# Capstone Project - The Battle of Neighborhoods (Week 2)

A full report consisting of all of the following components (15 marks):

## INTRODUCTION

Where you discuss the business problem and who would be interested in this project:
In a city of my choice, Columbus, Ohio, if someone is looking to open a restaurant, where would you recommend that they open it?

## DISCUSSION OF THE BUSINESS PROBLEM:

I am building a data analysis report for an entrepreneur who wants to open a restaurant here, in a Columbus suburb

The business requirements being:

1. Opening a restaurant at a few of the wealthiest suburbs in and around Columbus, Ohio.
2. A residential suburb is preferred since it is a family restaurant.
3. The Food Company Inc. , though is very well funded, still needs to choose the perfect mix of audience location to start its first venture. If this is successful, they are planning to replicate the same in more suburbial locations.
4. Starting this undertaking on a relatively smaller budget since this is a pilot attempt hence budgeting is quite a key factor.

## WHO WOULD BE INTERESTED?

This data analysis exploratory report is made for small business owners who are willing to try a pilot system of opening a family friendly restaurant offering healthier meals. Opening a restaurant is a considerable undertaking and, when done thoroughly and thoughtfully, can be a rewarding and profitable experience. By carefully following the steps outlined here, the business owner will be on his/her way to opening their doors for customers who desire their culinary services.
First move is very important, thereby choice of location is very important and hence I, as a data analyst have done my exploratory analysis in picking the best location that satisfies the business recommendations. At the end of my project presentation & discussions, the entrepreneur would be presented with picking one of the locations in either of these two suburbs-

**Dublin, Ohio or New Albany, Ohio**

DATA where you describe the data that will be used to solve the problem and the source of the data.
For picking the perfect location for the small business entrepreneur, the following data sources have been used in my analysis:
I shortlisted two specific suburbs -Dublin and New Albany
I collected the following data with respect to each of these suburbs

1. Demographics
2. Average Household Income
3. Availabilty of similar other restaurants in the vicinity
4. Average Retail Spending patterns in each of the two suburbs.
5. General eating and lifestyle options of the population in these two places

http://worldpopulationreview.com/us-cities/dublin-oh-population/
http://worldpopulationreview.com/us-cities/new-albany-oh-population/

