**BACKGROUND**

Gurgaon is a city just southwest of New Delhi (the capital of India) in northern India. It’s well known as one of the financial and technology hubs of the country. In the past one decade, Gurgaon has witnessed its population growing at an alarming pace but the health care facilities and infrastructure have not been updated in keeping with that pace.

As per Census 2011, Gurgaon’s population was 1.5 MN, which has now swelled to over 2.5 MN as per rough estimates by various agencies of the district administration. And there is a large chunk of population who cannot afford treatment and health care in private hospitals. This becomes a major pain point for the people and the government especially in light of COVID-19.

Its neighbour, New Delhi-the capital of India, however has one of the best healthcare infrastructures in the country.

**PROBLEM STATEMENT**

Our objective here is to determine the neighbourhoods or catchment areas of Gurgaon district which would be good locations to build a hospital.

**SOLUTION & DATA DESCRIPTION**

The two different approaches outlined below will analyse different neighbourhoods of New Delhi (Gurgaon’s close neighbour) and look for patterns in hospital locations. For e.g. if a certain neighbourhood with a hospital in New Delhi, also has a good amount of shopping centres, we check if proximity to a shopping centre is a good trigger for predicting whether that neighbourhood should also have a hospital.

**FIRST APPROACH**

This is a rule-based approach where we would look for similar catchment areas in Gurgaon using New Delhi as a benchmark. In the example mentioned above, we can look at New Delhi neighbourhoods and see how many shopping centres are there in hospital containing neighbourhoods vs no hospital containing neighbourhoods. We can recommend building a hospital in Gurgaon neighbourhoods with at least the cut-off (obtained from New Delhi data) no. of shopping centres. Similarly we can create rules on other variables like no. of cinemas/schools/etc. in the neighbourhood. We will create these rules using a mixture of basic exploratory analysis, k-means clustering and/or decision trees.

**SECOND APPROACH**

This is similar to the first approach but instead of creating rules, we keep the benchmarks variables like no. of cinemas, no. of schools, no. of shopping centres etc. in a neighbourhood as the independent variables and we keep the ***target variable to be predicted as a flag where 1= “build a hospital in the neighbourhood” and 0 = “don’t build a hospital in the neighbourhood”***. We train a machine learning model on the New Delhi data (keep 20% data aside for testing). The model will be run on Gurgaon neighbourhoods to determine neighbourhoods where a hospital should come up.

Please note that the neighbourhood clusters will be created using folium and nominatum libraries used in Week 3 Assignment. All the neighbourhood data points e.g. no. of shopping centres will come from Four Square location data (via the Four Square API)

