

Choosing the Location of a new brewery in Denver, Colorado, USA  
By Martin Palkovic



# Coursera IBM Data Science Professional Certificate

Capstone Project

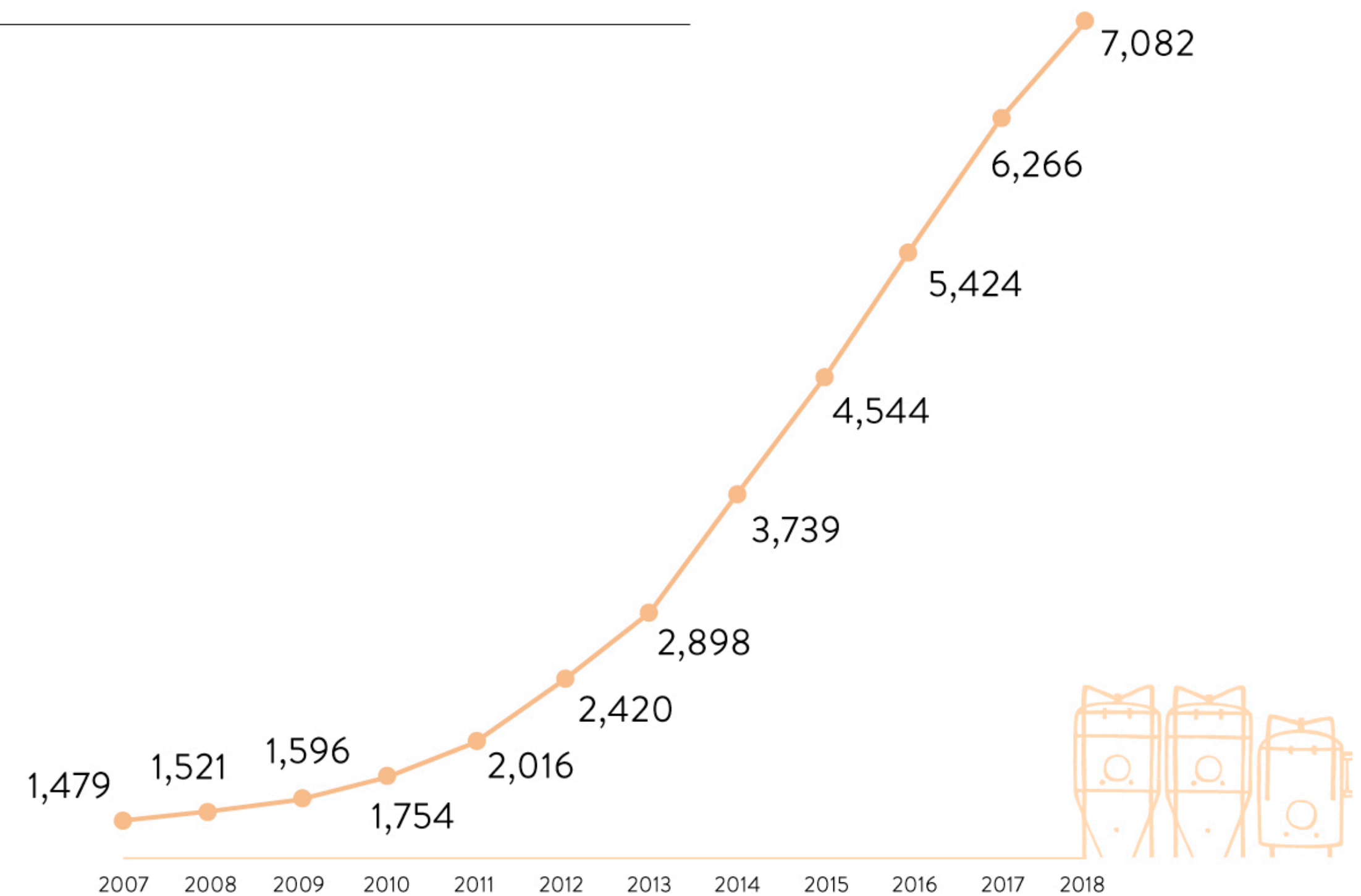


# Introduction

## Craft brewery popularity

- Craft breweries have shown tremendous growth in the last 13 years
- This data would indicate that opening a new brewery, provided that the product is good, would be a fruitful business endeavor

BREWERY GROWTH NATIONWIDE  
NUMBER OF CRAFT BREWERIES IN U.S.