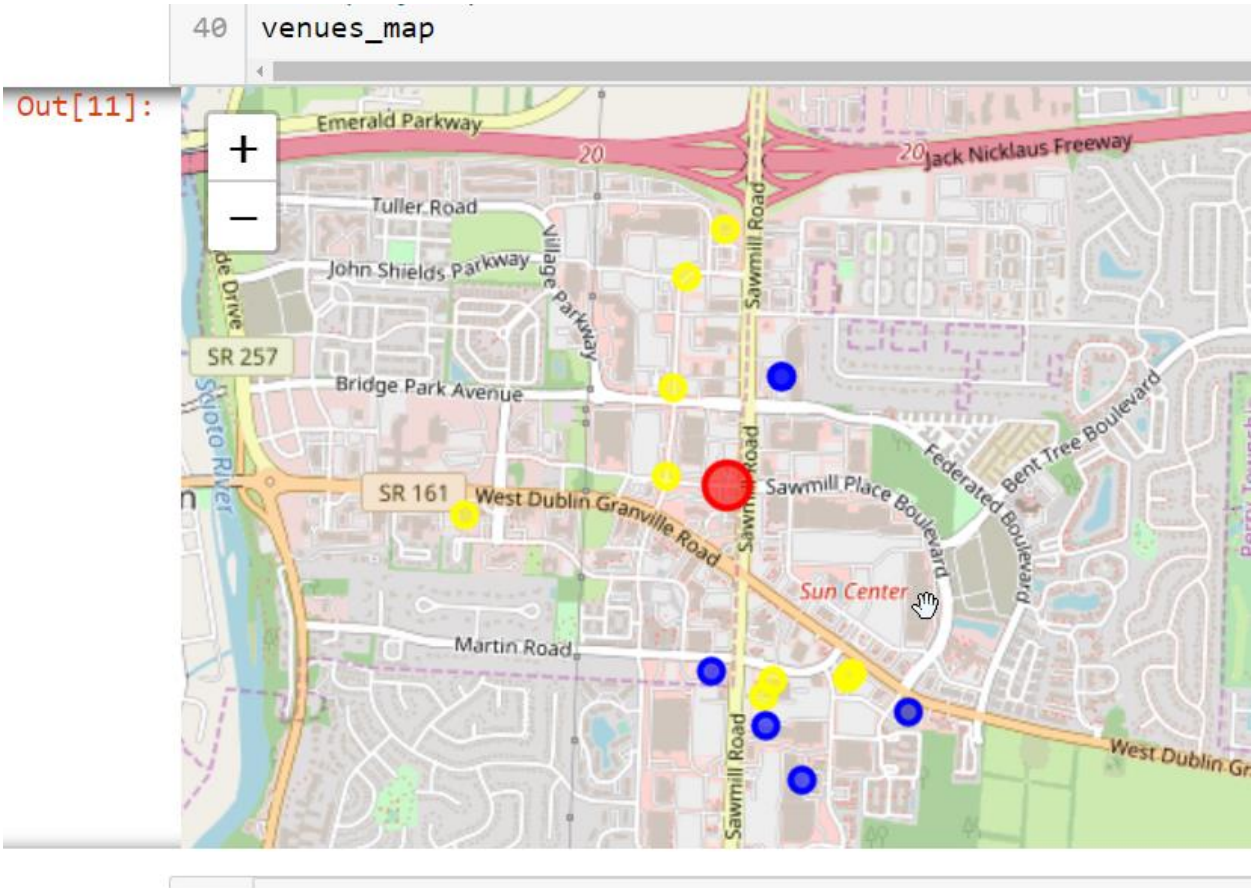
Appropriate average household income for both these neighborhoods was obtained from the above mentioned link as well.

https://www.census.gov/quickfacts/fact/csv/newalbanycityohio,dublincityohio/PST045218
http://zipatlas.com/us/zip-code-comparison/percentage-indian-population.htm

With each of these links, we used FourSquare API to get to the URL, which inturn gave us only the desired values that can be used directly for data analysis.

