IBM Capstone Project – Identifying the best US City to host the next Laver Cup - 2020

- By Angadvir Singh Paintal

Introduction

- The Laver Cup committee is tasked to identify the next best US city to host the Laver Cup, for 2020 edition of the Cup.

- The preference is to choose a city which hasn't hosted a Grand Slam event or a major ATP Tennis tournament, however, which has an arena established enough to host a grand Tennis event at a global level.

- Several pre-selected US cities initially participated in a lucky draw, of which 6 cities are shortlisted for the event.

- The last 6 candidate cities are listed below:

- Palm Springs, CA

- Phoenix, AZ

- Dallas, TX

- Cincinnati, OH

- Boston, MA

- Miami, FL

Introduction

- Our historical data will comprise of all 4 major Grand Slam events and the cities which hosted the last 3 Laver Cups.

- A K-means clustering algorithm will be implemented on all the 7 historical cities along with 6 new candidate cities.

- The list of 7 cities/venues is provided below:

- *US Open* – Flushing Meadows, Queens, NYC

- *Wimbledon* – Wimbledon, London, UK

- *French Open* – Phillipe Chartier Stadium, Paris, France

- *Australian Open* – Rod Laver Arena, Victoria, Australia

- *Laver Cup 2017* – O2 Arena, Prague, Czech Republic

- *Laver Cup 2018* – United Center, Chicago, Illinois

- *Laver Cup 2019* – Palexpo, Geneva, Switzerland

Analysis – Venue categories exploration of past major tennis events

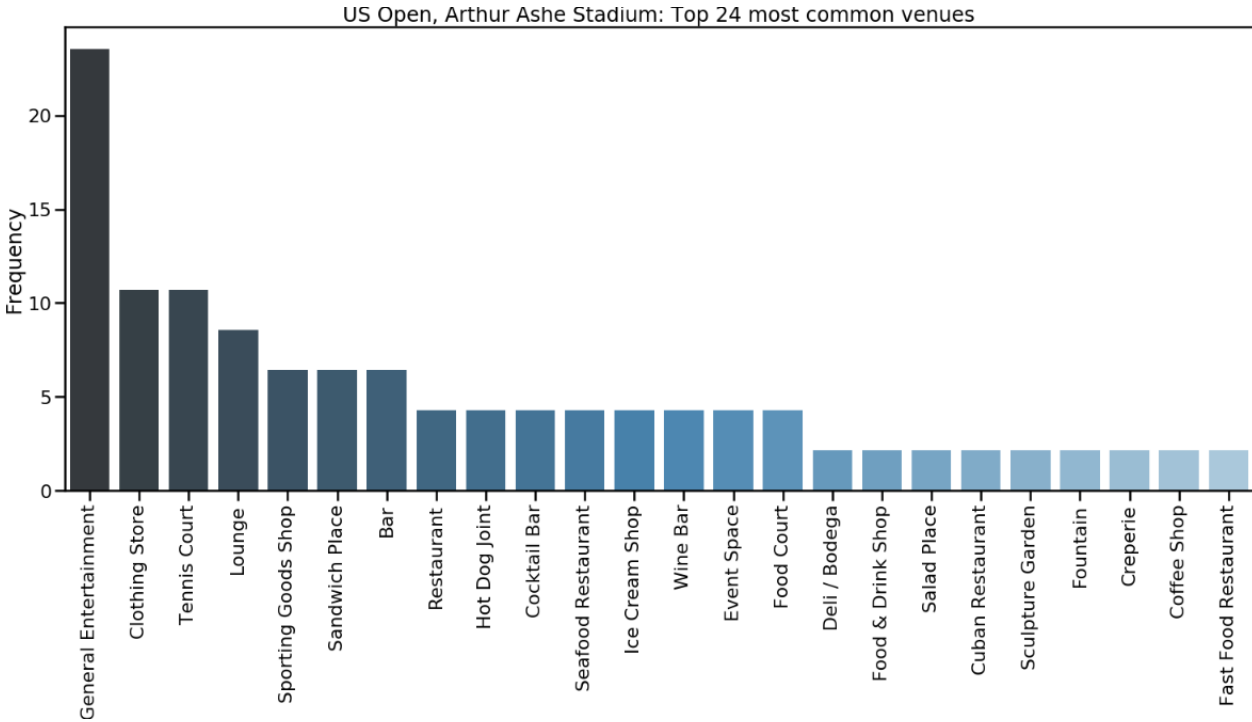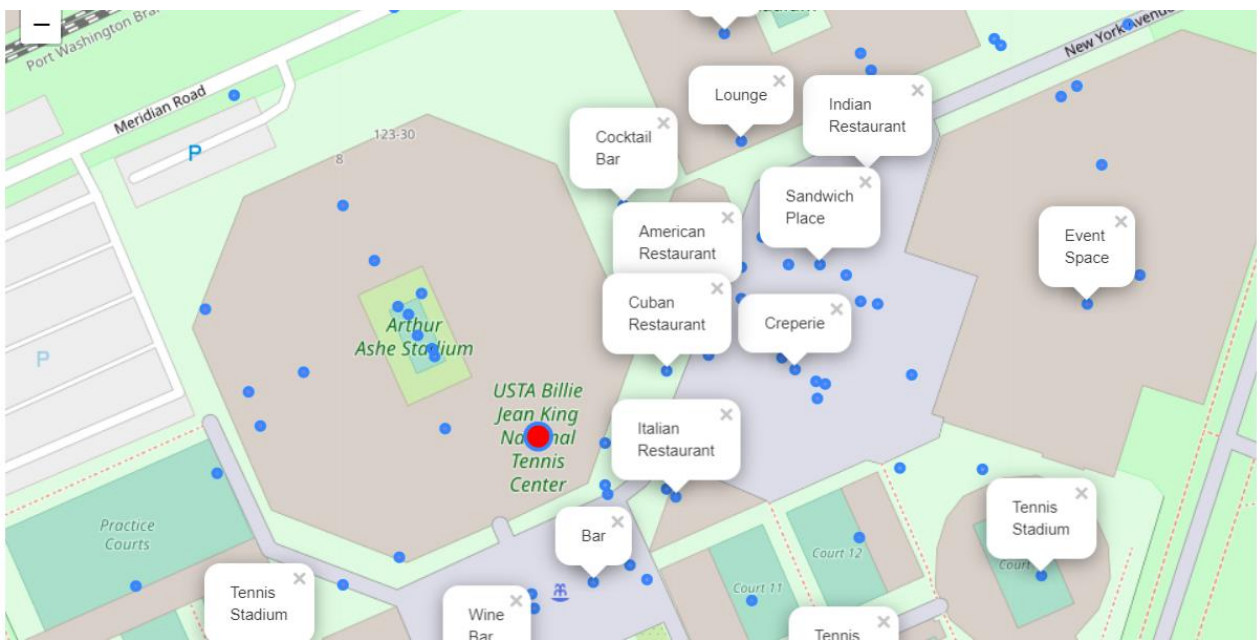| Event Venue	1st most common venue category	2nd most common venue category	3rd most common venue category	4th most common venue category	5th most common venue category	6th most common venue category	7th most common venue category	8th most common venue category
French Open	Tennis Court	Stadium	Arts & Entertainment	French Restaurant	College Classroom	Event Space	Office	Sporting Goods Shop
US Open	Tennis Stadium	General Entertainment	Clothing Store	Tennis Court	Lounge	Sporting Goods Shop	Sandwich Place	Bar
Australian Open	Event Space	Tennis Stadium	Warehouse	Tennis Court	General Entertainment	Café	Concert Hall	Food Service