<https://www.crresearch.com/blog/state-craft-beer>

# Business Problem

- Denver, Colorado is a popular city for young people, and is consistently ranked as one of the best places to live in the US ([https://realestate.usnews.com/places/rankings/best-places-to-live?src=usn\\_pr](https://realestate.usnews.com/places/rankings/best-places-to-live?src=usn_pr))
- I'm hypothesizing that a detailed, data science based/machine learning analysis of the current venues in the city will help me clarify which neighborhoods are good candidates for a new brewery
- This study would benefit anyone interested in opening a venue in Denver, not just breweries. The data science workflow will be the same



Denver's River North (RiNo) Neighborhood

<https://www.denver.org/things-to-do/denver-arts-culture/denver-art-districts/>



# Data

- City of Denver Statistical Neighborhoods, acquired from the Denver open data catalog <https://www.denvergov.org/opendata>. These are polygon features of the 76 named neighborhoods in Denver
- Foursquare API. Foursquare is a location data company, with data similar to that of Yelp or Google Maps.



**FOURSQUARE**

# Python Libraries used in this project

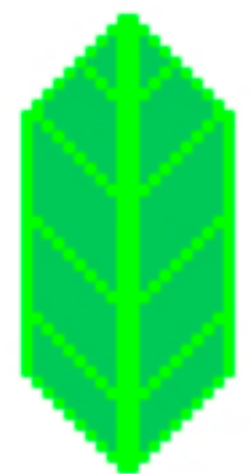


- Pandas
- GeoPandas
- Matplotlib
- NumPy
- Scikit-Learn
- JSON
- Requests
- Random
- Folium
- Geocoder

**matplotlib**



Folium



# Methodology

- Define a python function to call the Foursquare API
- Clean the Foursquare data
- Perform 'One Hot Encoding' to prepare the data for machine learning
- Run the K-Means machine learning algorithm on brewery data in Denver to determine which neighborhoods are good candidates for new breweries
- Plot data in Folium. Please see my 'DS\_Capstone.ipynb' Jupiter Notebook and my 'DS\_Capstone\_Final\_Report' for much greater detail :-)

# Denver Neighborhoods





# Results

## Clusters 0 and 2

| Cluster_0 |              |         |                |           |          |
|-----------|--------------|---------|----------------|-----------|----------|
|           | Neighborhood | Brewery | Cluster Labels | Longitude | Latitude |
| 26        | Five Points  | 0.1324  | 0              | -104.9834 | 39.7591  |
| 50        | Overland     | 0.125   | 0              | -104.9931 | 39.6814  |
| 65        | Valverde     | 0.1429  | 0              | -105.0152 | 39.7172  |

**Table 1.** Neighborhoods in Cluster 0. These neighborhoods all have a large amount of breweries

| Cluster_2 |                |         |                |           |          |
|-----------|----------------|---------|----------------|-----------|----------|
|           | Neighborhood   | Brewery | Cluster Labels | Longitude | Latitude |
| 51        | Platt Park     | 0.0357  | 2              | -104.9811 | 39.6866  |
| 39        | Jefferson Park | 0.0526  | 2              | -105.0192 | 39.7522  |
| 2         | Baker          | 0.0417  | 2              | -104.9962 | 39.7152  |
| 71        | West Colfax    | 0.0455  | 2              | -105.0386 | 39.74    |
| 72        | West Highland  | 0.0323  | 2              | -105.0392 | 39.764   |
| 1         | Auraria        | 0.037   | 2              | -105.0083 | 39.7458  |

