CAPSTONE PROJECT

The Battle of the Neighborhoods

Business Problem

Problem

In this project, we are going to recommend a location for a pharmacy to be started in a neighborhood.

Background

Toronto is the capital city of the Canadian province of Ontario. It is the fourth most populous city in North America. It is an international and multicultural city center with many businesses. This project will focus on areas in and near Toronto to identify the best choice locations for starting a new pharmacy.

Toronto's 2020 population is very diverse consisting of an international mix of people. The average life expectancy is about 83 years. The urban population has been on an increase(Reference). An aging population needs medical care and appropriate close-by pharmacies to get medicine soon. The pharmacy also typically helps with consultation and sometimes is even equipped with mini-clinics to offer advice to incoming customers with or without insurance at a nominal charge. Starting a pharmacy however can be tricky and should not be done in a place that is already overcrowded with these services. This project allows us to use four square api to get venues near a neighborhood location and apply machine learning techniques to analyse the data in order to recommend a location for starting a pharmacy. Age of people and income also matters as these are considered when pharmacy usage is involved.

Interest

The population that needs medical attention is growing and will constitute a need for more medical care and pharmacies. Also, the world is now experiencing a pandemic called Covid-19. Hence this problem is interesting and will provide a report to help find a good location to start a pharmacy.

Appropriate data gathering, cleaning, analysis using machine learning techniques learnt in the Coursera lessons and labs will be used to identify a solution to the problem.

Data

The project analysis can be applied to any city whose borough and neighborhood information is available, but we will focus on Toronto data that was available in the Coursera labs to analyze and report on a suitable location for a pharmacy setup.

Based on the definition of our problem, factors that will impact the decision are:
- Number of existing pharmacies in the neighborhood and nearby
- Number of existing medical centers in the neighborhood and nearby

- Toronto income and age levels reference study to understand the need for pharmacies. This is useful to understand if it is viable financially and demand wise to thrive well (this will be obtained from the net using different sources of information on the internet)

In this project, we will use the postal code and borough/neighborhood information pertaining to Toronto city. We will then clean the data and apply Foursquare API to get a list of venues related to medical data near the city. We will then use python libraries to create appropriate data frames that relate the neighborhoods to the frequency of nearby available medical centers including pharmacy. Using this data frame, we will then use the machine learning algorithm like k-means clustering to identify or predict which neighborhood may be better suited to start a pharmacy.

Data Acquisition

The data is obtained from the following sources:

- [Toronto Neighborhoods and Boroughs](#)
- [Toronto Geospatial Data](#) **We could use the Google Geocoding API but chose to use a set that is already available for the geospatial data from Coursera lab**
- **Toronto demographics information is obtained from these [sources](#)**
- **Toronto Venues of Interest: The Four-Square API will be used to fetch nearby medical center data including that for pharmacies. Limits are set to 100 with radius 500 due to limitations of free API availability.**

Data Description

Toronto Neighborhoods and Boroughs

The data fetched from this site will provide a list of postal codes along with the borough and neighborhood information for Toronto. This will be accessed using a http request and then the response will be parsed to obtain this list.

Postal Code ⇕	Borough ⇕	Neighbourhood ⇕
M1A	Not assigned	Not assigned
M2A	Not assigned	Not assigned
M3A	North York	Parkwoods
M4A	North York	Victoria Village
M5A	Downtown Toronto	Regent Park, Harbourfront
M6A	North York	Lawrence Manor, Lawrence Heights
M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government
M8A	Not assigned	Not assigned
M9A	Etobicoke	Islington Avenue, Humber Valley Village
M1B	Scarborough	Malvern, Rouge
M2B	Not assigned	Not assigned
M3B	North York	Don Mills

The geo spatial data is useful for finding locations and their latitude and longitude that will provide input to Four-Square API to get a list of nearby venues.
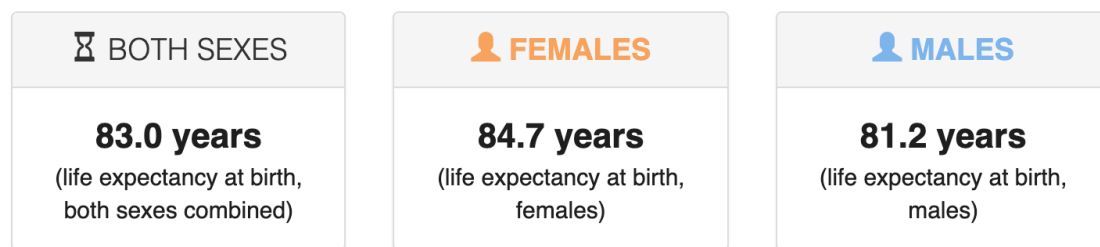
Postal Code	Latitude	Longitude
M1B	43.8066863	-79.194353
M1C	43.7845351	-79.160497
M1E	43.7635726	-79.188712
M1G	43.7709921	-79.216917
M1H	43.773136	-79.239476
M1J	43.7447342	-79.239476

Toronto Demographics

This is just used to understand the demographics, age and health status in Toronto. It also provides an insight to the population density and average mortality rate. These help us understand how health and pharmacies are essential.

Life Expectancy in Canada

See also: Countries in the world ranked by Life Expectancy

⌛ BOTH SEXES	👤 FEMALES	👤 MALES
83.0 years	**84.7 years**	**81.2 years**
(life expectancy at birth, both sexes combined)	(life expectancy at birth, females)	(life expectancy at birth, males)

Toronto Venues of Interest

Four-Square API will return a list of venues that are of interest to the geo spatial locations obtained using the geospatial data for certain borough (Etobicoke in this project) and neighborhoods in Toronto. This JSON formatted result set will be processed to identify close-by medical centers and pharmacies to the location being considered, in this case a borough in Toronto. The JSON data is parsed and converted to a pandas dataframe as follows.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Islington Avenue, Humber Valley Village	43.667856	-79.532242	Shoppers Drug Mart	43.663067	-79.531753	Pharmacy
1	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	Shoppers Drug Mart	43.641312	-79.576924	Pharmacy
2	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	Burnhamthorpe Health Centre	43.642328	-79.576959	Medical Center
3	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	Dr Henry Nirenberg Dental Office	43.641895	-79.578301	Dentist's Office
4	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	Medical Clinic - Family Practice	43.641797	-79.576441	Doctor's Office
5	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	Dr Tse	43.641522	-79.576825	Doctor's Office
6	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201	John C Kuhlmann	43.641707	-79.574864	Doctor's Office