Finalize franchisee applicants for Artisan pizzeria. (Hypothetical)

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1 July 2021

The Artisan Pizzeria

- Is a well-established International premium pizzeria franchisor
- Offers handcrafted specialty pizzas by skilled pizzaiolos with locally sourced fresh ingredients.
- After gaining immense popularity and good response in many other countries, Artisan pizzeria now wants to enter the Indian market, starting with Mumbai.
- Artisan pizzeria received a considerable number of franchisee applications

The Artisan Wants to Determine :

- How many locations are good enough to fulfill the entire city demand.
- How to divide city into zones, their size and minimum distance between two centroids .
- The perfect locations of the centroids or preferred franchise locations.
- Finalize the franchise fits in above criteria .
- Double check if the finalized applicants cover entire city within 20-minute reach from all competitor locations and don’t overlap each other zone(At least 40 min away from each other)

Understanding The Consumer & The City

- According to OALLEY.NET the average traffic speed in Mumbai is 15 km/h
- According to BrightLocal's and Statist finding consumer can drive 17 to maximum 30 minutes to eat.
- From above info we determined following distances :
  - Two franchise must be more than 30 min away from each other . I try to keep it 40 minutes i.e., 10 km.
  - The Artisan franchise should not be more than 20 minutes i.e., 5 km away from any of the competitor in that neighborhood.

Data & Machine Learning For the Rescue

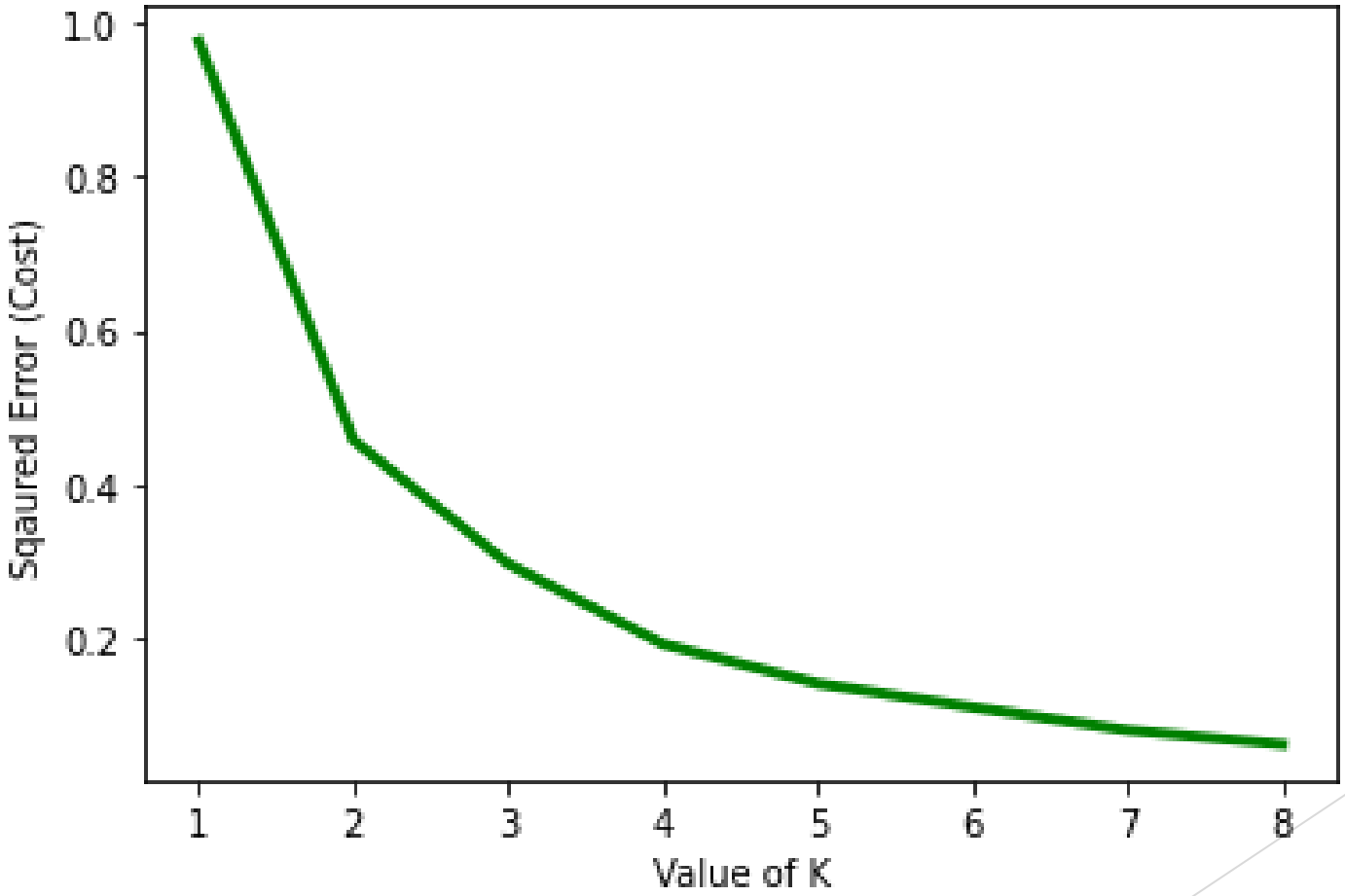
All existing pizza places and their locations data gathered from Foursquare API.(also gathered all café's data and used as applicant location)

