

Finding a good location to open a winter tennis club in Toronto

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Introduction

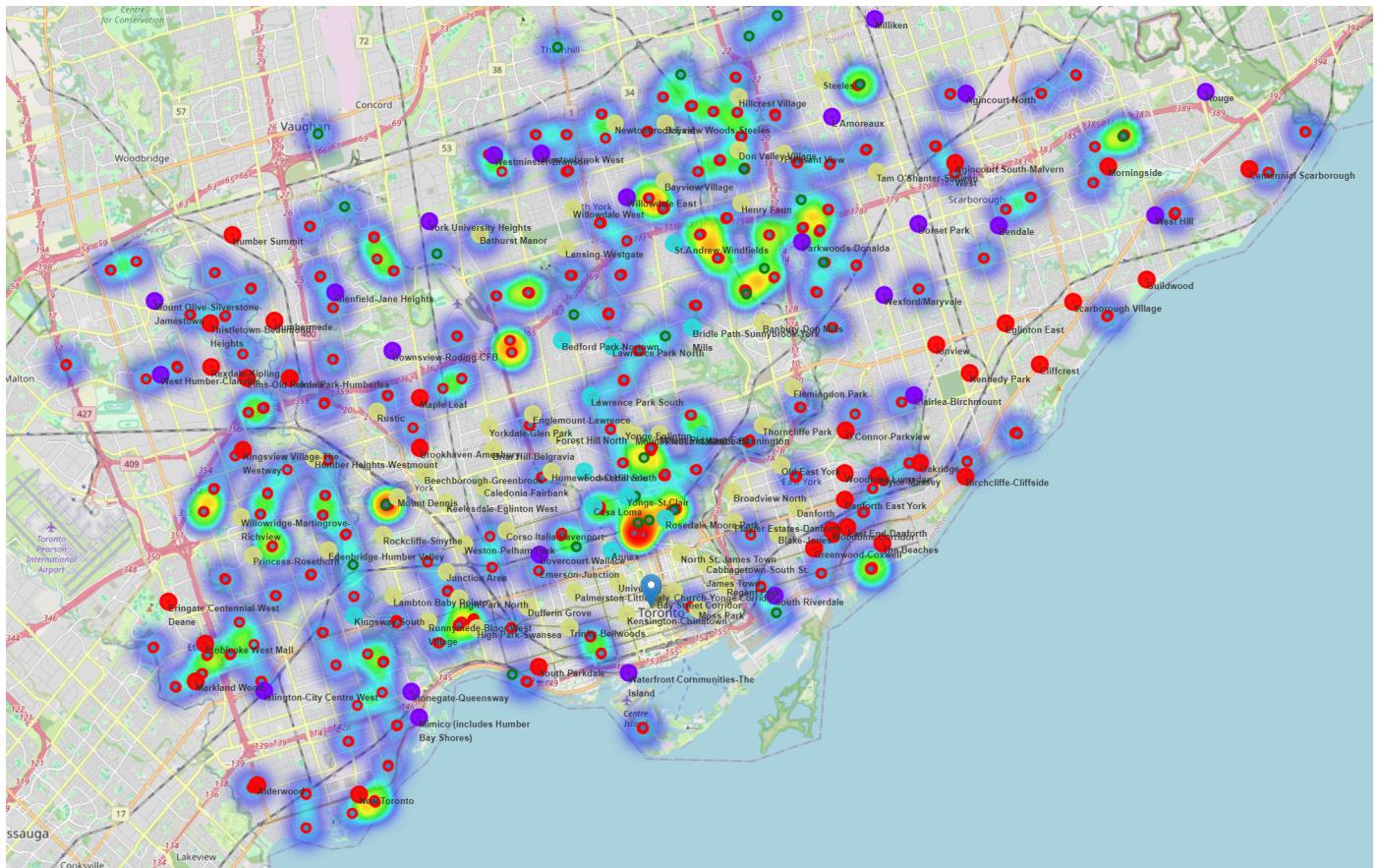
Toronto is one of the fastest-growing cities in North America. The overall increase in demand has sparked many people's interest in opening a business in the city. For example, Christina Barachina, the president of Thorncliffe Park Tennis Club, is interested in opening a winter tennis club. However, opening a winter tennis club in Toronto is not easy; aside from the cost, which is several million dollars, you must present valid arguments as to why your location is suitable for opening a winter club. Using data science and machine learning, we will determine which locations in Toronto are suitable for opening an indoor tennis club. This report will contain the results of our findings and explain why Thorncliffe Park is considered one of the good locations for opening a winter tennis club.

Methodology

First, we collected data about each neighbourhood in Toronto. The data included the population, average income, and geolocation of each neighbourhood. Then, we got tennis club information from the City of Toronto and the Ontario Tennis Association (OTA). This information included the tennis club name, geolocation and type (indoor/outdoor). Next, we calculated the distance between each tennis venue and the centre of the neighbourhood in which it is located. For each neighbourhood, to get the nearby tennis venues, we limited the distance to 5 km. In other words, we decided that a tennis venue is considered close to a neighbourhood if its distance to the centre of the neighbourhood is within a 5 km range. Then, we counted the number of tennis venues in each neighbourhood by type (indoor/outdoor).