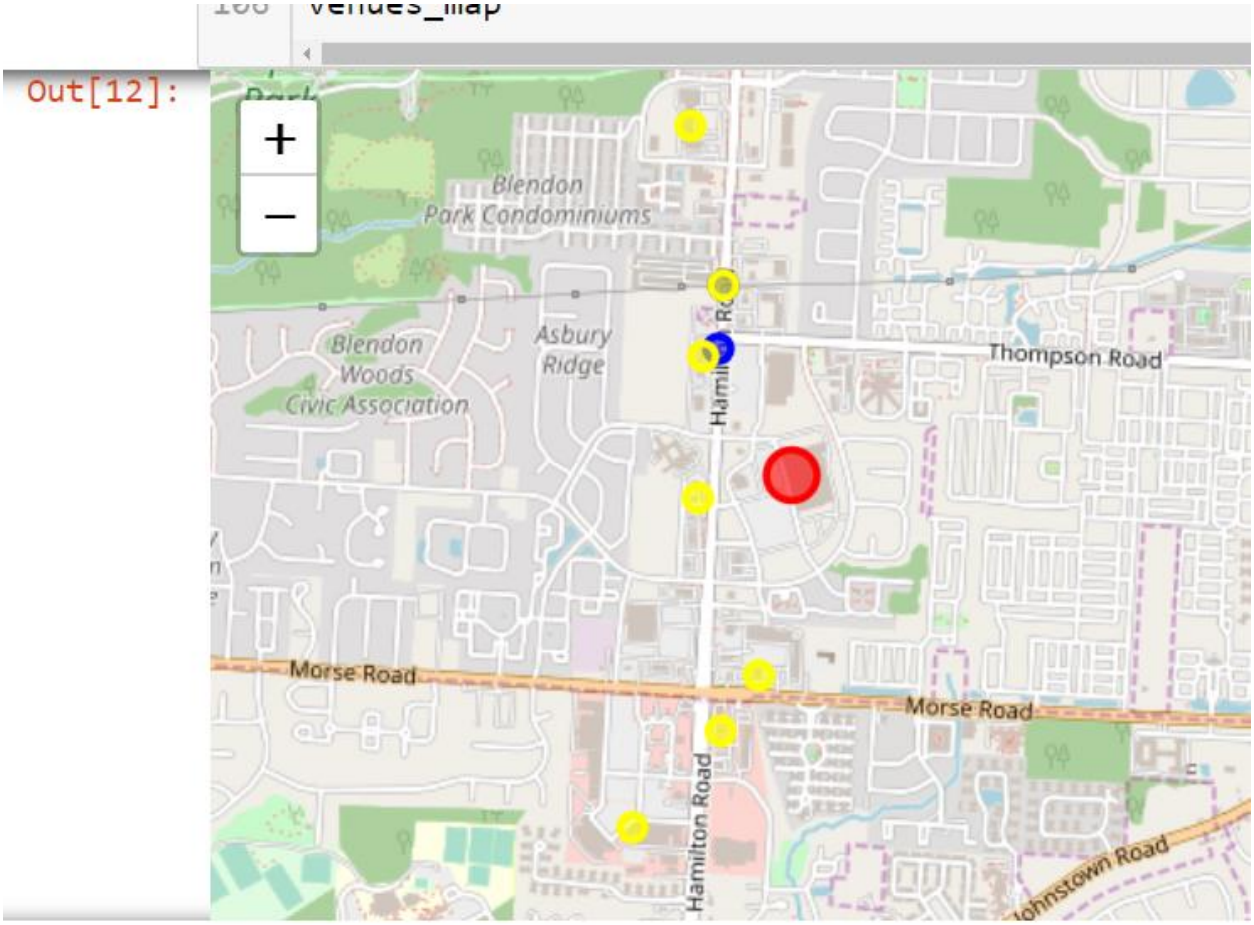
METHODOLOGY section which represents the main component of the report
where you discuss and describe any exploratory data analysis that you did,
any inferential statistical testing that you performed, if any,
and what machine learnings were used and why.
GET THE APPROPRIATE DATA FROM RELIABLE SOURCES,DO THE NECESSARY DATA WRANGLING TO MAKE THE DATA USABLE FOR MY ANALYSIS HERE and SHOW MY RESULTS ON AREA SPECIFIC MAPS
Initially, I used the latitude & longitude of Dublin with Foursquare API calls to get the URL. From the URL, I converted those values to JSON. Then, these into a dataframe, that gave me 10 restaurants in all and 6 Indian restaurants in Dublin.

**DUBLIN MAP of Restaurants**



Then, I put these on a map -the 'new' one marked in red, other ones in 'Yellow', Indian ones are in 'Blue'.
Similarly the identical methodology for New Albany(NA) that leaves us with only 1 Indian restaurant in New Albany with 7 other surrounding restaurants.

**NEW ALBANY MAP of Restaurants**




Next, the population comparision on both these suburbs. Got the Json data from the website
http://worldpopulationreview.com/us-cities/dublin-oh-population/
url = 'https://raw.githubusercontent.com/seethaparamesh/github-example/master/Dublin%20Demo%20data.json'

http://worldpopulationreview.com/us-cities/new-albany-oh-population/
url = 'https://raw.githubusercontent.com/seethaparamesh/github-example/master/New%20Albany%20Demo.json'

Converted these json into single dataframe each, one for NA & one for Dublin and then merged the 2 df.

