LOCATION SCOUTING FOR RAILWAY STATION BUSINESS - LONDON

INTRODUCTION

We are accustomed to seeing stores and other forms of businesses in airports, be it duty free stores and restaurants/bars. Most train stations on the other hand, do not have the space to have such establishments within the train station.

With some high-street stores across London announcing plans to open new branches in the immediate vicinity of transport hubs - particularly, railway stations, it is prudent to analyse the kinds of businesses operating in the area. This decision to expand to railway stations is partly as a result of increasing passenger journeys each year for the past 20 years. An analysis of most visited businesses close to railway stations will help some companies or individuals decide on how to take advantage of the yearly increase in passenger traffic.

Venues within 500 metres of the top 10 busiest railway stations in London will be explored

DATA

Primary data source used in this work was from Wikipedia - 'List of busiest railway stations in Great Britain'. The table contains a complete list of the busiest railway stations in Great Britain.

	Rank	Railway Station	Annual entries/exits(millions)2017–18	Annual interchanges (millions) 2017–18	Location	Main Services	Number of platforms	Interchange systems	Image
0	1	London Waterloo	94.345	5.859	London	South Western Main LineWest of England Main Line	24 (Platforms 25 and 26 are part of the Underg...	London Underground	NaN
1	2	London Victoria	74.955	6.126	London	Brighton Main LineChatham Main Line	19	London Underground	NaN
2	3	London Liverpool Street	66.967	3.790	London	Great Eastern Main LineWest Anglia Main Line	18	London Underground, London Overground, TfL Rail	NaN
3	4	London Bridge	48.453	7.393	London	South Eastern Main LineBrighton Main LineThame...	15	London Underground	NaN
4	5	London Euston	44.746	4.073	London	West Coast Main Line	18	London Underground, London Overground	NaN

Figure 1. Table showing the list of busiest railway stations in Great Britain.

Since the focus of this analysis was only for the city of London, the railway stations in the city of London were filtered from the main list by virtue of location (i.e. London) and the columns (railway station name). The coordinates of the stations of interest were obtained using *geopy.geocoders* and added to the dataframe containing the names of the top ten busiest railway stations in London.

	Railway Station	Latitude	Longitude
0	London Waterloo	51.502838	-0.112801
1	London Victoria	51.494733	-0.144580
2	London Liverpool Street	51.518043	-0.081773
3	London Bridge	51.508049	-0.087672
4	London Euston	51.528808	-0.134255
5	Stratford	52.192788	-1.706367
6	London Paddington	51.517086	-0.177542
7	London St Pancras	51.532196	-0.127090
8	London King's Cross	51.532395	-0.123022
9	Highbury and Islington	51.546368	-0.103654

Figure 2. Dataframe of top ten busiest railway stations in London with coordinates.

