

An Analysis on Bristol City for incoming international students from India

Done by: Mohamed Nazim Mohamed Nisar

Introduction

1.1 Background

I am from India and I have a masters program admit for September 2020 intake from the University of Bristol. I have always been fascinated about joining a university in the top 50 of the world rankings and I am extremely thrilled to join the University of Bristol in the coming months. One of the reasons for choosing Bristol was because of its multicultural society.

Few words about Bristol:

Bristol is a city and county in South West England with a population of 463,400. One of the UK's most popular tourist destinations, Bristol was selected in 2009 as one of the world's top ten cities by international travel publishers Dorling Kindersley in their *Eyewitness* series of travel guides. *The Sunday Times* named it as the best city in Britain in which to live in 2014 and 2017, and Bristol also won the EU's European Green Capital Award in 2015. (Ref: <http://en.wikipedia.org/wiki/Bristol>)

Bristol welcomes students from more than 150 countries across the world. To put things in perspective, more than 30,000 Indian students fly to the UK for higher education purposes. As of now, thousands of Indian students enter Bristol every year to pursue the highly valued education and become part of a vibrant community.

1.2 Project Idea and Target Audience:

IDEA:

The idea for this capstone project is to analyze Bristol from the perspective of an Indian student and help them get familiar with neighborhoods, venues, tourist spots and other key insights. The idea is now broken down into achievable Project Objectives. They are as follows:

Objectives:

1. To find out the parts of Bristol that have the most number of Indians.
2. To find out the neighborhoods which are highly likely to offer the most to an Indian student.
3. To explore neighborhoods and understand the most frequently found venue categories.
4. To understand about the university neighborhoods in Bristol and which one offers the more familiar environment for an Indian student.
5. To discover the top tourist spots in Bristol for the Indian students to visit on their weekends.

TARGET AUDIENCE:

The target audience is the Indian cohort that is either flying to Bristol for higher education or is searching for a suitable destination to pursue their university studies. This project will certainly help the Indian students who will be travelling to Bristol to pursue higher education choose the right neighborhoods to visit, stay and enjoy the plethora of venues. It will also help them to better understand the university neighborhoods, especially the necessary venues in the surrounding, and also the famous tourist spots.

2. Data section

There are quite a few datasets needed to be used in this project.

First, Bristol is divided into wards. The geometric boundaries for these wards are found in the official government website: <https://opendata.bristol.gov.uk/explore/dataset/wards/export/>. This geojson file helps to get started. This data is used to create exploratory maps of Bristol including choropleth maps in further sections. The geojson file is essential to clearly mark the boundaries of the wards of Bristol in the folium maps.

Second, the population data is found in the same website and under ethnicity: <https://opendata.bristol.gov.uk/explore/dataset/ethnicity/>. This helps with the first project objective. The Indian population for each ward is found with data from this source. This is done by first creating a pandas dataframe with the names of wards and Indian population for each ward. This can then be used in choropleth maps.

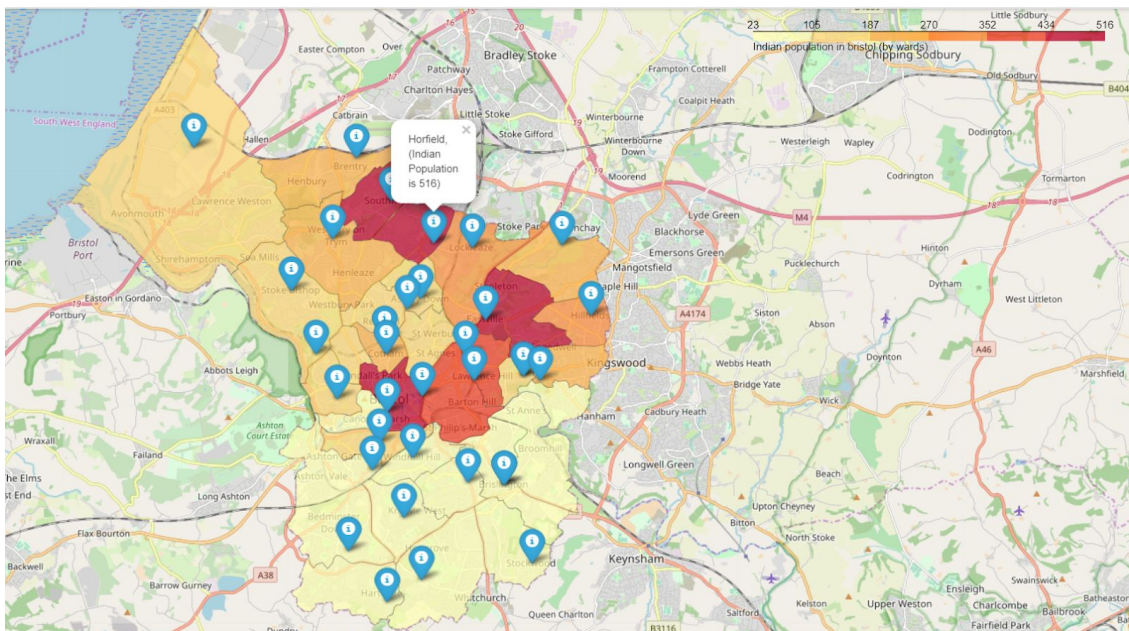
Third, the wards are subdivided into Neighborhoods. The data for this is available at: https://en.wikipedia.org/wiki/Subdivisions_of_Bristol. The web scraping technique, Beautiful Soup, is required to get the necessary data. The location data such as latitude and longitude is compiled using Nominatim. A pandas dataframe is created using the name of the neighborhoods scraped from this website and the collected location data.

