1. Introduction

1.1. Background

London is the capital and largest city of England and the third-most populous city in Europe. It is considered to be one of the world's most visited, most expensive and most influential cities. It is known for its rainy climate, ethnic diversity, Big Ben, the financial industry, and its sprawling subway system.

London is also one of the most amazing places to eat, thanks to an incredible variety of international cuisines and some of the most talented chefs in the world. London's thriving economy, multicultural demographics and access to ingredients make it an ideal place for restaurants to flourish.

1.2. Business problem

The objective of this project is to find the most suitable location(s) to open a new Italian restaurant in London.

1.3. Target audience

Types of clients or a group of people that would be interested in this project are:

- Business personnel who wants to invest or open an Italian restaurant in London. This analysis will be a comprehensive guide to start or expand restaurants targeting the large pool of office workers in major business districts of London city during lunch hours.

2. Data

2.1. Feature selection

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

- Restaurant business needs a regular flow of customers daily, so we will look for a **places with at least a few business centers and offices** nearby.
- It is good for businesses to have as few rivals as possible, so we will be looking for **places with the lowest number of existing restaurants** (any type of restaurant) and specifically the Italian restaurants in the vicinity.
- Good transportation system/connection to other neighborhoods of the city. So we will search for **places with at least one metro station** situated within walking distance.

We decided to look for potential places in the major business districts of London city. It should be within a walking distance to nearby metro station, so we will restrict ourselves to areas within circles of radius 500 meters from every metro station. Next, we will gather the information about were already existing restaurants are situated and will look for places with the lowest density.

2.2. Data sources

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

- List of major business districts in London:
  https://www.savills.co.uk/research_articles/229130/177600-0
- Geographical boundaries of London boroughs:
  https://joshuaboyd1.carto.com/tables/london_boroughs_proper/public
- Locations of metro stations and different cuisine restaurants will be gathered with the help of Foursquare API:
  https://developer.foursquare.com/docs

2.3. Data acquisition

First of all, we need to find the major business districts in London city. There are five major districts defined in our source data, but we will consider only the biggest ones: West End, The City, and Canary Wharf.

