Finding the Best Hotel for the Perfect Charleston Vacation

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Capstone Project for the IBM Applied Data Science Certification

Introduction/Business Problem

Charleston, South Carolina is very popular tourist destination. Charleston is known for its rich history, well-preserved architecture, distinguished restaurants, and hospitable people. For eight years and counting, Charleston has been *Condé Nast Traveler*'s top U.S. tourist destination.[1] *Travel + Leisure* readers also ranked Charleston number 1 in the U.S. for the seventh year in a row,[2] and *Southern Living* readers picked Charleston as the South's Best City.[3] Additionally, many tourists have begun to flock to Charleston due to its status of "international food destination," much like Paris.[4]

While many tourists enjoy the charm of historic Charleston, many find driving and parking in and around the city cumbersome,[5] turning what should be a relaxing vacation into a stressful one. Hotels are spread throughout the Charleston area, but many of the most popular tourist destinations and restaurants are within walking distance of one another.

The aim of this project is to determine the best hotels for tourists in Charleston, based upon the number of historic sites, attractions, shops and restaurants within walking distance. The intended audience for this project is the first-time tourist to Charleston, who would like to spend more time relaxing and enjoying the city and less time in traffic. Utilizing publicly available ZIP code and latitude and longitude information, coupled with data from the ***Foursquare API***, this project will provide tourists with a list of the hotels with the greatest number of walkable destinations, along with the ideal hotel location and information about the best hotel based on distance from ***Foursquare***.

Data

To begin our exploration of the Charleston area, we first use *BeautifulSoup* to scrape neighborhood ZIP Codes from https://www.zip-codes.com/county/sc-charleston.asp. This information is transformed into a *pandas* dataframe.

Next, latitudes and longitudes for the various neighborhoods are downloaded from https://public.opendatasoft.com/explore/dataset/us-zip-code-latitude-and-longitude/export/ as a .csv file. These are appended to the ZIP code dataframe.

Following the construction of a map of the Charleston area, **Foursquare** data is used to:

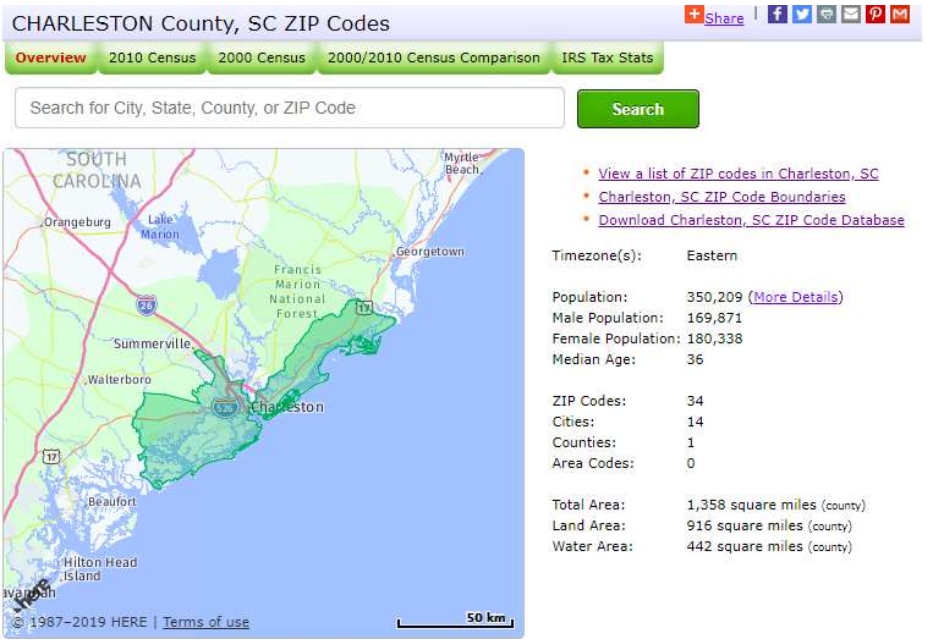
- Determine the Charleston area ZIP codes with the highest density of restaurants and attractions. These are the ZIP codes where the desired hotels must be located.
- Determine all the hotels within the ZIP codes.
- Determine which of the hotels has the highest number of restaurants and tourist attractions within 0.25 miles (considered to be an "acceptable" walking distance according to a study by the US Department of Health and Human Services[6]).