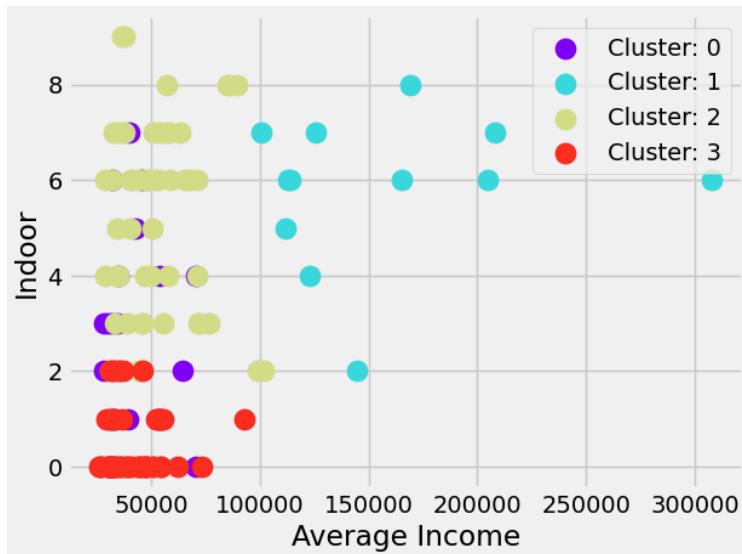
We used K-means clustering machine learning algorithm to identify clusters of locations in the Toronto area based on population, average income, and number of existing summer and indoor tennis venues in each neighbourhood.

Finally, to better understand the results, we visualized the clusters and density of tennis venues on a heat map:



Heat map

To identify characteristics of each cluster, we plotted clusters on a chart with different combination of parameters (eg. Number of indoor clubs and average income). We can see in the following example that cluster 0 has low number of indoor courts and low average income.



The machine learning algorithm identified 4 clusters in the data:

Cluster 0:

Cluster 0 contains a large population and lower income than other clusters.

Neighborhood	Population	Average Income	Indoor	Summer
Newtonbrook West	23831.0	34904.0	2.0	61.0
Dorset Park	25003.0	31692.0	3.0	72.0
Stonegate-Queensway	25051.0	64140.0	2.0	77.0
Westminster-Branson	26274.0	32724.0	2.0	46.0
Milliken	26572.0	28085.0	3.0	27.0
Clairlea-Birchmount	26984.0	36232.0	0.0	52.0
West Hill	27392.0	33323.0	1.0	30.0
York University Heights	27593.0	29958.0	3.0	50.0
South Riverdale	27876.0	53803.0	4.0	60.0
Wexford/Maryvale	27917.0	35047.0	4.0	66.0
Agincourt North	29113.0	30414.0	1.0	39.0
Bendale	29960.0	33256.0	1.0	47.0
Glenfield-Jane Heights	30491.0	27984.0	2.0	56.0
Niagara	31180.0	70623.0	0.0	0.0
Mount Olive-Silverstone-Jamestown	32954.0	26548.0	0.0	34.0
West Humber-Clairville	33312.0	31771.0	0.0	44.0
Mimico (includes Humber Bay Shores)	33964.0	54438.0	1.0	66.0
Parkwoods-Donalda	34805.0	42516.0	5.0	102.0
Downsview-Roding-CFB	35052.0	34168.0	3.0	77.0
Dovercourt-Wallace Emerson-Junction	36625.0	39740.0	7.0	99.0
Malvern	43794.0	29573.0	0.0	0.0
Islington-City Centre West	43965.0	52787.0	1.0	69.0
L'Amoreaux	43993.0	31826.0	6.0	91.0
Rouge	46496.0	39556.0	1.0	26.0
Willowdale East	50434.0	45326.0	6.0	124.0
Woburn	53485.0	30878.0	0.0	0.0
Waterfront Communities-The Island	65913.0	70600.0	4.0	38.0

Cluster 1:

Cluster 1 contains a small population and has the highest income, but has the lowest ratio of outdoor to indoor tennis clubs.

Neighborhood	Population	Average Income	Indoor	Summer
Bridle Path-Sunnybrook-York Mills	9266.0	308010.0	6.0	128.0
Kingsway South	9271.0	144642.0	2.0	111.0
Forest Hill South	10732.0	204521.0	6.0	93.0
Casa Loma	10968.0	165047.0	6.0	92.0
Yonge-St.Clair	12528.0	114174.0	6.0	101.0
Lawrence Park North	14607.0	111730.0	5.0	113.0
Lawrence Park South	15179.0	169203.0	8.0	120.0
Leaside-Bennington	16828.0	125564.0	7.0	105.0
St.Andrew-Windfields	17812.0	100516.0	7.0	145.0
Rosedale-Moore Park	20923.0	207903.0	7.0	99.0
Bedford Park-Nortown	23236.0	123077.0	4.0	81.0
Annex	30526.0	112766.0	6.0	92.0

Cluster 2:

Cluster 2 contains a small population and average income. Its ratio of outdoor to indoor tennis clubs is similar to that of cluster 1.