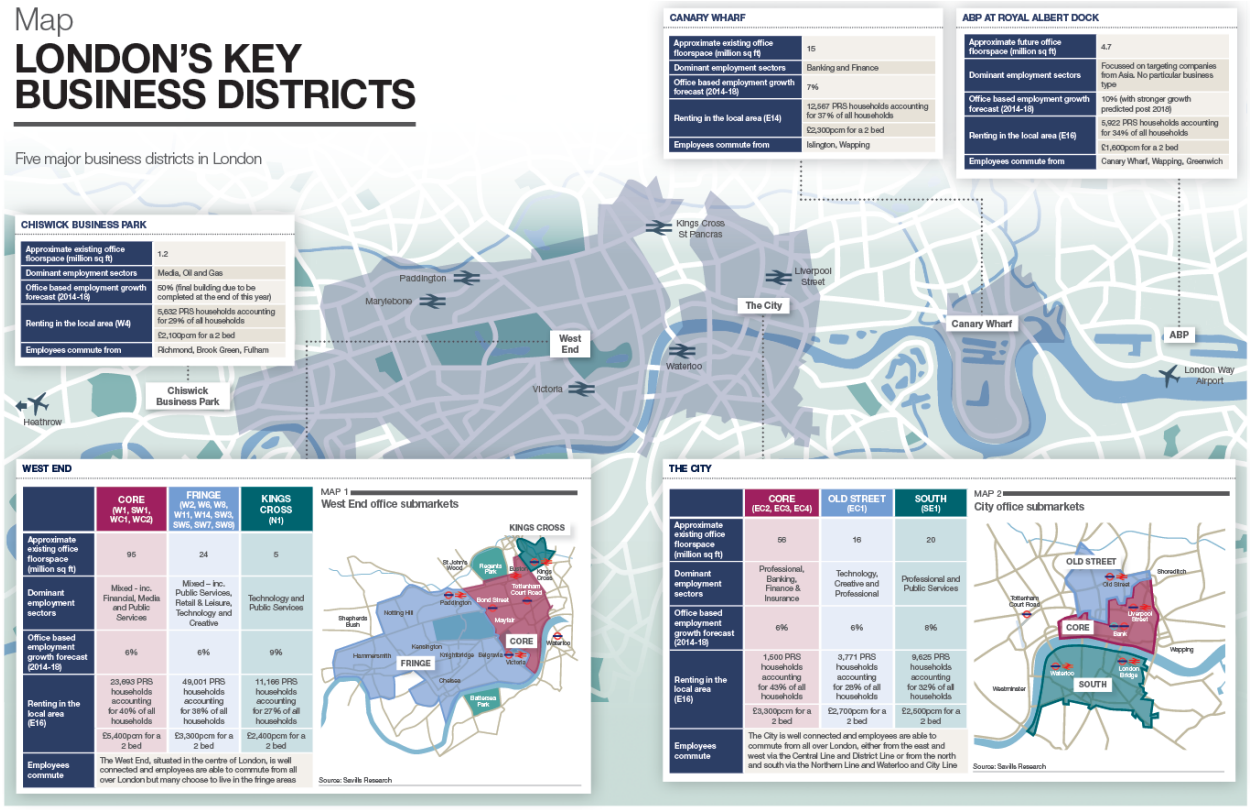

Figure 1 The major business districts in London. Source: https://www.savills.co.uk/research_articles/229130/177600-0

Next, we need to find the approximate coordinates of these districts. As we can see, all three are situated close to each other, so we can approximately draw a rectangular boundary around them. To do that, we will use google maps website (https://www.google.com/maps) to get the boundary coordinates manually.

