

Final Data Science Capstone

Introduction - Business Problem

In this project, we will explore London, the most multicultural city in the United Kingdom and its financial capital.

We explore places around London and discuss what makes London unique! London is truly a multicultural city with various restaurants like African restaurants, Chinese restaurants, German restaurants and many more.

The beautiful places around London is a reason why you need to visit London. London is known for its vibrant social life and it is a good place to start business. London is a city where businesses thrive. There are many amazing businesses around London.

First, we determine the places to start a restaurant in London.

and why London is a good place to live. London's vibrant social life is due to its many bars, restaurants, museums, pubs, and many more.

We use the postal district dataset given in the following link https://en.wikipedia.org/wiki/London_postal_district (https://en.wikipedia.org/wiki/London_postal_district). The link provides the postal district code, postal town, coverage and local authority area(s) of postal districts of London.

We use the Foursquare API to explore the venues given the location of the London's districts.

Finally, we use K-means clustering to cluster all the coverages(districts) in London. We then group them based on the clusters.

Data Section

In order to achieve our objectives stated in the Introduction. We use the postcode areas dataset in the following link https://en.wikipedia.org/wiki/London_postal_district (https://en.wikipedia.org/wiki/London_postal_district). We scrap using pandas.

The postcode areas in London are N, NW, SW, SE, W, WC, E and EC postcode areas. For each postcode area, we collect data on all the postcode districts, post town, coverage and local authority area(s) in the area. We merge all the 8 postcode areas to generate our final dataset with all coverages(districts) given.

We remove the data points where the local authority area(s) is non-geographic and other None values.

We use the Geopy library to find the location data for each district in our dataset.

Finally, we use the Foursquare API to explore the venues around each district using the location data provided by Geopy.

Methodology

Firstly, we want to do web scraping using pandas by extracting the postal table from https://en.wikipedia.org/wiki/London_postal_district (https://en.wikipedia.org/wiki/London_postal_district) using pandas.

Import all the necessary Libraries

```
In [1]: #import necessary libraries
!pip install geocoder
import geocoder # import geocoder

import numpy as np # Library to handle data in a vectorized manner

import pandas as pd # Library for data analysis
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json # Library to handle JSON files

!pip install geopy # uncomment this line if you haven't completed the Foursquare API lab
!pip install folium
from geopy.geocoders import Nominatim # convert an address into latitude and longitude values

import requests # Library to handle requests
from pandas.io.json import json_normalize # transform JSON file into a pandas dataframe

# Matplotlib and associated plotting modules
import matplotlib.pyplot as plt
import matplotlib.cm as cm
import matplotlib.colors as colors

# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven't completed the Foursquare API lab
import folium # map rendering library

print('Libraries imported.')
```

```

Requirement already satisfied: geocoder in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (1.38.1)
Requirement already satisfied: requests in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (2.24.0)
Requirement already satisfied: click in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (7.1.2)
Requirement already satisfied: ratelim in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (0.1.6)
Requirement already satisfied: six in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (1.15.0)
Requirement already satisfied: future in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geocoder) (0.18.2)
Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (3.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2020.12.5)
Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (1.25.9)
Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->geocoder) (2.9)
Requirement already satisfied: decorator in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from ratelim->geocoder) (4.4.2)
Requirement already satisfied: geopy in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (2.0.0)
Requirement already satisfied: geographiclib<2,>=1.49 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from geopy) (1.50)
Requirement already satisfied: folium in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (0.11.0)
Requirement already satisfied: branca>=0.3.0 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (0.4.2)
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Requirement already satisfied: numpy in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (1.18.5)
Requirement already satisfied: jinja2>=2.9 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from folium) (2.11.2)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (2020.12.5)
Requirement already satisfied: idna<3,>=2.5 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (2.9)
Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (1.25.9)
Requirement already satisfied: chardet<4,>=3.0.2 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from requests->folium) (3.0.4)
Requirement already satisfied: MarkupSafe>=0.23 in /opt/conda/envs/Python-3.7-main/lib/python3.7/site-packages (from jinja2>=2.9->folium) (1.1.1)
Libraries imported.

```

Read the table using pandas.read_html function

There are 8 post areas in London as listed in postal_areas below

```
In [2]: postal_areas = [ 'N', 'NW', 'SW', 'SE', 'W', 'WC', 'E' , 'EC']
        tables = []

        for item in postal_areas:

            if item != 'EC':
                url = 'https://en.wikipedia.org/wiki/{}_postcode_area'.format(item)
                tables_pd = pd.read_html(url)
                tables.append(tables_pd[1])

            elif item == 'EC':
                url = 'https://en.wikipedia.org/wiki/{}_postcode_area'.format(item)
                tables_pd = pd.read_html(url)
                tables.append(tables_pd[2])
            else:
                pass
```

The number of tables in tables can be calculated as follows:

```
In [3]: len(tables)
```

```
Out[3]: 8
```

Merge all the eight tables together

```
In [4]: result_df = pd.concat(tables)
```

```
In [5]: result_df.head()
```

```
Out[5]:
```

	Postcode district	Post town	Coverage	Local authority area(s)
0	N1	LONDON	Northern head district: Barnsbury (part), Cano...	Hackney, Islington, Camden
1	N1C	LONDON	Kings Cross Central	Camden
2	N1P	LONDON	PO boxes in N1 and N1C	non-geographic
3	N2	LONDON	East Finchley district: East Finchley, Fortis ...	Barnet, Haringey
4	N3	LONDON	Finchley district: Finchley, Church End, Finch...	Barnet

Find the types of the columns in the dataset

```
In [6]: result_df.dtypes
```

```
Out[6]: Postcode district      object
Post town                    object
Coverage                    object
Local authority area(s)      object
dtype: object
```

The number of rows and columns in our dataset can be calculated as follows

```
In [7]: print('There are {} rows and {} columns in our dataset'.format(result_df.shape[0], result_df.shape[1]))
```

```
There are 184 rows and 4 columns in our dataset
```

Next, collect all the data points where the Local authority area(s) = non-geographic

```
In [8]: nongeo_df = result_df[result_df['Local authority area(s)'] == 'non-geographic']
nongeo_df.head()
```

```
Out[8]:
```

	Postcode district	Post town	Coverage	Local authority area(s)
2	N1P	LONDON	PO boxes in N1 and N1C	non-geographic
24	N81	LONDON	Electoral Reform Services	non-geographic
1	NW1W	LONDON	PO boxes in NW1[4]	non-geographic
12	NW26	LONDON	PO boxes in NW10[4]	non-geographic
1	SE1P	LONDON	NaN	non-geographic

Next, remove all the data points where the Local authority area(s) != non-geographic and find the resulting dataset

```
In [9]: result_df = result_df[result_df['Local authority area(s)'] != 'non-geographic']
```

```
In [10]: result_df = result_df.drop('Local authority area(s)', axis = 1).dropna()
```

```
In [11]: result_df.shape
```

```
Out[11]: (173, 3)
```

```
In [12]: result_df.head()
```

```
Out[12]:
```

	Postcode district	Post town	Coverage
0	N1	LONDON	Northern head district: Barnsbury (part), Cano...
1	N1C	LONDON	Kings Cross Central
3	N2	LONDON	East Finchley district: East Finchley, Fortis ...
4	N3	LONDON	Finchley district: Finchley, Church End, Finch...
5	N4	LONDON	Finsbury Park district: Finsbury Park, Manor H...

```
In [13]: result_df['Coverage'] = result_df['Coverage'].map(lambda name: name.split(':')[0])
result_df = result_df.reset_index(drop = True)
```

Use Geopy to find the location data (longitude and latitude) of all districts

```
In [14]: post_data = result_df['Postcode district']
latitudes = []
longitudes = []
for post in post_data:
    geolocator = Nominatim(user_agent="my_app")
    location = geolocator.geocode("{} , England".format(post))
    if location != None:
        latitudes.append(location.latitude)
        longitudes.append(location.longitude)
    else:
        latitudes.append('NA')
        longitudes.append('NA')
```

```
In [15]: location_data = pd.DataFrame(columns = ['Postcode district', 'Latitude', 'Longitude'])
```

Location data is given as follows

```
In [16]: location_data['Postcode district'] = result_df['Postcode district']
location_data['Latitude'] = pd.Series(latitudes)
location_data['Longitude'] = pd.Series(longitudes)
result_df['Latitude'] = location_data['Latitude']
result_df['Longitude'] = location_data['Longitude']
location_data.head()
```

Out[16]:

	Postcode district	Latitude	Longitude
0	N1	52.599	-2.09829
1	N1C	51.5347	-0.124548
2	N2	52.6013	-2.09711
3	N3	52.5998	-2.09297
4	N4	52.5987	-2.09266

```
In [17]: result_df = result_df.reset_index(drop=True)
```

The resulting dataset is given below after including the location data for each district

```
In [18]: result_df.head()
```

Out[18]:

	Postcode district	Post town	Coverage	Latitude	Longitude
0	N1	LONDON	Northern head district	52.599	-2.09829
1	N1C	LONDON	Kings Cross Central	51.5347	-0.124548
2	N2	LONDON	East Finchley district	52.6013	-2.09711
3	N3	LONDON	Finchley district	52.5998	-2.09297
4	N4	LONDON	Finsbury Park district	52.5987	-2.09266

```
In [19]: result_df = result_df[result_df['Latitude'] != 'NA']
```

```
In [20]: result_df.shape
```

Out[20]: (166, 5)

```
In [21]: result_df.head()
```

Out[21]:

	Postcode district	Post town	Coverage	Latitude	Longitude
0	N1	LONDON	Northern head district	52.599	-2.09829
1	N1C	LONDON	Kings Cross Central	51.5347	-0.124548
2	N2	LONDON	East Finchley district	52.6013	-2.09711
3	N3	LONDON	Finchley district	52.5998	-2.09297
4	N4	LONDON	Finsbury Park district	52.5987	-2.09266