Neighborhood	Population	Average Income	Indoor	Summer
Beechborough-Greenbrook	6577.0	33829.0	2.0	89.0
University	7607.0	50757.0	7.0	94.0
Blake-Jones	7727.0	48511.0	6.0	101.0
Playter Estates-Danforth	7804.0	70831.0	6.0	105.0
Lambton Baby Point	7985.0	76629.0	3.0	94.0
Old East York	9233.0	53315.0	6.0	93.0
Danforth	9666.0	55225.0	3.0	84.0
Rustic	9941.0	31800.0	2.0	83.0
Caledonia-Fairbank	9955.0	35112.0	4.0	90.0
Runnymede-Bloor West Village	10070.0	71888.0	3.0	91.0
Regent Park	10803.0	34597.0	7.0	82.0
Humber Heights-Westmount	10948.0	45615.0	2.0	86.0
Princess-Rosethorn	11051.0	99055.0	2.0	91.0
Keelesdale-Eglinton West	11058.0	33316.0	3.0	98.0
Weston-Pelham Park	11098.0	33528.0	4.0	94.0
Broadview North	11499.0	44557.0	6.0	99.0
Cabbagetown-South St. James Town	11669.0	63012.0	7.0	90.0
Dufferin Grove	11785.0	40588.0	5.0	78.0
Yonge-Eglinton	11817.0	89330.0	8.0	107.0
Forest Hill North	12806.0	85099.0	8.0	113.0
Bayview Woods-Steeles	13154.0	47246.0	4.0	95.0
Mount Dennis	13593.0	30827.0	2.0	100.0
Palmerston-Little Italy	13826.0	58071.0	7.0	96.0
Corso Italia-Davenport	14133.0	41717.0	6.0	97.0
Briar Hill-Belgravia	14257.0	34768.0	4.0	76.0
Humewood-Cedarvale	14365.0	65274.0	6.0	93.0
Junction Area	14366.0	49709.0	4.0	93.0
Yorkdale-Glen Park	14804.0	38527.0	3.0	76.0
Edenbridge-Humber Valley	15535.0	101551.0	2.0	106.0
Henry Farm	15723.0	36359.0	7.0	133.0
Pleasant View	15818.0	36346.0	9.0	122.0
Bathurst Manor	15873.0	45936.0	3.0	64.0
Newtonbrook East	16097.0	45212.0	3.0	87.0
Lansing-Westgate	16164.0	72371.0	3.0	99.0
Trinity-Bellwoods	16556.0	50694.0	5.0	79.0
Mount Pleasant East	16775.0	85340.0	8.0	110.0
Hillcrest Village	16934.0	40442.0	6.0	92.0
Willowdale West	16936.0	44576.0	2.0	90.0
Kensington-Chinatown	17945.0	37422.0	7.0	77.0
North St. James Town	18615.0	32648.0	7.0	94.0
Moss Park	20506.0	58915.0	6.0	64.0
Thorncliffe Park	21108.0	28875.0	6.0	107.0
Bayview Village	21396.0	52035.0	6.0	128.0
Flemington Park	21933.0	28654.0	4.0	97.0
Willowridge-Martingrove-Richview	22156.0	44177.0	2.0	82.0
High Park North	22162.0	57465.0	4.0	95.0
Rockcliffe-Smythe	22246.0	34059.0	2.0	97.0
Englemount-Lawrence	22372.0	48134.0	6.0	86.0
High Park-Swansea	23925.0	71204.0	4.0	81.0
Steeles	24623.0	31786.0	6.0	71.0
Bay Street Corridor	25797.0	56526.0	7.0	76.0
Don Valley Village	27051.0	37379.0	9.0	117.0
Tam O'Shanter-Sullivan	27446.0	34200.0	5.0	81.0
Banbury-Don Mills	27695.0	67757.0	6.0	104.0
Mount Pleasant West	29658.0	57039.0	8.0	102.0

Cluster 3:

Cluster 3 contains a small population and relatively low income. Also, it has a very low number of indoor tennis clubs; most neighbourhoods do not have any indoor clubs. Additionally, cluster 3 contains the smallest number of outdoor tennis venues.

Neighborhood	Population	Average Income	Indoor	Summer
Woodbine-Lumsden	7865.0	47710.0	0.0	70.0
Elms-Old Rexdale	9456.0	32012.0	0.0	66.0
Guildwood	9917.0	53203.0	1.0	24.0
Long Branch	10084.0	47384.0	0.0	0.0
Maple Leaf	10111.0	37108.0	2.0	73.0
Thistletown-Beaumont Heights	10360.0	32815.0	0.0	52.0
Rexdale-Kipling	10529.0	34418.0	0.0	67.0
Markland Wood	10554.0	62378.0	0.0	34.0
Pelmo Park-Humberlea	10722.0	39003.0	0.0	78.0
New Toronto	11463.0	44101.0	0.0	35.0
Etobicoke West Mall	11848.0	38255.0	0.0	47.0
North Riverdale	11916.0	73253.0	0.0	0.0
Alderwood	12054.0	47709.0	0.0	39.0
Humber Summit	12416.0	30731.0	2.0	40.0
Highland Creek	12494.0	40972.0	0.0	0.0
Woodbine Corridor	12541.0	55199.0	1.0	61.0
Centennial Scarborough	13362.0	54045.0	1.0	16.0
Ionview	13641.0	31383.0	1.0	47.0
Oakridge	13845.0	26793.0	0.0	54.0
Wychwood	14349.0	54460.0	0.0	0.0
Greenwood-Coxwell	14417.0	46206.0	2.0	68.0
Roncesvalles	14974.0	50580.0	0.0	0.0
Humbermede	15545.0	29528.0	1.0	64.0
Little Portugal	15559.0	45737.0	0.0	0.0
Taylor-Massey	15683.0	30430.0	0.0	65.0
Cliffcrest	15935.0	44718.0	0.0	19.0
Clanton Park	16472.0	51181.0	0.0	0.0
Scarborough Village	16724.0	32913.0	0.0	28.0
Kennedy Park	17123.0	30974.0	0.0	34.0
Danforth East York	17180.0	51846.0	1.0	61.0
Morningside	17455.0	32291.0	1.0	39.0
Victoria Village	17510.0	35786.0	0.0	0.0
Brookhaven-Amesbury	17757.0	32483.0	2.0	68.0
Weston	17992.0	32997.0	0.0	0.0
Eringate-Centennial-West Deane	18588.0	47002.0	0.0	45.0
O'Connor-Parkview	18675.0	43907.0	0.0	72.0
Oakwood Village	21210.0	39803.0	0.0	0.0
East End-Danforth	21381.0	54324.0	1.0	59.0
The Beaches	21567.0	92580.0	1.0	49.0
Black Creek	21737.0	25989.0	0.0	0.0
South Parkdale	21849.0	35207.0	2.0	60.0
Kingsview Village-The Westway	22000.0	36674.0	1.0	81.0
Birchcliffe-Cliffside	22291.0	54360.0	0.0	42.0
Eglinton East	22776.0	30033.0	0.0	25.0
Agincourt South-Malvern West	23757.0	31825.0	1.0	59.0