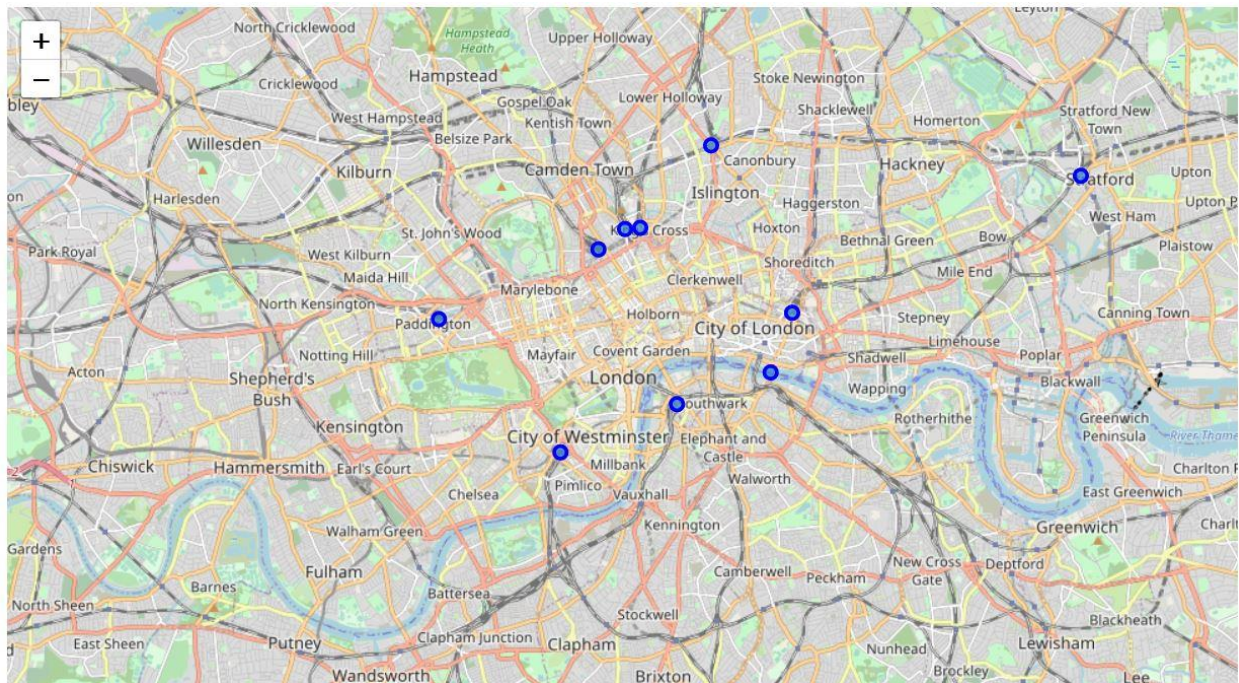The location of these railway stations is shown in Figure 3 below.

Figure 3. Location of the top ten busiest railway stations in London.

METHODOLOGY

The venues for the railway stations of interest were obtained from the Foursquare API. In order to obtain the venues, a function was written to return a list of hundred (100) venues within five hundred (500) metres of the top ten (10) busiest railway stations in London.

	Railway Station	Railway Station Latitude	Railway Station Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	London Waterloo	51.502838	-0.112801	The Old Vic	51.502176	-0.109686	Theater
1	London Waterloo	51.502838	-0.112801	Greensmiths	51.500995	-0.112407	Food & Drink Shop
2	London Waterloo	51.502838	-0.112801	ODEON BFI IMAX	51.504995	-0.113529	Movie Theater
3	London Waterloo	51.502838	-0.112801	Po Cha	51.501035	-0.112213	Korean Restaurant
4	London Waterloo	51.502838	-0.112801	Vaulty Towers	51.501188	-0.111909	Bar

Figure 4. List of first five venues close to London Waterloo Station

The function returned a total of seven hundred and twenty-one (721) venues for all ten railway stations. The returned dataframe showed the name of the station, the coordinates, the name of the venue, the coordinates of the venue, and the venue category as shown in Figure 4 above.

The top twenty venue categories for all the railway stations were filtered and the total number of each category was obtained and visualised.

	Total Count
Hotel	49
Coffee Shop	43
Café	40
Pub	37
Italian Restaurant	26
Bar	18
Burger Joint	17
Bakery	16
Sandwich Place	14
Restaurant	14
Gym / Fitness Center	13
Breakfast Spot	9
Theater	9
Pizza Place	9
Grocery Store	9
Beer Bar	8
Seafood Restaurant	8
Food Truck	8
Cocktail Bar	8
Park	8