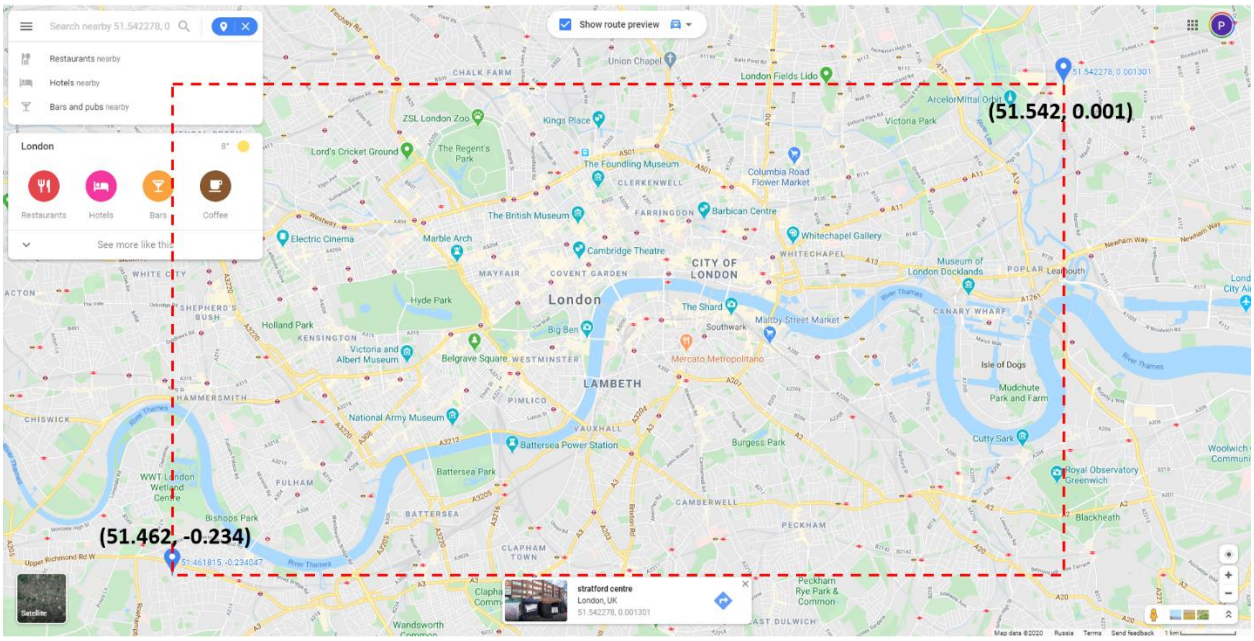

Figure 2. Approximate rectangular boundary for our business districts. The coordinates of the south-west and the north-east points found using google maps website.

We need the coordinates of only two points, the south-west, and the north-east boundary points of a rectangle. They are found to be: North-east: (51.542, 0.001) and South-west: (51.462, -0.234), where the numbers represent the latitude and the longitude, respectfully.

Now, we can proceed to the next task of finding the coordinates of all the metro stations in the chosen rectangle area. To do that, we will use the Foursquare API. By doing a little searching on the Foursquare API developer's documentations website (https://developer.foursquare.com/docs/resources/categories), one can notice that venues are divided into 10 different categories, which have their one subcategories. The main categories and their ids are as listed below:

Table 1. Main venue categories in the Foursquare API. Source: https://developer.foursquare.com/docs/resources/categories

name	id
Arts & Entertainment	4d4b7104d754a06370d81259
College & University	4d4b7105d754a06372d81259
Event	4d4b7105d754a06373d81259
Food	4d4b7105d754a06374d81259
Nightlife Spot	4d4b7105d754a06376d81259
Outdoors & Recreation	4d4b7105d754a06377d81259
Professional & Other Places	4d4b7105d754a06375d81259
Residence	4e67e38e036454776db1fb3a
Shop & Service	4d4b7105d754a06378d81259
Travel & Transport	4d4b7105d754a06379d81259

For no, we are only interested in the “Travel & Transport” category. By looking at its subcategories, we can quickly find the one we are looking for: “Metro Station” with id code “4bf58dd8d48988d1fd931735”.

To obtain the locations of all the metro stations we will use the Foursquare’s Places API that offers real-time access to Foursquare’s global database of rich venue data and user content. After creating the developer’s account and choosing the name for your first Foursquare app, two unique keys will be assigned. The keys are called the “CLIENT ID” and “CLIENT SECRET”. Finally we can make our first API call to find all the metro stations bounded to the rectangular area we defined above.

We have found a total of 106 metro stations and the resulting locations are shown below.