Wimbledon	Platform	Coffee Shop	Bank	Fast Food Restaurant	Salon / Barbershop	Bus Stop	Grocery Store	Mobile Phone Shop
Laver Cup – Czech Republic	Lounge	Clothing Store	Sporting Goods Shop	Skating Rink	Shoe Store	Women's Store	Lingerie Store	Baby Store
Laver Cup - Chicago	Bar	Stadium	General Entertainment	Outdoor Sculpture	Basketball Stadium	Sports Bar	Hockey Arena	Parking
Laver Cup - Switzerland	Convention Center	Hotel	Event Space	Exhibit	Café	Restaurant	Parking	Bank

Analysis – Clustering the 7 Tennis event venues into different categories based on neighborhood similarity

Event Venue	Cluster Labels	1st most common venue category	2nd most common venue category	3rd most common venue category	4th most common venue category	5th most common venue category	6th most common venue category	7th most common venue category	8th most common venue category
French Open	0	Tennis Court	Stadium	Arts & Entertainment	French Restaurant	College Classroom	Event Space	Office	Sporting Goods Shop
US Open	1	Tennis Stadium	General Entertainment	Clothing Store	Tennis Court	Lounge	Sporting Goods Shop	Sandwich Place	Bar
Australian Open	1	Event Space	Tennis Stadium	Warehouse	Tennis Court	General Entertainment	Café	Concert Hall	Food Service
Wimbledon	0	Platform	Coffee Shop	Bank	Fast Food Restaurant	Salon / Barbershop	Bus Stop	Grocery Store	Mobile Phone Shop
Laver Cup – Czech Republic	0	Lounge	Clothing Store	Sporting Goods Shop	Skating Rink	Shoe Store	Women's Store	Lingerie Store	Baby Store
Laver Cup - Chicago	0	Bar	Stadium	General Entertainment	Outdoor Sculpture	Basketball Stadium	Sports Bar	Hockey Arena	Parking
Laver Cup - Switzerland	0	Convention Center	Hotel	Event Space	Exhibit	Café	Restaurant	Parking	Bank

Observation: US Open and Australian Open are found to have similar neighborhoods when types of venues are taken into consideration. They fall under the same cluster as compared to rest of the Tennis venues.
U.S. Open will be taken as a venue for similarity analysis to the 6 candidate cities in the US, based on which the final city will be selected to host Laver Cup - 2020.

