



The Battle of the Neighbourhoods

CLUSTERING AND IDENTIFYING CHARACTERISTICS OF AN AREA FOR
PRODUCT PLACEMENT IN INSTALLED VENDING MACHINES



Issue

A vending machine company wants to improve sales by identifying what products would sell better in a particular area in London. Our analysis will target the problem by categorizing the different types of business areas. Since vending machines are automated retail miniature stores that offers product line flexibility we will analyse different clusters according to their characteristics to conclude the type of products that could be placed.

London has a lot of business potential for automated vending machine. Since london has a lot of activity, movement of people and transportation there is quite the need for quick service. London is a truly international city which is complimented with a fantastic mix of cultures and nationalities. Having accomplished that London is a great place for business, choosing the right business premises in London is imperative to stimulate sustained business growth as the cost of renting in London is higher compared to other cities.



Data

In this project there are two different data sets

1) List of London Boroughs where the machines would be installed

source: Wikipedia

url: https://en.wikipedia.org/wiki/List_of_London_boroughs

| Borough | Inner | Status | Local authority | Political control | Headquarters | Area (sq mi) | Population (2013 est) ^[1] | Co-ordinates | Nr. in map |
|--|-------|--------|---|-------------------|---|--------------|--------------------------------------|--|------------|
| Barking and Dagenham ^[note 1] | | | Barking and Dagenham London Borough Council | Labour | Town Hall, 1 Town Square | 13.93 | 194,352 |  51.5607°N 0.1557°E | 25 |
| Barnet | | | Barnet London Borough Council | Conservative | North London Business Park, Oakleigh Road South | 33.49 | 369,088 |  51.6252°N 0.1517°W | 31 |
| Bexley | | | Bexley London Borough Council | Conservative | Civic Offices, 2 Watling Street | 23.38 | 236,687 |  51.4549°N 0.1505°E | 23 |
| Brent | | | Brent London Borough Council | Labour | Brent Civic Centre, Engineers Way | 16.70 | 317,264 |  51.5588°N 0.2817°W | 12 |



Data

In this project there are two different data sets

2) Foursquare API

List of top 50 popular places in the neighborhood

source: Foursquare

url: <https://api.foursquare.com>

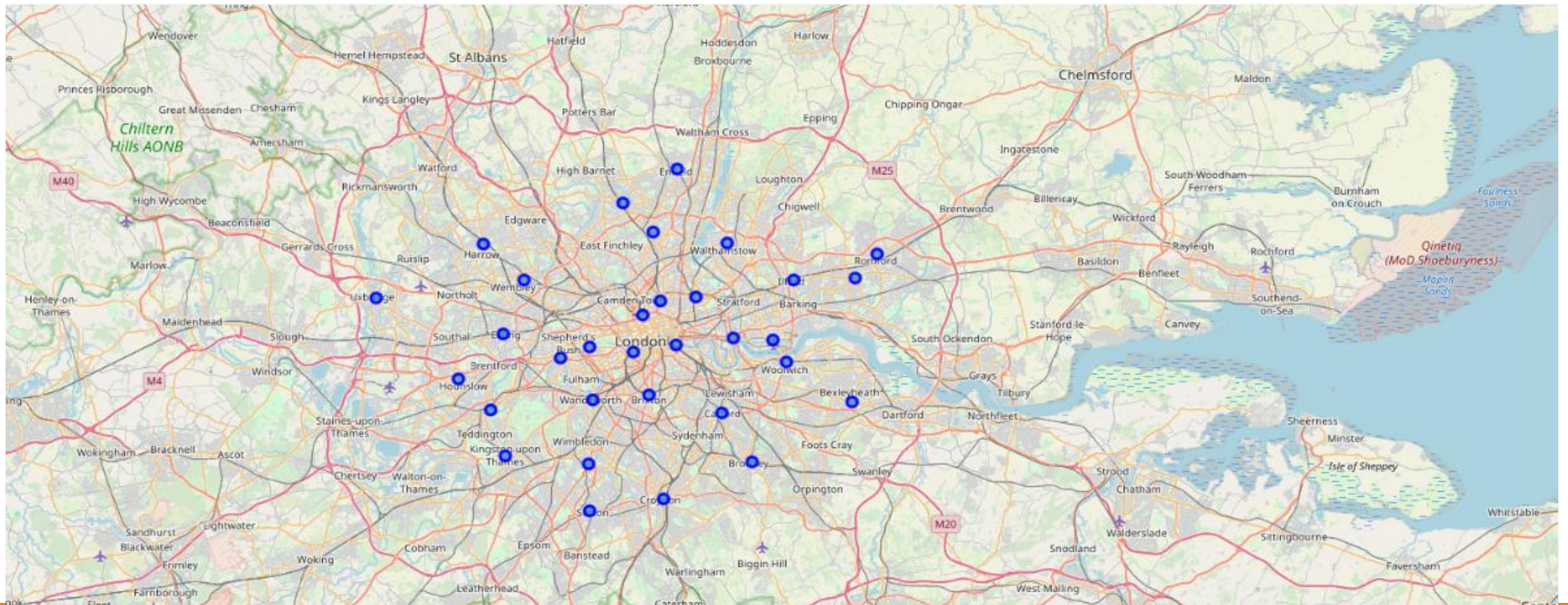
| | BoroughName | Borough Latitude | Borough Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|----------------------|------------------|-------------------|-----------------------------------|----------------|-----------------|----------------------|
| 0 | Barking and Dagenham | 51.5607 | 0.1557 | Central Park | 51.559580 | 0.161981 | Park |
| 1 | Barking and Dagenham | 51.5607 | 0.1557 | Crowlands Heath Golf Course | 51.562457 | 0.155818 | Golf Course |
| 2 | Barking and Dagenham | 51.5607 | 0.1557 | Robert Clack Leisure Centre | 51.560808 | 0.152704 | Martial Arts Dojo |
| 3 | Barking and Dagenham | 51.5607 | 0.1557 | Morrisons | 51.559774 | 0.148752 | Supermarket |
| 4 | Barking and Dagenham | 51.5607 | 0.1557 | Becontree Heath Bus Station | 51.561085 | 0.150998 | Bus Station |
| 5 | Barking and Dagenham | 51.5607 | 0.1557 | Beacontree Heath Leisure Centre | 51.560997 | 0.148932 | Gym / Fitness Center |
| 6 | Barking and Dagenham | 51.5607 | 0.1557 | Dagenham Swimming Pool | 51.560946 | 0.150054 | Pool |
| 7 | Barnet | 51.6252 | -0.1517 | M.I.M Montana International Music | 51.625620 | -0.152089 | Recording Studio |
| 8 | Barnet | 51.6252 | -0.1517 | The Atrium | 51.624726 | -0.151933 | Café |
| 9 | Barnet | 51.6252 | -0.1517 | Beaconsfield Road (BF) | 51.622827 | -0.151466 | Bus Stop |