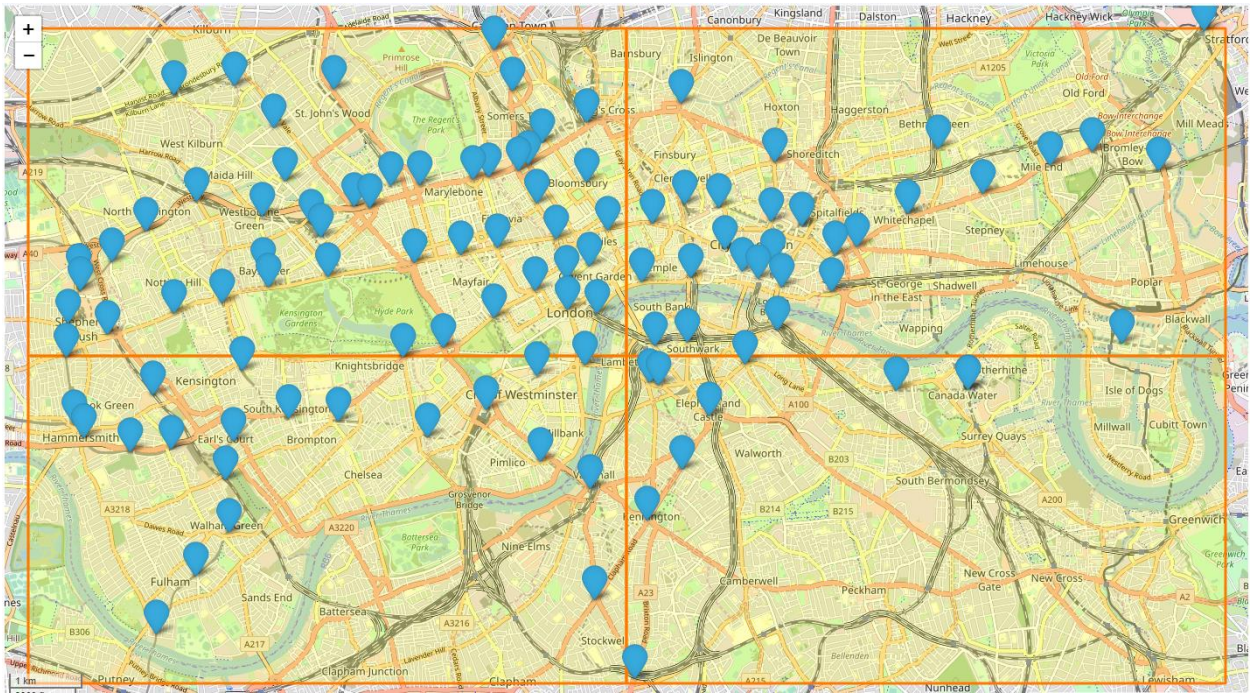

Figure 3. All the metro stations that are bounded to the rectangular area. Data retrieved using Foursquare’s Places API.

To be fair, we also divided the rectangular area into four smaller ones because there are more than 50 metro stations in the area which is the limit of how many venues one can receive from a single Places API call.

Next, we will restrict ourselves to the areas that are situated no further than 500 meters from any of the metro stations that we have found. This areas are depicted below.