**Table 2.** Neighborhoods in Cluster 2. These neighborhoods have a moderate amount of breweries



# Results

## Clusters 3 and 4

| Cluster_3 |              |         |                |           |          |
|-----------|--------------|---------|----------------|-----------|----------|
|           | Neighborhood | Brewery | Cluster Labels | Longitude | Latitude |
| 59        | Sun Valley   | 0.0714  | 3              | -105.0211 | 39.7358  |

**Table 3.** Neighborhood in Cluster 3. The Sun Valley Neighborhood has a moderate amount of breweries

| Cluster_4 |                |         |                |           |          |
|-----------|----------------|---------|----------------|-----------|----------|
|           | Neighborhood   | Brewery | Cluster Labels | Longitude | Latitude |
| 7         | Berkeley       | 0.1081  | 4              | -105.0394 | 39.7767  |
| 15        | City Park West | 0.1034  | 4              | -104.9666 | 39.7454  |

**Table 4.** Neighborhoods in Cluster 4. These neighborhoods have a large number of breweries

**\*Note that Cluster 1 was excluded, as all neighborhoods in Cluster 1 (with the exception of the ‘Union Station’ neighborhood) have no breweries**



# Discussion

- Always perform qualitative analyses alongside your numerical analyses!
- Case in point: You might look at the results and think that you should open a brewery in a neighborhood with NO existing breweries (Cluster 1). I would discourage that, most of the neighborhoods with no breweries are not ‘hip’ neighborhoods capable of providing enough business to sustain a brewery
- I’d instead consider the neighborhoods with a low-moderate amount of breweries (Cluster 2). These neighborhoods are up and coming, have cheaper real estate, and are capable of sustaining additional breweries (Table 5)
- Lastly: Don’t totally write off Clusters 0 or 4! These neighborhoods are popular for a reason, and I’d consider these clusters to be good second tier options after Cluster 2

| Cluster_Final |                |         |                |           |          |
|---------------|----------------|---------|----------------|-----------|----------|
|               | Neighborhood   | Brewery | Cluster Labels | Longitude | Latitude |
| 51            | Platt Park     | 0.0357  | 2              | -104.9811 | 39.6866  |
| 39            | Jefferson Park | 0.0526  | 2              | -105.0192 | 39.7522  |
| 2             | Baker          | 0.0417  | 2              | -104.9962 | 39.7152  |
| 71            | West Colfax    | 0.0455  | 2              | -105.0386 | 39.74    |
| 72            | West Highland  | 0.0323  | 2              | -105.0392 | 39.764   |

**Table 5.** My picks for good neighborhoods to open a New brewery in Denver. These neighborhoods are all from Cluster 2



# Conclusion

- If you're planning to open a new brewery in Denver, I'd choose one of the following neighborhoods (Table 5). These are all up and coming, popular neighborhoods that could easily sustain an additional quality brewery, and some of these neighborhoods will likely have lower commercial real estate prices than neighborhoods in cluster 0 or 4

| Cluster_Final |                |         |                |           |          |
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|               | Neighborhood   | Brewery | Cluster Labels | Longitude | Latitude |
| 51            | Platt Park     | 0.0357  | 2              | -104.9811 | 39.6866  |
| 39            | Jefferson Park | 0.0526  | 2              | -105.0192 | 39.7522  |
| 2             | Baker          | 0.0417  | 2              | -104.9962 | 39.7152  |
| 71            | West Colfax    | 0.0455  | 2              | -105.0386 | 39.74    |
| 72            | West Highland  | 0.0323  | 2              | -105.0392 | 39.764   |

**Table 5.** My picks for good neighborhoods to open a New brewery in Denver. These neighborhoods are all from Cluster 2