Methodology 1

Exploratory Analysis: Map of London

Plotted Coordinates of each borough to visualize them on the map





Methodology 2

Cluster Analysis: Popular Venues

Used one hot encoding to find the most popular venue categories from top 50 venues acquired from Foursquare. Grouped by borough names while frequency identifies popularity of the venue

----Barking and Dagenham----

| | venue | freq |
|---|----------------------|------|
| 0 | Park | 0.14 |
| 1 | Martial Arts Dojo | 0.14 |
| 2 | Supermarket | 0.14 |
| 3 | Golf Course | 0.14 |
| 4 | Gym / Fitness Center | 0.14 |

----Barnet----

| | venue | freq |
|---|----------------------------|------|
| 0 | Café | 0.4 |
| 1 | Bus Stop | 0.2 |
| 2 | Recording Studio | 0.2 |
| 3 | Construction & Landscaping | 0.2 |
| 4 | African Restaurant | 0.0 |

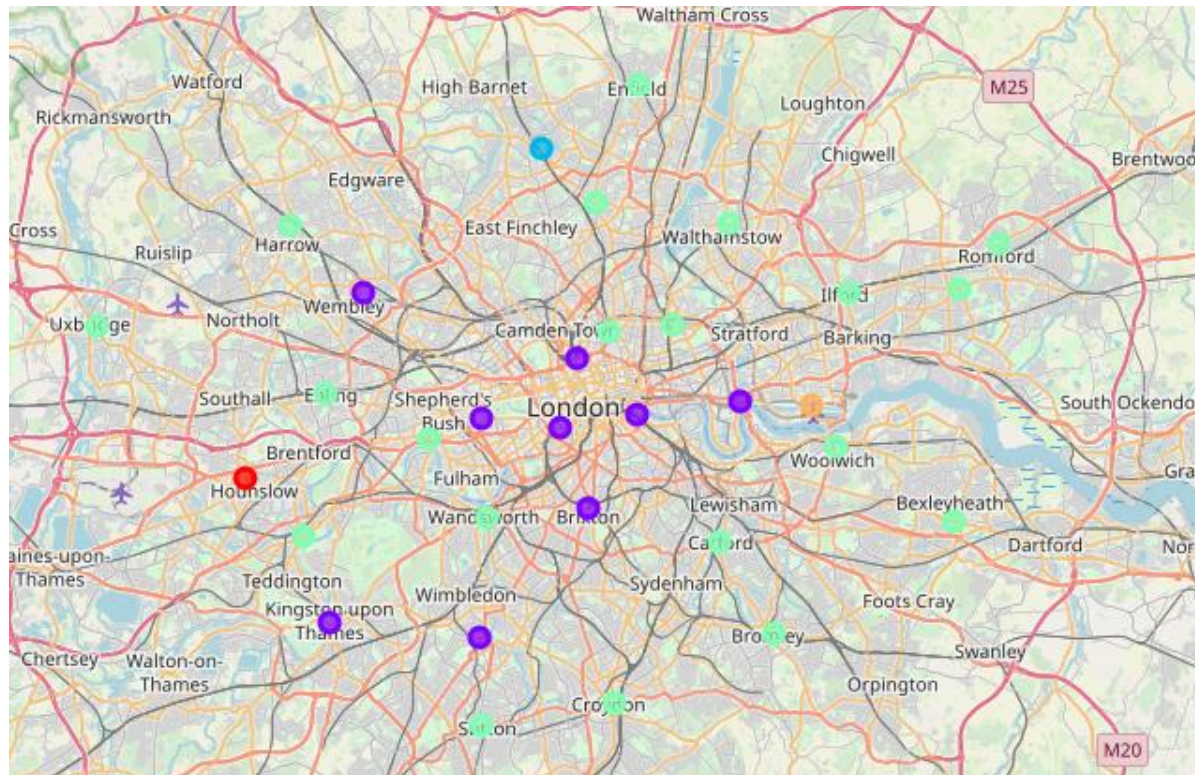
| | BoroughName | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|---|----------------------|-----------------------------|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| 0 | Barking and Dagenham | Pool | Bus Station | Supermarket | Park | Gym / Fitness Center | Golf Course | Martial Arts Dojo | Yoga Studio | Dumpling Restaurant | Fish & Chips Shop |
| 1 | Barnet | Café | Construction & Landscaping | Bus Stop | Recording Studio | Yoga Studio | English Restaurant | Food Court | Flea Market | Fish Market | Fish & Chips Shop |
| 2 | Bexley | Clothing Store | Pub | Italian Restaurant | Fast Food Restaurant | Supermarket | Coffee Shop | Pharmacy | Warehouse Store | Furniture / Home Store | Optical Shop |
| 3 | Brent | Coffee Shop | Hotel | Clothing Store | Sporting Goods Shop | Grocery Store | American Restaurant | Sandwich Place | Bar | Outlet Mall | Outdoor Sculpture |
| 4 | Bromley | Coffee Shop | Clothing Store | Gym / Fitness Center | Burger Joint | Pizza Place | Bar | Ice Cream Shop | Supermarket | Bookstore | Chocolate Shop |



Methodology 3

Cluster Analysis: K-Means Clustering

Based on common venue categories, boroughs were grouped into five clusters as displayed



| | BoroughName | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue |
|---|----------------------|-----------------------|----------------------------|-----------------------|
| 0 | Barking and Dagenham | Pool | Bus Station | Supermarket |
| 1 | Barnet | Café | Construction & Landscaping | Bus Stop |
| 2 | Bexley | Clothing Store | Pub | Italian Restaurant |
| 3 | Brent | Coffee Shop | Hotel | Clothing Store |
| 4 | Bromley | Coffee Shop | Clothing Store | Gym / Fitness Center |



Methodology 3

Cluster Analysis: K-Means Clustering

Each cluster was then given a name according to the characteristics they displayed

```
# Cluster 0: Busy Area
london_merged.loc[london_merged['Cluster Labels'] == 0, london_merged.columns[[0] + list(range(5, london_merged.shape[1]))]]
```

6]:

| | BoroughName | 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 |
|----|-------------|-----------------------------|--------------------------|--------------------------|-----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| 16 | Hounslow | Café | Metro Station | Park | Bed & Breakfast | Yoga Studio | English Restaurant | Food Court | Flea Market | Fish Market | Fish & Chips Shop |

```
# Cluster 1: Restaurants and Shopping area (Pubs, Restaurants)
london_merged.loc[london_merged['Cluster Labels'] == 1, london_merged.columns[[0] + list(range(5, london_merged.shape[1]))]]
```

9]:

| | BoroughName | 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 |
|----|---------------------------|-----------------------------|--------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|
| 3 | Brent | Coffee Shop | Hotel | Clothing Store | Sporting Goods Shop | Grocery Store | American Restaurant | Sandwich Place | Bar | Outlet Mall | Outdoor Sculpture |
| 5 | Camden | Hotel | Café | Coffee Shop | Train Station | Pizza Place | Bakery | Breakfast Spot | Hotel Bar | Italian Restaurant | Juice Bar |
| 18 | Kensington and Chelsea | Café | Clothing Store | Juice Bar | Burger Joint | Restaurant | Modern European Restaurant | Bakery | French Restaurant | English Restaurant | Gym / Fitness Center |
| 19 | Kingston upon | Coffee Shop | Café | Italian | Department | Burger Joint | Sushi Restaurant | Pub | Japanese | Burrito Place | Cajun / Creole |



