# Optimal Location for Hospital

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Introduction

In this project, we are trying to find an optimal location for a hospital in Delhi. This report is targeted to stakeholders who are interested in opening a hospital in Delhi, India.

When the stakeholder is planning to build a hospital in order to help people in emergency situations, it is better to compute distance between existing hospitals and find the areas with no or less hospitals. So we are trying to find locations that are not already crowded with hospitals. We are also particularly interested in areas with no hospitals in the vicinity. We would also prefer locations as close to the city center (shown in map) as possible.
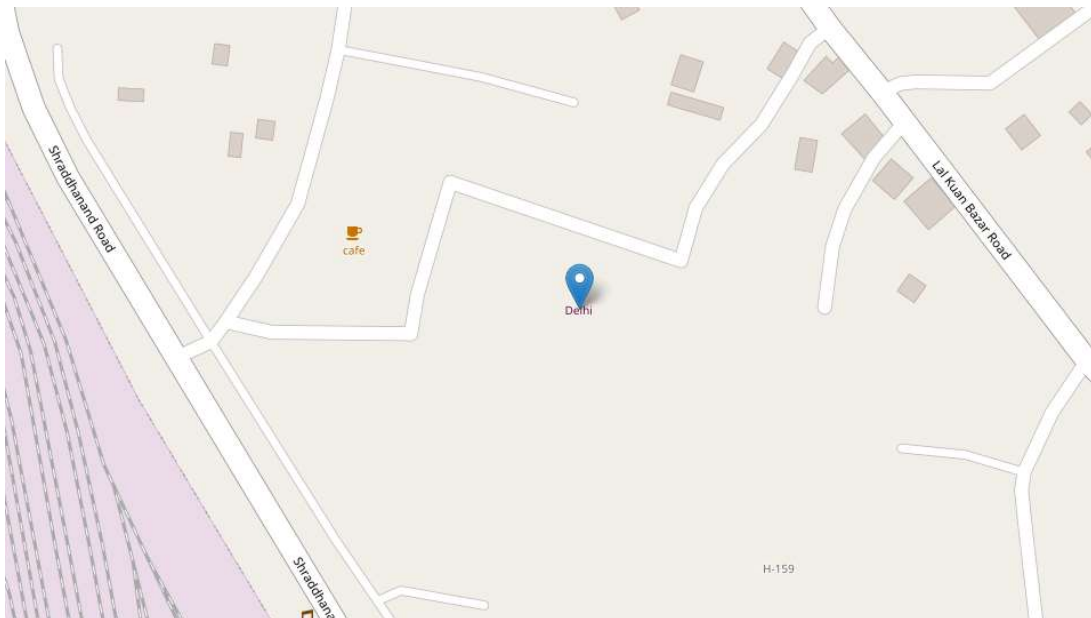
We will use our data science powers to generate a few most promising neighborhoods based on these criteria. Advantages of each area will then be clearly expressed so that best possible final location can be chosen by stakeholders.

Data

Based on the definition of our problem, factors that will influence our decision are:

- Number of existing hospitals in the neighborhood.

- Distance of neighborhood from city center.

We decide to use a regularly spaced grid of locations, centered around the city center, to define our neighborhoods.

Following data sources will be needed to extract/generate the required information:

- Number of hospitals and their location in every neighborhood will be obtained using Foursquare API.

- Latitude and longitude of an area will be obtained using geocoder python package.

Methodology:

In this project we will direct our efforts on detecting areas of Delhi that have low hospital density, particularly those with low number hospitals. We will limit our analysis to area ~10 km around city center.
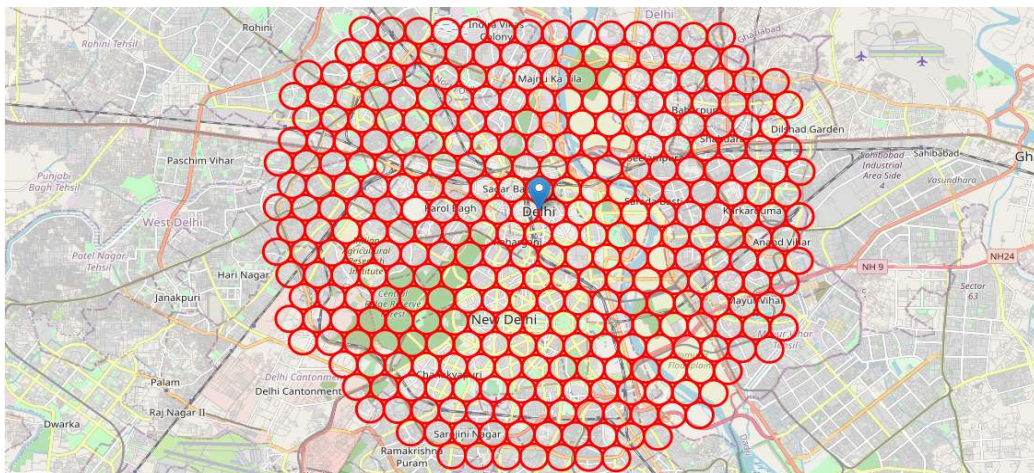
In first step we have collected the required data: location of every hospital within 10km from Central Delhi (shown in map).
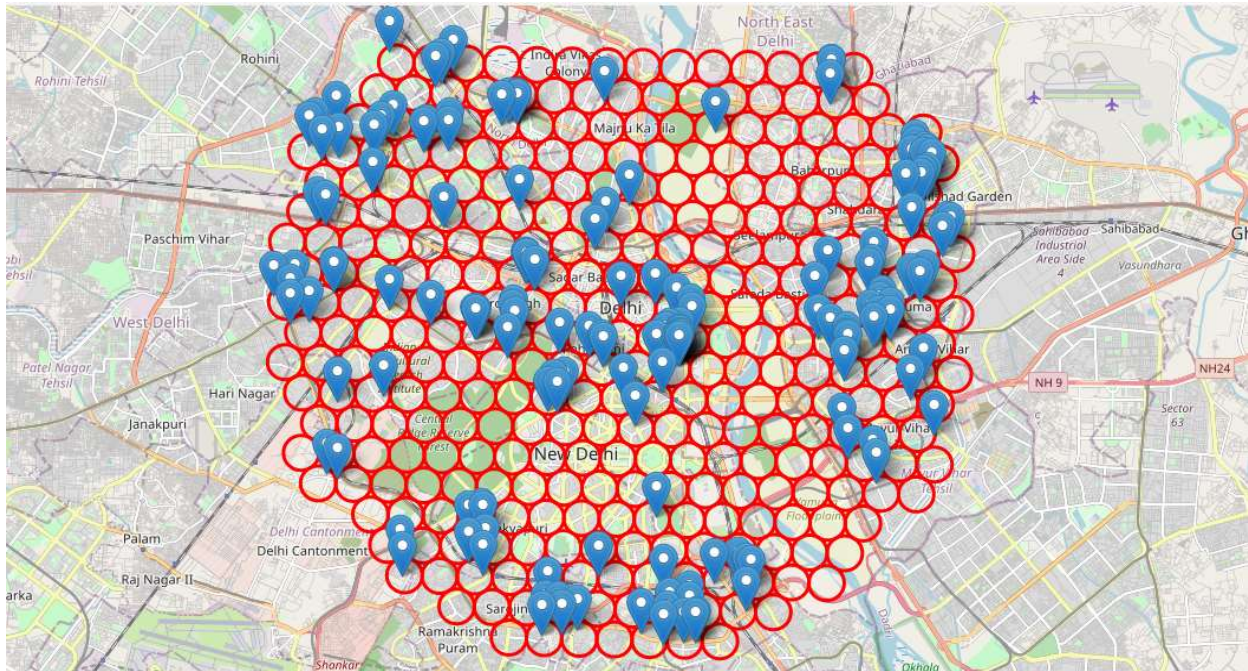
Second step in our analysis will be calculation and exploration of hospital across different areas of Delhi — we will use heat maps to identify a few promising areas close to center with low number of hospital in general and focus our attention on those areas.
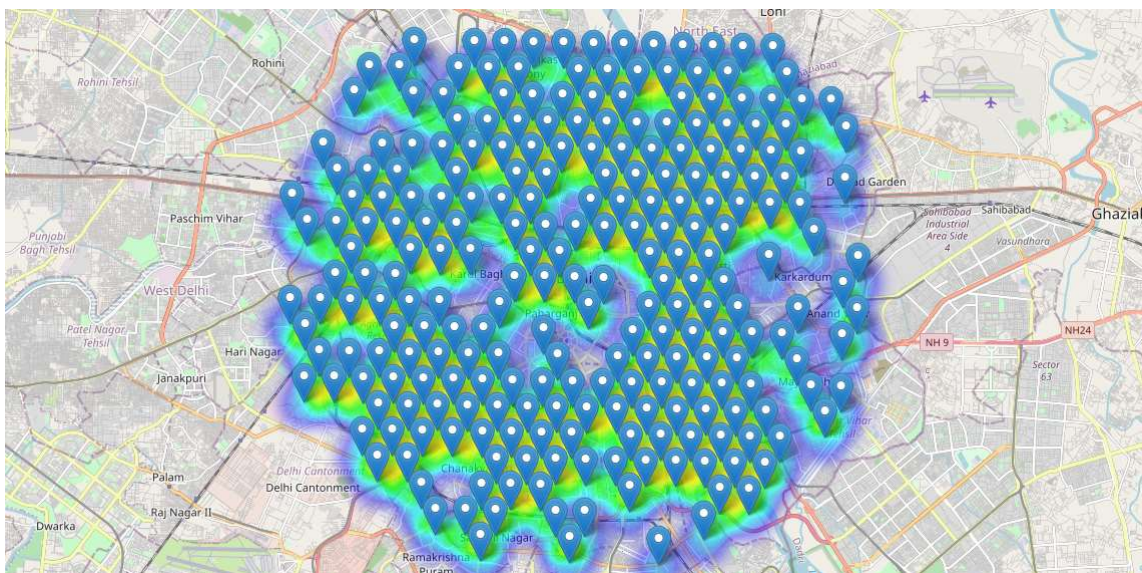
In third and final step we will focus on most promising areas and within those create clusters of locations that meet some basic requirements established in discussion with stakeholders: we will take into consideration locations with no hospital in radius of 500 meters, and we want locations without hospital in radius of 500 meters. We will present map of all such locations but also **create clusters (using k-means clustering)** of those locations to identify general zones / neighborhoods / addresses which should be a starting point for final 'street level' exploration and search for optimal venue location by stakeholders.