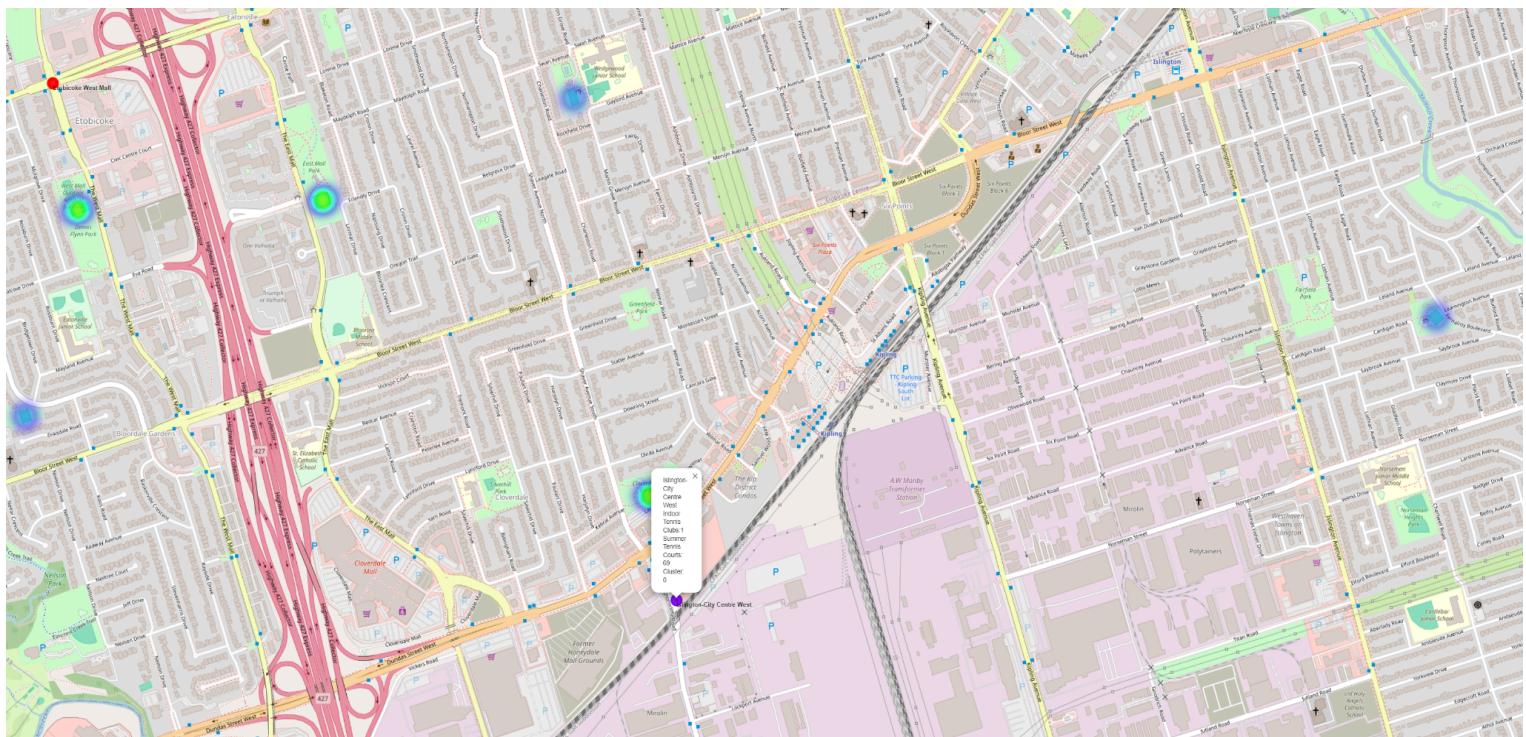
We looked at the characteristics of each cluster and determined that a neighbourhood is considered a good location for a winter tennis club if there are a small number of existing indoor tennis clubs, and a large number of summer tennis clubs, in that neighbourhood. Additional factors that were taken into consideration were population and average income. Based on preliminary results, we identified good candidates for indoor tennis clubs in each cluster. Some examples of such neighbourhoods include: Islington-City Centre West, Leaside-Bennington, Edenbridge-Humber Valley, Bayview Village, Thorncliffe Park, O'Connor-Parkview and The Beaches. The results will be explained in further detail in the “Results” section of this report.

Results

Let's examine some of the suitable neighbourhoods in more detail:

Cluster 0:

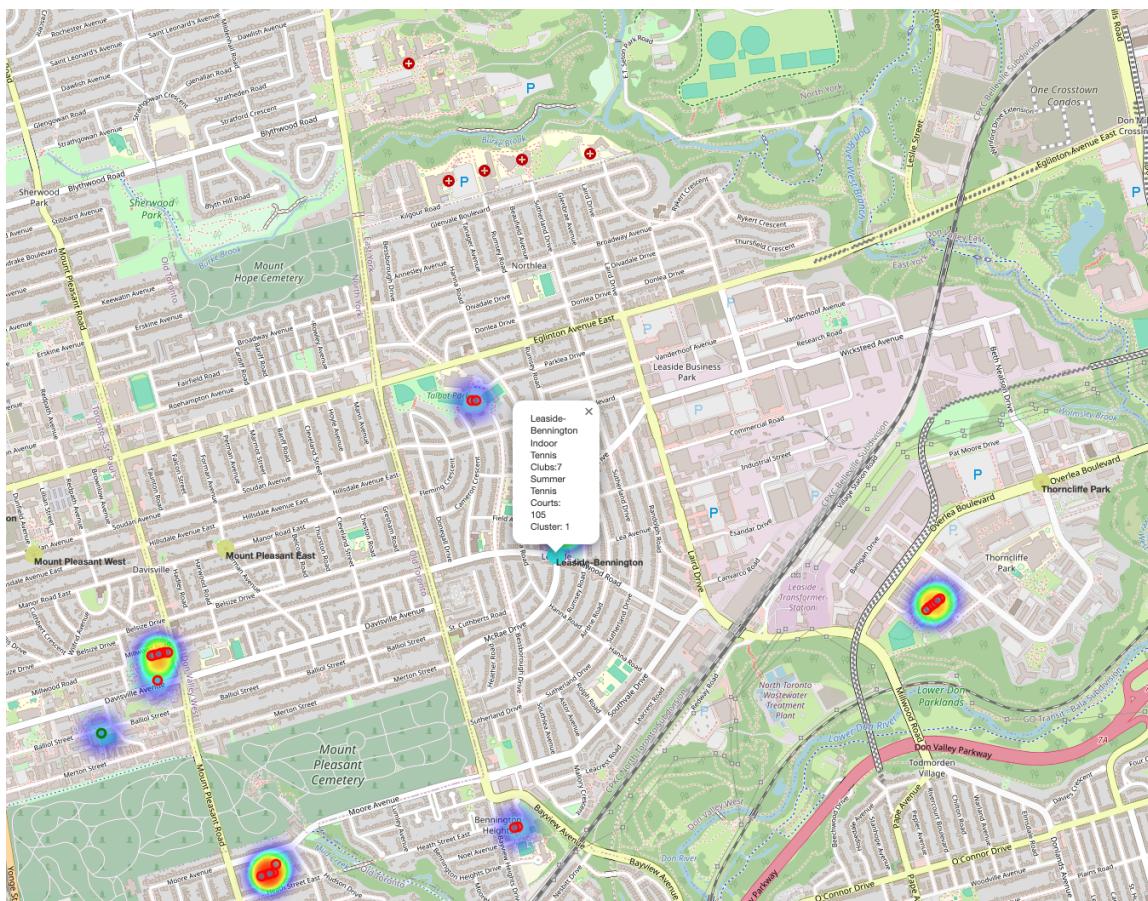
In cluster 0, it looks like the Islington-City Centre West neighbourhood may be a good option for opening a winter tennis club. First, the population and average income in this neighbourhood are higher than the average population and income of cluster 0. Then, Islington-City Centre West has a relatively high ratio of summer to indoor tennis clubs, with 69 outdoor clubs and only 1 indoor club. Additional factors that make this neighbourhood a good candidate for a winter tennis club are its proximity to the subway line and highway. There is also plenty of parking space available, due to the nearby mall and grocery stores. Furthermore, there are several junior and middle schools in the area. This would benefit a winter tennis club because there could be a high demand for after-school tennis programs, for instance.



Islington-City Centre West

Cluster 1:

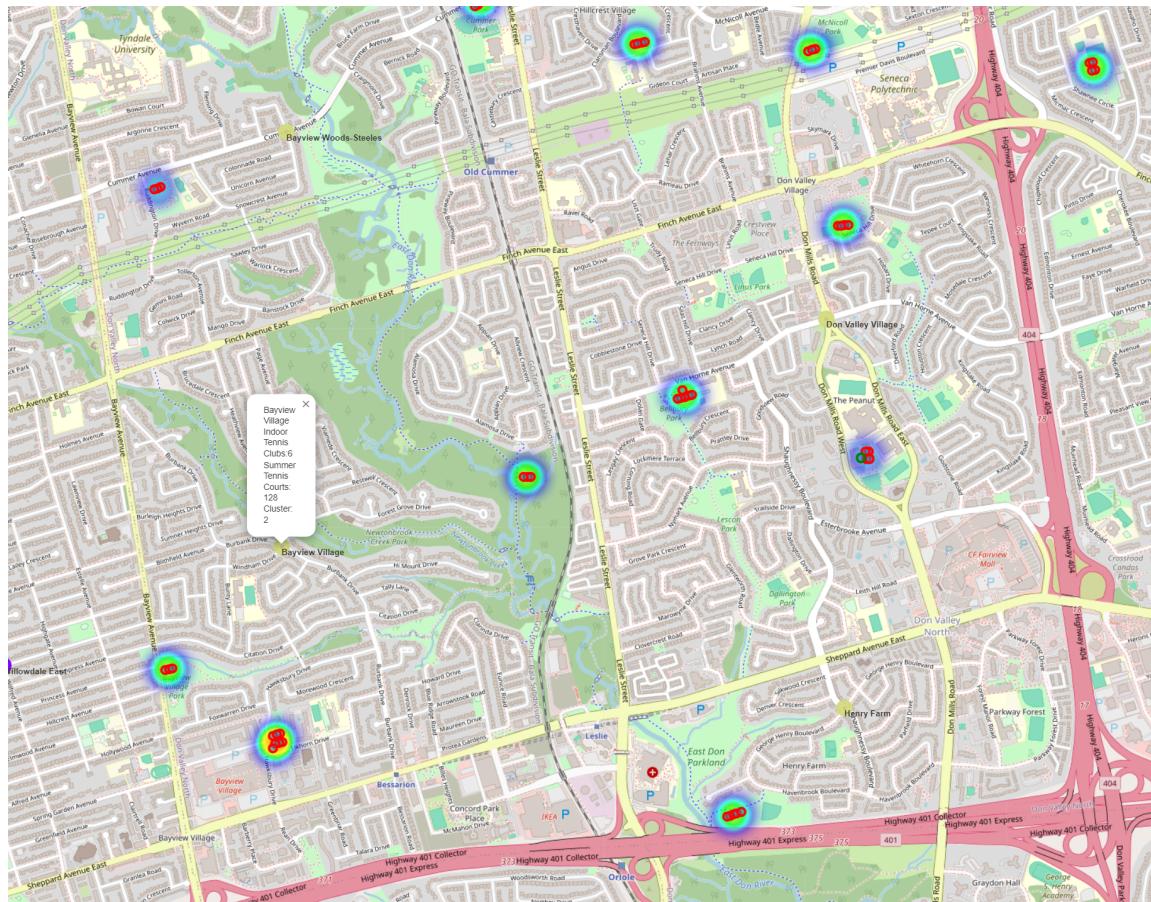
In cluster 1, the neighbourhood Leaside-Bennington seems like it may be a good location for opening a winter tennis club. First, its population is a bit higher than that of cluster 1. Then, Leaside-Bennington has a high income compared to neighbourhoods in other clusters, so it is more likely that residents will be able to afford a membership for a winter tennis club. Additionally, Leaside-Bennington has a large number of outdoor courts, which means there may be many people in the neighbourhood who play tennis and who would join a winter tennis club if it were to open in that location. Furthermore, there are many parks and lots of green space surrounding this neighbourhood, which means two things; first, there are probably a lot of recreational and physical activities that people enjoy in this area, so they may be interested in joining a tennis club. Secondly, a lot of land in any particular region signifies that it is not too dense and there is space for building, so there would be plenty of space to build an indoor tennis club in this neighbourhood. Finally, Leaside-Bennington is easily accessible, as it is close to the highway (Don Valley Parkway).