Map of London, England with all the districts

```
In [22]: address = 'London, England'

geolocator = Nominatim(user_agent="my_app")
lond_location = geolocator.geocode(address)
lond_latitude = lond_location.latitude
lond_longitude = lond_location.longitude
print('The geograpical coordinate of London are {}, {}'.format(lond_latitude,
lond_longitude))
```

The geograpical coordinate of London are 51.5073219, -0.1276474.

```
In [23]: # create map of London using latitude and longitude values
map_london = folium.Map(location=[lond_latitude, lond_longitude], zoom_start=10)

# add markers to map
for lat, lng, post_town, coverage in zip(result_df['Latitude'], result_df['Longitude'], result_df['Post town'], result_df['Coverage']):
    label = '{} {}'.format(coverage, post_town)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='green',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_london)

map_london
```

Out[23]: Make this Notebook Trusted to load map: File -> Trust Notebook

Foursquare API

It's time to explore the locations nearby the districts using Foursquare API. We will start with the Foursquare details.

```
In [24]: CLIENT_ID = 'BL2ZUBYOFSD40CFRZHGTYYVR0WZCIC2RBXY3CP52YQJYQ4B12' # your Foursquare ID
CLIENT_SECRET = 'UCAMQEVDA0WSKEGJE10Y001ZYDR1T4KBJAD4DXG3LCMXREPC' # your Foursquare Secret
VERSION = '20180605' # Foursquare API version
LIMIT = 100 # A default Foursquare API limit value

print('Your credentials:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)
```

Your credentials:

CLIENT_ID: BL2ZUBYOFSD40CFRZHGTYYVR0WZCIC2RBXY3CP52YQJYQ4B12

CLIENT_SECRET:UCAMQEVDA0WSKEGJE10Y001ZYDR1T4KBJAD4DXG3LCMXREPC

Let us explore the first coverage(district)

```
In [25]: result_df.loc[0, 'Coverage']
```

```
Out[25]: 'Northern head district'
```

```
In [26]: # the location data for the first district

district_latitude = result_df.loc[0, 'Latitude'] # neighborhood latitude value
district_longitude = result_df.loc[0, 'Longitude'] # neighborhood longitude value

district_name = result_df.loc[0, 'Coverage'] # neighborhood name

print('Latitude and longitude values of {} are {}, {}'.format(district_name,
    district_latitude, district_longitude))
```

Latitude and longitude values of Northern head district are 52.5989524, -2.0982864.

```
In [27]: LIMIT = 100 # limit of number of venues returned by Foursquare API

radius = 500 # define radius

url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={}&radius={}&limit={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    district_latitude,
    district_longitude,
    radius,
    LIMIT
)
print(url)
```

https://api.foursquare.com/v2/venues/explore?&client_id=BL2ZUBYOFSD40CFRZHGTYYVR0WZCIC2RBXY3CP52YQJYQ4B12&client_secret=UCAMQEVDA0WSKEGJE10Y001ZYDR1T4KBJAD4DXG3LCMXREPC&v=20180605&ll=52.5989524,-2.0982864&radius=500&limit=100

```
In [28]: results = requests.get(url).json()
```

```
In [29]: def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']
```

```
In [30]: venues = results['response']['groups'][0]['items']

nearby_venues = pd.json_normalize(venues) # flatten JSON

# filter columns
filtered_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.location.lng']
nearby_venues = nearby_venues.loc[:, filtered_columns]

# filter the category for each row
nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)

# clean columns
nearby_venues.columns = [col.split(".")[1] for col in nearby_venues.columns]

nearby_venues.head()
```

Out[30]:

	name	categories	lat	lng
0	WHSmith	Stationery Store	52.599423	-2.095442
1	Cineworld	Movie Theater	52.596291	-2.092581
2	Heath Town Park	Park	52.596837	-2.099860
3	Eastside Coffee Shop	Coffee Shop	52.600520	-2.094384
4	Greggs	Bakery	52.601881	-2.092942

```
In [31]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))

6 venues were returned by Foursquare.
```

Explore all the venues in all the districts in London using the result_df dataset

```

In [32]: def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        #print(name)

        # create the API request URL
        url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

        # make the GET request
        results = requests.get(url).json()["response"]['groups'][0]['items']

        # return only relevant information for each nearby venue
        venues_list.append([
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['categories'][0]['name']) for v in results])

    nearby_venues = pd.DataFrame([item for venue_list in venues_list for item
in venue_list])
    nearby_venues.columns = ['Coverage',
                            'Coverage Latitude',
                            'Coverage Longitude',
                            'Venue',
                            'Venue Latitude',
                            'Venue Longitude',
                            'Venue Category']

    return(nearby_venues)

```

```

In [33]: london_venues = getNearbyVenues(names=result_df['Coverage'],
                                           latitudes=result_df['Latitude'],
                                           longitudes=result_df['Longitude']
                                           )

```

London has many restaurants, bars, clothing stores, pubs, shopping malls, science museums, and theaters. It is indeed a good place for social life.

Now, we want to find districts or places in London where there are no restaurants. One of those places is a good location to start a restaurant

The 'london_nonrestaurants_venues' table contains that list

```
In [36]: london_nonrestaurants_venues = london_venues.where(~london_venues['Venue Category'].str.contains('Restaurant'))
london_nonrestaurants_venues = london_nonrestaurants_venues.dropna().reset_index(drop=True)
london_nonrestaurants_venues['Coverage'].unique()[:5]
```

```
Out[36]: array(['Northern head district', 'Kings Cross Central',
               'East Finchley district', 'Finchley district',
               'Finsbury Park district'], dtype=object)
```

```
In [37]: london_venues.groupby('Coverage').count().head()
```

Out[37]:

	Coverage Latitude	Coverage Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Coverage						
A projection around Parliament Square. Nearby Westminster School to Westminster Cathedral to CCAL, University of the Arts, London (omitting all backstreets nearest to Vauxhall Bridge Road) – derivation	55	55	55	55	55	55
Abbey Wood district	3	3	3	3	3	3
All but the west of St James's	88	88	88	88	88	88
Anerley district	5	5	5	5	5	5
Balham district	61	61	61	61	61	61

```
In [38]: print('There are {} uniques categories.'.format(len(london_venues['Venue Category'].unique())))
```

There are 334 uniques categories.

```
In [39]: # one hot encoding
london_onehot = pd.get_dummies(london_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
london_onehot['Coverage'] = london_venues['Coverage']

# move neighborhood column to the first column
fixed_columns = [london_onehot.columns[-1]] + list(london_onehot.columns[:-1])
london_onehot = london_onehot[fixed_columns]

london_onehot.head()
```

Out[39]:

	Coverage	Accessories Store	African Restaurant	Airport Lounge	Airport Service	American Restaurant	Antique Shop	Arcade	Argentina Restaurant
0	Northern head district	0	0	0	0	0	0	0	
1	Northern head district	0	0	0	0	0	0	0	
2	Northern head district	0	0	0	0	0	0	0	
3	Northern head district	0	0	0	0	0	0	0	
4	Northern head district	0	0	0	0	0	0	0	

Districts where you can find African Restaurants in London

```
In [40]: african_venues = london_venues[london_venues['Venue Category'] == 'African Restaurant']
african_venues
```

Out[40]:

	Coverage	Coverage Latitude	Coverage Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
285	South Tottenham district	51.589918	-0.099070	Le Chamarel	51.589688	-0.105921	African Restaurant
509	Wood Green district	51.592298	-0.105241	Le Chamarel	51.589688	-0.105921	African Restaurant
1819	Stockwell district	51.476685	-0.111061	Adulis	51.479486	-0.111702	African Restaurant
3293	Fitzrovia, Tottenham Court Road	51.524002	-0.140537	African Kitchen Gallery	51.527265	-0.136386	African Restaurant
3596	Shepherds Bush district	51.504004	-0.230712	Red Sea Restaurant	51.506485	-0.235160	African Restaurant
5378	Finsbury, Finsbury Estate (west)	51.528399	-0.106873	Spinach & Agushi	51.525288	-0.110348	African Restaurant

List of the districts where you can find african restaurants

```
In [41]: for district in african_venues.Coverage:
          print(district)
```

```
South Tottenham district
Wood Green district
Stockwell district
Fitzrovia, Tottenham Court Road
Shepherds Bush district
Finsbury, Finsbury Estate (west)
```

Map of African Restaurants in London


```
In [42]: # create map of London using Latitude and Longitude values
def create_venues_map(venues):
    map_london = folium.Map(location=[lond_latitude, lond_longitude], zoom_start=10)
    for lat, lng, venue, category in zip(venues['Venue Latitude'], venues['Venue Longitude'], venues['Venue'], venues['Venue Category']):
        label = '{} , {}'.format(venue, category)
        label = folium.Popup(label, parse_html=True)
        folium.CircleMarker(
            [lat, lng],
            radius=5,
            popup=label,
            color='green',
            fill=True,
            fill_color='#3186cc',
            fill_opacity=0.7,
            parse_html=False).add_to(map_london)
    return map_london
create_venues_map(african_venues)
```

Out[42]: Make this Notebook Trusted to load map: File -> Trust Notebook

Districts where you can find American Restaurants in London

```
In [43]: american_venues = london_venues[london_venues['Venue Category'] == 'American R
restaurant']
for district in american_venues.Coverage:
    print(district)
```

```
Tottenham district
Barnes district
Portland Place, Regent Street
Marylebone
Marylebone
Fitzrovia, Tottenham Court Road
Great Portland Street, Fitzrovia
University College London, SOAS
Covent Garden
Somerset House, Temple (west)
Woodford and South Woodford district
Non-geographic postcode district (NatWest, delivers to E1)
Non-geographic postcode district (News International, delivers to E1W)
```