Analysis – Finding the 24 most common types of venues found near the Arthur Ashe Stadium, in Flushing Meadows, Queens, NYC

Analysis – Clustering the 7 Tennis event venues into different categories based on neighborhood similarity

Event Venue	Cluster Labels	1st most common category	2nd most common category	3rd most common category	4th most common category	5th most common category	6th most common category	7th most common category	8th most common category
US Open	1	Tennis Stadium	General Entertainment	Tennis Court	Clothing Store	Lounge	Bar	Sporting Goods Shop	Sandwich Place
Palm Spring, CA	0	Building	Clothing Store	Pharmacy	Sporting Goods Shop	Café	Department Store	Big Box Store	Coworking Space
Phoenix, AZ	0	Building	Convenience Store	Church	Mexican Restaurant	Bar	Salon / Barbershop	Automotive Shop	American Restaurant
Miami, FL	2	Beach	Tennis Court	Residential Building	Café	Gas Station	Office	Other Great Outdoors	Boat or Ferry
Cincinnati, OH	2	Tennis Court	Theme Park	Water Park	Theme Park Attraction	Office	Tennis Stadium	General Entertainment	Parking
Boston, MA	3	Bar	Platform	Hockey Arena	General Entertainment	Hockey Field	Lounge	Pizza Place	Sporting Goods Shop
Dallas, TX	3	Bar	Sports Bar	Lounge	Event Space	Parking	Office	Residential Building	Italian Restaurant

Observation: Each of the 6 candidate cities is found to be in a cluster different from that of the 'US Open'. We will look into each of the 6 candidate cities which were shortlisted in the draw, to analyze to choose the best city to host the Cup.

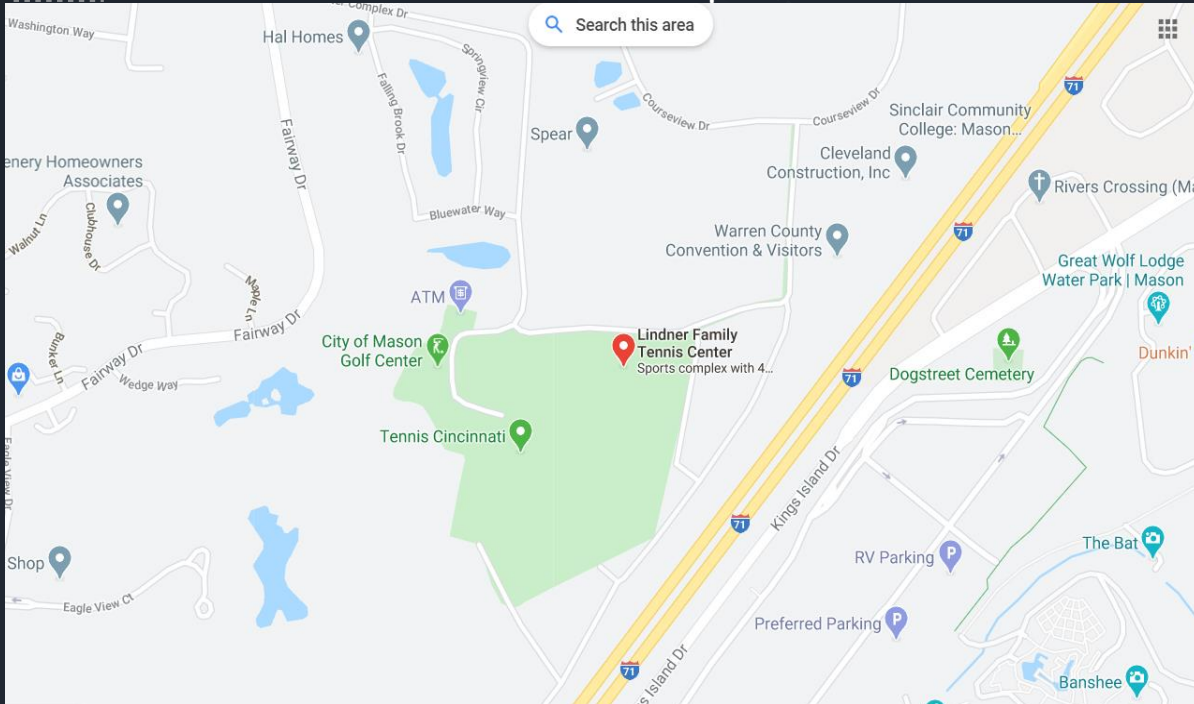# Analysis – Analyzing each of the 6 candidate cities