Methodology 3

Cluster Analysis: K-Means Clustering

Each cluster was then given a name according to the characteristics they displayed

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

]:

| | BoroughName | 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 |
|---|-------------|-----------------------|----------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| 1 | Barnet | Café | Construction & Landscaping | Bus Stop | Recording Studio | Yoga Studio | English Restaurant | Food Court | Flea Market | Fish Market | Fish & Chips Shop |

```
# Cluster 3: Healthy area
london_merged.loc[london_merged['Cluster Labels'] == 3, london_merged.columns[[0] + list(range(5, london_merged.shape[1]))]]
```

]:

| | BoroughName | 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 | Barking and Dagenham | Pool | Bus Station | Supermarket | Park | Gym / Fitness Center | Golf Course | Martial Arts Dojo | Yoga Studio | Dumpling Restaurant | Fish & Chips Shop |
| 2 | Bexley | Clothing Store | Pub | Italian Restaurant | Fast Food Restaurant | Supermarket | Coffee Shop | Pharmacy | Warehouse Store | Furniture / Home Store | Optical Shop |

```
# Cluster 4: Traveller area
london_merged.loc[london_merged['Cluster Labels'] == 4, london_merged.columns[[0] + list(range(5, london_merged.shape[1]))]]
```

]:

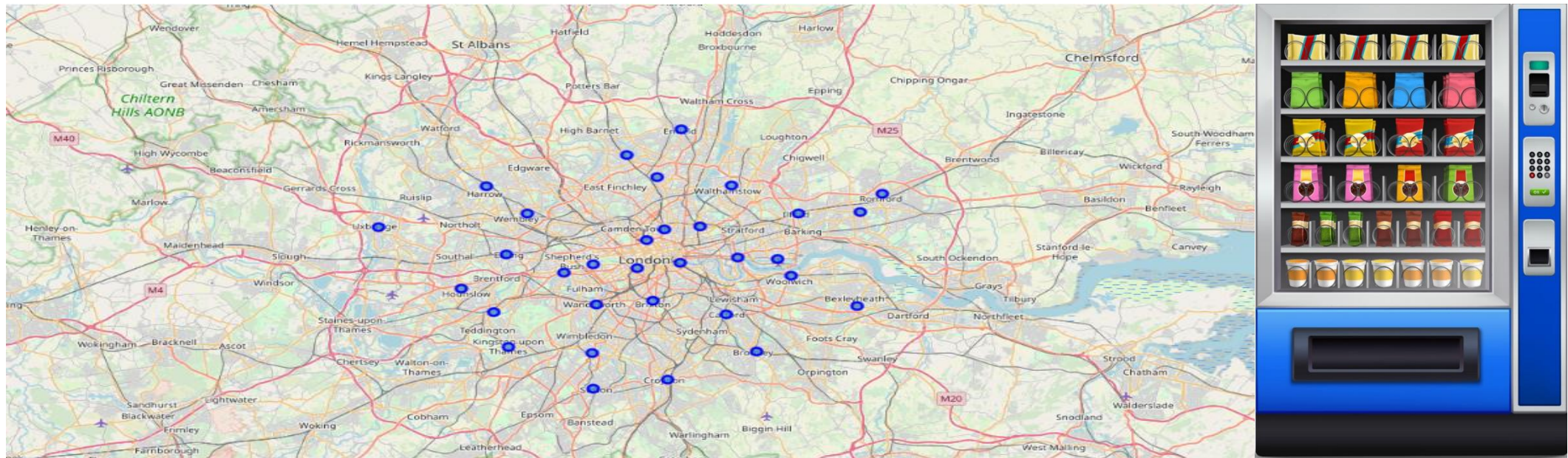
| | BoroughName | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
|----|-------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| 23 | Newham | Hotel | Airport Service | Light Rail Station | Chinese Restaurant | Airport | Airport Lounge | Pharmacy | Rafting | Sandwich Place | Yoga Studio |



Result

As identified we have made clusters based on characteristics and will now be in a better position to identify the products to be placed in the vending machines in those areas.

Stocking the vending machines in the Healthy area with disposable wet wipes, water bottles, gum etc would may yield more sales and profits.





Conclusion

Limitations

However, it obviously seems strange that the best places to install vending machines in London are all far out suburbs. This is due to limitations this research holds. Among numerous factors that determine a good neighborhood, we only took into consideration what type of venues are popular for the sake of simplification.

To overcome the limitations of this study, we will need further data such as population concentration and sqft. rental prices. Nevertheless, this research was still meaningful in that we were able to explore the neighborhoods in depth.