Fourth, the **Foursquare API** becomes essential to identify the different venues in all the neighborhoods, thereby identifying the most suitable/familiar neighborhoods to Indian students and also identify the university with a better Indian-suited neighborhood. The Foursquare API is used to request venues for all the neighborhoods we found using the earlier steps. These venues are then used to analyze how suited they are to an Indian student. **This accounts for the Project objectives 2,3 and 4.**

Finally, Beautiful Soup is used to scrape data for the top 10 tourist attractions in Bristol from this website: <https://www.planetware.com/tourist-attractions-/bristol-eng-av-bristol.htm>. The location data is compiled using Nominatim. A data frame consisting of all these data is compiled and used to produce folium maps with markers pointing to the location of the tourist spots. This data is used to achieve the final objective of the project, which is to map the top 10 tourist spots in Bristol.

3. Methodology

3.1. Indian population by wards in Bristol



The choropleth library in folium maps is utilized to visualize ethnicity data of wards in Bristol. This helps to determine those with the highest Indian population. This representation also uses markers to improve comprehension of the map. Nominatim is used to obtain the location data of the corresponding wards; this data is then passed on to the markers. Besides, the markers also have information icons to display the corresponding ward name and location coordinates when clicked. This is very helpful to quickly explore ethnicity in Bristol.

The exploratory analysis is confirmed manually by sorting our pandas dataframe.

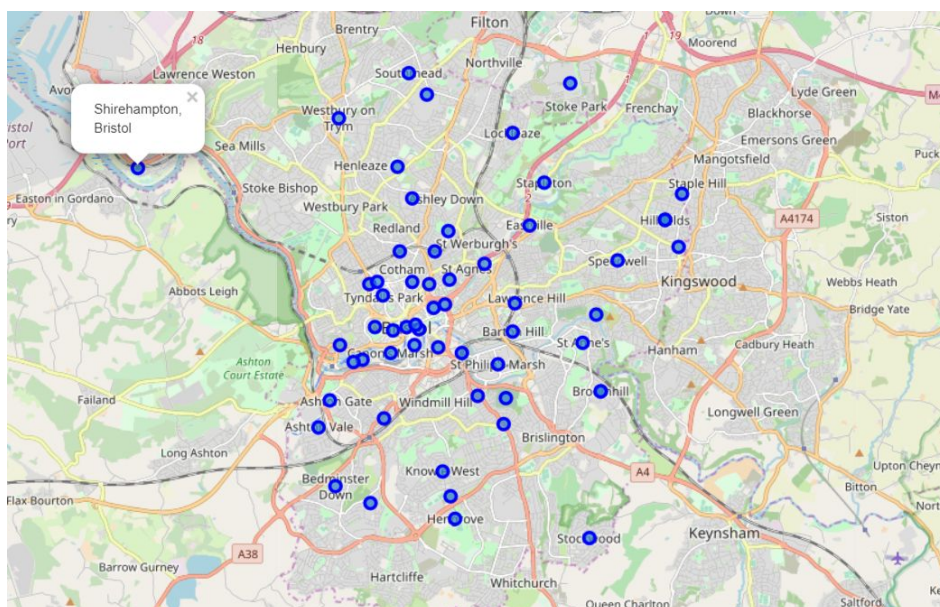
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[ ] Five_most_Indian_Population
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	Ward	Indian Population	Total Population
25	Horfield	516	11832
31	Eastville	491	13255
22	Central	485	12415
5	Southmead	445	12451
32	Lawrence Hill	414	16556

According to the census taken in 2011, the five wards with most Indian population are: Horfield, Eastville, Central, Southmead, Lawrence Hill.