- Miami, Florida – Crandon Park Tennis Stadium:

- The Crandon Park Stadium currently holds a crowd of approximately 13,500. Also looking at the neighborhood of the stadium, it is pre-dominantly surrounded by beaches and Tennis courts, and does not have a high concentration of bars, cafés or international restaurants, like the US Open.

- Considering the above factors, the Florida State committee will need to embark on a significant expansion project to develop and ready Tennis fan at a global level. Considering only 8 months are left to host the 2020 Laver Cup, it may be too small of a time horizon for the Florida State to complete this expansion and neighborhood re-development in time.

- Hence, Miami is dropped as a candidate city for hosting this year's Laver Cup.
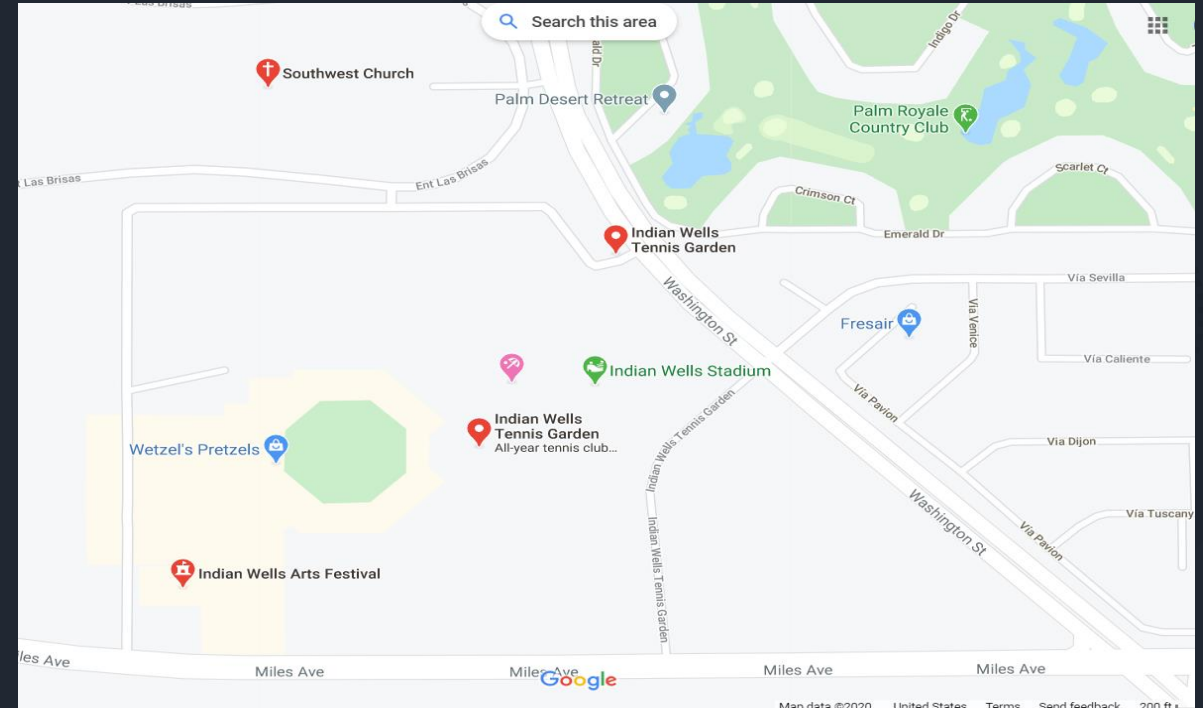
Analysis – Analyzing each of the 6 candidate cities

- Cincinnati, OH and Palm Springs (Indian Wells), CA are home to major ATP tournaments and regions have a strong fan base when it comes to Tennis.

- Since the Laver Cup committee has a preference to host the Laver Cup event at a city which has not yet hosted a major Tennis tournament, the committee will choose a new city to host this year's, 2020 Laver Cup, to propagate the sport of Tennis in the host city and its surrounding neighborhoods and suburbs.