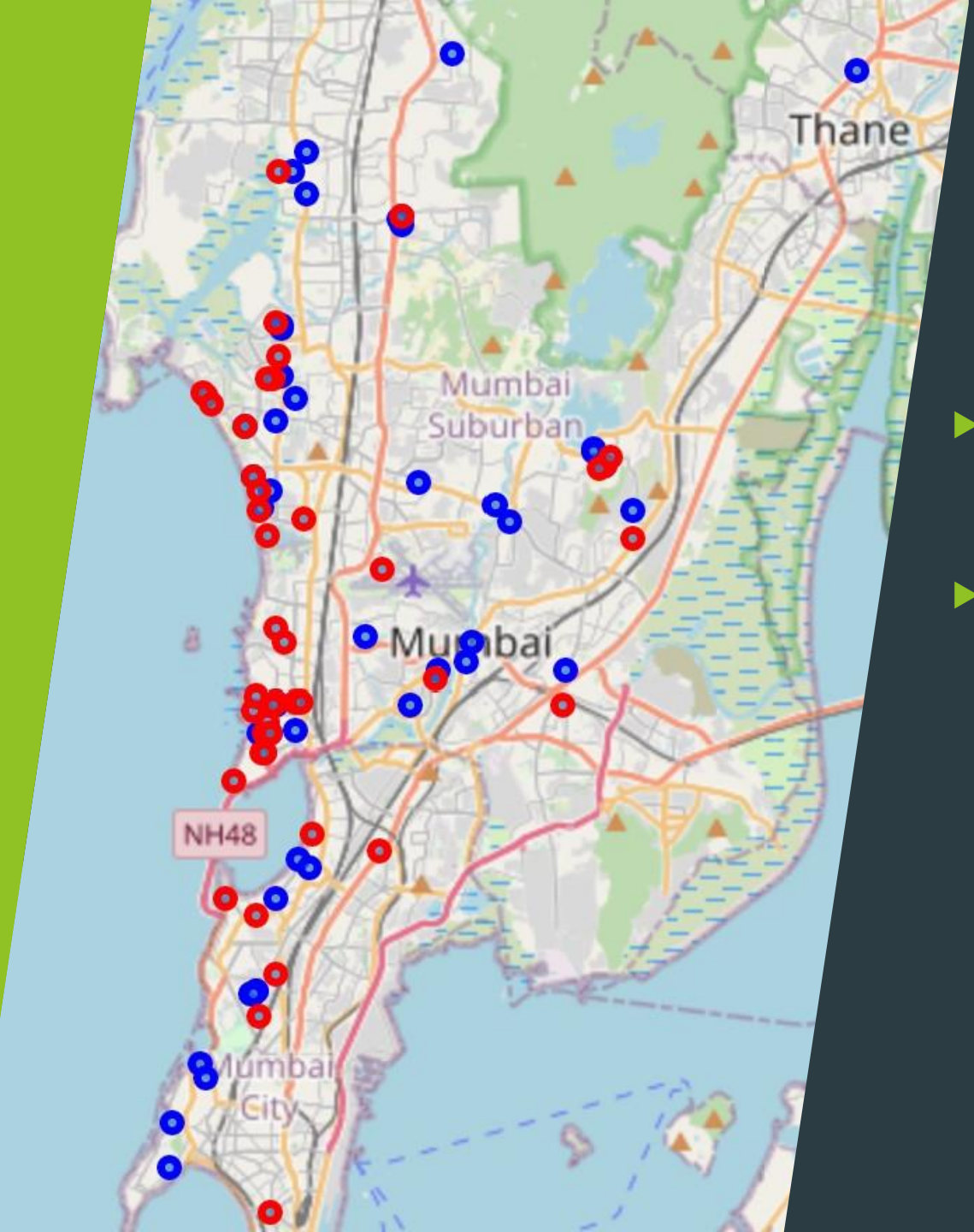
Used K-means clustering for k vlue 1 to 9 and ploted graph k vlue vs squared error. From elbow method I got K= 3 is optimum number of clusters.