Figure 5. Total count of the top twenty venue categories for the ten busiest railway stations in London
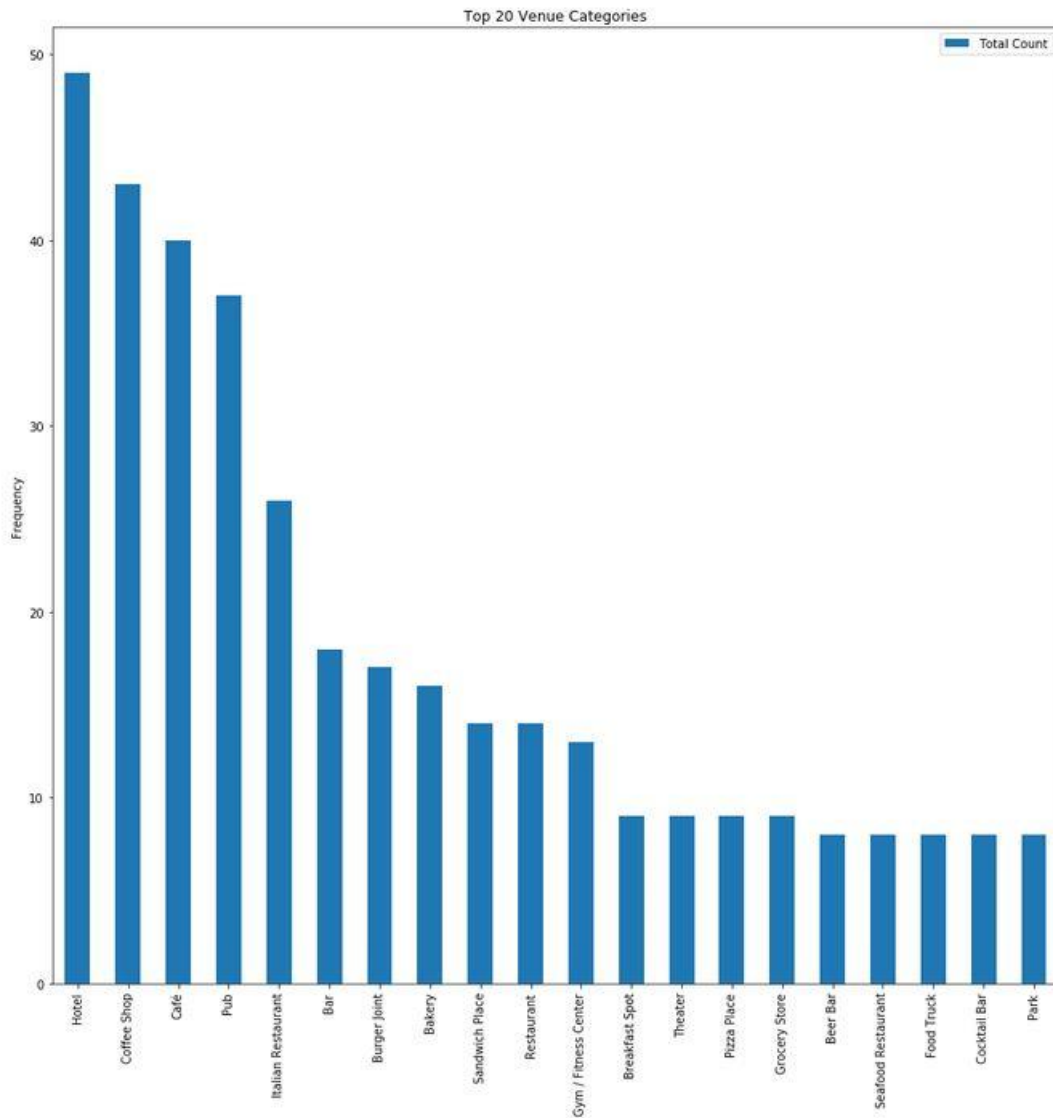
Figure 6. Bar plot of the frequency of top 20 venue categories for all railway stations.

From the dataframe and Figure 6, it is evident the most visited venue category around the top ten busiest railway stations in London is hotel, followed by coffee shop and café – all in the hospitality industry.

RESULSTS

A knowledge of the immediate neighbourhoods lends some credence to the results in the dataframe below (Figure 7). For instance, the immediate surroundings of Highbury and Islington consists of mainly residential dwellings which explains why there are no hotels in the vicinity.

On the other hand, London Paddington is in West End – a Central London district with many tourist attractions, shops and businesses. This might explain why there are many hotels and cafes concentrated in the vicinity of the station.

A breakdown of the venue categories by station (Figure 7) shows the quantity of each venue category for each station. This breakdown will help in clustering the stations based on similar characteristics.