3.2 Exploring Neighborhoods of Bristol

First, the neighborhoods are scraped from a wikipedia page using the technique - Beautiful Soup. These neighborhoods are plotted in folium maps.



Foursquare is used to get the top 50 venues within a radius of 500 meters for each of the Bristol neighborhoods. One-hot encoding is performed to get the frequency of each venue category. The data is then processed to get the 10 most frequent types of venues in each Bristol neighborhood. Here is a snippet of the output:

	Neighborhood	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	Arnos Vale, Bristol	Bar	Recording Studio	Pizza Place	Park	Health Food Store	Coffee Shop	Fast Food Restaurant	Wine Shop	Food Truck	Food & Drink Shop
1	Ashton Gate, Bristol	Bakery	Electronics Store	Soccer Stadium	Brewery	Gym / Fitness Center	Tapas Restaurant	Beer Bar	Fast Food Restaurant	Park	Discount Store
2	Ashton Vale	Discount Store	Electronics Store	Supermarket	Fast Food Restaurant	Sandwich Place	Food	Fried Chicken Joint	French Restaurant	Food Truck	Food & Drink Shop
3	Baldwin St, Bristol	Bar	Pub	Coffee Shop	Pizza Place	Burger Joint	Indian Restaurant	Steakhouse	Café	Italian Restaurant	Theater
4	Baltic Wharf	Pub	Harbor / Marina	Pier	Bar	English Restaurant	Plaza	Thai Restaurant	Café	History Museum	Art Gallery

The stakeholder is now able to clearly understand the different types of venues present in all the Bristol neighborhoods. The data exploration done in this section is the centerpiece of the project. The reason for this statement will be known in the subsequent sections.

3.3 Criteria List: Neighborhood Familiarity

After getting the top 50 venues using Foursquare and applying one-hot encoding to get the frequency for each of them, a criteria-list is created. This is just a list of venue categories that are familiar to an average Indian. For example, venues under categories such as 'Indian restaurant' and 'Theatre' are much more familiar to an Indian than those under categories like 'Moroccan restaurant' and 'Sushi bar'.

The methodology to rank neighborhoods based on the frequency of the venues is straightforward. A mean of all the venue category frequencies is taken for all the neighborhoods which are then sorted and ranked based on this mean value. Besides, the sum, standard deviation, and the number of unique venue categories are also calculated for better comprehension. It can be seen that 'Monks Park', 'Filwood Park' and 'Arnos Vale' have comparatively higher average frequencies and the number of unique venue categories than the other neighborhoods.

This means that it is more probable for an Indian to encounter several unique venues that are familiar to him at one of these neighborhoods.

3.3 Exploring University Neighborhoods

After listing the top 10 most common venues of all neighborhoods, the focus is turned towards understanding the university neighborhoods. There are two universities in Bristol namely, 'The University of the West of England, Bristol' and 'The University of Bristol'.

Next, the average venue frequencies of the two university neighborhoods are compared to identify which university provides a more familiar environment to an Indian student.

Displaying the top 10 venues of the two neighborhood universities.

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[ ] bristol_merged.loc[bristol_merged['Neighborhood'] == 'The University of the West of England, Bristol', bristol_merged.columns[[1] + list(range(5, bristol_merged.shape[1]))]]
```

	Neighborhood	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
48	The University of the West of England, Bristol	Bar	Coffee Shop	Food Truck	Wine Shop	Food & Drink Shop	Furniture / Home Store	Frozen Yogurt Shop	Fried Chicken Joint	French Restaurant	Food

```
[288] Rating_Indian_Neighborhoods.loc[Rating_Indian_Neighborhoods['Neighborhood'] == 'The University of the West of England, Bristol']
```

	Neighborhood	sum	average	standard deviation	Number of Unique categories	Ward Name
3	The University of the West of England, Bristol	0.75	0.045456	0.156362	5	Frome Vale