**INPUT DATASET**

|  |  |  |  |
| --- | --- | --- | --- |
| **TARGET VARIABLE** | **VALUES** | **INDEPENDENT VARIABLE** | **VALUES** |
| **Build\_Hospital\_Flag** | {1,0} | **Index** | Neighborhood Name |
|  |  | **Yoga Studio** | (count, category, rating) |
|  |  | **Accessories Store** | (count, category, rating) |
|  |  | **Afghan Restaurant** | (count, category, rating) |
|  |  | **Airport** | (count, category, rating) |
|  |  | **Airport Food Court** | (count, category, rating) |
|  |  | **Airport Gate** | (count, category, rating) |
|  |  | **Airport Lounge** | (count, category, rating) |
|  |  | **Airport Service** | (count, category, rating) |
|  |  | **Airport Terminal** | (count, category, rating) |
|  |  | **American Restaurant** | (count, category, rating) |
|  |  | **Amphitheater** | (count, category, rating) |
|  |  | **Animal Shelter** | (count, category, rating) |
|  |  | **Antique Shop** | (count, category, rating) |
|  |  | **Aquarium** | (count, category, rating) |
|  |  | **Arcade** | (count, category, rating) |
|  |  | **Arepa Restaurant** | (count, category, rating) |
|  |  | **Art Gallery** | (count, category, rating) |
|  |  | **Art Museum** | (count, category, rating) |
|  |  | **Arts & Crafts Store** | (count, category, rating) |
|  |  | **Asian Restaurant** | (count, category, rating) |
|  |  | **Athletics & Sports** | (count, category, rating) |
|  |  | **Auto Dealership** | (count, category, rating) |
|  |  | **Auto Garage** | (count, category, rating) |
|  |  | **Auto Workshop** | (count, category, rating) |
|  |  | **BBQ Joint** | (count, category, rating) |
|  |  | **Baby Store** | (count, category, rating) |
|  |  | **Badminton Court** | (count, category, rating) |
|  |  | **Bagel Shop** | (count, category, rating) |
|  |  | **Bakery** | (count, category, rating) |
|  |  | **Bank** | (count, category, rating) |
|  |  | **Bar** | (count, category, rating) |
|  |  | **Baseball Field** | (count, category, rating) |
|  |  | **Baseball Stadium** | (count, category, rating) |
|  |  | **Basketball Stadium** | (count, category, rating) |
|  |  | **Beach** | (count, category, rating) |
|  |  | **Beach Bar** | (count, category, rating) |
|  |  | **Bed & Breakfast** | (count, category, rating) |
|  |  | **Beer Bar** | (count, category, rating) |
|  |  | **Beer Store** | (count, category, rating) |
|  |  | **Belgian Restaurant** | (count, category, rating) |
|  |  | **Bike Shop** | (count, category, rating) |
|  |  | **Bistro** | (count, category, rating) |
|  |  | **Boat or Ferry** | (count, category, rating) |
|  |  | **Bookstore** | (count, category, rating) |
|  |  | **Botanical Garden** | (count, category, rating) |
|  |  | **Boutique** | (count, category, rating) |
|  |  | **Bowling Alley** | (count, category, rating) |
|  |  | **Brazilian Restaurant** | (count, category, rating) |
|  |  | **Breakfast Spot** | (count, category, rating) |
|  |  | **Brewery** | (count, category, rating) |
|  |  | **Bridal Shop** | (count, category, rating) |
|  |  | **Bubble Tea Shop** | (count, category, rating) |
|  |  | **Building** | (count, category, rating) |
|  |  | **Burger Joint** | (count, category, rating) |
|  |  | **Burrito Place** | (count, category, rating) |
|  |  | **Bus Line** | (count, category, rating) |
|  |  | **Bus Station** | (count, category, rating) |
|  |  | **Bus Stop** | (count, category, rating) |
|  |  | **Business Service** | (count, category, rating) |
|  |  | **Butcher** | (count, category, rating) |
|  |  | **Cafeteria** | (count, category, rating) |
|  |  | **Café** | (count, category, rating) |
|  |  | **Cajun / Creole Restaurant** | (count, category, rating) |
|  |  | **Camera Store** | (count, category, rating) |
|  |  | **Candy Store** | (count, category, rating) |
|  |  | **Cantonese Restaurant** | (count, category, rating) |
|  |  | **Caribbean Restaurant** | (count, category, rating) |
|  |  | **Carpet Store** | (count, category, rating) |
|  |  | **Castle** | (count, category, rating) |
|  |  | **Cheese Shop** | (count, category, rating) |
|  |  | **Chinese Restaurant** | (count, category, rating) |
|  |  | **Chiropractor** | (count, category, rating) |
|  |  | **Chocolate Shop** | (count, category, rating) |
|  |  | **Church** | (count, category, rating) |
|  |  | **Churrascaria** | (count, category, rating) |
|  |  | **Climbing Gym** | (count, category, rating) |
|  |  | **Clothing Store** | (count, category, rating) |
|  |  | **Cocktail Bar** | (count, category, rating) |
|  |  | **Coffee Shop** | (count, category, rating) |
