+02 69 86 36 94 1.3e+02 1.4e+02 0 1.4e+02 62 93 1.2e+02 32
East Harlem 1.2e+02 0 75 10 0 28 0 0 0 1.3e+02 43 63 32 0 34 27 8 0 85
East Village 66 1.0e+02 74 31 50 56 50 50 88 2.2e+02 59 50 1.1e+02 0 66 1.1e+02 77 66 60
Financial District 1.6e+02 82 1e+02 90 1e+02 1.5e+02 1.3e+02 1e+02 1.4e+02 1e+02 1e+02 1.4e+02 1.6e+02 50 1.9e+02 1.8e+02 1e+02 1.3e+02 24
Flatiron 0 0 1.3e+02 20 72 88 81 45 10 0 30 15 48 0 4 10 1.4e+02 59 63
Gramercy 40 1e+02 1.5e+02 38 40 88 40 40 74 1.2e+02 79 40 1.3e+02 0 64 89 1.2e+02 86 60
Greenwich Village 0 0 1.4e+02 83 79 1.2e+02 87 1.4e+02 59 49 38 28 1.2e+02 0 1.1e+02 78 1.5e+02 91 97
Hamilton Heights 1.4e+02 45 1.6e+02 1.3e+02 1.3e+02 1.6e+02 1.6e+02 1.5e+02 2e+02 1.7e+02 90 1.4e+02 1.8e+02 20 2.1e+02 2.5e+02 1.5e+02 1.5e+02 89
Hudson Yards 60 46 1.9e+02 1.0e+02 1.1e+02 2.3e+02 1.9e+02 1.3e+02 1.8e+02 71 87 1e+02 1.9e+02 0 1.5e+02 1.1e+02 2.3e+02 2.3e+02 50
Inwood 24 0 63 79 62 1.5e+02 1.2e+02 56 1.2e+02 1.4e+02 0 37 1.2e+02 10 1.2e+02 1.5e+02 72 1.1e+02 70
Lenox Hill 1.3e+02 40 1.9e+02 78 1.5e+02 1.3e+02 1e+02 96 1.4e+02 72 1.1e+02 1e+02 1.2e+02 0 1.5e+02 1.6e+02 1.9e+02 1.2e+02 47
Lincoln Square 0 0 1.2e+02 91 18 82 81 72 68 63 15 85 81 0 81 86 1.2e+02 82 90
Little Italy 1.8e+02 25 2.2e+02 1.2e+02 75 1.4e+02 1.3e+02 1.7e+02 1.2e+02 1.3e+02 1.4e+02 1.6e+02 1.3e+02 0 1.6e+02 2e+02 1.9e+02 1.4e+02 1.6e+02
Lower East Side 56 10 1e+02 37 98 71 92 1.2e+02 76 58 1e+02 60 61 0 47 1.6e+02 1e+02 80 1.1e+02
Manhattan Valley 90 1.2e+02 1.2e+02 45 1.3e+02 90 90 1.1e+02 1.2e+02 1.9e+02 1.6e+02 96 1.7e+02 48 90 1.5e+02 90 1e+02 92
Manhattanville 1.6e+02 1.1e+02 1.4e+02 97 90 1.4e+02 1.2e+02 90 96 1.7e+02 1.1e+02 1.4e+02 1.3e+02 50 1.1e+02 1.1e+02 2.1e+02 1.6e+02 48
Marble Hill 94 40 1.4e+02 40 1.1e+02 1.6e+02 1.4e+02 80 1.0e+02 48 1.9e+02 80 1.7e+02 9 80 1.2e+02 80 80 80
Midtown 1.7e+02 50 1.1e+02 50 1.4e+02 1.6e+02 1.8e+02 1.9e+02 1.8e+02 92 1.1e+02 1.9e+02 1.9e+02 0 1.4e+02 1.4e+02 1.4e+02 1.8e+02 75
Midtown South 68 25 1.1e+02 25 1.5e+02 1.4e+02 1.6e+02 1.6e+02 1.2e+02 54 50 73 1.1e+02 0 72 56 1.4e+02 1.7e+02 66
Morningside Heights 87 40 1.4e+02 1.6e+02 90 1.8e+02 1.3e+02 1.2e+02 1.2e+02 95 80 2.1e+02 1.2e+02 1e+02 1.6e+02 1.6e+02 1.4e+02 1.5e+02 1.1e+02
Murray Hill 1.1e+02 77 2.1e+02 62 2.2e+02 2.3e+02 2.2e+02 1.6e+02 1.7e+02 97 1.4e+02 1.1e+02 1.8e+02 0 1.5e+02 1.1e+02 2.1e+02 2.5e+02 1.4e+02
Noho 64 20 1.2e+02 40 1e+02 1.2e+02 1e+02 64 1.2e+02 1.0e+02 1.2e+02 40 98 0 80 58 1.8e+02 1.3e+02 69
Roosevelt Island 4 0 5 0 5 36 0 35 20 0 0 0 8 80 0 32 0 0 0
Soho 1.2e+02 40 1.8e+02 85 86 1.2e+02 1.1e+02 1.9e+02 1.2e+02 85 1.1e+02 1.2e+02 1.4e+02 0 1.4e+02 1.4e+02 1.8e+02 1.2e+02 50
Stuyvesant Town 64 1.1e+02 60 1.1e+02 60 60 60 60 60 76 60 1.7e+02 80 1e+02 60 80 60 64 24
Sutton Place 65 54 1.5e+02 90 60 1e+02 84 60 1.0e+02 66 94 1.3e+02 1.3e+02 50 65 1.4e+02 1.5e+02 83 18
Tribeca 30 15 1.4e+02 1.6e+02 42 1.4e+02 85 78 79 60 51 1.4e+02 84 90 1.2e+02 1.1e+02 1.4e+02 1.2e+02 60
Tudor City 40 20 1.3e+02 1.8e+02 81 1.5e+02 1.6e+02 1.2e+02 1.1e+02 1.7e+02 76 1.6e+02 1.5e+02 94 1.3e+02 1.5e+02 1.2e+02 1.2e+02 1.1e+02
Turtle Bay 50 1.2e+02 2.1e+02 1.6e+02 1.5e+02 1.5e+02 1.1e+02 60 1.3e+02 1.5e+02 1e+02 60 1.0e+02 1.2e+02 2.6e+02 1.7e+02 73
Upper East Side 40 1.5e+02 58 1.0e+02 98 80 1e+02 89 76 1.5e+02 1.5e+02 82 0 80 1.1e+02 1.6e+02 98 55
Upper West Side 1.2e+02 48 1.2e+02 1.1e+02 1e+02 1.3e+02 1.9e+02 60 94 1.6e+02 0 1.1e+02 1.7e+02 1.9e+02 1.3e+02 1.6e+02
Washington Heights 83 0 97 1.7e+02 20 1e+02 90 80 70 1.3e+02 23 1e+02 90 0 90 1.3e+02 80 80 1.5e+02
West Village 70 10 1.1e+02 70 20 85 20 20 30 12 57 85 20 50 1e+02 40 1.1e+02 67 8
Yorkville 90 1e+02 1.9e+02 65 1.6e+02 1.9e+02 1.6e+02 1.1e+02 1e+02 1.3e+02 1.3e+02 90 1.9e+02 0 90 1e+02 2e+02 1.3e+02 85
RESULT
250
200
150
100
50
0