The following are the Python packages I used:

- Pandas - Library for Data Analysis
- NumPy – Library to handle data in a vectorized manner
- JSON – Library to handle JSON files
- Geopy – To retrieve Location Data
- Requests – Library to handle http requests
- Matplotlib – Python Plotting Module
- Sklearn – Python machine learning Library
- Folium – Map rendering Library

Result and Discussion :

We have formed 5 clusters using K-means clustering which in turn we have got the 5 optimal locations for hospitals which satisfies our criteria "**Areas having no hospitals nearby and close to the city center as possible**". So, we started with the centre of the city and generated the neighbourhoods. We got the list of hospitals using FourSquare API and find out the locations where building the hospital will really help the people and the stakeholders. Here is our position of optimal locations in Delhi to build a hospital or a medical venue.
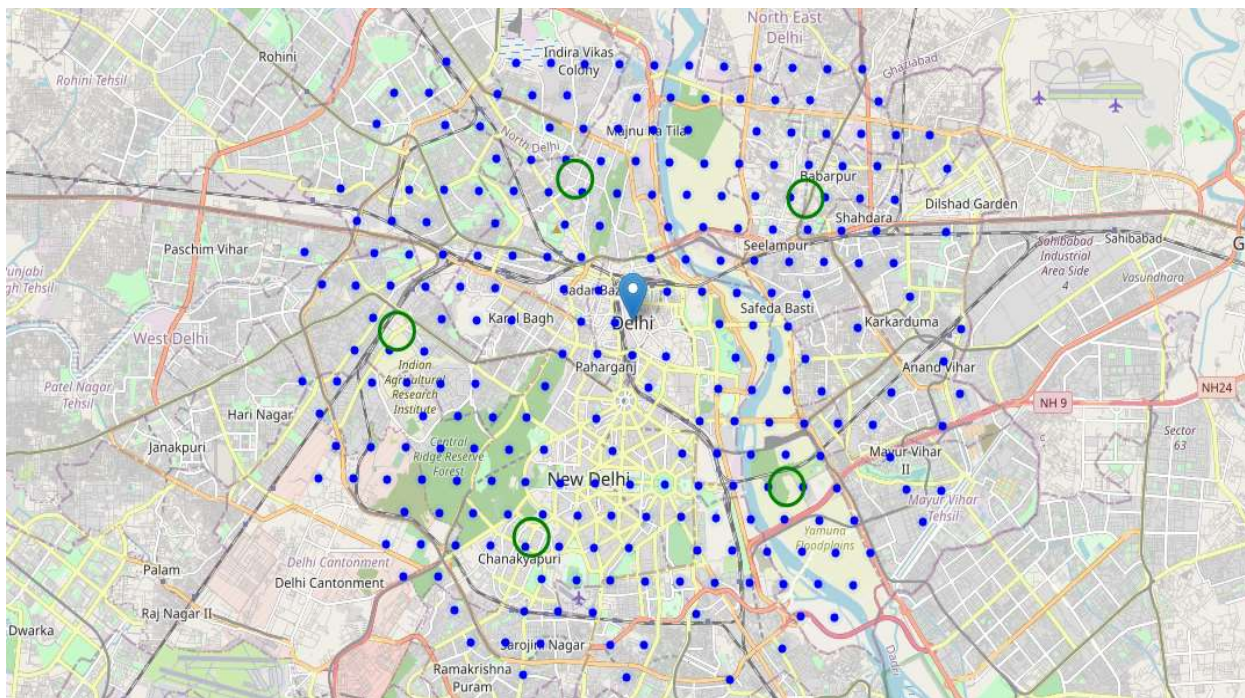
Conclusion :

The main purpose of this project was to identify Delhi areas close to center with no hospitals in order to aid stakeholders in narrowing down the search for the optimal location for a new hospital. The final decision of location will be taken by stakeholders based on their additional needs like the cost of building a hospital in

that area, road facilities etc.