Out[13]:

| | Race | Dublin Population | New Albany Population |
|---|---|---|---|
| 0 | White | 21967 | 5142 |
| 1 | Asian | 5216 | 489 |
| 2 | Hispanic | 814 | 51 |
| 3 | Black | 603 | 534 |
| 4 | Multiple Races | 434 | 57 |
| 5 | Other Race | 164 | 36 |
| 6 | Native American | 46 | 9 |

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Getting to the business requirement of opening a restaurant in 'one of the wealthiest neighborhoods', I went ahead and created a dataframe from the average household income data json that i got from the following websites.

url = 'https://raw.githubusercontent.com/seethaparamesh/github-example/master/Dublin%20Income.json'

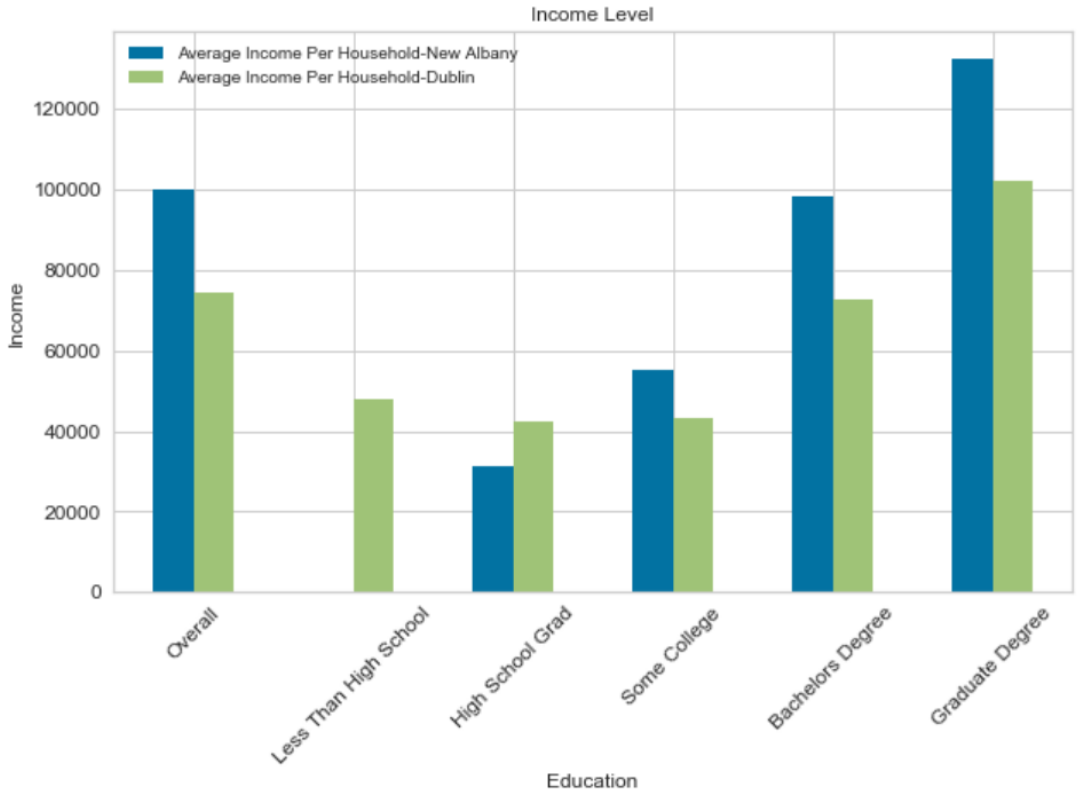
url='https://raw.githubusercontent.com/seethaparamesh/github-example/master/New%20Albany%20Income.json'

Out[16]:

| | Name | Average Income Per Household-Dublin | Average Income Per Household-New Albany |
|---|---|---|---|
| 0 | Overall | 74350 | 100080 |
| 1 | Less Than High School | 47807 | 0 |
| 2 | High School Grad | 42335 | 31125 |
| 3 | Some College | 43263 | 55192 |
| 4 | Bachelors Degree | 72718 | 98397 |
| 5 | Graduate Degree | 102136 | 132578 |