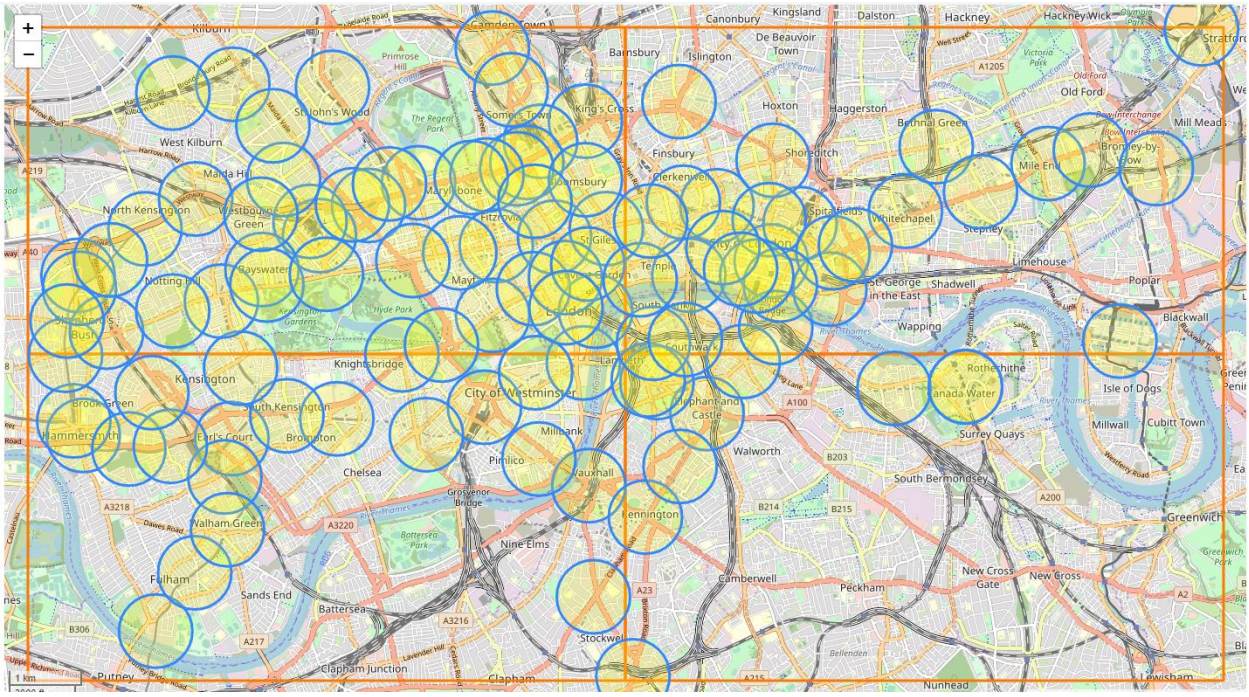

Figure 4. The areas that fall within the radius of 500 meters to the nearest metro station.

To find all the already existing Italian restaurants in the areas of interest, we will make API calls for every metro station, looking for venues that fall under category “Food Italian Restaurant” and restrict our search by setting radius of 500 meters. Resulting data is shown below.

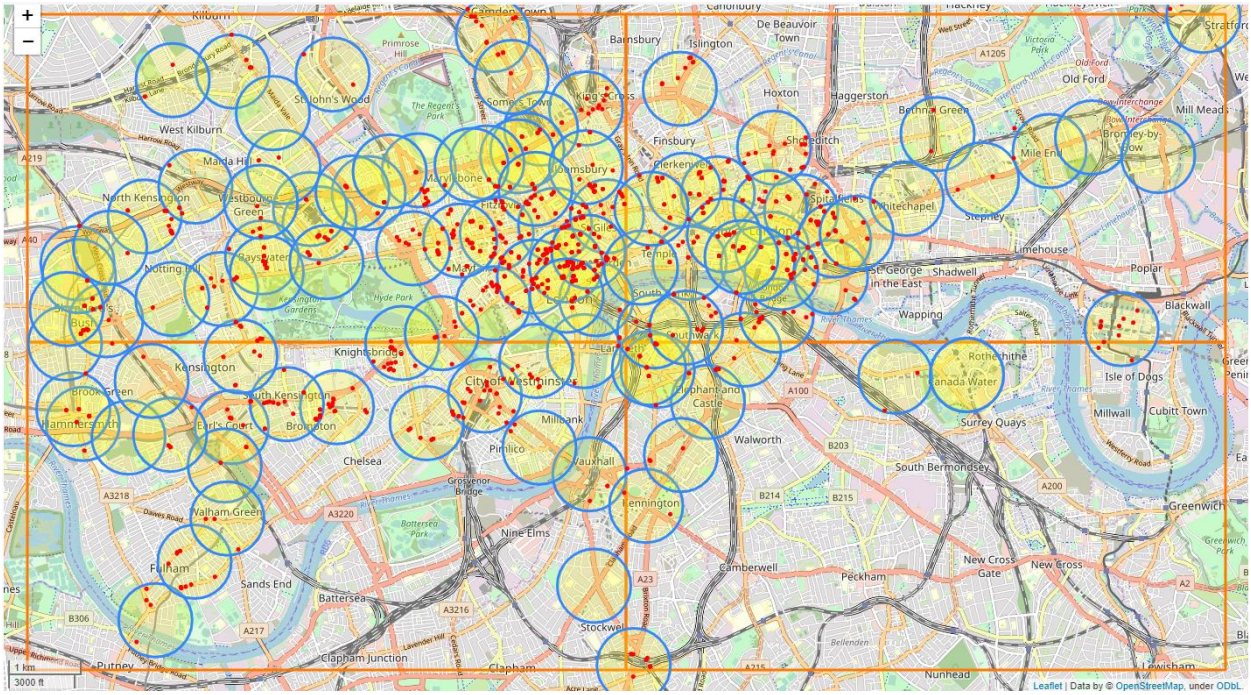

Figure 5. Distribution of Italian restaurant locations (in red) across all the areas of interest (yellow circle).