Leaside-Bennington

Cluster 2:

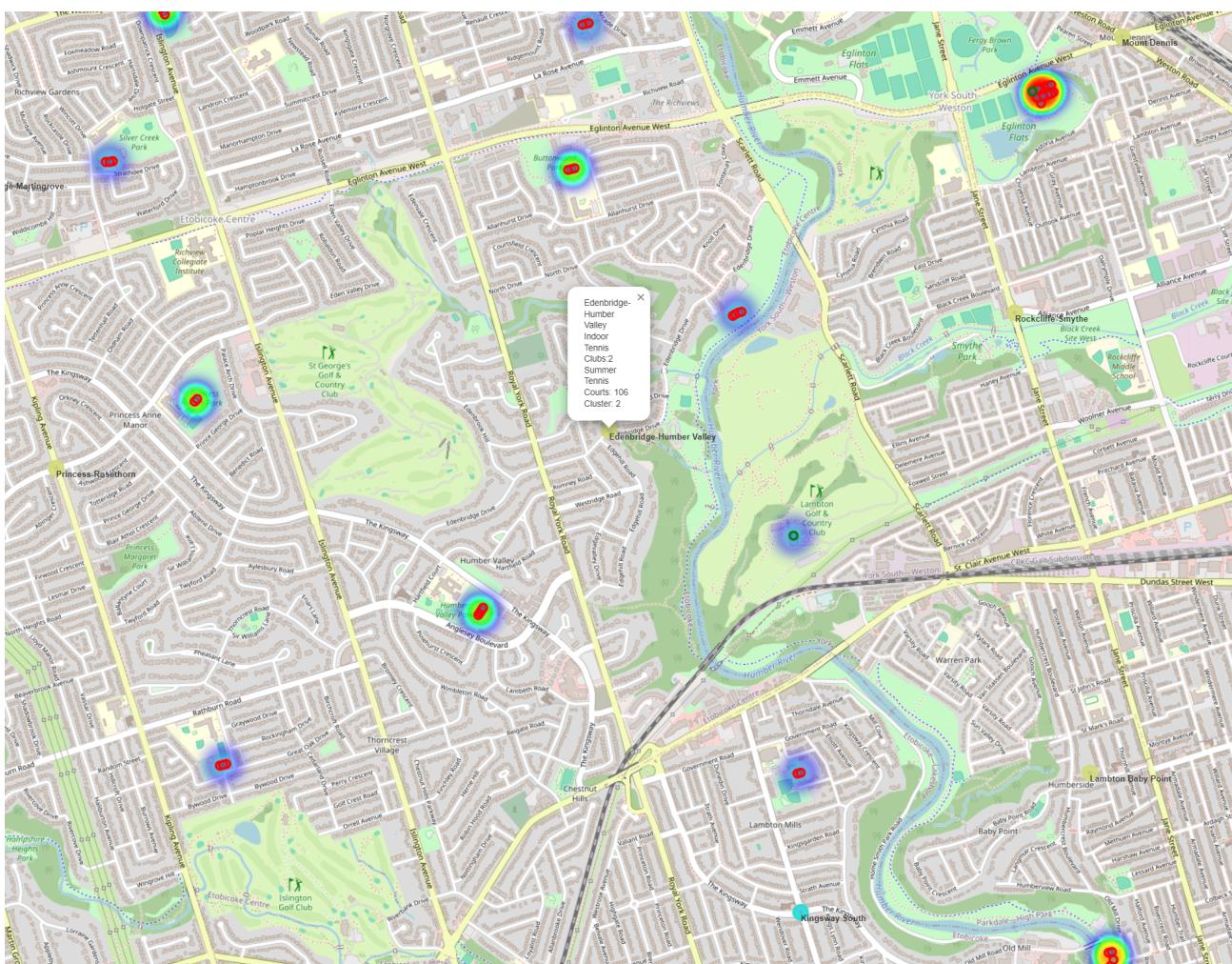
In cluster 2, there are a few neighbourhoods which are suitable for opening an indoor tennis club. The first option is Edenbridge-Humber Valley. This neighbourhood is located right by the Humber River, where people enjoy a variety of recreational and physical activities. Opening an indoor tennis club would give these people an opportunity to try another activity and many of them may be interested in tennis. Also, there are over 100 outdoor tennis courts in the area and only 2 indoor tennis clubs, which means there may be a high demand for tennis in this region. However, there are probably not enough indoor courts to accommodate all the tennis players in the neighbourhood, so opening another indoor club would be beneficial. Furthermore, the average income in the Edenbridge-Humber Valley neighbourhood is very high; about twice as much as the average income for cluster 2. This implies that many residents could probably afford a winter tennis membership and perhaps they would consider it if a winter tennis club were to open nearby. Furthermore, there are several golf courses in this region. Often, people who enjoy golf also enjoy tennis, and vice versa, so there may be a high interest in tennis in this area.



Edenbridge-Humber Valley

Another neighborhood in cluster 2 that may be suitable for opening an indoor tennis club is Bayview Village.