Map of American Restaurants in London

```
In [44]: create_venues_map(american_venues)
```

Out[44]: Make this Notebook Trusted to load map: File -> Trust Notebook

```
In [45]: london_grouped = london_onehot.groupby('Coverage').mean().reset_index()
london_grouped.head()
```

Out[45]:

	Coverage	Accessories Store	African Restaurant	Airport Lounge	Airport Service	American Restaurant	Antique Shop	Arcade	Argentinian Restaura
0	A projection around Parliament Square. Nearby ...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
1	Abbey Wood district	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
2	All but the west of St James's	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
3	Anerley district	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
4	Balham district	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0

Top 5 venues in each district

```
In [46]: num_top_venues = 5

for hood in london_grouped['Coverage']:
    print("-----"+hood+"-----")
    temp = london_grouped[london_grouped['Coverage'] == hood].T.reset_index()
    temp.columns = ['venue', 'freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')
```

----A projection around Parliament Square. Nearby Westminster School to Westminster Cathedral to CCAL, University of the Arts, London (omitting all backstreets nearest to Vauxhall Bridge Road) - derivation----

	venue	freq
0	Coffee Shop	0.13
1	Café	0.13
2	Sandwich Place	0.05
3	Outdoor Sculpture	0.05
4	Plaza	0.05

----Abbey Wood district----

	venue	freq
0	Soccer Field	0.33
1	Fish & Chips Shop	0.33
2	Grocery Store	0.33
3	Accessories Store	0.00
4	Palace	0.00

----All but the west of St James's----

	venue	freq
0	Plaza	0.06
1	Hotel	0.06
2	Café	0.05
3	Theater	0.05
4	Pub	0.03

----Anerley district----

	venue	freq
0	Fast Food Restaurant	0.2
1	Hotel	0.2
2	Supermarket	0.2
3	Convenience Store	0.2
4	Grocery Store	0.2

----Balham district----

	venue	freq
0	Coffee Shop	0.15
1	Pub	0.08
2	Indian Restaurant	0.07
3	Pizza Place	0.07
4	Bakery	0.05

----Bank of England----

	venue	freq
0	Coffee Shop	0.10
1	Gym / Fitness Center	0.05
2	Italian Restaurant	0.05
3	French Restaurant	0.04
4	Sandwich Place	0.04

----Barbican----

	venue	freq
0	Italian Restaurant	0.07
1	Gym / Fitness Center	0.07
2	Coffee Shop	0.07
3	Deli / Bodega	0.04
4	Café	0.04

----Barnes district----

	venue	freq
0	American Restaurant	0.5
1	Seafood Restaurant	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----Battersea head district----

	venue	freq
0	Pub	0.12
1	Café	0.07
2	Pharmacy	0.05
3	Supermarket	0.05
4	Cocktail Bar	0.05

----Bethnal Green district----

	venue	freq
0	Turkish Restaurant	0.24
1	Café	0.08
2	Clothing Store	0.05
3	Discount Store	0.03
4	Hardware Store	0.03

----Blackfriars----

	venue	freq
0	Coffee Shop	0.08
1	Sandwich Place	0.06
2	Italian Restaurant	0.03
3	Restaurant	0.03
4	French Restaurant	0.03

----Blackheath district----

	venue	freq
0	Pub	0.11
1	Bakery	0.11
2	Pizza Place	0.07
3	Café	0.07
4	Bus Stop	0.04

----Bloomsbury, British Museum, Southampton Row----

	venue	freq
0	Chinese Restaurant	0.07
1	Hotel	0.05

2	Pub	0.05
3	Sandwich Place	0.05
4	Coffee Shop	0.05

----Bow district----

	venue	freq
0	Bus Stop	0.2
1	Hockey Field	0.2
2	Market	0.2
3	Park	0.2
4	Plaza	0.2

----Brixton district----

	venue	freq
0	Grocery Store	0.29
1	Bus Stop	0.14
2	Pub	0.14
3	Portuguese Restaurant	0.14
4	Coffee Shop	0.14

----Broadgate, Liverpool Street----

	venue	freq
0	Hotel	0.05
1	Coffee Shop	0.04
2	Wine Bar	0.04
3	Pub	0.04
4	Italian Restaurant	0.04

----Brockley district----

	venue	freq
0	Beer Store	0.10
1	Gastropub	0.10
2	Grocery Store	0.10
3	Coffee Shop	0.10
4	Vietnamese Restaurant	0.05

----Camberwell district----

	venue	freq
0	Pub	0.10
1	Café	0.07
2	Park	0.07
3	Bus Stop	0.05
4	Gastropub	0.05

----Cannon Street----

	venue	freq
0	Gym / Fitness Center	0.09
1	Vietnamese Restaurant	0.05
2	Sandwich Place	0.05
3	Steakhouse	0.05
4	Cocktail Bar	0.05

----Catford district----

	venue	freq
0	Coffee Shop	0.29
1	Recreation Center	0.14
2	Grocery Store	0.14
3	Chinese Restaurant	0.14
4	Fried Chicken Joint	0.14

----Charing Cross----

	venue	freq
0	Theater	0.07
1	Bakery	0.06
2	Coffee Shop	0.05
3	Plaza	0.04
4	Ice Cream Shop	0.04

----Charlton district----

	venue	freq
0	Paintball Field	0.11
1	Café	0.11
2	Discount Store	0.11
3	Soccer Stadium	0.11
4	Go Kart Track	0.11

----Chelsea district----

	venue	freq
0	Café	0.07
1	Clothing Store	0.06
2	Italian Restaurant	0.05
3	Hotel	0.05
4	Japanese Restaurant	0.04

----Chingford district----

	venue	freq
0	Bus Stop	0.2
1	Hockey Field	0.2
2	Market	0.2
3	Park	0.2
4	Plaza	0.2

----Clapham district----

	venue	freq
0	Pub	0.08
1	Coffee Shop	0.07
2	Café	0.05
3	Italian Restaurant	0.04
4	Bar	0.04

----Clapton district----

	venue	freq
0	Athletics & Sports	0.17
1	Bus Stop	0.17
2	Hockey Field	0.17
3	Market	0.17
4	Park	0.17

----Clerkenwell, Farringdon----

	venue	freq
0	Food Truck	0.08
1	Pub	0.06
2	Hotel	0.06
3	Coffee Shop	0.05
4	Café	0.05

----Cornhill, Gracechurch Street, Lombard Street----

	venue	freq
0	Coffee Shop	0.07
1	Gym / Fitness Center	0.07
2	Pub	0.05
3	Vietnamese Restaurant	0.05
4	Cocktail Bar	0.04

----Covent Garden----

	venue	freq
0	Theater	0.07
1	Burger Joint	0.06
2	Ice Cream Shop	0.05
3	Coffee Shop	0.04
4	Bakery	0.04

----Cricklewood district----

	venue	freq
0	Grocery Store	0.10
1	Bus Stop	0.10
2	Hotel	0.10
3	Fast Food Restaurant	0.10
4	Supermarket	0.05

----Deptford district----

	venue	freq
0	Fast Food Restaurant	0.12
1	Platform	0.12
2	Bus Stop	0.12
3	Pub	0.12
4	Café	0.12

----Drury Lane, Kingsway, Aldwych----

	venue	freq
0	Pub	0.07
1	Sandwich Place	0.07

2	Coffee Shop	0.05
3	Café	0.05
4	Chinese Restaurant	0.05

----Dulwich district----

	venue	freq
0	Café	0.25
1	Brewery	0.25
2	Train Station	0.12
3	Pub	0.12
4	Italian Restaurant	0.12

----Ealing district----

	venue	freq
0	Golf Course	0.25
1	Airport Service	0.25
2	Italian Restaurant	0.25
3	Hotel	0.25
4	Pakistani Restaurant	0.00

----Earls Court district----

	venue	freq
0	Hotel	0.30
1	Garden	0.06
2	Italian Restaurant	0.04
3	Cocktail Bar	0.04
4	Café	0.03

----East Dulwich district----

	venue	freq
0	Café	0.13
1	Pub	0.10
2	Gastropub	0.06
3	Indian Restaurant	0.06
4	Coffee Shop	0.06

----East Finchley district----

	venue	freq
0	Stationery Store	0.33
1	Bakery	0.33
2	Coffee Shop	0.33
3	Peruvian Restaurant	0.00
4	Perfume Shop	0.00

----East Ham district----

	venue	freq
0	Clothing Store	0.10
1	Pub	0.04
2	Pharmacy	0.04
3	Coffee Shop	0.04
4	Fast Food Restaurant	0.04

----Eastern head district----

	venue	freq
0	Indian Restaurant	0.33
1	Beer Garden	0.33
2	Nature Preserve	0.33
3	Accessories Store	0.00
4	Perfume Shop	0.00

----Eltham district----

	venue	freq
0	Event Service	0.33
1	Soccer Field	0.33
2	Park	0.33
3	Accessories Store	0.00
4	Palace	0.00

----Fetter Lane----

	venue	freq
0	Pub	0.12
1	Coffee Shop	0.10
2	Italian Restaurant	0.07
3	Sandwich Place	0.06
4	Wine Bar	0.04

----Finchley district----

	venue	freq
0	Clothing Store	0.12
1	Sporting Goods Shop	0.08
2	Coffee Shop	0.08
3	Fast Food Restaurant	0.08
4	Warehouse Store	0.04

----Finsbury (east), Moorfields Eye Hospital----

	venue	freq
0	Coffee Shop	0.13
1	Café	0.07
2	Pub	0.07
3	Sandwich Place	0.06
4	Italian Restaurant	0.06

