Analysing   Neighbourhoods of Manchester For Starting A New Restaurant.

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Introduction

- Manchester: One of the biggest cities in UK
- United Kingdom's second-most populous urban area, with a population of 2.9 million
- The population comprises of people of various ethnicities from all over the world

Business Problem

- Start a restaurant
- Neighbourhood that is most likely to give a good business

Data

- Neighbourhoods of Manchester
  - Neighbourhoods of Manchester wikipedia page through data scraping.

- Geographical coordinates of the neighbourhoods
  - Using GeoPy library.

- Venue data from FourSquare
  - Using FourSquare API

Methodology

- Feature Extraction
  - One Hot Encoding

```
man_1hot = pd.get_dummies(explore_man[['Venue Category']], prefix="", prefix_sep="")

# Add neighbourhood column back to dataframe
man_1hot['Neighbourhood'] = explore_man['Neighbourhood']

# Move neighbourhood column to the first column
fixed_columns = [man_1hot.columns[-1]] + man_1hot.columns[:-1].values.tolist()
man_1hot = man_1hot[fixed_columns]

man_1hot.head()
```

- Unsupervised Learning
  - K-Means Clustering

```python
max_range = 15 #Max range 15 (number of clusters)

from sklearn.metrics import silhouette_samples, silhouette_score


indices = []
scores = []

for man_clusters in range(2, max_range) :

    # Run k-means clustering
    man_gc = man_grouped_clustering
    kmeans = KMeans(n_clusters = man_clusters, init = 'k-means++', random_state = 0).fit_predict(man_gc)

    # Gets the score for the clustering operation performed