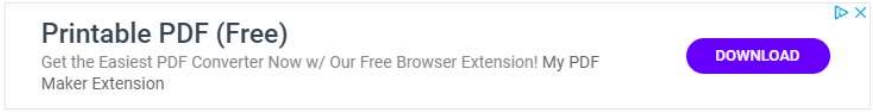
The tourist will be provided a list of the hotels with the highest number of destinations within walking distance, along with a map of the hotel locations, hotel information from Foursquare, and a list of the types of venues within walking distance.

Methodology

Acquiring ZIP Codes and Associated Latitudes & Longitudes from Open Source Websites

To begin our exploration of the Charleston area, we will use ***BeautifulSoup*** to scrape ZIP Codes from https://www.zip-codes.com/county/sc-charleston.asp.





CHARLESTON County, SC Covers 34 ZIP Codes

ZIP Code	Classification	City	Population	Timezone	Area Code(s)
ZIP Code 29401	General	Charleston	10,895	Eastern	843/854
ZIP Code 29402	P.O. Box	Charleston	0	Eastern	843/854
ZIP Code 29403	General	Charleston	20,818	Eastern	843/854
ZIP Code 29404	General	Charleston AFB	1,348	Eastern	843
ZIP Code 29405	General	North Charleston	26,328	Eastern	843
ZIP Code 29406	General	Charleston	29,314	Eastern	843
ZIP Code 29407	General	Charleston	34,827	Eastern	843
ZIP Code 29409	Unique	Charleston	2,100	Eastern	843/854
ZIP Code 29412	General	Charleston	35,850	Eastern	843/854
ZIP Code 29413	P.O. Box	Charleston	0	Eastern	843/854
ZIP Code 29414	General	Charleston	31,883	Eastern	843
ZIP Code 29415	P.O. Box	North Charleston	0	Eastern	843/854
ZIP Code 29416	P.O. Box	Charleston	0	Eastern	843/854
ZIP Code 29417	P.O. Box	Charleston	0	Eastern	843/854
ZIP Code 29418	General	North Charleston	23,540	Eastern	843
ZIP Code 29419	P.O. Box	North Charleston	0	Eastern	843/854
ZIP Code 29422	P.O. Box	Charleston	0	Eastern	843/854
ZIP Code 29423	P.O. Box	Charleston	956	Eastern	843/854
ZIP Code 29424	Unique	Charleston	389	Eastern	843
ZIP Code 29425	Unique	Charleston	0	Eastern	843
ZIP Code 29426	General	Adams Run	1,741	Eastern	843
ZIP Code 29429	General	Awendaw	2,737	Eastern	843
ZIP Code 29439	P.O. Box	Folly Beach	2,399	Eastern	843/854

Figure 1: The zip-codes.com website has several tables, advertisements, and maps. Only the ZIP Codes should be extracted.

The ZIP Code information is extracted from the website and is transformed into a ***pandas*** dataframe. The cleaned dataframe has 34 rows of data:

	ZIP Code
1	29401
2	29402
3	29403
4	29404
5	29405

Figure 2: Head of ZIP Code Dataframe

Next, latitudes and longitudes for the various neighborhoods are downloaded from https://public.opendatasoft.com/explore/dataset/us-zip-code-latitude-and-longitude/table/ as a .csv file.

Figure 3: Source of US ZIP Code Latitude and Longitude .csv file

After the ZIP Code, Latitude and Longitude data were extracted from the .csv file, they were cleaned and placed into a ***pandas*** dataframe with over 43,000 rows of data:

	ZIP Code	Latitude	Longitude
0	71937	34.398483	-94.39398
1	72044	35.624351	-92.16056
2	56171	43.660847	-94.74357
3	49430	43.010337	-85.89754
4	52585	41.194129	-91.98027

Figure 4: Head of US Latitude and Longitude Dataframe

Now that all the geolocation data has been acquired and placed into dataframes, both dataframes can be merged to give ZIP Code, Latitude and Longitude for all 34 neighborhoods in Charleston:

	ZIP Code	Latitude	Longitude
0	29401	32.779126	-79.93550
1	29402	32.848850	-79.85773
2	29403	32.799326	-79.94813
3	29404	32.897903	-80.06061
4	29405	32.856634	-79.98218
5	29406	32.918757	-80.02280
6	29407	32.794841	-80.00500
7	29409	32.848850	-79.85773
8	29412	32.737270	-79.95409
9	29413	32.848850	-79.85773
10	29414	32.821238	-80.05353