----Finsbury Park district----

	venue	freq
0	Clothing Store	0.13
1	Fast Food Restaurant	0.06
2	Sporting Goods Shop	0.06
3	Supermarket	0.06
4	Coffee Shop	0.06

----Finsbury, Finsbury Estate (west)----

	venue	freq
0	Coffee Shop	0.09
1	Pub	0.08
2	Café	0.08
3	Gym / Fitness Center	0.05
4	Bar	0.05

----Fitzrovia, Tottenham Court Road----

	venue	freq
0	Coffee Shop	0.10
1	Indian Restaurant	0.04
2	Restaurant	0.04
3	Pub	0.03
4	Furniture / Home Store	0.03

----Forest Gate district----

	venue	freq
0	Bus Stop	0.2
1	Hockey Field	0.2
2	Market	0.2
3	Park	0.2
4	Plaza	0.2

----Forest Hill district----

	venue	freq
0	Garden	0.5
1	Park	0.5
2	Pakistani Restaurant	0.0
3	Persian Restaurant	0.0
4	Perfume Shop	0.0

----Fulham district----

	venue	freq
0	Coffee Shop	0.16
1	Café	0.06
2	Pub	0.04
3	Bakery	0.04
4	French Restaurant	0.04

----Golders Green district----

	venue	freq
0	Coffee Shop	0.12
1	Korean Restaurant	0.08
2	Turkish Restaurant	0.08
3	Grocery Store	0.08
4	Café	0.08

----Gray's Inn----

	venue	freq
0	Coffee Shop	0.11
1	Pub	0.07

2	Hotel	0.06
3	Restaurant	0.03
4	Gym / Fitness Center	0.03

----Great Portland Street, Fitzrovia----

	venue	freq
0	Coffee Shop	0.14
1	Pub	0.06
2	Indian Restaurant	0.04
3	Vietnamese Restaurant	0.04
4	Restaurant	0.04

----Greenwich district----

	venue	freq
0	Pub	0.13
1	Pier	0.05
2	Turkish Restaurant	0.05
3	Café	0.05
4	Grocery Store	0.05

----Guildhall----

	venue	freq
0	Coffee Shop	0.10
1	Italian Restaurant	0.04
2	Sandwich Place	0.04
3	French Restaurant	0.04
4	Bakery	0.03

----Hackney district----

	venue	freq
0	Bus Stop	0.2
1	Hockey Field	0.2
2	Market	0.2
3	Park	0.2
4	Plaza	0.2

----Hampstead district----

	venue	freq
0	Café	0.17
1	Hotel Bar	0.09
2	Italian Restaurant	0.09
3	Breakfast Spot	0.04
4	Hotel	0.04

----Hatton Garden----

	venue	freq
0	Pub	0.09
1	Coffee Shop	0.09
2	Sandwich Place	0.05
3	Bar	0.03
4	Food Truck	0.03

----Hendon district----

	venue	freq
0	Clothing Store	0.12
1	Coffee Shop	0.10
2	Café	0.10
3	Department Store	0.07
4	Supermarket	0.05

----Herne Hill district----

	venue	freq
0	Fish & Chips Shop	0.2
1	Stadium	0.1
2	Playground	0.1
3	Food & Drink Shop	0.1
4	Gym / Fitness Center	0.1

----High Holborn----

	venue	freq
0	Pub	0.07
1	Coffee Shop	0.05
2	Chinese Restaurant	0.05
3	Sandwich Place	0.05
4	Bookstore	0.04

----Highbury district----

	venue	freq
0	Rental Car Location	0.25
1	Bus Stop	0.17
2	Hotel	0.17
3	Airport Service	0.08
4	Coffee Shop	0.08

----Highgate district----

	venue	freq
0	Airport Service	0.5
1	Coffee Shop	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----Homerton district----

	venue	freq
0	Park	1.0
1	Accessories Store	0.0
2	Peruvian Restaurant	0.0
3	Perfume Shop	0.0
4	Performing Arts Venue	0.0

----Hornsey district----

	venue	freq
0	Pharmacy	0.5
1	Spa	0.5
2	Accessories Store	0.0
3	Paintball Field	0.0
4	Performing Arts Venue	0.0

----Kennington district----

	venue	freq
0	Pub	0.22
1	Coffee Shop	0.08
2	Indian Restaurant	0.05
3	Café	0.05
4	Pizza Place	0.05

----Kentish Town district----

	venue	freq
0	Café	0.15
1	Pub	0.12
2	Gym / Fitness Center	0.09
3	Italian Restaurant	0.09
4	Convenience Store	0.09

----Kilburn district----

	venue	freq
0	Café	0.06
1	Grocery Store	0.06
2	Coffee Shop	0.06
3	Fish & Chips Shop	0.06
4	Gym / Fitness Center	0.06

----Kings Cross Central----

	venue	freq
0	Café	0.08
1	Park	0.03
2	Breakfast Spot	0.03
3	Train Station	0.03
4	Movie Theater	0.03

----Kings Cross, Finsbury (west), Clerkenwell (north)----

	venue	freq
0	Coffee Shop	0.11
1	History Museum	0.06
2	Bookstore	0.04
3	Restaurant	0.04
4	Garden	0.04

----Lee district----

	venue	freq
0	Gym	0.5
1	Convenience Store	0.5

2	Accessories Store	0.0
3	Pakistani Restaurant	0.0
4	Perfume Shop	0.0

----Leicester Square, St. Giles----

	venue	freq
0	Coffee Shop	0.07
1	Bakery	0.06
2	Theater	0.05
3	Ice Cream Shop	0.05
4	Sushi Restaurant	0.04

----Lewisham district----

	venue	freq
0	Clothing Store	0.09
1	Grocery Store	0.07
2	Coffee Shop	0.07
3	Pub	0.05
4	Fast Food Restaurant	0.05

----Leyton district----

	venue	freq
0	Park	0.2
1	Coffee Shop	0.1
2	Farm	0.1
3	Train Station	0.1
4	Hotel	0.1

----Leytonstone district----

	venue	freq
0	Restaurant	0.25
1	Irish Pub	0.25
2	Park	0.25
3	Supermarket	0.25
4	Accessories Store	0.00

----Lincoln's Inn Fields, Royal Courts of Justice, Chancery Lane----

	venue	freq
0	Pub	0.16
1	Coffee Shop	0.11
2	Sandwich Place	0.08
3	Hotel	0.05
4	Bar	0.04

----Lloyd's of London, Fenchurch Street----

	venue	freq
0	Hotel	0.08
1	Restaurant	0.06
2	Sandwich Place	0.06
3	Pub	0.06
4	Gym / Fitness Center	0.05

----Lower Edmonton district----

	venue	freq
0	Coffee Shop	0.09
1	Hotel	0.09
2	Bar	0.09
3	Theater	0.06
4	Pub	0.06

----Manor Park district----

	venue	freq
0	Indian Restaurant	0.2
1	Restaurant	0.2
2	Gym / Fitness Center	0.2
3	Turkish Restaurant	0.2
4	Park	0.2

----Mansion House----

	venue	freq
0	Coffee Shop	0.06
1	Pub	0.06
2	Gym / Fitness Center	0.06
3	Clothing Store	0.04
4	Wine Bar	0.04

----Marylebone----

	venue	freq
0	Coffee Shop	0.06
1	Hotel	0.06
2	Café	0.04
3	French Restaurant	0.04
4	Clothing Store	0.04

----Mayfair (east), Hanover Square, Savile Row, Royal Academy----

	venue	freq
0	Boutique	0.06
1	Clothing Store	0.05
2	Indian Restaurant	0.05
3	Seafood Restaurant	0.04
4	Hotel	0.04

----Mayfair (north), Grosvenor Square----

	venue	freq
0	Hotel	0.14
1	Café	0.06
2	Coffee Shop	0.06
3	French Restaurant	0.05
4	Hotel Bar	0.04

----Mayfair (south), Piccadilly----

	venue	freq
0	Clothing Store	0.08
1	Boutique	0.07
2	Hotel	0.05
3	Jewelry Store	0.03
4	Coffee Shop	0.03

----Mill Hill district----

	venue	freq
0	Bus Stop	0.11
1	Coffee Shop	0.11
2	Grocery Store	0.11
3	Pharmacy	0.05
4	Salon / Barbershop	0.05

----Monument, Billingsgate----

	venue	freq
0	Garden	0.08
1	Hotel	0.08
2	Scenic Lookout	0.05
3	History Museum	0.05
4	Gym / Fitness Center	0.05

----Mortlake district----

	venue	freq
0	Sports Club	0.14
1	Rugby Pitch	0.14
2	Park	0.14
3	Gym	0.14
4	Farmers Market	0.14

----Muswell Hill district----

	venue	freq
0	Café	0.14
1	Pizza Place	0.09
2	Coffee Shop	0.09
3	Bakery	0.06
4	Pub	0.06

----New Cross district----

	venue	freq
0	Clothing Store	0.14
1	Electronics Store	0.14
2	Bus Stop	0.14
3	Restaurant	0.14
4	Train Station	0.14

----New Oxford Street----

	venue	freq
0	Chinese Restaurant	0.06
1	Hotel	0.06

2	Plaza	0.05
3	Café	0.05
4	Coffee Shop	0.05

----New Southgate district----

	venue	freq
0	Airport Lounge	0.27
1	Airport Service	0.18
2	Champagne Bar	0.18
3	English Restaurant	0.09
4	Spa	0.09

----Non-geographic postcode district (NatWest, delivers to E1)----

	venue	freq
0	American Restaurant	0.5
1	Seafood Restaurant	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----Non-geographic postcode district (News International, delivers to E1W)---

-

	venue	freq
0	American Restaurant	0.5
1	Seafood Restaurant	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----North Finchley district----

	venue	freq
0	Café	0.15
1	Park	0.10
2	Coffee Shop	0.10
3	Vegetarian / Vegan Restaurant	0.05
4	Modern European Restaurant	0.05

