# Identifying the Gaps in University Coverage in Toronto

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### 1. Introduction

# 1.1. Background

Toronto has been consistently ranked as one of the top student cities in the world (11<sup>th</sup> in 2019, 13<sup>th</sup> in 2018, 11<sup>th</sup> in 2017)<sup>1</sup>. There are four universities in Toronto, namely Ryerson University, University of Toronto, York University, and Trent University<sup>2</sup>. Data shows that there are around 180,000 students studying at these universities<sup>3</sup>. Of the four universities mentioned, only Trent University is situated outside the city of Toronto.

In 2016, statistics show that 54% of Canadians aged 25 to 64 have a college or university diploma, which ranks first among the Organisation for Economic Co-Operation and Development (OECD) countries<sup>4</sup>. Census data shows that there are 245,605 people aged 18 to 25 in Toronto<sup>5</sup>. Multiplying the percentage of Canadians in college with the number of potential students in Toronto, there are roughly 132,000 people in college and 135,000 people who are not in college.

#### 1.2. Problem

Ideally 100% of people would have the option of tertiary education, but they may be constrained by factors such as cost or distance. This project aims to determine the ideal locations

<sup>&</sup>lt;sup>1</sup> https://www.topuniversities.com/city-rankings/2019

<sup>&</sup>lt;sup>2</sup> https://studyabroad.shiksha.com/top-universities-in-toronto-articlepage-1533

<sup>&</sup>lt;sup>3</sup> https://ocul.on.ca/populations

<sup>&</sup>lt;sup>4</sup> https://www150.statcan.gc.ca/n1/daily-quotidien/171129/dq171129a-eng.htm

<sup>&</sup>lt;sup>5</sup> https://www12.statcan.gc.ca/census-recensement/2011/dp-

for new universities or satellite campuses in Toronto that serve the neighborhoods which may be too far from the existing universities while accounting for the total population of neighborhoods<sup>6</sup>.

#### 1.3. Interest

It would be of interest to Ontario's Ministry of Training, Colleges, and Universities to see in what areas of Toronto – the most populous city in Ontario – have limited access to universities, and therefore the province can create new public universities in the target areas. It would also be of interest to private universities who are interested in creating satellite campuses in Toronto to serve a greater population of students. Finally, it would be of interest to the youth of Toronto who may be looking to take up tertiary education but the current universities may be far away from them.

# 2. Data Acquisition and Cleaning

### 2.1. Data Sources

FourSquare, a technological company which uses a massive database of accurate location data, will be utilized to determine the locations and distances of universities in Toronto. Data for the total population of neighborhoods will be sourced from the census of Statistics Canada.

A post on medium.com by A Gordon was also used for information on the boundaries of Toronto neighborhoods and conversion to a Choropleth map<sup>7</sup>.

## 2.2. Data Cleaning

The total population of each postal code was first tallied and placed in a dataframe.

<sup>&</sup>lt;sup>6</sup> https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-

pl/Table.cfm?Lang=Eng&T=1201&SR=1&S=22&O=A&RPP=9999&PR=0

<sup>&</sup>lt;sup>7</sup> https://medium.com/dataexplorations/generating-geojson-file-for-toronto-fsas-9b478a059f04

Data collected from FourSquare will be compiled and will only take into account the three universities mentioned and any satellite campuses they have in Toronto. Other universities and colleges that are not recognized but are shown on FourSquare will be removed.

A problem was encountered when trying to determine the universities near Toronto, wherein most of the results shown were within 1,000 meters from the center of Toronto whereas York University was more than 16,000 meters from the center. As such, a separate search was performed to include York University.

## 2.3. Feature Selection

After data cleaning, there were 103 neighborhoods and 6 features, namely Postal Code, Borough, Neighborhood, Average Income, Latitude, and Longitude.

Pos	stal Code	Borough	Neighborhood	Total Population	Postal Code	Latitude	Longitude	
0	M1B	Scarborough	Malvern, Rouge	66108	M1B	43.806686	-79.194353	
1	M1C	Scarborough	Rouge Hill, Port Union, Highland Creek	35626	M1C	43.784535	-79.160497	
2	M1E	Scarborough	Guildwood, Morningside, West Hill	46943	M1E	43.763573	-79.188711	
3	M1G	Scarborough	Woburn	29690	M1G	43.770992	-79.216917	
4	M1H	Scarborough	Cedarbrae	24383	M1H	43.773136	-79.239476	

The three universities contained 16 features, namely Name, Categories, Address CC (Country Code), City, Country, Cross Street, Distance from Toronto center, LabeledLatLngs, Latitude, Longitude, Neighborhood, Postal Code, Province, and ID.

	name	categories	address	cc	city	country	cross Street	distance	formattedAddress	labeledLatLngs	lat	Ing	neighborhood	postalCode	state	ld
0	University of Toronto	University	27 King's College Cir	CA	Toronto	Canada	at King's College Rd	1148	[27 King's College Cir (at King's College Rd),	[{'label': 'display', 'lat': 43.6624934706167,	43.662493	-79.39522	NaN	M5S 1A1	ON	4ad4c05ef964a52097f620e3
14	Ryerson University	University	350 Victoria St.	CA	Toronto	Canada	at Gould St.	698	[350 Victoria St. (at Gould St.), Toronto ON M	[('label': 'display', 'lat': 43.65793504826254	43.657935	-79.38049	NaN	M58 2K3	ON	4ad7797cf964a520170b21e3
0	York University - Keele	University	4700 Keele St.	CA	Toronto	Canada	NaN	16079	[4700 Keele St., Toronto ON M3J 1P3, Canada]	[{'label': 'display', 'lat': 43.77210701043441	43.772107	-79.50219	NaN	M3J 1P3	ON	4ad78121f964a5208b0b21e3

Finally, a choropleth map was created using the postal codes as boundaries. The scale runs from yellow to red, where yellow means less residents and red mean more residents. Universities were added to the map and are marked by a green marker.