Figure 5: Head of merged geolocation data for neighborhoods in Charleston, SC

Mapping the Neighborhoods in Charleston

Since we have all the geolocation data in one dataframe, we can use the ***Python*** package ***matplotlib*** to create a Folium map of all the neighborhoods of Charleston:

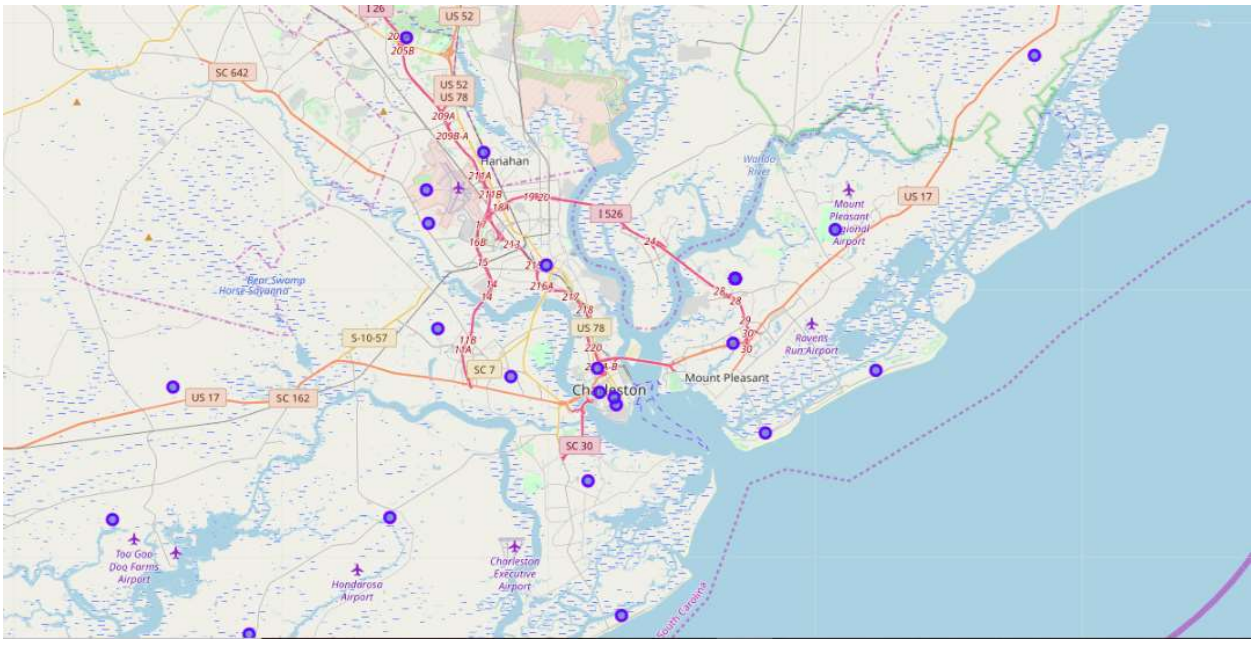


Figure 6: Folium map of all 34 Charleston neighborhoods

Exploring Neighborhoods in Charleston with *Foursquare*

Now that we have the necessary geolocation data for Charleston and have visualized it on a map, we can import venues from ***Foursquare***, based upon our location dataframe. As shown in Figure 7 below, we retrieved 307 venues, along with each venue's neighborhood, latitude, longitude, and venue category.

```
[21]: #Checking size of resulting dataframe
      print(charleston_venues.shape)
      charleston_venues.head()
```

```
(307, 7)
```

Out[21]:

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	29401	32.779126	-79.9355	Le Farfalle	32.780793	-79.934589	Italian Restaurant
1	29401	32.779126	-79.9355	Queen Street Grocery	32.777549	-79.936078	Food & Drink Shop
2	29401	32.779126	-79.9355	Second State Coffee	32.779859	-79.937648	Coffee Shop
3	29401	32.779126	-79.9355	Pure Barre Market Street	32.780714	-79.934621	Gym
4	29401	32.779126	-79.9355	Fulton Five	32.779654	-79.933429	Italian Restaurant

Figure 7: Screen shot of ***Jupyter Notebook***, showing Charleston venue data retrieved from ***Foursquare***

After grouping the data by neighborhood, we learn that the largest number of venues is in ZIP Code 29424, with 81 total venues. The second largest number of venues is in ZIP Code 29401, with 65 total venues. Interestingly, these ZIP Codes are right next to each other on the Charleston peninsula. Now we can zoom in and look only at venues in these ZIP Codes, since the hotels with the largest number of venues within walking distance must be in these two ZIP Codes.