----North Kensington district----

	venue	freq
0	Coffee Shop	0.06
1	Grocery Store	0.06
2	Café	0.06
3	Bakery	0.06
4	Pizza Place	0.04

----North Western head district----

	venue	freq
0	Garden	0.28
1	Park	0.22
2	Café	0.17
3	Coffee Shop	0.11

4 Pedestrian Plaza 0.06

----Northern 'Victoria' around Buckingham Gate (a street) to include both sides of part of Victoria Street----

	venue	freq
0	Coffee Shop	0.11
1	Hotel	0.10
2	Theater	0.06
3	Sushi Restaurant	0.05
4	Sandwich Place	0.03

----Northern head district----

	venue	freq
0	Stationery Store	0.17
1	Pub	0.17
2	Bakery	0.17
3	Coffee Shop	0.17
4	Park	0.17

----Norwood district----

	venue	freq
0	Coffee Shop	0.17
1	Breakfast Spot	0.08
2	Asian Restaurant	0.08
3	Thrift / Vintage Store	0.08
4	Gastropub	0.08

----Notting Hill district----

	venue	freq
0	Butcher	0.07
1	Italian Restaurant	0.07
2	Gym / Fitness Center	0.07
3	Grocery Store	0.07
4	Chocolate Shop	0.07

----Olympic Park district----

	venue	freq
0	Clothing Store	0.07
1	Café	0.05
2	Coffee Shop	0.05
3	Italian Restaurant	0.04
4	Burger Joint	0.04

----Palmers Green district----

	venue	freq
0	Golf Course	0.14
1	Pub	0.14
2	Park	0.14
3	Tennis Court	0.14
4	Outdoor Gym	0.14

----Peckham district----

	venue	freq
0	Grocery Store	0.18
1	Bus Station	0.09
2	Supermarket	0.09
3	Park	0.09
4	Bar	0.09

----Plaistow district----

	venue	freq
0	Café	0.2
1	Grocery Store	0.2
2	Bus Stop	0.1
3	Vietnamese Restaurant	0.1
4	Park	0.1

----Poplar district----

	venue	freq
0	Café	0.07
1	Pizza Place	0.07
2	Park	0.07
3	Tapas Restaurant	0.07
4	Harbor / Marina	0.07

----Portland Place, Regent Street----

	venue	freq
0	Gym / Fitness Center	0.05
1	French Restaurant	0.05
2	Pub	0.05
3	Park	0.05
4	Gastropub	0.05

----Putney district----

	venue	freq
0	Coffee Shop	0.09
1	Sandwich Place	0.05
2	Bar	0.05
3	Grocery Store	0.05
4	Café	0.05

----Rest of Belgravia (north of Eaton Square), Knightsbridge (eastern half) and Chelsea (a corner)----

	venue	freq
0	Hotel	0.12
1	Boutique	0.08
2	Café	0.06
3	Italian Restaurant	0.06
4	Plaza	0.04

----Rotherhithe district----

	venue	freq
0	Bus Stop	0.11
1	Fast Food Restaurant	0.11
2	Café	0.11
3	Supermarket	0.07
4	Pizza Place	0.07

----Russell Square, Great Ormond Street----

	venue	freq
0	Coffee Shop	0.10
1	Bookstore	0.10
2	Pub	0.08
3	Garden	0.06
4	Plaza	0.04

----Shepherds Bush district----

	venue	freq
0	Pub	0.07
1	Middle Eastern Restaurant	0.07
2	Grocery Store	0.07
3	Chinese Restaurant	0.07
4	Fast Food Restaurant	0.04

----Shoreditch----

	venue	freq
0	Hotel	0.08
1	Food Truck	0.07
2	Coffee Shop	0.07
3	Italian Restaurant	0.05
4	Sandwich Place	0.04

----Soho (south east); Chinatown, Soho Square----

	venue	freq
0	Bakery	0.06
1	Theater	0.05
2	Coffee Shop	0.05
3	Hotel	0.04
4	Cocktail Bar	0.03

----Somerset House, Temple (west)----

	venue	freq
0	Pub	0.12
1	Hotel	0.09
2	Theater	0.09
3	Restaurant	0.05
4	Coffee Shop	0.05

----South Eastern head district----

	venue	freq
0	Pub	0.20
1	Bus Stop	0.15

2	Middle Eastern Restaurant	0.10
3	Cocktail Bar	0.05
4	Indian Restaurant	0.05

----South Kensington district----

	venue	freq
0	Hotel	0.10
1	Exhibit	0.06
2	Italian Restaurant	0.05
3	Burger Joint	0.05
4	Science Museum	0.04

----South Lambeth district----

	venue	freq
0	Bus Stop	0.15
1	Portuguese Restaurant	0.15
2	Convenience Store	0.08
3	Brewery	0.08
4	Coffee Shop	0.08

----South Norwood district----

	venue	freq
0	Platform	0.24
1	Café	0.18
2	Pub	0.12
3	Coffee Shop	0.12
4	Gas Station	0.06

----South Tottenham district----

	venue	freq
0	Bus Stop	0.12
1	Coffee Shop	0.06
2	Café	0.06
3	Pub	0.06
4	Indian Restaurant	0.06

----South or lower Belgravia and Chelsea (a corner), from Sloane Square to Victoria Station to Grosvenor Waterside basin----

	venue	freq
0	Hotel	0.12
1	Pub	0.09
2	Italian Restaurant	0.09
3	Café	0.06
4	Bakery	0.04

----Southgate district----

	venue	freq
0	Fast Food Restaurant	0.15
1	Coffee Shop	0.10
2	Pizza Place	0.10
3	Dance Studio	0.05

4 Sandwich Place 0.05

----St Bartholomew's Hospital----

	venue	freq
0	Pub	0.13
1	Coffee Shop	0.04
2	Sandwich Place	0.04
3	Bar	0.04
4	Café	0.03

----St John's Wood district----

	venue	freq
0	Cricket Ground	0.11
1	Café	0.08
2	Pub	0.05
3	French Restaurant	0.05
4	Deli / Bodega	0.05

----St Luke's, Bunhill Fields----

	venue	freq
0	Coffee Shop	0.11
1	Gym / Fitness Center	0.06
2	Food Truck	0.06
3	Bar	0.05
4	Italian Restaurant	0.04

----St Pancras, UCL Institute of Education----

	venue	freq
0	Coffee Shop	0.08
1	Café	0.08
2	Pub	0.07
3	Hotel	0.07
4	Burger Joint	0.04

----St Paul's----

	venue	freq
0	Pub	0.10
1	Italian Restaurant	0.08
2	Coffee Shop	0.06
3	Sandwich Place	0.05
4	Salad Place	0.04

----Stockwell district----

	venue	freq
0	Café	0.17
1	Deli / Bodega	0.11
2	Gym / Fitness Center	0.11
3	Sushi Restaurant	0.06
4	Bakery	0.06

----Stoke Newington district----

	venue	freq
0	Cocktail Bar	0.11
1	Café	0.09
2	Pub	0.09
3	Turkish Restaurant	0.05
4	Breakfast Spot	0.05

----Stratford district----

	venue	freq
0	Hotel	0.29
1	Park	0.29
2	Bulgarian Restaurant	0.14
3	Fast Food Restaurant	0.14
4	Breakfast Spot	0.14

----Streatham district----

	venue	freq
0	Pub	0.14
1	Supermarket	0.09
2	Coffee Shop	0.09
3	Gastropub	0.09
4	Bus Stop	0.05

----Surrounds of St James's Park tube station centred on Broadway, Queen Anne's Gate and Old Queen Street to include both sides of part of Victoria Street - derivation----

	venue	freq
0	Coffee Shop	0.12
1	Hotel	0.09
2	Outdoor Sculpture	0.07
3	Pub	0.07
4	Historic Site	0.07

----Sydenham district----

	venue	freq
0	Supermarket	0.12
1	Café	0.12
2	Sandwich Place	0.06
3	Park	0.06
4	Pharmacy	0.06

----Temple----

	venue	freq
0	Pub	0.16
1	Hotel	0.09
2	Coffee Shop	0.09
3	Restaurant	0.05
4	Wine Bar	0.04

----The Hyde district----

	venue	freq
0	Office	0.33
1	Bus Stop	0.33
2	Park	0.33
3	Pakistani Restaurant	0.00
4	Persian Restaurant	0.00

----Tooting district----

	venue	freq
0	Indian Restaurant	0.13
1	Convenience Store	0.07
2	Grocery Store	0.07
3	Pub	0.07
4	Supermarket	0.07

----Tottenham district----

	venue	freq
0	American Restaurant	0.5
1	Seafood Restaurant	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----University College London, SOAS----

	venue	freq
0	Coffee Shop	0.13
1	Greek Restaurant	0.05
2	Plaza	0.05
3	Pizza Place	0.05
4	Italian Restaurant	0.03

----Upper Edmonton district----

	venue	freq
0	Clothing Store	0.09
1	Coffee Shop	0.06
2	Café	0.05
3	Ice Cream Shop	0.03
4	Italian Restaurant	0.03

----Upper Holloway district----

	venue	freq
0	Coffee Shop	0.11
1	Pub	0.11
2	Grocery Store	0.11
3	Fast Food Restaurant	0.07
4	Bus Stop	0.07

----Victoria Docks and North Woolwich district----

	venue	freq
0	Vietnamese Restaurant	0.25
1	Business Service	0.25

2	Café	0.25
3	Park	0.25
4	Accessories Store	0.00

----Walthamstow district----

	venue	freq
0	Sandwich Place	0.06
1	Coffee Shop	0.06
2	Pizza Place	0.06
3	Café	0.06
4	Grocery Store	0.04