    score = silhouette_score(man_gc, kmeans)

    # Appending the index and score to the respective lists
    indices.append(man_clusters)
    scores.append(score)
```
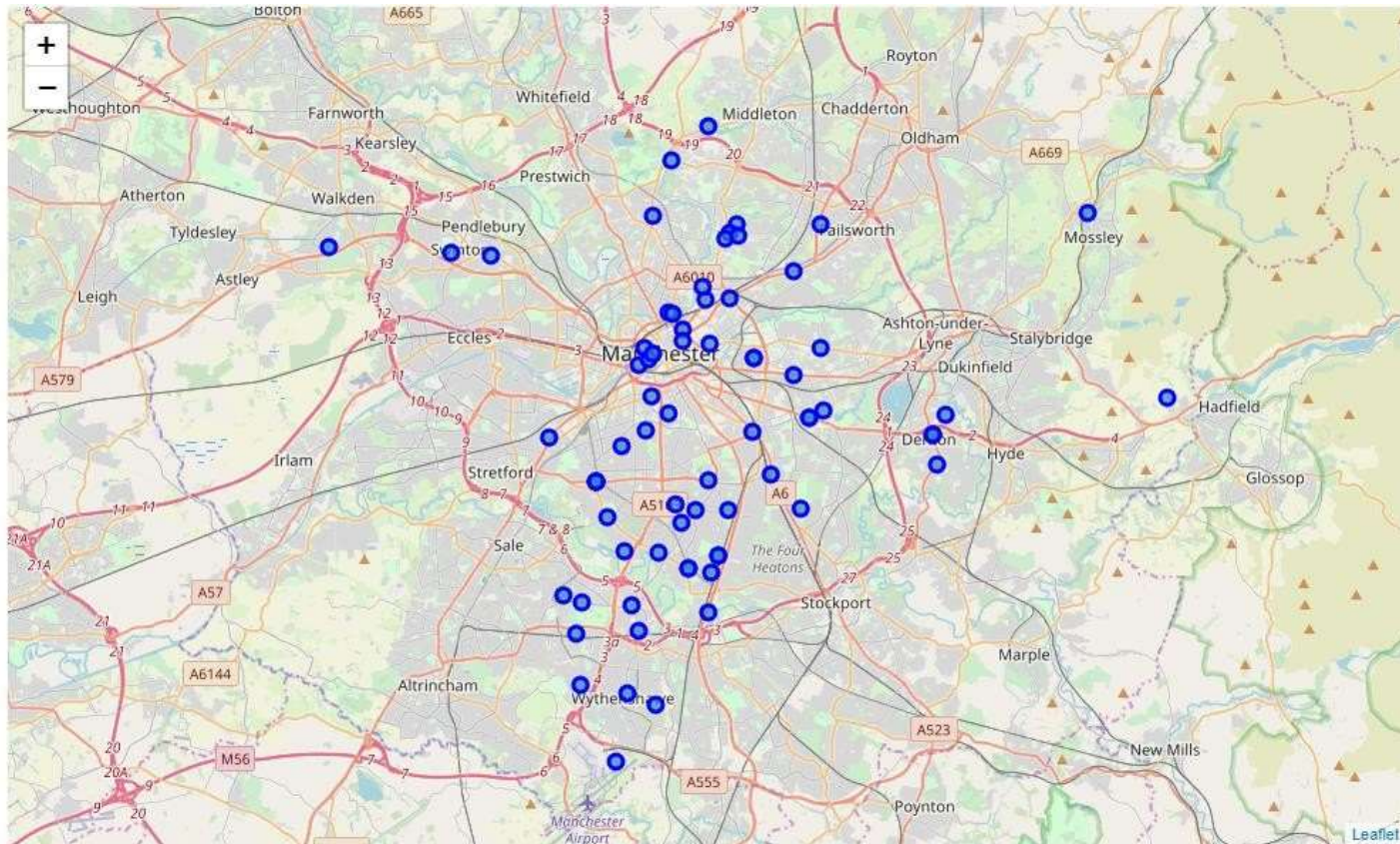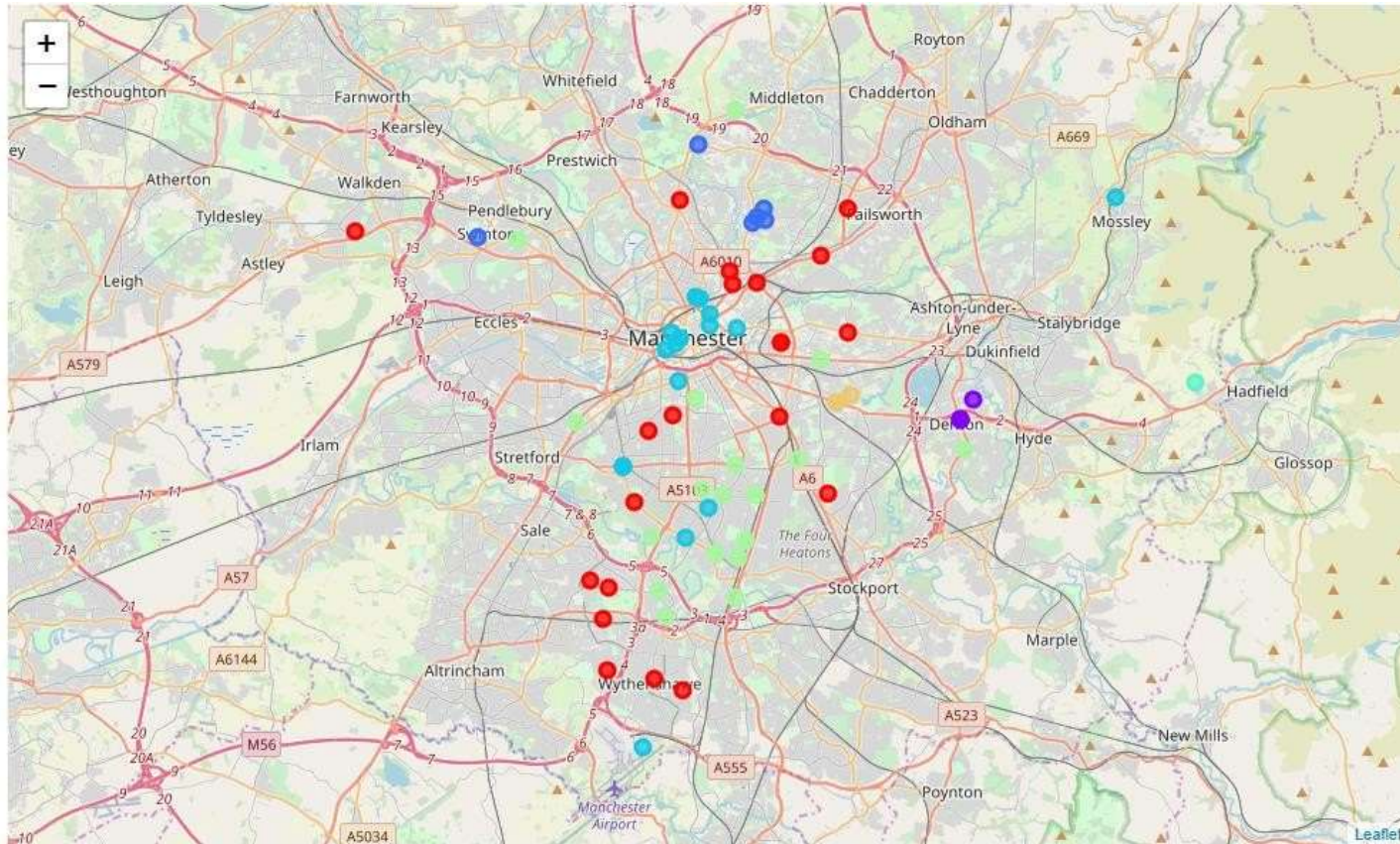
- Plotting
  - Folium

Results

- Visualization of clusters

- After visualising the clusters, the individual clusters were studied and some important conclusions were derived. The neighbourhood that had the most number of restaurants was cluster number 4.

Discussion

- Most suitable neighbourhoods for starting the restaurant business are present in the cluster number 4.

- Our K-Means model worked perfectly and successfully clustered similar neighbourhoods together.

- After studying all four clusters, it is recommended to the client that neighbourhoods such as Barlow Moor, Brookelands and Hyde Newton (Ward) that fall in cluster 4 look like good locations for starting their restaurant business.

- The client can go ahead and make a decision depending on other factors like availability and legal requirements that are out of scope of this project.

Conclusion

- Data analysis and machine learning techniques used in this project can be very helpful in determining solutions of certain business problems.

- Python's inbuilt libraries such as GeoPy, Folium and BeautifulSoup make it very easy and effective to analyse a geographical location.

- In this project we studied the neighbourhoods of Manchester city and came up with a recommendation of neighbourhoods where our client can start their restaurant business.