

The Impact of Different Venues on COVID-19 Transmission in the city of Toronto, Canada

Yicong Li

June 25th, 2021

COVID-19 Pandemic

- According to the data records provided by Centers for Disease Control and Prevention (CDC), the number of infection cases in the United States until June 25th, 2021, is about 34 million [1].
- Currently, the main known route of transmission of SARS-CoV-2 is through close direct or indirect person-to-person contact [2].

Knowing which specific facilities have enhanced the spread of the virus could be valuable.

The data analysis of possible transmission points:

- Could provide some reference for controlling the spread of the virus.
- Could offer valuable cases for preventing the spread of other infectious diseases in ways of analyzing the characteristics of these transmission points and executing targeted public health management on similar locations.
- The result might be concerned by the local government for decision-making on related issues.

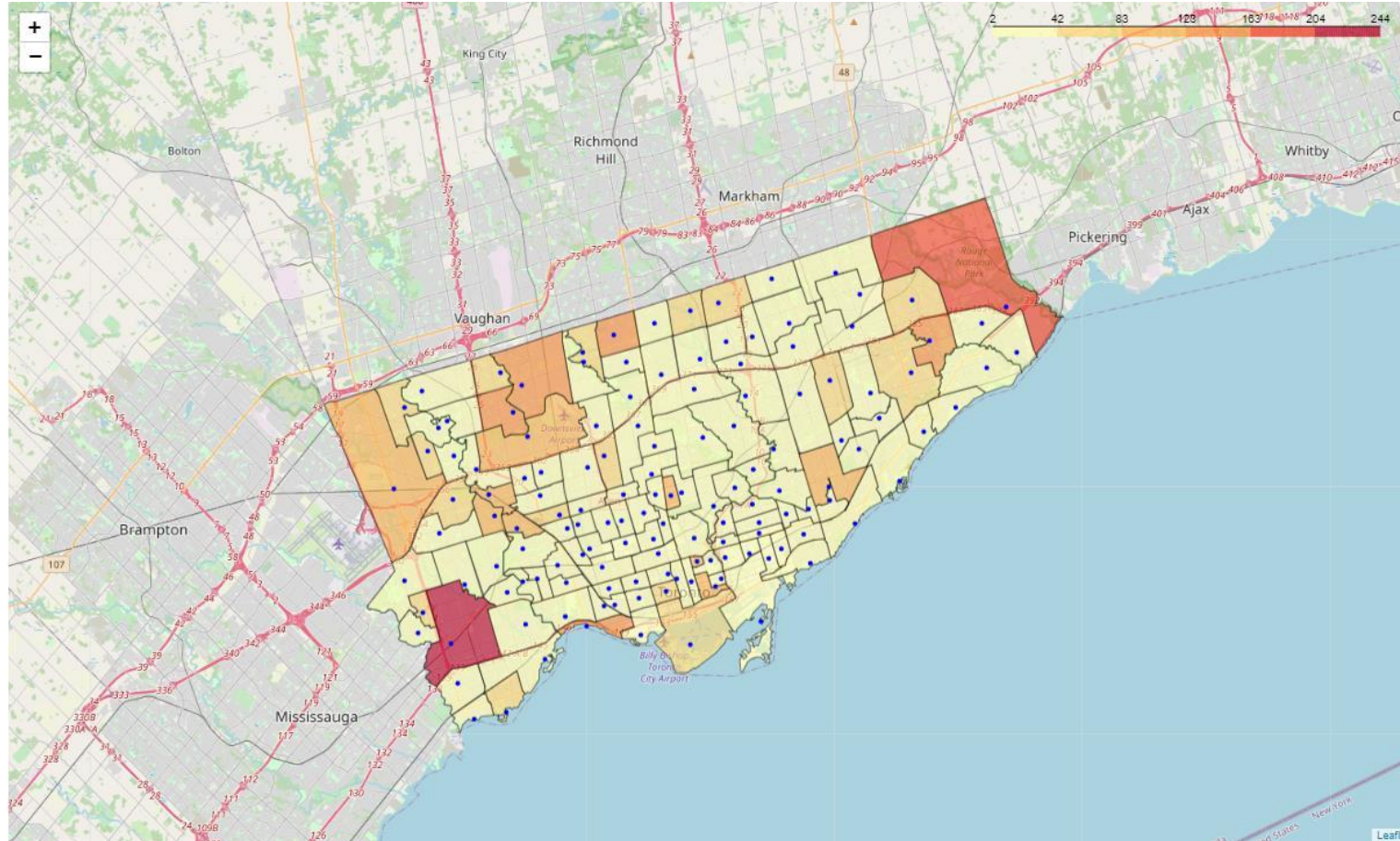
Data acquisition

- Data about the confirmed and probable cases of patients infected with SARS-CoV-2 virus is provided by Open Data Portal of the city of Toronto [3].
- Neighborhood Data of Toronto city is also provided by Open Data Portal [4].
- Foursquare Place API [5] offers access to its global database which contains location-based data of venues, including venue trending, venue categories, venue latitude and longitudes and so on.

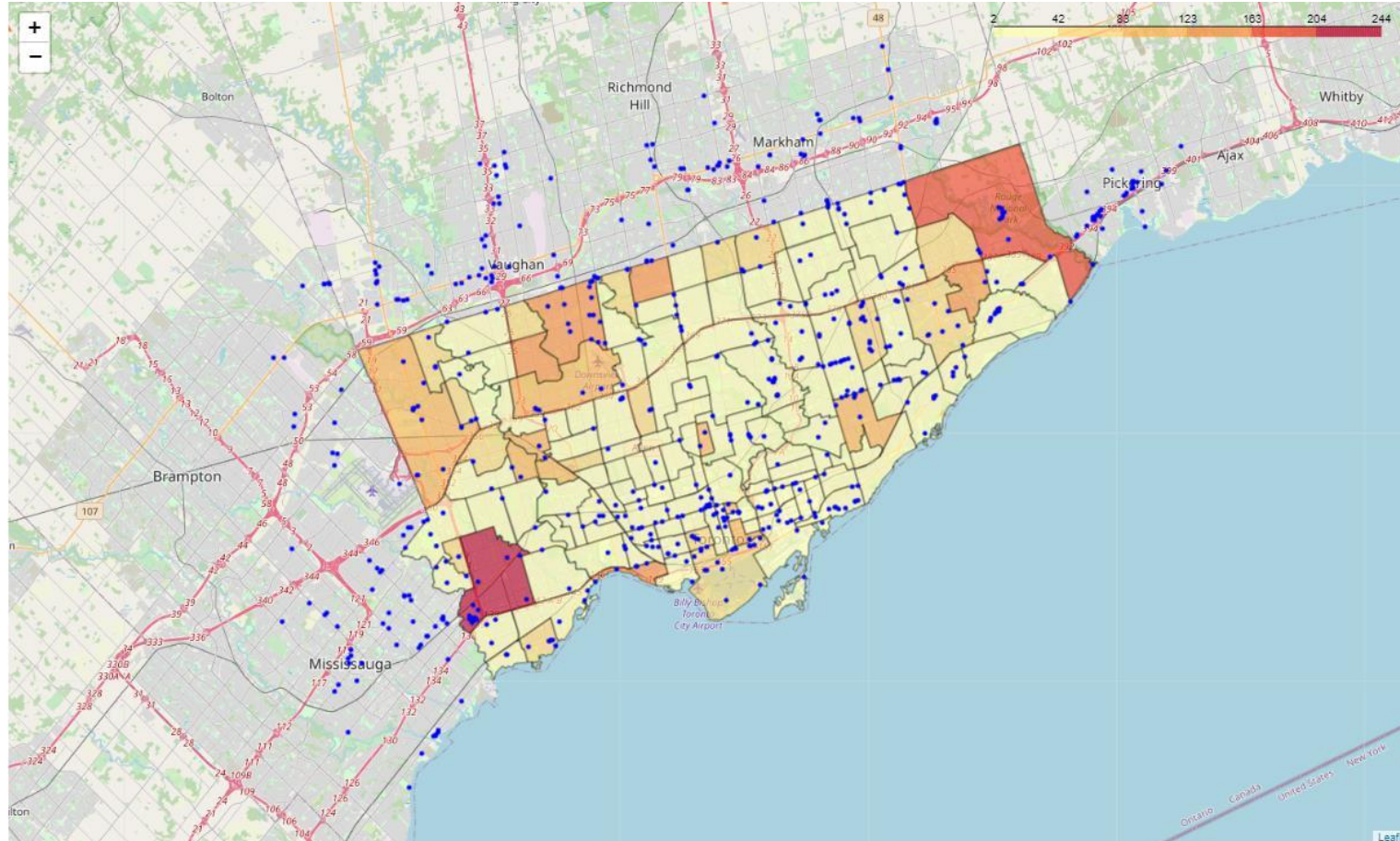
About Venue Data Retrieving:

- Location: Centroid coordinates of neighborhoods
- Radius: 10000km
- Selection: Trending
- Version: 20200101

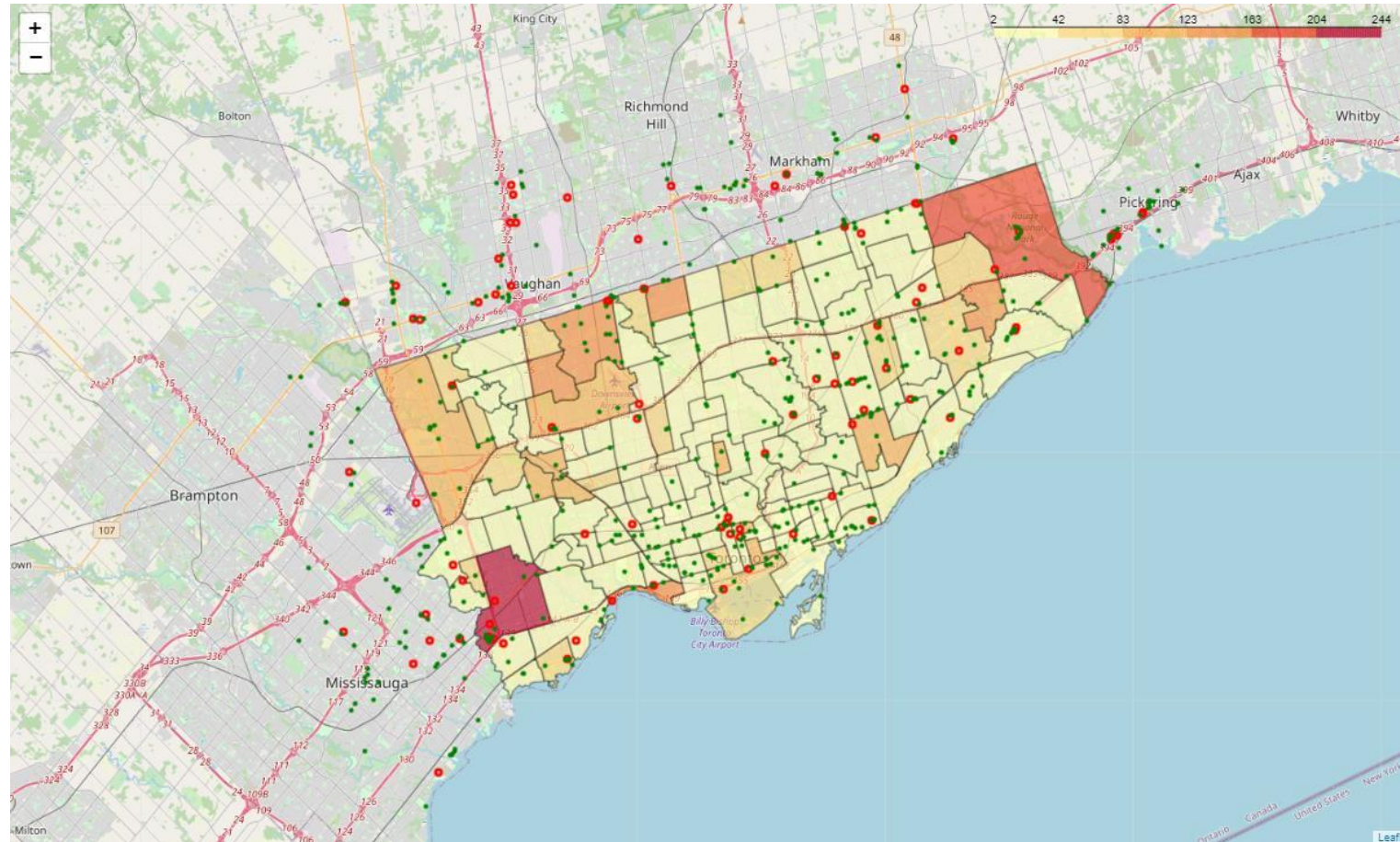
Choropleth map of Toronto Cases with neighborhood centroids