----Walworth district----

	venue	freq
0	Café	0.21
1	Pharmacy	0.04
2	Park	0.04
3	Falafel Restaurant	0.04
4	Middle Eastern Restaurant	0.04

----Wandsworth district----

	venue	freq
0	Garden Center	0.2
1	Pub	0.2
2	Breakfast Spot	0.2
3	Tennis Court	0.2
4	Convenience Store	0.2

----Wapping, St Katharine Docks, Stepney (part), Shadwell (part), Whitechapel (part)----

	venue	freq
0	Pub	0.15
1	Coffee Shop	0.09
2	History Museum	0.06
3	Harbor / Marina	0.06
4	Park	0.06

----West Brompton district----

	venue	freq
0	Italian Restaurant	0.11
1	Pub	0.08
2	Restaurant	0.08
3	Grocery Store	0.06
4	Nightclub	0.06

----West Ealing district----

	venue	freq
0	Fast Food Restaurant	0.25
1	Park	0.25
2	Supermarket	0.25
3	Hotel	0.25

4 Accessories Store 0.00

----West Kensington district----

	venue	freq
0	Hotel	0.10
1	Café	0.10
2	Pub	0.10
3	Coffee Shop	0.10
4	Grocery Store	0.07

----West Norwood district----

	venue	freq
0	Brewery	0.50
1	Pub	0.25
2	Park	0.25
3	Accessories Store	0.00
4	Pakistani Restaurant	0.00

----West Wimbledon district----

	venue	freq
0	Café	0.10
1	Pub	0.10
2	Indian Restaurant	0.10
3	Platform	0.06
4	Grocery Store	0.06

----Whetstone district----

	venue	freq
0	Pub	0.25
1	Coffee Shop	0.25
2	Café	0.12
3	Mediterranean Restaurant	0.12
4	Brazilian Restaurant	0.12

----Whitehall, Buckingham Palace, the Houses of Parliament and west of St James's----

	venue	freq
0	Hotel	0.07
1	Boutique	0.07
2	Clothing Store	0.05
3	French Restaurant	0.05
4	Seafood Restaurant	0.04

----Willesden district----

	venue	freq
0	Café	0.29
1	Rental Car Location	0.14
2	Train Station	0.14
3	Middle Eastern Restaurant	0.14
4	Pub	0.14

----Wimbledon district----

	venue	freq
0	Bar	0.07
1	Pub	0.06
2	Coffee Shop	0.06
3	Clothing Store	0.05
4	Grocery Store	0.03

----Winchmore Hill district----

	venue	freq
0	Italian Restaurant	0.2
1	Bus Stop	0.1
2	Supermarket	0.1
3	Bistro	0.1
4	Train Station	0.1

----Wood Green district----

	venue	freq
0	Fast Food Restaurant	0.09
1	Clothing Store	0.09
2	Coffee Shop	0.07
3	Sandwich Place	0.07
4	Turkish Restaurant	0.05

----Woodford and South Woodford district----

	venue	freq
0	American Restaurant	0.5
1	Seafood Restaurant	0.5
2	Accessories Store	0.0
3	Palace	0.0
4	Persian Restaurant	0.0

----Woolwich district----

	venue	freq
0	Train Station	0.25
1	Park	0.25
2	Supermarket	0.25
3	Hotel	0.25
4	Pakistani Restaurant	0.00

----between Vauxhall Bridge, Grosvenor (or Victoria Railway) Bridge and Victoria Station, taking in both sides of Vauxhall Bridge Road; includes Pimlico----

	venue	freq
0	Hotel	0.07
1	Coffee Shop	0.07
2	Pub	0.05
3	Italian Restaurant	0.05
4	Restaurant	0.04

Ten most common venues in each district

```
In [47]: def return_most_common_venues(row, num_top_venues):  
    row_categories = row.iloc[1:]  
    row_categories_sorted = row_categories.sort_values(ascending=False)  
  
    return row_categories_sorted.index.values[0:num_top_venues]
```

```
In [48]: def ten_most_common_venues(data = london_grouped):  
  
    num_top_venues = 10  
    indicators = ['st', 'nd', 'rd']  
  
    # create columns according to number of top venues  
  
    columns = ['Coverage']  
  
    for ind in np.arange(num_top_venues):  
        try:  
            columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))  
        except:  
            columns.append('{}th Most Common Venue'.format(ind+1))  
  
    # create a new dataframe  
  
    coverages_venues_sorted = pd.DataFrame(columns=columns)  
  
    coverages_venues_sorted['Coverage'] = data['Coverage']  
  
    for ind in np.arange(data.shape[0]):  
        coverages_venues_sorted.iloc[ind, 1:] = return_most_common_venues(data  
            .iloc[ind, :], num_top_venues)  
  
    return coverages_venues_sorted
```

```
In [49]: coverages_venues_sorted = ten_most_common_venues(london_grouped)
coverages_venues_sorted.head()
```

Out[49]:

	Coverage	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
0	A projection around Parliament Square. Nearby ...	Coffee Shop	Café	Sandwich Place	Outdoor Sculpture	Plaza	Restaurant	Historic Site
1	Abbey Wood district	Fish & Chips Shop	Grocery Store	Soccer Field	Film Studio	Exhibit	Fabric Shop	Falafel Restaurant
2	All but the west of St James's	Hotel	Plaza	Theater	Café	Bookstore	Pub	Coffee Shop
3	Anerley district	Hotel	Grocery Store	Convenience Store	Fast Food Restaurant	Supermarket	Yoshoku Restaurant	Fabric Shop
4	Balham district	Coffee Shop	Pub	Indian Restaurant	Pizza Place	Italian Restaurant	Supermarket	Bakery

Clustering using KMeans

```
In [50]: # set number of clusters
kclusters = 5

london_grouped_clustering = london_grouped.drop('Coverage', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(london_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:20]
```

Out[50]: array([3, 3, 3, 3, 3, 3, 3, 2, 3, 3, 3, 3, 3, 4, 3, 3, 3, 3, 3, 3],
dtype=int32)

```

In [51]: # add clustering labels
coverages_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

#coverages_venues_sorted['Cluster Labels'] = coverages_venues_sorted['Cluster
Labels'].astype(int)

london_merged = result_df

# merge london_grouped with london_data to add Latitude/Longitude for each nei
ghborhood
london_merged = london_merged.join(coverages_venues_sorted.set_index('Coverag
e'), on='Coverage')

london_merged = london_merged.dropna()
london_merged.head()

```

Out[51]:

	Postcode district		Post town	Coverage	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	N1	LONDON		Northern head district	52.599	-2.09829	3.0	Pub	Park	Bakery
1	N1C	LONDON		Kings Cross Central	51.5347	-0.124548	3.0	Café	Burger Joint	Plaza
2	N2	LONDON		East Finchley district	52.6013	-2.09711	3.0	Bakery	Stationery Store	Coffee Shop
3	N3	LONDON		Finchley district	52.5998	-2.09297	3.0	Clothing Store	Fast Food Restaurant	Sporting Goods Shop
4	N4	LONDON		Finsbury Park district	52.5987	-2.09266	3.0	Clothing Store	Supermarket	Coffee Shop


```
In [52]: # create map
map_clusters = folium.Map(location=[lond_latitude, lond_longitude], zoom_start=11)

# set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

# add markers to the map
markers_colors = []
for lat, lon, poi, cluster in zip(london_merged['Latitude'], london_merged['Longitude'], london_merged['Coverage'], london_merged['Cluster Labels']):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color=rainbow[int(cluster)-1],
        fill=True,
        fill_color=rainbow[int(cluster)-1],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters
```

Out[52]: Make this Notebook Trusted to load map: File -> Trust Notebook

Cluster 1

```
In [53]: london_merged.loc[london_merged['Cluster Labels'] == 0, london_merged.columns
[[1, 2] + list(range(5, london_merged.shape[1]))]]
```

Out[53]:

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
13	LONDON	Palmers Green district	0.0	Outdoor Gym	Park	Pub	Tennis Court	Golf Course
23	LONDON	North Western head district	0.0	Garden	Park	Café	Coffee Shop	Pedestrian Plaza
54	LONDON	Mortlake district	0.0	Sports Club	Pub	Gym	Park	Bus Stop
68	LONDON	Deptford district	0.0	Pub	Cosmetics Shop	Park	Fast Food Restaurant	Platform
69	LONDON	Eltham district	0.0	Event Service	Park	Soccer Field	Fish & Chips Shop	Fabric Shop
74	LONDON	New Cross district	0.0	Park	Bus Stop	Train Station	Clothing Store	Restaurant
78	LONDON	Woolwich district	0.0	Hotel	Train Station	Park	Supermarket	Fish & Chips Shop
83	LONDON	Forest Hill district	0.0	Garden	Park	Yoshoku Restaurant	Fish Market	Fabric Shop
87	LONDON	West Norwood district	0.0	Brewery	Pub	Park	Yoshoku Restaurant	Fish Market
112	LONDON	West Ealing district	0.0	Hotel	Park	Fast Food Restaurant	Supermarket	Yoshoku Restaurant
138	LONDON	Leyton district	0.0	Park	Fried Chicken Joint	Indian Restaurant	Train Station	Farm
139	LONDON	Leytonstone district	0.0	Irish Pub	Park	Restaurant	Supermarket	Yoshoku Restaurant
140	LONDON	Manor Park district	0.0	Gym / Fitness Center	Restaurant	Park	Indian Restaurant	Turkish Restaurant
143	LONDON	Stratford district	0.0	Hotel	Park	Bulgarian Restaurant	Breakfast Spot	Fast Food Restaurant
144	LONDON	Victoria Docks and North Woolwich district	0.0	Vietnamese Restaurant	Park	Business Service	Café	Flea Market