- Moreover, both Cincinnati and Indian Wells Tennis Centers are in a suburban area, far from the city centers. Another criteria, that the committee is interested in considering when it comes to venue selection for the Laver Cup.
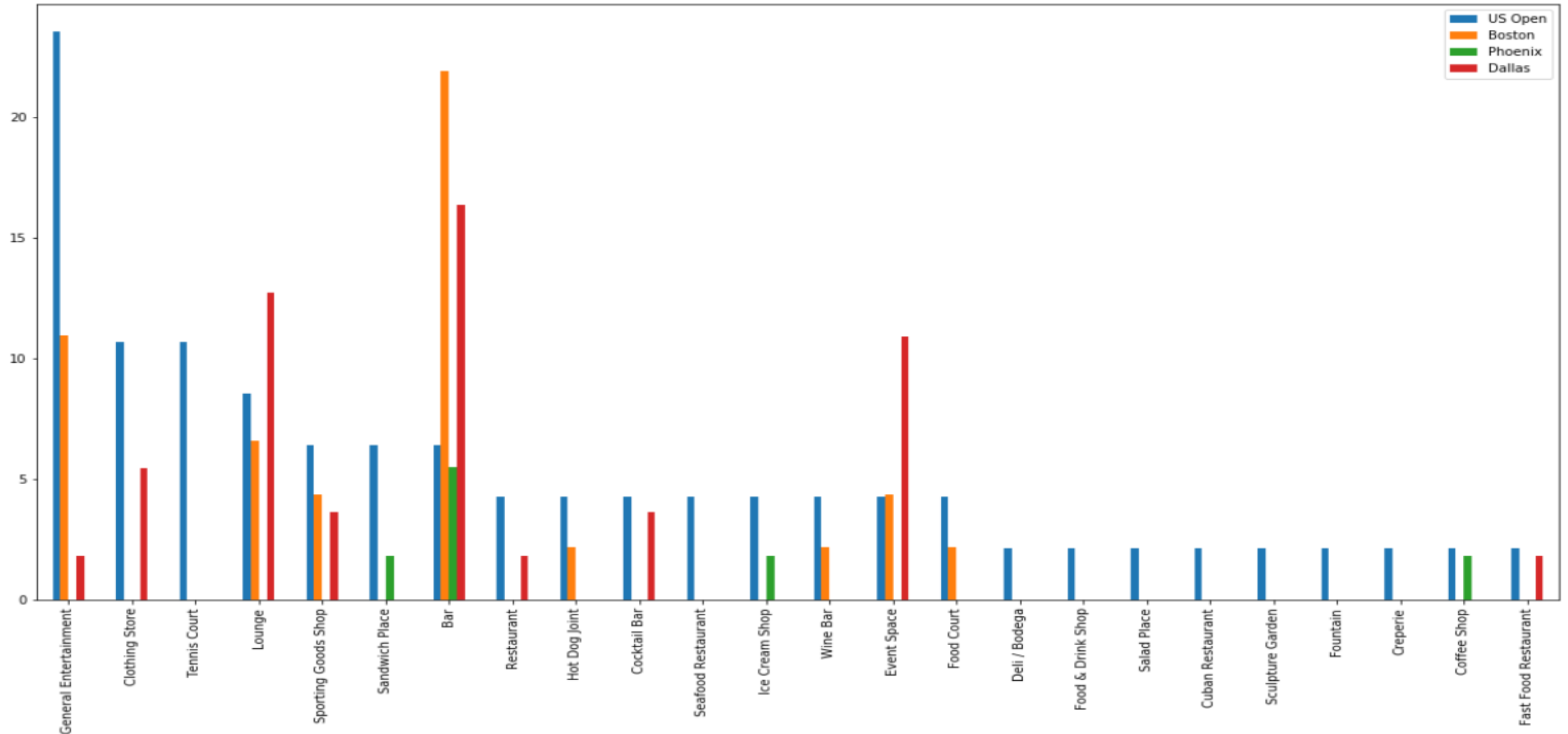
Cincinnati Open