Comparison of the average income between the 2 suburbs in 1 dataframe

Bar Chart depicting the average household income comparison in both the suburbs




Validate that analysis of data got from
worldpopulationreview.com/us-cities/new-albany-oh-population/

matches a secondary source.
# US Census data got from
https://www.census.gov/quickfacts/fact/csv/newalbanycityohio,dublincityohio/PST045218
Snapshot of the population growth

Out[18]:

| | Fact | New Albany city, Ohio | Dublin city, Ohio |
|---|---|---|---|
| 0 | Population estimates, July 1, 2018, (V2018) | 10,889 | 48,647 |
| 1 | Population estimates base, April 1, 2010, (V2... | 7,867 | 41,364 |
| 2 | Population, percent change - April 1, 2010 (es... | 38.40% | 17.60% |
| 3 | Population, Census, April 1, 2010 | 7,724 | 41,751 |
| 4 | Total retail sales per capita, 2012 | $74,083 | $23,251 |
| 5 | Mean travel time to work (minutes), workers ag... | 20.7 | 24.3 |
| 6 | Median household income (in 2017 dollars), 201... | $187,200 | $128,916 |
| 7 | Per capita income in past 12 months (in 2017 d... | $76,811 | $58,386 |

Based on Census data-
Population of New Albany is growing at 38.4% in the past 8 years as compared to only 17.6% for Dublin.
Average medium income from Census data also match the previous analysis that New Albany is more affluent for high earners.
Per Capita of retail sales also show that Consumer Expenditure is significantly higher in New Albany as compared to Dublin.

Thus ends the initial analysis of the two suburbs that the business owner would be interested in.

FUNDAMENTAL DISTRIBUTION OF INDIAN RESTAURANTS ACROSS INDIAN POPULATION IN THE US

Next, let's do the fundamental distribution of Indian restaurants in a list of Cities all across the US.

#http://zipatlas.com/us/zip-code-comparison/percentage-indian-population.htm

In [91]:
```
1
2 print(TopIndianPopulationZIPNotFiltered.to_string())
```

| | Zip | Population | City | State | NumOfIndianRestuarant |
|---|---|---|---|---|---|
| 0 | 19437 | 714 | Gwynedd Valley | PA | 8.0 |
| 5 | 07878 | 774 | Mount Tabor | NJ | 12.0 |
| 14 | 50323 | 957 | Urbandale | IA | 3.0 |
| 23 | 75251 | 1331 | Dallas | TX | 7.0 |
| 24 | 22027 | 1377 | Dunn Loring | VA | 9.0 |
| 28 | 30346 | 1452 | Atlanta | GA | 11.0 |
| 33 | 19453 | 1608 | Mont Clare | PA | 4.0 |
| 37 | 20759 | 1684 | Fulton | MD | 30.0 |
| 38 | 94304 | 1704 | Palo Alto | CA | 4.0 |
| 48 | 20818 | 1987 | Cabin John | MD | 4.0 |
| 53 | 73128 | 2137 | Oklahoma City | OK | 8.0 |
| 58 | 52401 | 2392 | Cedar Rapids | IA | 3.0 |
| 61 | 20763 | 2438 | Savage | MD | 4.0 |
| 63 | 33620 | 2532 | Tampa | FL | 13.0 |
| 64 | 07852 | 2558 | Ledgewood | NJ | 3.0 |