Mapping Hotels and Venues in Tourist Neighborhoods

Extracting hotels in ZIP Codes 29424 and 29401 reveals this Folium map:

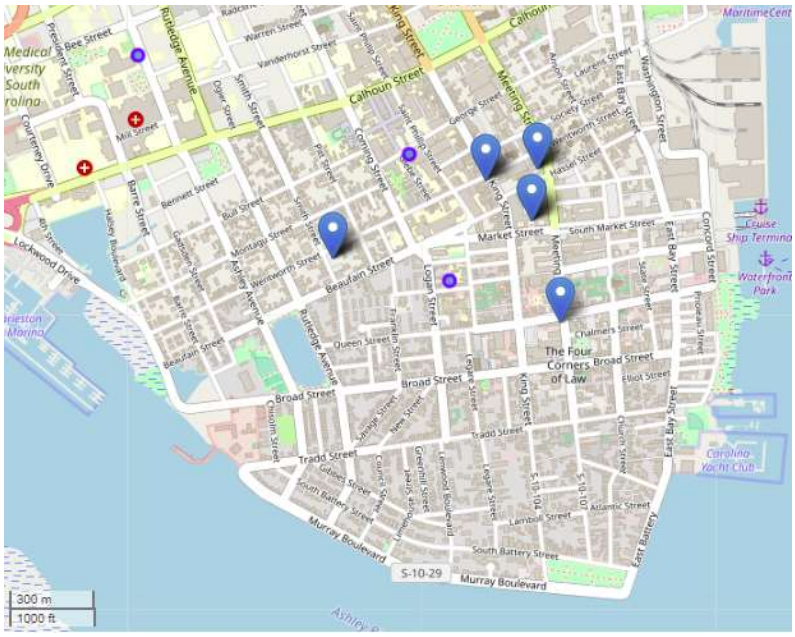


Figure 8: Hotels in Charleston Tourist District indicated by

When overlaid with the venues in the tourist district, the following map is generated:

Figure 9: Hotels and Venues (Shown as **O**) in Charleston Tourist District

Determination of "Most Walkable" Hotel

To determine an ideal location for our hotel based on walking distance, we can calculate the center point for all our venues' geolocations. With coordinates so close to each other, we can treat the Earth as being locally flat and simply find the centroid as though they were planar coordinates. Then we simply take the average of the latitudes and the average of the longitudes to find the latitude and longitude of the centroid.[7] The ideal location is shown as the green icon on the Folium map in Figure 10.

