Problem Description and Background Discussion

On March 21, 2020, the City of Chicago came under the stay-at-home gubernatorial order in the aftermath of the outbreak of Coronavirus Disease in the last quarter of 2019 (COVID-19). In the fight against COVID-19, the administration of the City of Chicago is on the lookout for data analysis and insight that would provide the foundation to contain the spread of the virus.

Effective data analysis and insight is the tool that would enable the mayoral administration of the City of Chicago to enact orders, rules, regulations, guidelines, measures, activities and operations aiming at enabling the city-wide response that is specific and appropriate to each zip code area.

On what has to be designed as the target variables, the first criterion upon which the response would be determined is the overall level of severity of COVID-19 infection in a given zip code area. The second criterion is the singular prediction score of each of the factors; namely, state of emergency, effectiveness of healthcare facilities, access to the services necessary to maintain good health, COVID-related mortality rate, health-conscious culture, rate of health insurance coverage, percentage of positive cases, safety and security, and contamination risk.

Both criteria - the overall severity level and factors score- will feed into the recommendation engine to determine the state of response the authority of the City of Chicago should take. In fact, the task consists of two components, which are the unsupervised prediction and the recommendation engine.

Data Description and Data Utilization for Problem Solution

Therefore, the machine learning algorithm needs a set of data from which to perform a number of computations.

Among the many data sources necessary to complete the task, there are data fetched by the Foursquare API. For each zip code area, the Foursquare API's endpoint of search is used to retrieve data comprised of geographical location of hospitals and healthcare facilities, pharmacies, nursing homes and senior shelters, rehabilitation centers, public housing, mental health asylums, firefighter department engines, Emergency Medical Technician (EMT) and paramedical teams, police stations, public facilities and hotels.

Within the same context, the Foursquare API's endpoint of explore provides comprehensive data about the number of liquor stores, COVID testing units, hospitals and healthcare facilities, pharmacies, rehabilitation centers, public housing, mental health asylums, firefighters, Emergency Medical Technician (EMT) and paramedical teams, public facilities, hotels, fast food restaurants, as well as nursing homes and senior shelters

Other internet sources provide data about the number of individuals in aforementioned facilities, the number of individuals in each age group, the number of available police officers, the number of individuals suffering from chronic diseases, the number of COVID-19 positive cases per 1000, the contagion rate, the death toll of COVID-19 positive cases, rate of health insurance coverage, the effectiveness of healthcare workforce, access to the services necessary to maintain good health, proper administrative management applied in a timely manner (governance), medical systems management of the supply chain, socio-economic prosperity policies and conditions, safety and security, personal freedom, social capital, investment environment, education level, ethnic composition, the number of discriminatory cases, the level of gathering likelihood, and the density in residential buildings.