|  |  | **College Arts Building** | (count, category, rating) |
|  |  | **College Gym** | (count, category, rating) |
|  |  | **College Rec Center** | (count, category, rating) |
|  |  | **College Stadium** | (count, category, rating) |
|  |  | **College Theater** | (count, category, rating) |
|  |  | **Comfort Food Restaurant** | (count, category, rating) |
|  |  | **Comic Shop** | (count, category, rating) |
|  |  | **Community Center** | (count, category, rating) |
|  |  | **Concert Hall** | (count, category, rating) |
|  |  | **Construction & Landscaping** | (count, category, rating) |
|  |  | **Convenience Store** | (count, category, rating) |
|  |  | **Cosmetics Shop** | (count, category, rating) |
|  |  | **Coworking Space** | (count, category, rating) |
|  |  | **Creperie** | (count, category, rating) |
|  |  | **Cuban Restaurant** | (count, category, rating) |
|  |  | **Cupcake Shop** | (count, category, rating) |
|  |  | **Curling Ice** | (count, category, rating) |
|  |  | **Dance Studio** | (count, category, rating) |
|  |  | **Deli / Bodega** | (count, category, rating) |
|  |  | **Department Store** | (count, category, rating) |
|  |  | **Design Studio** | (count, category, rating) |
|  |  | **Dessert Shop** | (count, category, rating) |
|  |  | **Dim Sum Restaurant** | (count, category, rating) |
|  |  | **Diner** | (count, category, rating) |
|  |  | **Discount Store** | (count, category, rating) |
|  |  | **Distribution Center** | (count, category, rating) |
|  |  | **Dive Bar** | (count, category, rating) |
|  |  | **Dog Run** | (count, category, rating) |
|  |  | **Doner Restaurant** | (count, category, rating) |
|  |  | **Donut Shop** | (count, category, rating) |
|  |  | **Drugstore** | (count, category, rating) |
|  |  | **Dumpling Restaurant** | (count, category, rating) |
|  |  | **Eastern European Restaurant** | (count, category, rating) |
|  |  | **Electronics Store** | (count, category, rating) |
|  |  | **Elementary School** | (count, category, rating) |
|  |  | **Ethiopian Restaurant** | (count, category, rating) |
|  |  | **Event Space** | (count, category, rating) |
|  |  | **Falafel Restaurant** | (count, category, rating) |
|  |  | **Farm** | (count, category, rating) |
|  |  | **Farmers Market** | (count, category, rating) |
|  |  | **Fast Food Restaurant** | (count, category, rating) |
|  |  | **Field** | (count, category, rating) |
|  |  | **Filipino Restaurant** | (count, category, rating) |
|  |  | **Fish & Chips Shop** | (count, category, rating) |
|  |  | **Fish Market** | (count, category, rating) |
|  |  | **Flea Market** | (count, category, rating) |
|  |  | **Flower Shop** | (count, category, rating) |
|  |  | **Food** | (count, category, rating) |
|  |  | **Food & Drink Shop** | (count, category, rating) |
|  |  | **Food Court** | (count, category, rating) |
|  |  | **Food Truck** | (count, category, rating) |
|  |  | **Fountain** | (count, category, rating) |
|  |  | **French Restaurant** | (count, category, rating) |
|  |  | **Fried Chicken Joint** | (count, category, rating) |
|  |  | **Frozen Yogurt Shop** | (count, category, rating) |
|  |  | **Fruit & Vegetable Store** | (count, category, rating) |
|  |  | **Furniture / Home Store** | (count, category, rating) |
|  |  | **Gaming Cafe** | (count, category, rating) |
|  |  | **Garden** | (count, category, rating) |
|  |  | **Garden Center** | (count, category, rating) |
|  |  | **Gas Station** | (count, category, rating) |
|  |  | **Gastropub** | (count, category, rating) |
|  |  | **Gay Bar** | (count, category, rating) |
|  |  | **General Entertainment** | (count, category, rating) |
|  |  | **General Travel** | (count, category, rating) |
|  |  | **German Restaurant** | (count, category, rating) |
|  |  | **Gift Shop** | (count, category, rating) |
|  |  | **Golf Course** | (count, category, rating) |
|  |  | **Golf Driving Range** | (count, category, rating) |
|  |  | **Gourmet Shop** | (count, category, rating) |
|  |  | **Greek Restaurant** | (count, category, rating) |
|  |  | **Grocery Store** | (count, category, rating) |
|  |  | **Gym** | (count, category, rating) |
|  |  | **Gym / Fitness Center** | (count, category, rating) |
|  |  | **Gym Pool** | (count, category, rating) |
|  |  | **Hakka Restaurant** | (count, category, rating) |
|  |  | **Harbor / Marina** | (count, category, rating) |
|  |  | **Hardware Store** | (count, category, rating) |
|  |  | **Hawaiian Restaurant** | (count, category, rating) |
|  |  | **Health & Beauty Service** | (count, category, rating) |