```
[ ] bristol_merged.loc[bristol_merged['Neighborhood'] == 'University of Bristol, Bristol', bristol_merged.columns[[1] + list(range(5, bristol_merged.shape[1]))]]
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19	University of Bristol, Bristol	Pub	Bar	Bakery	Cocktail Bar	Coffee Shop	Hotel	History Museum	Plaza	Movie Theater	Mexican Restaurant

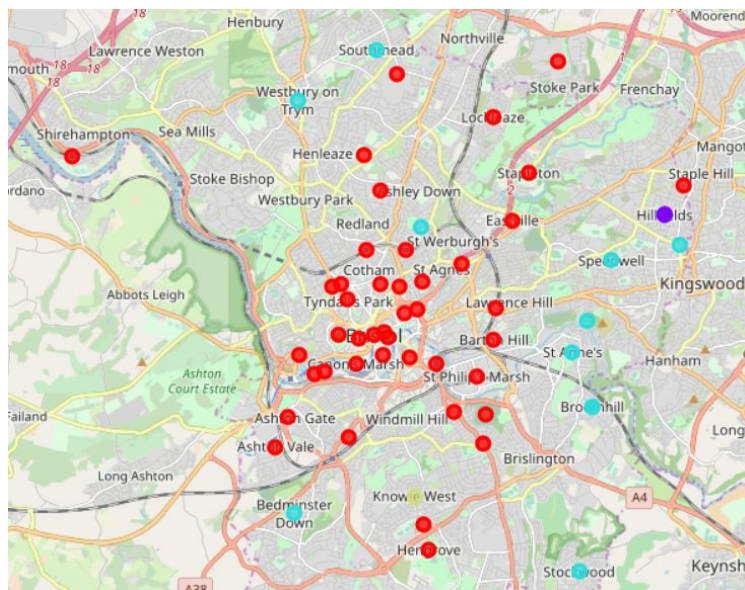
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[289] Rating_Indian_Neighborhoods.loc[Rating_Indian_Neighborhoods['Neighborhood'] == 'University of Bristol, Bristol']
```

	Neighborhood	sum	average	standard deviation	Number of Unique categories	Ward Name
47	University of Bristol, Bristol	0.292683	0.017738	0.051747	11	Cabot

3.4 Clustering

An unsupervised machine learning technique - Clustering, is done in this project. Specifically, the K-means clustering is done. This is to identify similar neighborhoods and cluster them together.

The initial number of K-means clusters is assumed to be 4. The algorithm is run and a folium map is plotted.



It is found that the majority of the neighborhoods are similar, particularly in the central region. There are a handful of neighborhoods in the eastern region that are quite similar. Also, there are clusters with just one to three neighborhoods, meaning that they are very distinct.

4. Results

Reporting results for each of the project objectives:

- **To find out the parts of Bristol that have the most number of Indians.**

[63] Five_most_Indian_Population

	Ward	Indian Population	Total Population
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According to the census taken in 2011, the five wards with most Indian population are: Horfield, Eastville, Central, Southmead, Lawrence Hill.

Horfield has the highest number of Indians in Bristol.

- **To explore neighborhoods and understand the most frequently found venue categories.**

The most common venues for all the Bristol neighborhoods are found. The following is a sample snippet of the result.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Arnos Vale, Bristol	Bar	Pizza Place	Fast Food Restaurant	Coffee Shop	Health Food Store
1	Ashton Gate, Bristol	Bakery	Electronics Store	Beer Bar	Soccer Stadium	Brewery
2	Ashton Vale	Sandwich Place	Fast Food Restaurant	Supermarket	Discount Store	Electronics Store
3	Baldwin St, Bristol	Bar	Pub	Coffee Shop	Italian Restaurant	Burger Joint
4	Baltic Wharf	Pub	Harbor / Marina	Art Gallery	Pier	English Restaurant

- To find out the neighborhoods which are likely to be the most familiar to an Indian student.

These are the ten most familiar Bristol neighborhoods to an Indian.

[284] Top_ten_suited_neighborhoods

	Neighborhood	sum	average	standard deviation	Number of Unique categories	Ward Name
0	Monks Park	1.000000	0.060606	0.184948	7	Horfield
1	Filwood Park	1.000000	0.060606	0.204405	5	Filwood
2	Arnos Vale, Bristol	0.833333	0.050505	0.156158	7	Brislington West
3	The University of the West of England, Bristol	0.750000	0.045455	0.156362	5	Frome Vale
4	Golden Hill, Bristol	0.750000	0.045455	0.143740	6	Henleaze
5	St Philips Marsh	0.750000	0.045455	0.143740	6	Lawrence Hill
6	Staple Hill, Bristol	0.714286	0.043290	0.133850	7	Hillfields
7	Hillfields West	0.666667	0.040404	0.159071	4	Hillfields
8	Hillfields North	0.666667	0.040404	0.159071	4	Hillfields
9	Hillfields East	0.666667	0.040404	0.159071	4	Hillfields

It can be seen that Monks Park and Filwood Park have the highest average venue frequencies with a good unique number of venues.

- To understand about the university neighborhoods in Bristol and which one offers the more familiar environment for an Indian student.

Displaying the top 10 venues of the two neighborhood universities.

[] bristol_merged.loc[bristol_merged['Neighborhood'] == 'The University of the West of England, Bristol', bristol_merged.columns[[1] + list(range(5, bristol_merged.shape[1]))]]

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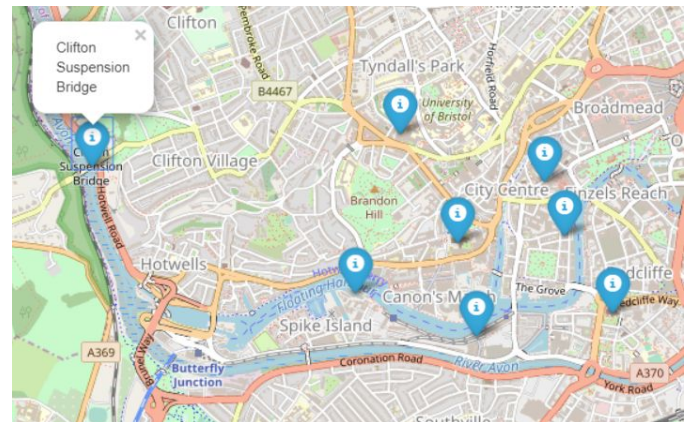
	Neighborhood	sum	average	standard deviation	Number of Unique categories	Ward Name
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The analysis shows that 'the University of the West of England (UWE)' has more number of familiar venues to Indian students on an average while 'the University of Bristol' has more number of unique familiar venue categories.

- To discover the top tourist spots in Bristol for the Indian students to visit on their weekends.