Indian Wells Open

Analysis – Analyzing each of the 6 candidate cities

- After dropping off Miami, Cincinnati and Palm Springs (Indian Wells) from the list, we're left with the below list of candidate cities:
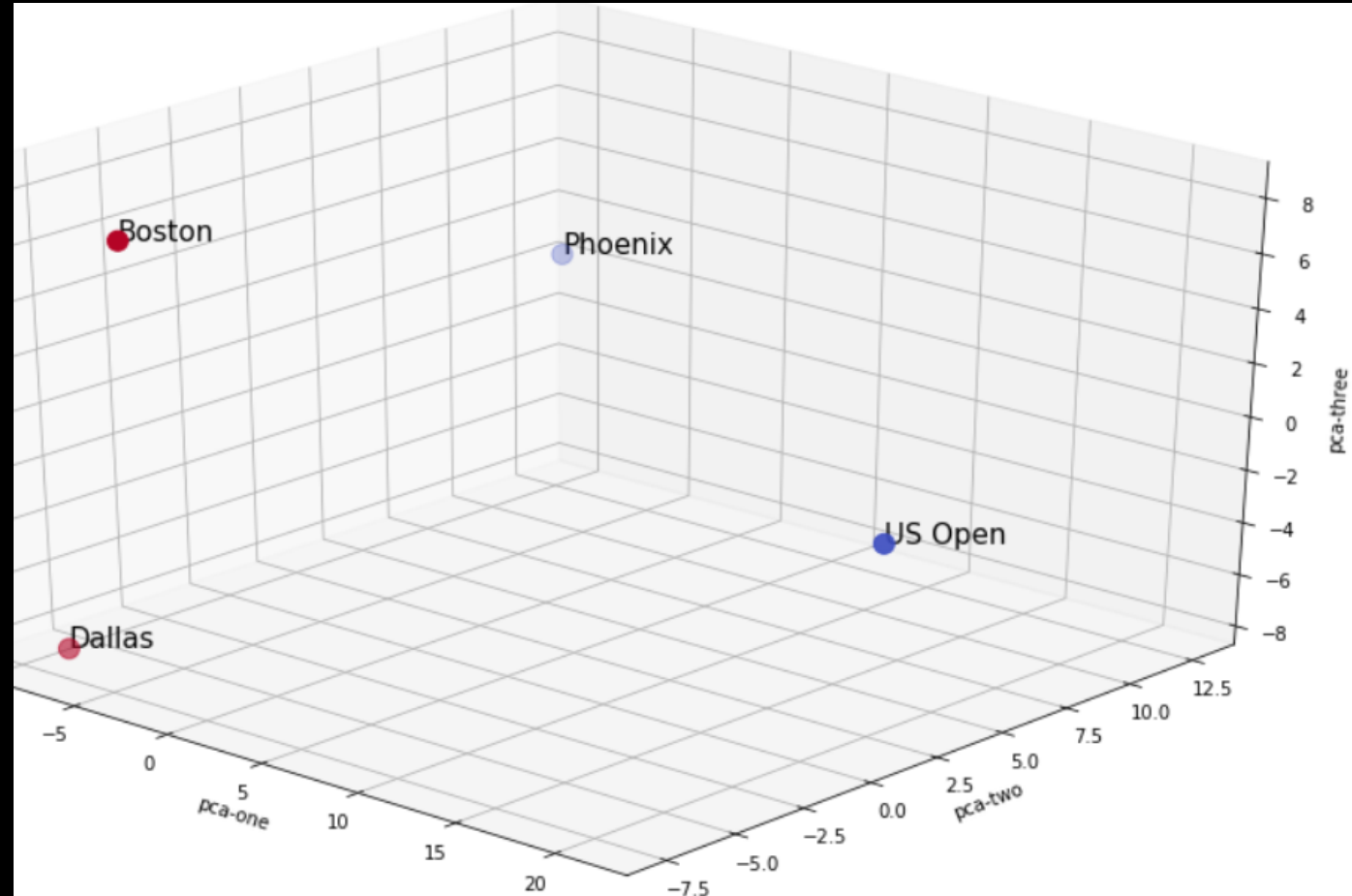
Event Venue	Cluster Labels	1st most common category	2nd most common category	3rd most common category	4th most common category	5th most common category	6th most common category	7th most common category	8th most common category
US Open	1	Tennis Stadium	General Entertainment	Tennis Court	Clothing Store	Lounge	Bar	Sporting Goods Shop	Sandwich Place
Phoenix, AZ	0	Building	Convenience Store	Church	Mexican Restaurant	Bar	Salon / Barbershop	Automotive Shop	American Restaurant
Boston, MA	3	Bar	Platform	Hockey Arena	General Entertainment	Hockey Field	Lounge	Pizza Place	Sporting Goods Shop
Dallas, TX	3	Bar	Sports Bar	Lounge	Event Space	Parking	Office	Residential Building	Italian Restaurant

Comparing top 24 venue types found in US Open against 3 remaining candidate cities:
U.S. Open venues vs Boston, Phoenix and Dallas venues

Comparing top 24 venue types found in US Open against 3 remaining candidate cities: *U.S. Open venues vs Boston, Phoenix and Dallas venues*
Heat Map Visualization