Cluster 2

```
In [54]: london_merged.loc[london_merged['Cluster Labels'] == 1, london_merged.columns
[[1, 2] + list(range(5, london_merged.shape[1]))]]
```

Out[54]:

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
137	LONDON	Homerton district	1.0	Park	Yoshoku Restaurant	Event Space	Fabric Shop	Falafel Restaurant	Farm

Cluster 3

```
In [55]: london_merged.loc[london_merged['Cluster Labels'] == 2, london_merged.columns
[[1, 2] + list(range(5, london_merged.shape[1]))]]
```

Out[55]:

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
17	LONDON	Tottenham district	2.0	Seafood Restaurant	American Restaurant	Yoshoku Restaurant	Fish & Chips Shop	Exhibit	Falafel Restaurant
53	LONDON	Barnes district	2.0	Seafood Restaurant	American Restaurant	Yoshoku Restaurant	Fish & Chips Shop	Exhibit	Falafel Restaurant
146	LONDON	Woodford and South Woodford district	2.0	Seafood Restaurant	American Restaurant	Yoshoku Restaurant	Fish & Chips Shop	Exhibit	Falafel Restaurant
148	LONDON	Non-geographic postcode district (NatWest, del...	2.0	Seafood Restaurant	American Restaurant	Yoshoku Restaurant	Fish & Chips Shop	Exhibit	Falafel Restaurant
149	LONDON	Non-geographic postcode district (News Interna...	2.0	Seafood Restaurant	American Restaurant	Yoshoku Restaurant	Fish & Chips Shop	Exhibit	Falafel Restaurant

Cluster 4

```
In [56]: london_merged.loc[london_merged['Cluster Labels'] == 3, london_merged.columns  
[[1, 2] + list(range(5, london_merged.shape[1]))]]
```

Out[56]:

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
0	LONDON	Northern head district	3.0	Pub	Park	Bakery	Stationery Store	
1	LONDON	Kings Cross Central	3.0	Café	Burger Joint	Plaza	Breakfast Spot	
2	LONDON	East Finchley district	3.0	Bakery	Stationery Store	Coffee Shop	Yoshoku Restaurant	Fish
3	LONDON	Finchley district	3.0	Clothing Store	Fast Food Restaurant	Sporting Goods Shop	Coffee Shop	Re
4	LONDON	Finsbury Park district	3.0	Clothing Store	Supermarket	Coffee Shop	Sporting Goods Shop	F; Re
5	LONDON	Highbury district	3.0	Rental Car Location	Bus Stop	Hotel	Gym / Fitness Center	
6	LONDON	Highgate district	3.0	Airport Service	Coffee Shop	Yoshoku Restaurant	Fish Market	Fab
8	LONDON	Hornsey district	3.0	Pharmacy	Spa	Yoshoku Restaurant	Fish Market	Fab
9	LONDON	Lower Edmonton district	3.0	Bar	Hotel	Coffee Shop	Italian Restaurant	
10	LONDON	Muswell Hill district	3.0	Café	Pizza Place	Coffee Shop	Gym / Fitness Center	
11	LONDON	New Southgate district	3.0	Airport Lounge	Airport Service	Champagne Bar	Clothing Store	
12	LONDON	North Finchley district	3.0	Café	Park	Coffee Shop	Pub	Fish
14	LONDON	Southgate district	3.0	Fast Food Restaurant	Pizza Place	Coffee Shop	Italian Restaurant	Re
15	LONDON	South Tottenham district	3.0	Bus Stop	Coffee Shop	Café	Pub	Re
16	LONDON	Stoke Newington district	3.0	Cocktail Bar	Café	Pub	Pizza Place	Re
18	LONDON	Upper Edmonton district	3.0	Clothing Store	Coffee Shop	Café	Ice Cream Shop	Bur
19	LONDON	Upper Holloway district	3.0	Pub	Coffee Shop	Grocery Store	Pizza Place	F; Re
20	LONDON	Whetstone district	3.0	Pub	Coffee Shop	Mediterranean Restaurant	Park	I Re
21	LONDON	Winchmore Hill district	3.0	Italian Restaurant	Bus Stop	Pub	Bar	Trair

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
22	LONDON	Wood Green district	3.0	Fast Food Restaurant	Clothing Store	Coffee Shop	Sandwich Place	Re
24	LONDON	Cricklewood district	3.0	Grocery Store	Bus Stop	Fast Food Restaurant	Hotel	Supr
25	LONDON	Hampstead district	3.0	Café	Italian Restaurant	Hotel Bar	Hill	
26	LONDON	Hendon district	3.0	Clothing Store	Café	Coffee Shop	Department Store	Supr
27	LONDON	Kentish Town district	3.0	Café	Pub	Convenience Store	Italian Restaurant	
28	LONDON	Kilburn district	3.0	Burger Joint	BBQ Joint	Pub	Convenience Store	Coff
29	LONDON	Mill Hill district	3.0	Bus Stop	Grocery Store	Coffee Shop	Pharmacy	
30	LONDON	St John's Wood district	3.0	Cricket Ground	Café	Deli / Bodega	Pub	Re
32	LONDON	Willesden district	3.0	Café	Pub	Rental Car Location	Train Station	
33	LONDON	Golders Green district	3.0	Coffee Shop	Turkish Restaurant	Café	Grocery Store	Re
34	LONDON	Whitehall, Buckingham Palace, the Houses of Pa...	3.0	Hotel	Boutique	Clothing Store	French Restaurant	Re
35	LONDON	Northern 'Victoria' around Buckingham Gate (a ...	3.0	Coffee Shop	Hotel	Theater	Sushi Restaurant	
36	LONDON	Surrounds of St James's Park tube station cent...	3.0	Coffee Shop	Hotel	Outdoor Sculpture	Pub	Hist
37	LONDON	A projection around Parliament Square. Nearby ...	3.0	Coffee Shop	Café	Sandwich Place	Outdoor Sculpture	
38	LONDON	between Vauxhall Bridge, Grosvenor (or Victori...	3.0	Coffee Shop	Hotel	Pub	Italian Restaurant	Re

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
39	LONDON	South or lower Belgravia and Chelsea (a corner...	3.0	Hotel	Pub	Italian Restaurant	Café	
40	LONDON	Rest of Belgravia (north of Eaton Square), Kni...	3.0	Hotel	Boutique	Café	Italian Restaurant	
41	LONDON	All but the west of St James's	3.0	Hotel	Plaza	Theater	Café	Br
42	LONDON	Brixton district	3.0	Grocery Store	Pub	Portuguese Restaurant	Bus Stop	Coff
43	LONDON	Chelsea district	3.0	Café	Clothing Store	Hotel	Italian Restaurant	
44	LONDON	Clapham district	3.0	Pub	Coffee Shop	Café	Burger Joint	
45	LONDON	Earls Court district	3.0	Hotel	Garden	Italian Restaurant	Cocktail Bar	
46	LONDON	Fulham district	3.0	Coffee Shop	Café	Pub	Bakery	Re
47	LONDON	South Kensington district	3.0	Hotel	Exhibit	Italian Restaurant	Burger Joint	I
48	LONDON	South Lambeth district	3.0	Portuguese Restaurant	Bus Stop	Gym / Fitness Center	Coffee Shop	Pe Art
49	LONDON	Stockwell district	3.0	Café	Gym / Fitness Center	Deli / Bodega	Pub	
50	LONDON	West Brompton district	3.0	Italian Restaurant	Pub	Restaurant	Grocery Store	N
51	LONDON	Battersea head district	3.0	Pub	Café	Pharmacy	Pizza Place	B
52	LONDON	Balham district	3.0	Coffee Shop	Pub	Indian Restaurant	Pizza Place	Re
55	LONDON	Putney district	3.0	Coffee Shop	Bar	Grocery Store	Café	S
56	LONDON	Streatham district	3.0	Pub	Supermarket	Coffee Shop	Gastropub	
57	LONDON	Tooting district	3.0	Indian Restaurant	Convenience Store	Pub	Supermarket	
58	LONDON	Wandsworth district	3.0	Pub	Garden Center	Breakfast Spot	Convenience Store	Tenr

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
59	LONDON	Wimbledon district	3.0	Bar	Pub	Coffee Shop	Clothing Store	S
60	LONDON	West Wimbledon district	3.0	Pub	Café	Indian Restaurant	Platform	PI
61	LONDON	South Eastern head district	3.0	Pub	Bus Stop	Middle Eastern Restaurant	Lebanese Restaurant	Musi
62	LONDON	Abbey Wood district	3.0	Fish & Chips Shop	Grocery Store	Soccer Field	Film Studio	
63	LONDON	Blackheath district	3.0	Bakery	Pub	Café	Pizza Place	Hi Re
64	LONDON	Brockley district	3.0	Grocery Store	Beer Store	Coffee Shop	Gastropub	
65	LONDON	Camberwell district	3.0	Pub	Café	Park	Beer Bar	Gi
66	LONDON	Catford district	3.0	Coffee Shop	Chinese Restaurant	Recreation Center	Fried Chicken Joint	
67	LONDON	Charlton district	3.0	Paintball Field	Electronics Store	Café	Go Kart Track	Con: Lanc
70	LONDON	Greenwich district	3.0	Pub	Turkish Restaurant	Café	Pier	
71	LONDON	Kennington district	3.0	Pub	Coffee Shop	Café	Indian Restaurant	Piz:
72	LONDON	Lee district	3.0	Gym	Convenience Store	Yoshoku Restaurant	Fish Market	Fab
73	LONDON	Lewisham district	3.0	Clothing Store	Coffee Shop	Grocery Store	Pharmacy	F: Re
75	LONDON	Peckham district	3.0	Grocery Store	Bus Station	Hotel	Bar	
76	LONDON	Rotherhithe district	3.0	Bus Stop	Café	Fast Food Restaurant	Pizza Place	Supr
77	LONDON	Walworth district	3.0	Café	Bagel Shop	Food & Drink Shop	Caribbean Restaurant	Fish
79	LONDON	Norwood district	3.0	Coffee Shop	Pub	Diner	Breakfast Spot	Gi
80	LONDON	Anerley district	3.0	Hotel	Grocery Store	Convenience Store	Fast Food Restaurant	Supr
81	LONDON	Dulwich district	3.0	Brewery	Café	Italian Restaurant	Pub	Trair