Choropleth map of Toronto Cases with trending venues



Choropleth map of Toronto Cases with identified trending venue candidates



Conclusion and future directions

- Find possible venues categories which may contribute to the occurrence of COVID-19 cases based on trending venues in the city of Toronto, Canada, during the beginning of the pandemic in order to provide local government and other possible research of interest to this topic with ideas which might narrowing down the scope of possible geographical search on virus transmission.
- Retrieve information of all venues around the city of Toronto.
- Implement other machine-learning models and compare their results and performances.
- Consider variables like radius, age group and so on as hyper-parameters.

Reference

1. How COVID-19 Spreads. (n.d.). Centers for Disease Control and Prevention. Retrieved June 24, 2021, from <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>.
2. United States COVID-19 Cases, Deaths, and Laboratory Testing (NAATs) by State, Territory, and Jurisdiction. (n.d.). Centers for Disease Control and Prevention. Retrieved June 24, 2021, from https://covid.cdc.gov/covid-data-tracker/#cases_totalcases.
3. COVID-19 Cases in Toronto (Jun 23, 2021). (2020). [Dataset]. Toronto Public Health. <https://open.toronto.ca/dataset/covid-19-cases-in-toronto/>
4. Neighbourhoods (Mar 15, 2021). (2021). [Dataset]. Social Development, Finance & Administration. <https://open.toronto.ca/dataset/neighbourhoods/>
5. Toronto Venue Data (Jan 1st, 2020). (2020). [API]. Foursquare. <https://developer.foursquare.com/docs/places-api/>
6. COVID-19 pandemic in Toronto. (n.d.). Wikipedia. Retrieved June 22, 2021, from https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Toronto.
7. Yang, Z., Zeng, Z., Wang, K., Wong, S. S., Liang, W., Zanin, M., Liu, P., Cao, X., Gao, Z., Mai, Z., Liang, J., Liu, X., Li, S., Li, Y., Ye, F., Guan, W., Yang, Y., Li, F., Luo, S., Xie, Y., ... He, J. (2020). Modified SEIR and AI prediction of the epidemics trend of COVID-19 in China under public health interventions. *Journal of thoracic disease*, 12(3), 165–174. <https://doi.org/10.21037/jtd.2020.02.64>.
8. Dahlberg, Matz & Edin, Per-Anders & Grönqvist, Erik & Lyhagen, Johan & Östh, John & Siretskiy, Alexey & Toger, Marina. (2020). Effects of the COVID-19 Pandemic on Population Mobility under Mild Policies: Causal Evidence from Sweden.
9. Song, Chaoming & Qu, Zehui & Blumm, Nicholas & Barabasi, Albert-Laszlo. (2010). Limits of Predictability in Human Mobility. *Science* (New York, N.Y.). 327. 1018-21. 10.1126/science.1177170.