EXAMPLES

- Example #1: Bob lives in Chinatown (the 5th row on the Y-axis). The best neighborhood in Toronto to live in is Berczy Park. In fact, based on Google map, Toronto's Chinatown is couple streets off the center of Berzy Park.
- Example #2: Jody lives in Soho (the 11th row from the bottom up on the Y-axis), a place with many high-end shopping places. The best neighborhood in Toronto to live in is Garden District, Ryerson, which is a place surrounded by shopping complexes.


Noho 64 20 1.2e+02 40 1e+02 1.2e+02 1e+02 64 1.2e+02
Roosevelt Island 4 0 5 0 5 36 0 35 20
Soho 1.2e+02 40 1.8e+02 85 86 1.2e+02 1.1e+02 1.9e+02
Stuyvesant Town 64 1.1e+02 60 1.1e+02 60 60 60 60 60
Sutton Place 65 54 1.5e+02 90 60 1e+02 84 60 1.0e+02
Tribeca 30 15 1.4e+02 1.6e+02 42 1.4e+02 85 78 79
Tudor City 40 20 1.3e+02 1.8e+02 81 1.5e+02 1.6e+02 1.2e+02 1.1e+02
Turtle Bay 1.4e+02 50 2.1e+02 1.2e+02 2.1e+02 1.6e+02 1.5e+02 1.5e+02 1.1e+02
Upper East Side 1.4e+02 40 1.5e+02 58 1.0e+02 98 80 1e+02 89
Upper West Side 66 79 2e+02 1.2e+02 48 1.2e+02 1.1e+02 1e+02 1.3e+02
Washington Heights 83 0 97 1.7e+02 20 1e+02 90 80 70
West Village 70 10 1.1e+02 70 20 85 20 20 30
Yorkville 90 1e+02 1.9e+02 65 1.6e+02 1.9e+02 1.6e+02 1.1e+02 1e+02
Berczy Park
Central Bay Street
Christie
Church and Wellesley
Commerce Court, Victoria Hotel
First Canadian Place, Underground city
Garden District, Ryerson
EXAMPLE - SOHO

CONCLUSION

- As more and more unrests happen in the United States, more and more people will want to move to neighboring country, Canada. This project is a good starting point for people to investigate where in Canada is best suitable for Americans.