Comparing top 24 venue types found in US Open against 3 remaining candidate cities:
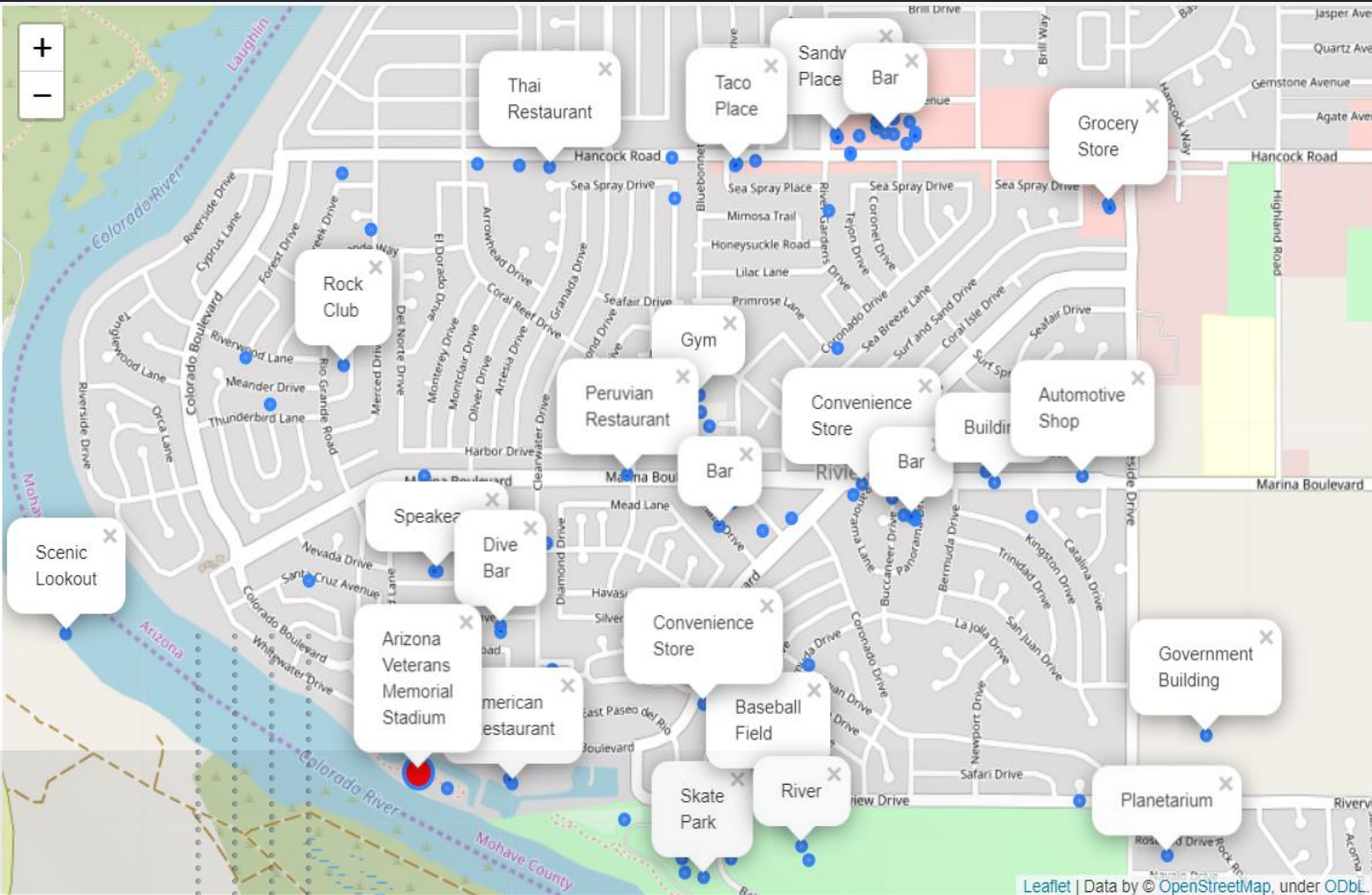## *U.S. Open venues vs Boston, Phoenix and Dallas venues*

- After performing PCA on the dataset and reducing the dimensionality of the features space to 3 dimensions, below results are found post running the un-supervised K-Means algorithm on the dataset:

- The 'Arizona Memorial Sports Stadium' and 'Arthur Ashe Stadium' in Flushing Meadows are clustered together in the same set, showing to have similar neighborhoods, as seen in **blue data points**.