|  |  | **Health Food Store** | (count, category, rating) |
|  |  | **Historic Site** | (count, category, rating) |
|  |  | **History Museum** | (count, category, rating) |
|  |  | **Hobby Shop** | (count, category, rating) |
|  |  | **Hockey Arena** | (count, category, rating) |
|  |  | **Home Service** | (count, category, rating) |
|  |  | **Hookah Bar** | (count, category, rating) |
|  |  | **Hostel** | (count, category, rating) |
|  |  | **Hot Dog Joint** | (count, category, rating) |
|  |  | **Hotel** | (count, category, rating) |
|  |  | **Hotel Bar** | (count, category, rating) |
|  |  | **IT Services** | (count, category, rating) |
|  |  | **Ice Cream Shop** | (count, category, rating) |
|  |  | **Indian Chinese Restaurant** | (count, category, rating) |
|  |  | **Indian Restaurant** | (count, category, rating) |
|  |  | **Indie Movie Theater** | (count, category, rating) |
|  |  | **Indonesian Restaurant** | (count, category, rating) |
|  |  | **Intersection** | (count, category, rating) |
|  |  | **Italian Restaurant** | (count, category, rating) |
|  |  | **Japanese Restaurant** | (count, category, rating) |
|  |  | **Jazz Club** | (count, category, rating) |
|  |  | **Jewelry Store** | (count, category, rating) |
|  |  | **Jewish Restaurant** | (count, category, rating) |
|  |  | **Juice Bar** | (count, category, rating) |
|  |  | **Kitchen Supply Store** | (count, category, rating) |
|  |  | **Korean Restaurant** | (count, category, rating) |
|  |  | **Lake** | (count, category, rating) |
|  |  | **Latin American Restaurant** | (count, category, rating) |
|  |  | **Library** | (count, category, rating) |
|  |  | **Light Rail Station** | (count, category, rating) |
|  |  | **Lingerie Store** | (count, category, rating) |
|  |  | **Liquor Store** | (count, category, rating) |
|  |  | **Lounge** | (count, category, rating) |
|  |  | **Mac & Cheese Joint** | (count, category, rating) |
|  |  | **Malay Restaurant** | (count, category, rating) |
|  |  | **Market** | (count, category, rating) |
|  |  | **Martial Arts Dojo** | (count, category, rating) |
|  |  | **Massage Studio** | (count, category, rating) |
|  |  | **Medical Center** | (count, category, rating) |
|  |  | **Mediterranean Restaurant** | (count, category, rating) |
|  |  | **Men's Store** | (count, category, rating) |
|  |  | **Metro Station** | (count, category, rating) |
|  |  | **Mexican Restaurant** | (count, category, rating) |
|  |  | **Middle Eastern Restaurant** | (count, category, rating) |
|  |  | **Miscellaneous Shop** | (count, category, rating) |
|  |  | **Mobile Phone Shop** | (count, category, rating) |
|  |  | **Modern European Restaurant** | (count, category, rating) |
|  |  | **Molecular Gastronomy Restaurant** | (count, category, rating) |
|  |  | **Monument / Landmark** | (count, category, rating) |
|  |  | **Motorcycle Shop** | (count, category, rating) |
|  |  | **Movie Theater** | (count, category, rating) |
|  |  | **Moving Target** | (count, category, rating) |
|  |  | **Museum** | (count, category, rating) |
|  |  | **Music School** | (count, category, rating) |
|  |  | **Music Store** | (count, category, rating) |
|  |  | **Music Venue** | (count, category, rating) |
|  |  | **Nail Salon** | (count, category, rating) |
|  |  | **Neighborhood** | (count, category, rating) |
|  |  | **New American Restaurant** | (count, category, rating) |
|  |  | **Nightclub** | (count, category, rating) |
|  |  | **Noodle House** | (count, category, rating) |
|  |  | **Office** | (count, category, rating) |
|  |  | **Opera House** | (count, category, rating) |
|  |  | **Optical Shop** | (count, category, rating) |
|  |  | **Organic Grocery** | (count, category, rating) |
|  |  | **Other Great Outdoors** | (count, category, rating) |
|  |  | **Outdoor Supply Store** | (count, category, rating) |
|  |  | **Outdoors & Recreation** | (count, category, rating) |
|  |  | **Pakistani Restaurant** | (count, category, rating) |
|  |  | **Paper / Office Supplies Store** | (count, category, rating) |
|  |  | **Park** | (count, category, rating) |
|  |  | **Peking Duck Restaurant** | (count, category, rating) |
|  |  | **Performing Arts Venue** | (count, category, rating) |
|  |  | **Persian Restaurant** | (count, category, rating) |
|  |  | **Pet Store** | (count, category, rating) |
|  |  | **Pharmacy** | (count, category, rating) |
|  |  | **Pier** | (count, category, rating) |
|  |  | **Pilates Studio** | (count, category, rating) |
|  |  | **Pizza Place** | (count, category, rating) |
