Predicting optimum locations for mobile towers/ WiFi hotspots

Vineet Puri

Dec 27, 2020

1. Introduction

1.1 Background

Network planning is an important job in any telecommunication company. We need to provide good coverage at all the required locations at minimum cost. As the number of towers increase, the cost of installation and maintenance also rises. So, we need to install towers in such a way that our target of coverage is achieved with minimum number of towers. In this project, I have tried to achieve this by using data science tools.

1.2 Business Problem

A huge sports event is going to be organised in the city of Toronto. As a telecommunication company we wish demonstrate our 5G technology during this event. It has been decided by the management that priority will be to cover all the public places or venues in the area and this needs to be done by installing minimum possible number of towers/antennae. So, our main target is to provide coverage at the venues even if there is no coverage at places outside the venues.

Also, the range of our 5G towers is 400 to 500 meters. So, any venue which is more than 400 meters away from the tower will be considered out of range. As a data scientist we need to calculate the best locations to install these towers so that all important places are covered with minimum number of towers.

1.3 Interest

This kind of implementation of data science can be of interest to telecommunication companies who wish to plan their future networks. Although, I have taken the example of mobile towers in this project but the strategy can be used to plan WiFi hotspots and other radio networks too.

2. Data description

2.1 Data sources

I have used Foursquare API to get the list of venues in the target area. We need to provide coverage at all these venues in this list. We need latitude, longitude, venue name from Foursquare around our target location. We will fetch all the venues in an area of approximately 7X7 Kms centred at our target location.

I am using free service of Foursquare which gives me a limited number of venues around a location at a time. So, to overcome that I created a square grid (5X5) of 25 locations centred at the target location and then fetched the list of venues for all these locations within 1 Km radius from Foursquare.

Venue	Venue Latitude	Venue Longitude	Venue Category
Bobbette & Belle	43.731339	-79.403769	Bakery
For The Win Cafe	43.728636	-79.403255	Bubble Tea Shop
T-buds	43.731247	-79.403640	Tea Room
Mastermind Toys	43.732046	-79.404141	Toy / Game Store
Menchies Frozen Yogurt	43.728336	-79.403173	Ice Cream Shop
The Belly Buster Submarines	43.733743	-79.404390	Sandwich Place
Shinobu by Maki Sushi	43.732562	-79.404147	Japanese Restaurant
The Burger Cellar	43.732362	-79.403894	Burger Joint
STACK	43.729311	-79.403241	BBQ Joint
The Rolling Pin	43.733315	-79.404318	Bakery

2.2 Data cleaning

We will obviously get duplicate venues by this method which we need to correct by deleting all duplicate venues.