- The 'TD Garden' in Boston and 'American Airlines Center' in Dallas are clustered together and found to have similar neighborhoods when comparing venue categories, as seen by the **red data points.**
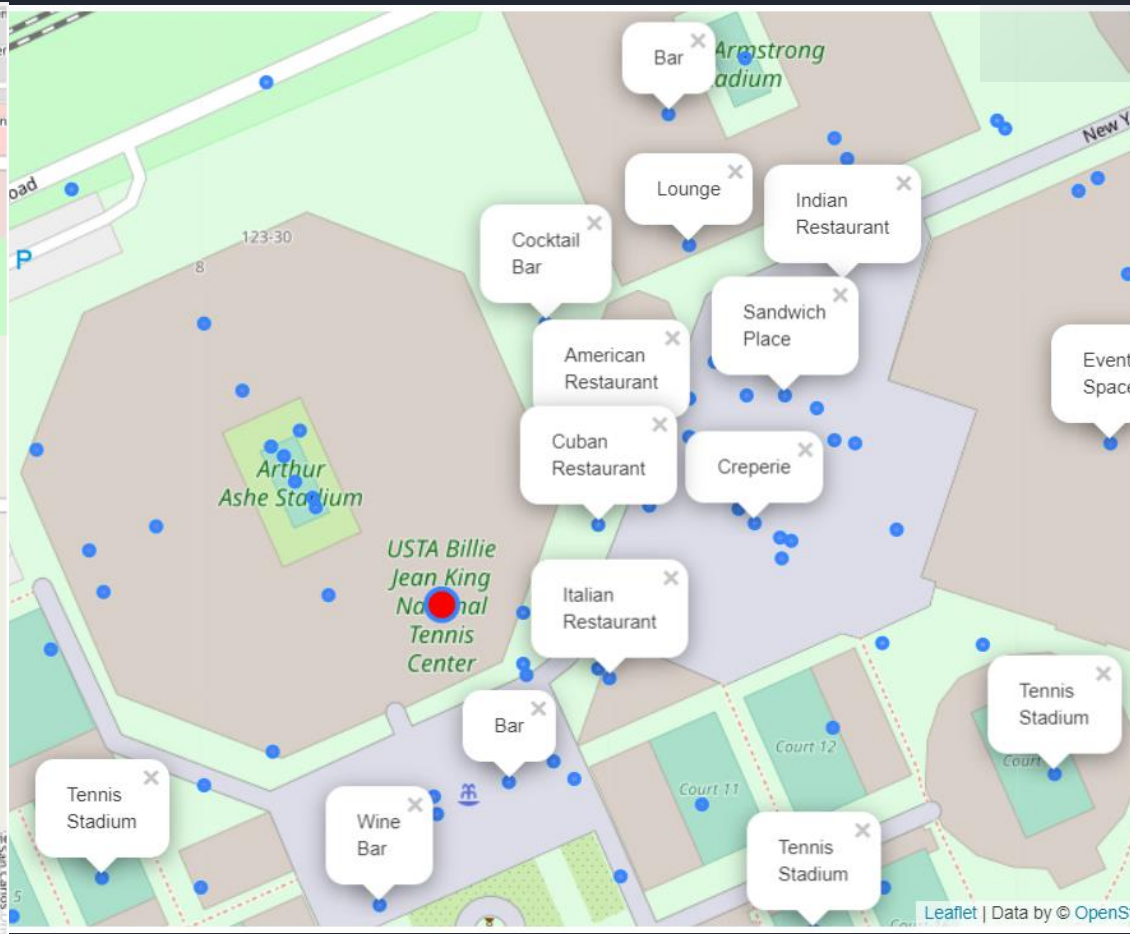
Comparing venues categories found around 'Arizona Veterans Memorial Stadium' against those found around U.S. open, around 'Arthur Ashe Stadium'

- The 4 venue categories found most common around the 2 city Tennis stadiums are:

- *'Sandwich places'*, *'Coffee Shops'*, *'American Restaurants'* and *'Bars'*

- These 4 venue types are very conducive of a touristy environment and encourage a very strong celebratory sports cultures in the host city.

Phoenix, AZ: Arizona Veterans Memorial Stadium

U.S. Open: Arthur Ashe Stadium

Conclusion

• The Multi-sport stadium in **Phoenix, AZ** is one of the best locations for the respective Tennis Federation / Organization to host the next Laver Cup, to be hosted in 2020*. Since the neighborhood, in terms of the types of venues around the stadium, is most similar to that of the U.S. Open stadium in Flushing Meadows (both 'US Open' and 'AZ' state fall under the same cluster), there's expected to be a good turn-around of tennis fans to watch and support the intensive and celebratory 3-Days Laver Cup event, initiated by Roger Federer and Rod Laver.

• On visualizing the neighborhood of Phoenix, AZ, we find a very similar city and landscape to that of U.S. Open venue, around the 'Arthur Ashe Stadium'.

• The same can be observed when comparing the Euclidian distance of the 'Phoenix' data point to that of 'US Open' in the 3-D projected graph utilizing Principal Component Analysis. Note, the Euclidian distance between 'Boston' and 'Dallas' from that of 'US Open' is greater and hence are categorized together in a separate cluster.