|  |  | **Plane** | (count, category, rating) |
|  |  | **Playground** | (count, category, rating) |
|  |  | **Plaza** | (count, category, rating) |
|  |  | **Poke Place** | (count, category, rating) |
|  |  | **Pool** | (count, category, rating) |
|  |  | **Pool Hall** | (count, category, rating) |
|  |  | **Portuguese Restaurant** | (count, category, rating) |
|  |  | **Poutine Place** | (count, category, rating) |
|  |  | **Pub** | (count, category, rating) |
|  |  | **Ramen Restaurant** | (count, category, rating) |
|  |  | **Record Shop** | (count, category, rating) |
|  |  | **Rental Car Location** | (count, category, rating) |
|  |  | **Restaurant** | (count, category, rating) |
|  |  | **River** | (count, category, rating) |
|  |  | **Rock Climbing Spot** | (count, category, rating) |
|  |  | **Rock Club** | (count, category, rating) |
|  |  | **Roof Deck** | (count, category, rating) |
|  |  | **Sake Bar** | (count, category, rating) |
|  |  | **Salad Place** | (count, category, rating) |
|  |  | **Salon / Barbershop** | (count, category, rating) |
|  |  | **Sandwich Place** | (count, category, rating) |
|  |  | **Scenic Lookout** | (count, category, rating) |
|  |  | **Sculpture Garden** | (count, category, rating) |
|  |  | **Seafood Restaurant** | (count, category, rating) |
|  |  | **Shoe Store** | (count, category, rating) |
|  |  | **Shop & Service** | (count, category, rating) |
|  |  | **Shopping Mall** | (count, category, rating) |
|  |  | **Skate Park** | (count, category, rating) |
|  |  | **Skating Rink** | (count, category, rating) |
|  |  | **Smoke Shop** | (count, category, rating) |
|  |  | **Smoothie Shop** | (count, category, rating) |
|  |  | **Snack Place** | (count, category, rating) |
|  |  | **Soccer Field** | (count, category, rating) |
|  |  | **Social Club** | (count, category, rating) |
|  |  | **Soup Place** | (count, category, rating) |
|  |  | **Souvlaki Shop** | (count, category, rating) |
|  |  | **Spa** | (count, category, rating) |
|  |  | **Speakeasy** | (count, category, rating) |
|  |  | **Sporting Goods Shop** | (count, category, rating) |
|  |  | **Sports Bar** | (count, category, rating) |
|  |  | **Sri Lankan Restaurant** | (count, category, rating) |
|  |  | **Stadium** | (count, category, rating) |
|  |  | **Stationery Store** | (count, category, rating) |
|  |  | **Steakhouse** | (count, category, rating) |
|  |  | **Storage Facility** | (count, category, rating) |
|  |  | **Street Art** | (count, category, rating) |
|  |  | **Supermarket** | (count, category, rating) |
|  |  | **Supplement Shop** | (count, category, rating) |
|  |  | **Sushi Restaurant** | (count, category, rating) |
|  |  | **Swim School** | (count, category, rating) |
|  |  | **Syrian Restaurant** | (count, category, rating) |
|  |  | **Taco Place** | (count, category, rating) |
|  |  | **Tailor Shop** | (count, category, rating) |
|  |  | **Taiwanese Restaurant** | (count, category, rating) |
|  |  | **Tanning Salon** | (count, category, rating) |
|  |  | **Tapas Restaurant** | (count, category, rating) |
|  |  | **Tea Room** | (count, category, rating) |
|  |  | **Tech Startup** | (count, category, rating) |
|  |  | **Tennis Court** | (count, category, rating) |
|  |  | **Thai Restaurant** | (count, category, rating) |
|  |  | **Theater** | (count, category, rating) |
|  |  | **Theme Park Ride / Attraction** | (count, category, rating) |
|  |  | **Theme Restaurant** | (count, category, rating) |
|  |  | **Thrift / Vintage Store** | (count, category, rating) |
|  |  | **Toy / Game Store** | (count, category, rating) |
|  |  | **Track** | (count, category, rating) |
|  |  | **Trail** | (count, category, rating) |
|  |  | **Train Station** | (count, category, rating) |
|  |  | **Tram Station** | (count, category, rating) |
|  |  | **Tunnel** | (count, category, rating) |
|  |  | **Turkish Restaurant** | (count, category, rating) |
|  |  | **Udon Restaurant** | (count, category, rating) |
|  |  | **University** | (count, category, rating) |
|  |  | **Vegetarian / Vegan Restaurant** | (count, category, rating) |
|  |  | **Video Game Store** | (count, category, rating) |
|  |  | **Video Store** | (count, category, rating) |
|  |  | **Vietnamese Restaurant** | (count, category, rating) |
|  |  | **Warehouse Store** | (count, category, rating) |
|  |  | **Wine Bar** | (count, category, rating) |
|  |  | **Wine Shop** | (count, category, rating) |
|  |  | **Wings Joint** | (count, category, rating) |
|  |  | **Women's Store** | (count, category, rating) |