First, there is a lot of green space in this region, meaning there is plenty of space to build an indoor tennis venue. Then, there are many schools in the area, so if a tennis club were to open, perhaps there would be a high demand for after-school tennis programs. Additionally, there are a very large number of outdoor tennis courts, so tennis may be a popular activity in this neighbourhood. Furthermore, Bayview Village is easily accessible from highways 401 and 404. Finally, the population and average income of this neighbourhood are both slightly higher than those of cluster 2, which means there is a higher chance of more people being able to afford to join an indoor tennis club.



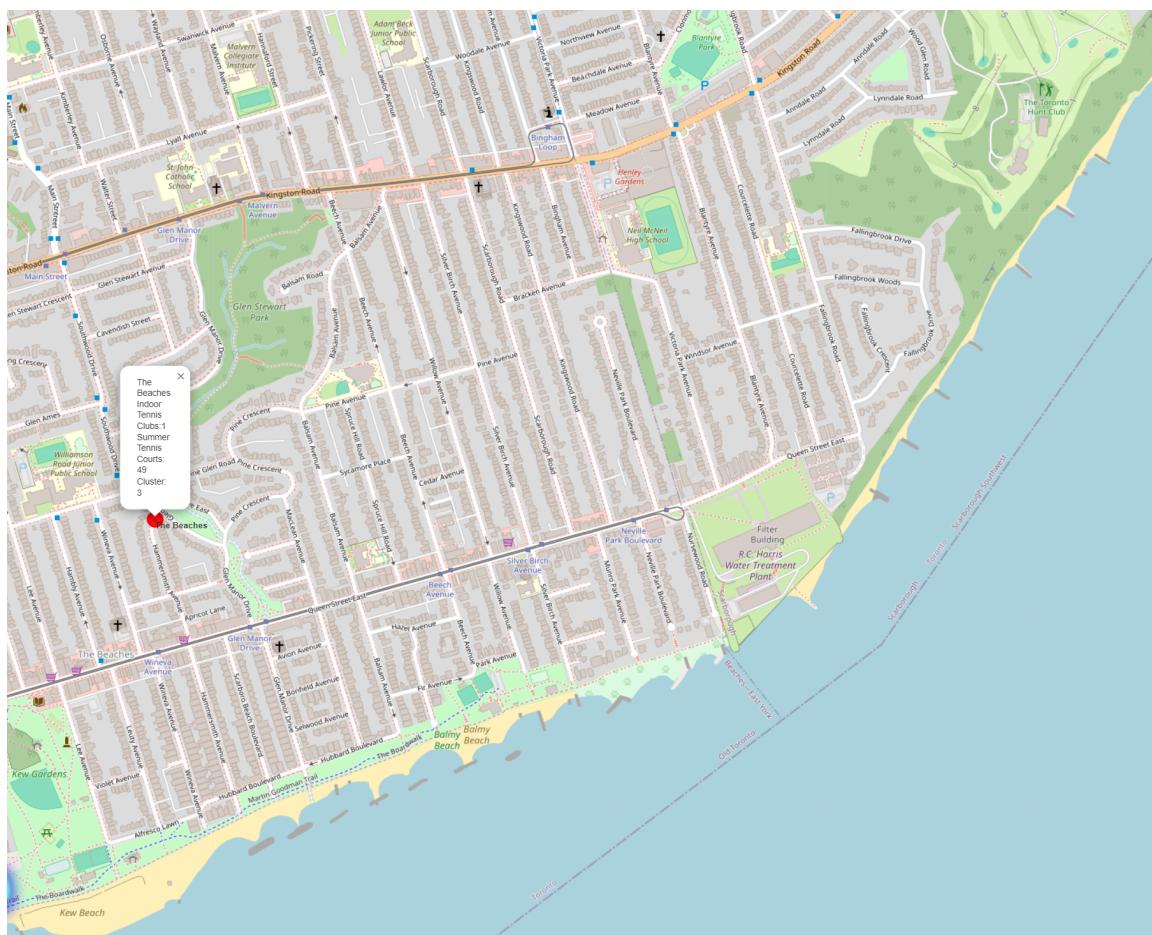
Bayview Village

A third option in cluster 2 which may be a good neighbourhood for opening a winter tennis club is Thorncliffe Park. As per its name, this is an area with many parks and green spaces. Consequently, there is a lot of building space and many recreational facilities, including outdoor tennis courts. There are over 100 outdoor tennis courts in the area and not too many indoor courts, so it would be beneficial to open another indoor tennis club. Next, there are many nearby restaurants and lots of parking spaces available in the area, both of which would be useful to members of a tennis club. Additionally, the population of this neighbourhood is higher than the average population of cluster 2, so there is a greater chance of getting more people to join an indoor tennis club. Finally, the Thorncliffe Park neighbourhood is easily accessible; it is located close enough to downtown, close to a major highway (Don Valley Parkway) and will be off the new Ontario Line.