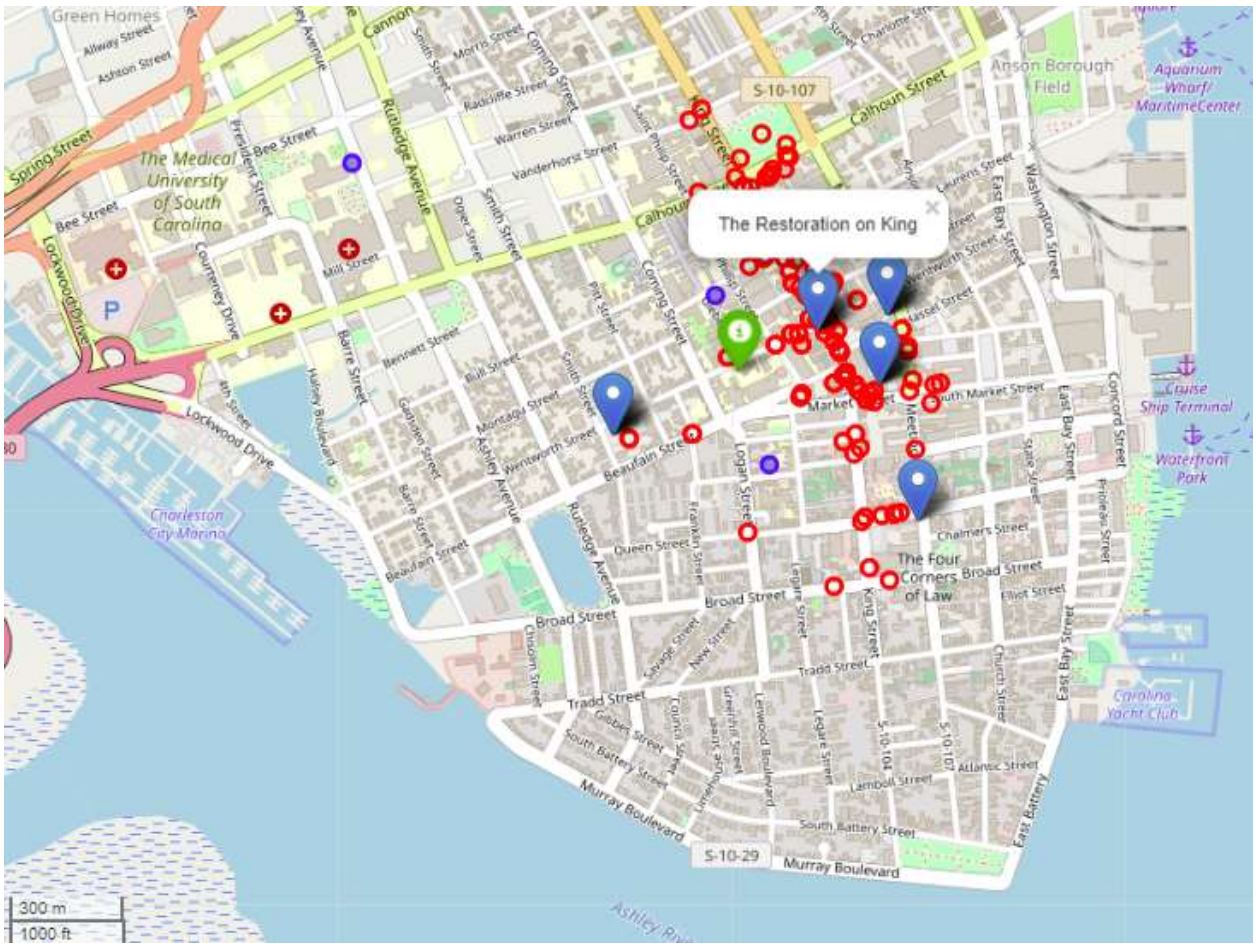


Figure 10: Centroid of venues is shown as a green marker. This is the ideal location for the "most walkable" hotel.

Results

Examining the map in Figure 9 tells us that the three best hotels in Charleston based upon walking distance to attractions are **The Restoration on King, Belmond Charleston Place, and King Charles Inn**.

The best hotel, based upon number of venues within walking distance as shown in Figure 10, is **The Restoration on King**. This hotel is closest to the ideal hotel location.

Each of these hotels has 62 unique types of venues within walking distance, including many types of restaurants, bookstores, coffee shops, antiques stores, art galleries, farmers markets and theaters.

Discussion

Based upon these results, there are several hotels within walking distance to many of Charleston's finest attractions. Staying at one of these hotels will provide guests the optimum experience if they would prefer not to drive on small streets in a historic city.

One caveat about these results is that they are dependent upon the venues that exist in the ***Foursquare*** database. While ***Foursquare*** has many venues listed in its database, some of Charleston's most famous attractions are not listed, such as Rainbow Row, The Battery, Waterfront Park and the South Carolina Aquarium, just to name a few. Fortunately, restaurants and other venues like the ones in ***Foursquare*** tend to exist in areas with other well-known attractions, so it is safe to assume that the results presented in this analysis are reasonably accurate for most attractions in historic downtown Charleston.

Combining the results of our analysis with the data that Foursquare provides about the hotels, tourists can do a little research to decide which hotel is best for them:

The Restoration on King	https://foursquare.com/v/the-restoration-on-king/4be16f5a8dd062b564473e3c
Belmond Charleston Place	https://foursquare.com/charlestonplace
King Charles Inn	https://foursquare.com/v/king-charles-inn/4b5e3bd9f964a5203c8529e3

Conclusion

The aim of this project was to determine the best hotels for tourists in Charleston, based upon the number of historic sites, attractions, shops and restaurants within walking distance. The intended audience for this project was the first-time tourist to Charleston, who would like to spend more time relaxing and enjoying the city and less time in traffic. Utilizing publicly available ZIP code and latitude and longitude information, coupled with data from the ***Foursquare API***, the results of this project provided tourists with a list of the hotels with the greatest number of walkable destinations, along with the ideal hotel location and information about the best hotels from ***Foursquare***.

References

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