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
82	LONDON	East Dulwich district	3.0	Café	Pub	Coffee Shop	Indian Restaurant	Ga
84	LONDON	Herne Hill district	3.0	Fish & Chips Shop	Gym / Fitness Center	Bakery	Stadium	Trair
85	LONDON	South Norwood district	3.0	Platform	Café	Pub	Coffee Shop	E
86	LONDON	Sydenham district	3.0	Café	Supermarket	Pub	Pharmacy	Por Re
89	LONDON	Portland Place, Regent Street	3.0	Park	Coffee Shop	Pub	Vietnamese Restaurant	
91	LONDON	Soho (south east); Chinatown, Soho Square	3.0	Bakery	Theater	Coffee Shop	Hotel	Coc
94	LONDON	Marylebone	3.0	Hotel	Coffee Shop	Café	Clothing Store	J
95	LONDON	Mayfair (south), Piccadilly	3.0	Clothing Store	Boutique	Hotel	Dessert Shop	
96	LONDON	Mayfair (north), Grosvenor Square	3.0	Hotel	Coffee Shop	Café	French Restaurant	F
97	LONDON	Mayfair (east), Hanover Square, Savile Row, Ro...	3.0	Boutique	Indian Restaurant	Clothing Store	Seafood Restaurant	Re
98	LONDON	Fitzrovia, Tottenham Court Road	3.0	Coffee Shop	Indian Restaurant	Restaurant	Plaza	
99	LONDON	Marylebone	3.0	Hotel	Coffee Shop	Café	Clothing Store	J
100	LONDON	Great Portland Street, Fitzrovia	3.0	Coffee Shop	Pub	Vietnamese Restaurant	Restaurant	Re
104	LONDON	Ealing district	3.0	Italian Restaurant	Airport Service	Golf Course	Hotel	Re
109	LONDON	North Kensington district	3.0	Grocery Store	Café	Bakery	Coffee Shop	
110	LONDON	Notting Hill district	3.0	Pub	Latin American Restaurant	Butcher	Cheese Shop	C
111	LONDON	Shepherds Bush district	3.0	Pub	Grocery Store	Chinese Restaurant	Middle Eastern Restaurant	Re

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
113	LONDON	West Kensington district	3.0	Coffee Shop	Pub	Hotel	Café	
114	LONDON	New Oxford Street	3.0	Chinese Restaurant	Hotel	Sandwich Place	Plaza	Coff
115	LONDON	Bloomsbury, British Museum, Southampton Row	3.0	Chinese Restaurant	Pub	Coffee Shop	Sandwich Place	
116	LONDON	University College London, SOAS	3.0	Coffee Shop	Plaza	Greek Restaurant	Pizza Place	
117	LONDON	St Pancras, UCL Institute of Education	3.0	Café	Coffee Shop	Pub	Hotel	Bur
118	LONDON	Russell Square, Great Ormond Street	3.0	Bookstore	Coffee Shop	Pub	Garden	
119	LONDON	Gray's Inn	3.0	Coffee Shop	Pub	Hotel	Food Truck	S
120	LONDON	High Holborn	3.0	Pub	Chinese Restaurant	Coffee Shop	Sandwich Place	
121	LONDON	Kings Cross, Finsbury (west), Clerkenwell (north)	3.0	Coffee Shop	History Museum	Garden	Food Truck	Br
122	LONDON	Lincoln's Inn Fields, Royal Courts of Justice,...	3.0	Pub	Coffee Shop	Sandwich Place	Hotel	Re
123	LONDON	Drury Lane, Kingsway, Aldwych	3.0	Pub	Sandwich Place	Café	Chinese Restaurant	Coff
124	LONDON	Covent Garden	3.0	Theater	Burger Joint	Ice Cream Shop	Bakery	Coff
125	LONDON	Leicester Square, St. Giles	3.0	Coffee Shop	Bakery	Theater	Ice Cream Shop	Re
126	LONDON	Charing Cross	3.0	Theater	Bakery	Coffee Shop	Plaza	
127	LONDON	Somerset House, Temple (west)	3.0	Pub	Theater	Hotel	Coffee Shop	Re
128	LONDON	Eastern head district	3.0	Nature Preserve	Beer Garden	Indian Restaurant	Yoshoku Restaurant	Fisl

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
129	LONDON	Wapping, St Katharine Docks, Stepney (part), S...	3.0	Pub	Coffee Shop	Italian Restaurant	History Museum	
130	LONDON	Bethnal Green district	3.0	Turkish Restaurant	Café	Clothing Store	Gym / Fitness Center	H
134	LONDON	East Ham district	3.0	Clothing Store	Pharmacy	Coffee Shop	Pub	F; Re
141	LONDON	Plaistow district	3.0	Café	Grocery Store	Vietnamese Restaurant	Park	Conv
142	LONDON	Poplar district	3.0	Jazz Club	Pizza Place	Café	Park	Re
145	LONDON	Walthamstow district	3.0	Café	Pizza Place	Coffee Shop	Sandwich Place	
147	LONDON	Olympic Park district	3.0	Clothing Store	Café	Coffee Shop	Burger Joint	Re
150	LONDON	St Bartholomew's Hospital	3.0	Pub	Bar	Coffee Shop	Sandwich Place	Piz;
151	LONDON	Clerkenwell, Farringdon	3.0	Food Truck	Hotel	Pub	Café	Coff
152	LONDON	Hatton Garden	3.0	Pub	Coffee Shop	Sandwich Place	Bar	
153	LONDON	Finsbury, Finsbury Estate (west)	3.0	Coffee Shop	Pub	Café	Bar	
154	LONDON	Finsbury (east), Moorfields Eye Hospital	3.0	Coffee Shop	Café	Pub	Sandwich Place	Viel Re
155	LONDON	St Luke's, Bunhill Fields	3.0	Coffee Shop	Gym / Fitness Center	Food Truck	Bar	G;
156	LONDON	Shoreditch	3.0	Hotel	Food Truck	Coffee Shop	Italian Restaurant	S
157	LONDON	Broadgate, Liverpool Street	3.0	Hotel	Italian Restaurant	Pub	Coffee Shop	V
159	LONDON	Bank of England	3.0	Coffee Shop	Italian Restaurant	Gym / Fitness Center	Wine Bar	S
160	LONDON	Guildhall	3.0	Coffee Shop	Italian Restaurant	French Restaurant	Sandwich Place	

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5 C
161	LONDON	Barbican	3.0	Italian Restaurant	Gym / Fitness Center	Coffee Shop	Pub	
163	LONDON	Lloyd's of London, Fenchurch Street	3.0	Hotel	Pub	Sandwich Place	Restaurant	
165	LONDON	Monument, Billingsgate	3.0	Garden	Hotel	Scenic Lookout	Gym / Fitness Center	
166	LONDON	Cornhill, Gracechurch Street, Lombard Street	3.0	Gym / Fitness Center	Coffee Shop	Pub	Vietnamese Restaurant	Coc
167	LONDON	Fetter Lane	3.0	Pub	Coffee Shop	Italian Restaurant	Sandwich Place	
168	LONDON	St Paul's	3.0	Pub	Italian Restaurant	Coffee Shop	Sandwich Place	
169	LONDON	Mansion House	3.0	Pub	Coffee Shop	Gym / Fitness Center	Vietnamese Restaurant	Re
170	LONDON	Cannon Street	3.0	Gym / Fitness Center	Steakhouse	Historic Site	Seafood Restaurant	S
171	LONDON	Blackfriars	3.0	Coffee Shop	Sandwich Place	French Restaurant	Restaurant	V
172	LONDON	Temple	3.0	Pub	Coffee Shop	Hotel	Restaurant	S

Cluster 5

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In [57]: london_merged.loc[london_merged['Cluster Labels'] == 4, london_merged.columns
[[1, 2] + list(range(5, london_merged.shape[1]))]]
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Out[57]:

	Post town	Coverage	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
31	LONDON	The Hyde district	4.0	Office	Bus Stop	Park	Yoshoku Restaurant	Fish Market	Falafe Restaurant
131	LONDON	Bow district	4.0	Market	Bus Stop	Park	Plaza	Hockey Field	Yoshoku Restaurant
132	LONDON	Chingford district	4.0	Market	Bus Stop	Park	Plaza	Hockey Field	Yoshoku Restaurant
133	LONDON	Clapton district	4.0	Athletics & Sports	Bus Stop	Market	Park	Plaza	Hockey Field
135	LONDON	Forest Gate district	4.0	Market	Bus Stop	Park	Plaza	Hockey Field	Yoshoku Restaurant
136	LONDON	Hackney district	4.0	Market	Bus Stop	Park	Plaza	Hockey Field	Yoshoku Restaurant

Conclusion

London is truly a multicultural city. It has many restaurants ranging from African restaurants, Chinese restaurants, German restaurants and many more.

There are many businesses in London and they thrive. This means that London is one of the best place in the world to start a business.

Someone can start a restaurants in many areas of London like Northern head district

1. Kings Cross Central 2.East Finchley district 3.Finchley district 4.Finsbury Park district 5.Highbury district 6.Highgate district 7.Hornsey district
2. Lower Edmonton district and many more.

Finally, we use Kmeans Clustering to cluster the venues into 5 clusters.