	Railway Station	Hotel	Coffee Shop	Café	Pub	Italian Restaurant	Bar	Burger Joint	Bakery	Sandwich Place	Restaurant	Gym / Fitness Center	Breakfast Spot	Theater	Pizza Place	Grocery Store	Beer Bar	Seafood Restaurant	Food Truck	Cocktail Bar	Park
0	Highbury and Islington	0	8	9	8	4	1	0	4	2	0	1	1	0	1	1	1	1	0	2	4
1	London Bridge	2	5	1	5	3	1	2	3	0	3	1	1	0	1	1	0	4	1	1	0
2	London Euston	1	2	2	3	2	0	1	0	1	0	2	2	2	0	0	3	0	0	1	0
3	London King's Cross	3	3	3	2	0	2	4	1	0	1	0	2	0	2	1	0	0	0	0	0
4	London Liverpool Street	3	2	1	1	1	0	1	0	1	2	2	0	0	1	0	0	1	5	3	0
5	London Paddington	19	5	14	4	5	1	0	1	2	0	1	0	0	1	4	1	1	1	0	1
6	London St Pancras	4	2	2	1	2	3	1	0	0	2	1	3	0	0	1	0	0	0	0	1
7	London Stratford	2	2	1	7	2	2	3	2	2	0	1	0	0	2	1	0	0	0	0	0
8	London Victoria	9	7	3	4	7	1	2	3	3	3	3	0	4	0	0	0	1	0	1	1
9	London Waterloo	6	7	4	2	0	7	3	2	3	3	1	0	3	1	0	3	0	1	0	1

Figure 7. Summary of venue category at each of the ten busiest railway stations in London

K-means was run to cluster the railway stations into 4 clusters.

Main characteristics of cluster 1 include hospitality, and recreational venues.

	Railway Station	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
6	London Paddington	Hotel	Café	Italian Restaurant	Coffee Shop	Grocery Store	Pub	Greek Restaurant	Sandwich Place	Garden	Middle Eastern Restaurant

Cluster 2 mainly consist of hospitality venues, recreational venues, fitness locations, and stores

	Railway Station	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	London Waterloo	Bar	Coffee Shop	Hotel	Café	Sandwich Place	Restaurant	Beer Bar	Theater	Burger Joint	Concert Hall
1	London Victoria	Hotel	Italian Restaurant	Coffee Shop	Pub	Theater	Mediterranean Restaurant	Bakery	Café	Restaurant	Sandwich Place
3	London Bridge	Coffee Shop	Pub	Seafood Restaurant	Bakery	Italian Restaurant	Restaurant	Burger Joint	Hotel	Fast Food Restaurant	Burrito Place
4	London Euston	Beer Bar	Pub	Museum	Breakfast Spot	Italian Restaurant	Café	Coffee Shop	Gym / Fitness Center	Theater	Sandwich Place
5	London Stratford	Pub	Clothing Store	Burger Joint	Toy / Game Store	Sandwich Place	Pizza Place	Cosmetics Shop	Department Store	Juice Bar	Italian Restaurant
9	Highbury and Islington	Café	Coffee Shop	Pub	Park	Italian Restaurant	Bakery	Middle Eastern Restaurant	Deli / Bodega	Music Venue	Cocktail Bar

Main characteristics of cluster 3 are hospitality and fitness venues.

	Railway Station	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
2	London Liverpool Street	Food Truck	Cocktail Bar	Hotel	English Restaurant	Mediterranean Restaurant	Gym / Fitness Center	Coffee Shop	Boxing Gym	Restaurant	Salad Place

Main characteristics of cluster 4 are hospitality, recreational, and transportation venues

	Railway Station	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
7	London St Pancras	Hotel	Breakfast Spot	Bar	Café	Coffee Shop	Chocolate Shop	Gastropub	Train Station	Restaurant	Italian Restaurant
8	London King's Cross	Burger Joint	Café	Coffee Shop	Hotel	Train Station	Pub	Breakfast Spot	Supermarket	Bar	Pizza Place

CONCLUSION

Based on the clusters returned and depending on the type of business an individual wants to start, one can decide on the best location for the business. Any potential opportunities/gaps can be also be exploited in any of the locations based on the results obtained.