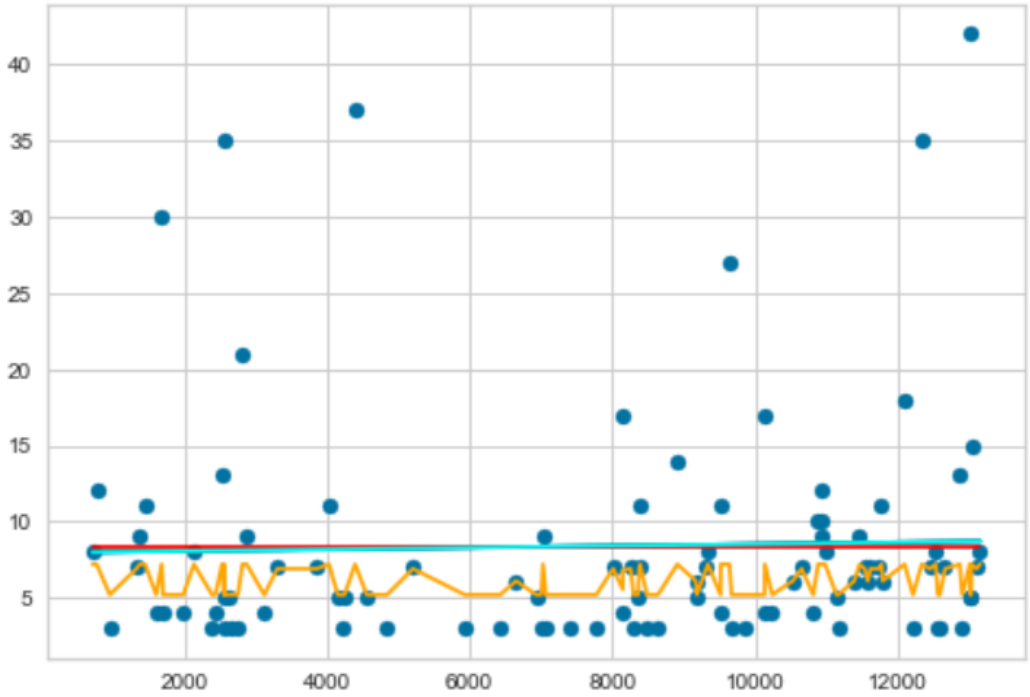
Performed Data Wrangling and Data Cleanup

Now, we do the similar analysis of all the cities in the above mentioned df , iterating through all zipcodes from the above df.
At each zipcode, I am calculating simultaneously the number of Indian restaurants.

At this, Foursquare provides a maximum of only 50 venues per zipcode.Hence any zipcode that has a 'num' value of 50 and 0 are considered outliers(this data would pretty much be irrelevant to us) and have been excluded from the data analysis.

After these outliers have been dealt with, I have made a scatter plot to show the distribution of the number of Indian restaurants against the total Indian population in each of the zipcodes of cities
that we have considered in the table above.
This data would be used as the training data and I have used the following supervised learning models:
Lasso
Linear Regression
ElasticNetCV
SVRrbf
Ridge

```
Out[88]: [<matplotlib.lines.Line2D at 0x184c3a4f9c8>]
```




At the end of this data modelling & prediction, the SVRrbf turns out to be the best prediction model for this training data.
The final point is to use these models on our test data under consideration- New Albany Vs. Dublin.
Applying all these prediction models on both the location gives us the conclusion that
New Albany has better prospects to be successful than Dublin for opening a new Indian restaurant.

Predation based on Dublin Population

```
model_linear_model :  8.247207666095603
model_LinearRegression :  8.247191570198762
model_rbf :  6.1952380952380945
model_Ridge :  8.247191570246068
```

Predation based on New Albany Population

```
model_linear_model :  7.972158850647531
model_LinearRegression :  7.972112582971042
model_rbf :  6.1952380952380945
model_Ridge :  7.972112583107026
```

## RESULTS

From all the analysis above, in between the two suburbs in question, opening a restaurant in New Albany has better chances of survival than in Dublin that can be seen from the factors considered above.

DISCUSSION section where you discuss any observations you noted and any recommendations
you can make based on the results.
My recommendation would be to start off the restaurant in New Albany as compared to Dublin because of various major factors like the ratio of people to restaurants, the lack of many similar cuisines In New Albany, the average spending pattern/power of the New Albany Residents and relatively growing population since New Albany is only an up and coming village compared to the already established city of Dublin.

CONCLUSION section where you conclude the report.
The report thus concludes that for an entrepreneur with the above mentioned business requirements, New Albany, Ohio would be a very good option to start off his new restaurant on the basis of the exploratory data analysis, and statistical inferences.