```
[ ] df_bristol_attraction
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	Place	Latitude	Longitude
0	Bristol Harbour	51.4473	-2.59952
1	St. Mary Redcliffe	51.4483	-2.58962
2	Bristol Cathedral	51.4515	-2.60089
3	Brunel's SS Great Britain	51.449221	-2.608373
4	Llandoger Trow	51.4518	-2.59313
5	Clifton Suspension Bridge	51.455	-2.62764
6	Bristol Old City	51.4544	-2.59456
7	Bristol Museum and Art Gallery	51.4565	-2.6051
8	Blaise Castle House	51.506	-2.63481
9	Cheddar Gorge	51.2826	-2.76565



It is found that 8 out of 10 top Bristol tourist attractions are quite close to the City Centre. The data collected is visualized using the Folium maps.

5. Discussion

There are a few notable patterns and connections in this project. These elements are discussed in this section.

1. The neighborhood which has the most familiar ambience is 'Monks Park' and it is located in the ward of 'Horfield'. This is also the ward with the most number of Indians. So this result isn't surprising and is an important point to be noted.
2. The University of the West of England is a neighborhood with many more venues that are familiar to an Indian student compared to the University of Bristol.
3. On the other hand, the University of Bristol has many more different and unique venue categories that are familiar to an Indian student. That is, UWE might have 4 Indian restaurants but UofB might have 2 Indian restaurants and 1 theatre. So, both the neighborhoods have something to offer to the Indian students.
4. Around 8 out of 10 top attractions at Bristol are very close to the University of Bristol whereas the University of the West of England is located on the northern end of the county and so commuting may be more difficult.
5. The clustering suggests that the University neighborhoods are very different. This is probably because of their distant locations.

6. Conclusion

The following can be concluded from this project:

- If you are an Indian student looking for a University that suits you, you may choose either of the universities as they both have something to offer.
- Provided you are okay with the programs offered by either of the universities, choose UWE if you would look to stay away from the hassles of a tourist place and be in a familiar environment with many options to choose from within the same venue category.
- On the other hand, choose University of Bristol if you would like to live in a vibrant community and also be in close proximity to a diverse range of familiar venues without many options.
- You can also visit Horfield to become part of the largest Indian community in Bristol. This ward is also home to the Monks park which is a neighborhood that could be very much familiar to you.