Thorncliffe Park

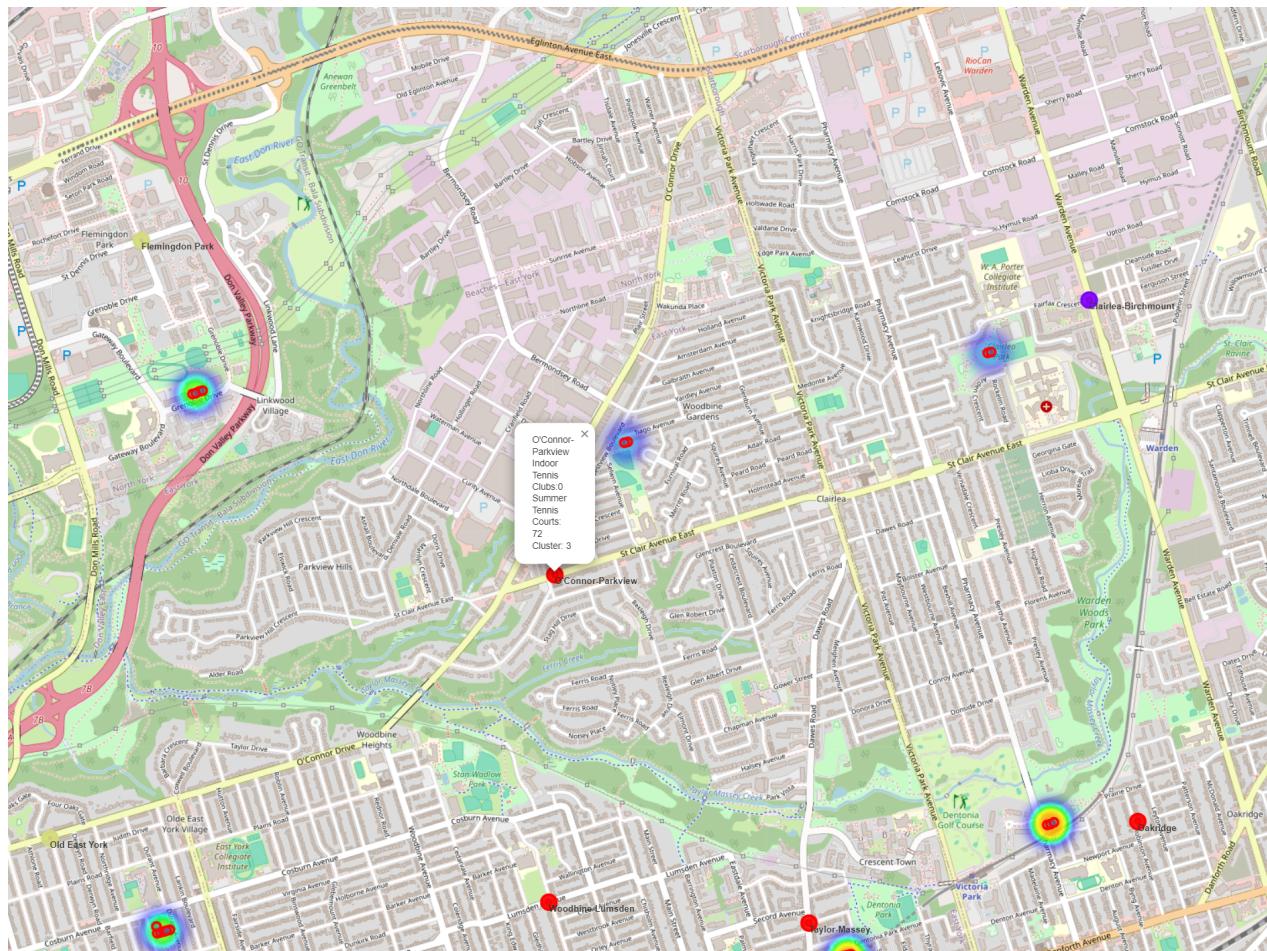
Finally, in cluster 3, there are also a few different options in terms of which neighbourhood may be a good location for opening an indoor tennis club. One of the options is the O'Connor-Parkview neighbourhood. First, this neighbourhood has a population and average income that are both higher than those of cluster 3. Then, this neighbourhood has one of the highest counts of outdoor tennis courts in cluster 3; it contains 72 outdoor courts. Additionally, there are no existing indoor tennis courts in the neighbourhood, so it would be a good idea to open an indoor tennis club; there would be little to no competition from other indoor clubs and there would probably be a high demand for winter tennis, from those who play at the outdoor courts in the neighbourhood. Furthermore, O'Connore-Parkview is located right by a large river with many surrounding parks, which means that the residents of this neighbourhood probably enjoy many recreational and physical activities. Hence, many of them may benefit from an indoor tennis club in the area. There is also a golf course nearby, so many people who play golf may consider joining a winter tennis club. Finally, the O'Connor-Parkview neighbourhood is easily accessible, as there are many bike paths in the area and it is also close to a major highway (Don Valley Parkway).



O'Connor-Parkview

Another location in cluster 3 where it may be good to open an indoor tennis club is The Beaches. Its population is higher than the average population of neighbourhoods in cluster 3, and the average income of this neighbourhood is very high; more than twice the average income of cluster 3. This means there are probably many people living in The Beaches who can afford a membership for a winter tennis club. Furthermore, this neighbourhood is close to the lake and to parks, meaning there are a lot of recreational facilities and active people in the area. Additionally, there are many outdoor tennis courts, but only one indoor tennis club in the area.

Finally, The Beaches is a popular tourist area with many cafes and restaurants, which may be frequented by members of the tennis club. Tourists in this area may also benefit from an indoor tennis club, when the weather is not suitable for outdoor activities.



The Beaches

Conclusion

Using data gathered from reliable sources, through the K-Means clustering algorithm and data exploration and analysis, we determined that there are numerous neighbourhoods in Toronto that may be good locations for opening a winter tennis club. Although there are several suitable neighbourhoods, our client is particularly interested in opening a winter tennis club in Thorncliffe Park, as she currently runs a summer club in that area. After assessing the client's requirements and doing thorough data analysis, we concluded that Thorncliffe Park is one of the better locations in Toronto for opening a winter tennis club.

References

Homepage. City of Toronto Open Data Portal. (n.d.). <https://open.toronto.ca/>

Hoodq Homebuyer Hub. Toronto Neighbourhoods: Thorncliffe Park. (n.d.).
<https://hoodq.com/explore/toronto-on/thorncliffe-park>

Indoor Ota Clubs. (n.d.-b). [https://www.tennisontario.com/storage/app/public/document-repositories/June2023/Indoor OTA Clubs \(new\).pdf](https://www.tennisontario.com/storage/app/public/document-repositories/June2023/Indoor%20OTA%20Clubs%20(new).pdf)