I decided to visualize and compare K=3 and k=4. To see which satisfies all the conditions.

I mapped a circle of 5 km around the centeroid and finalized applicant to see how reachable are they from competitors in the particular zone.

Value of K vs Squared Error (Finding the Elbow)
Optimal value might be found within k=2 to k=4

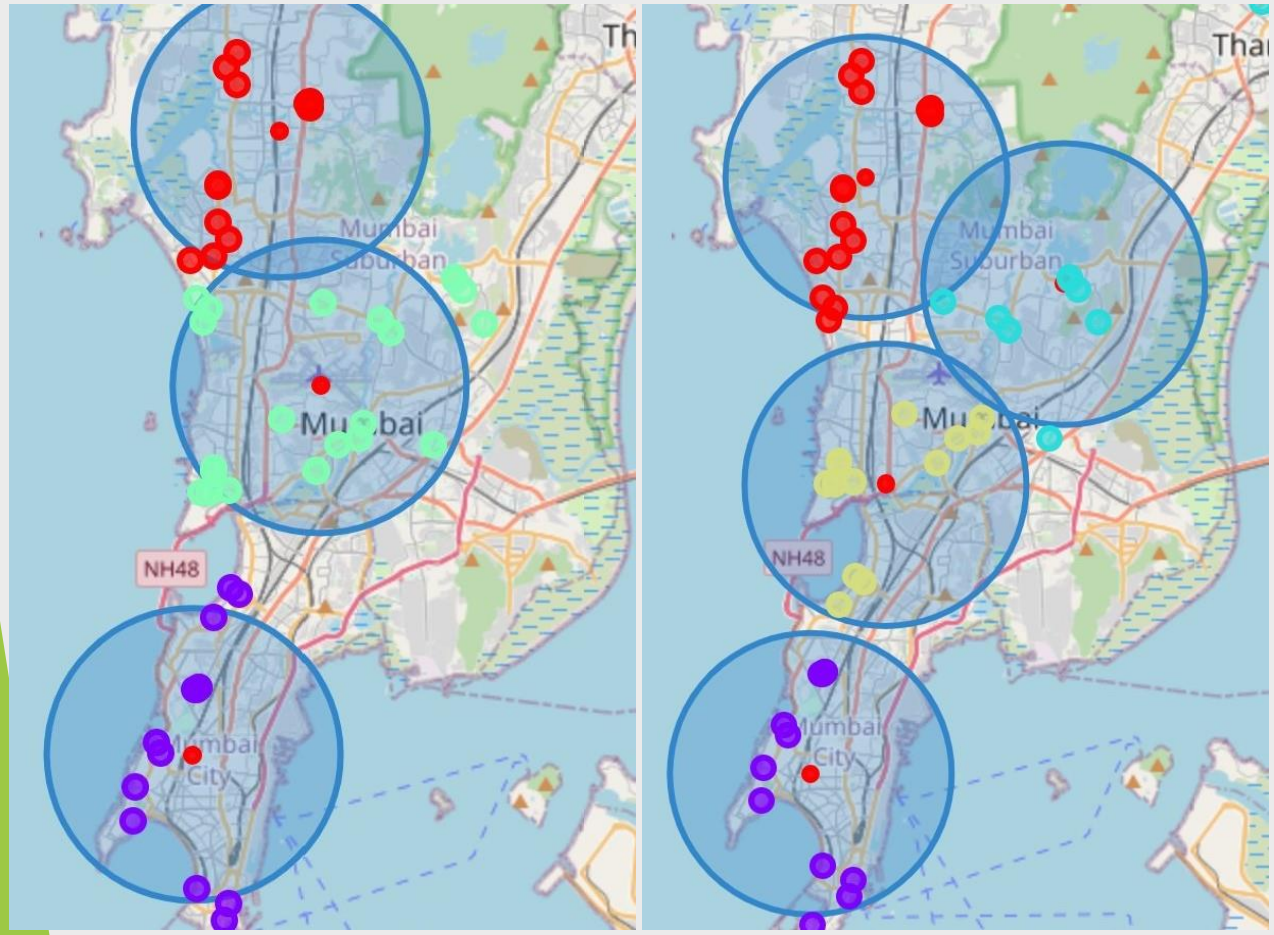




Visualize Distribution of Pizza Places vs Applicants

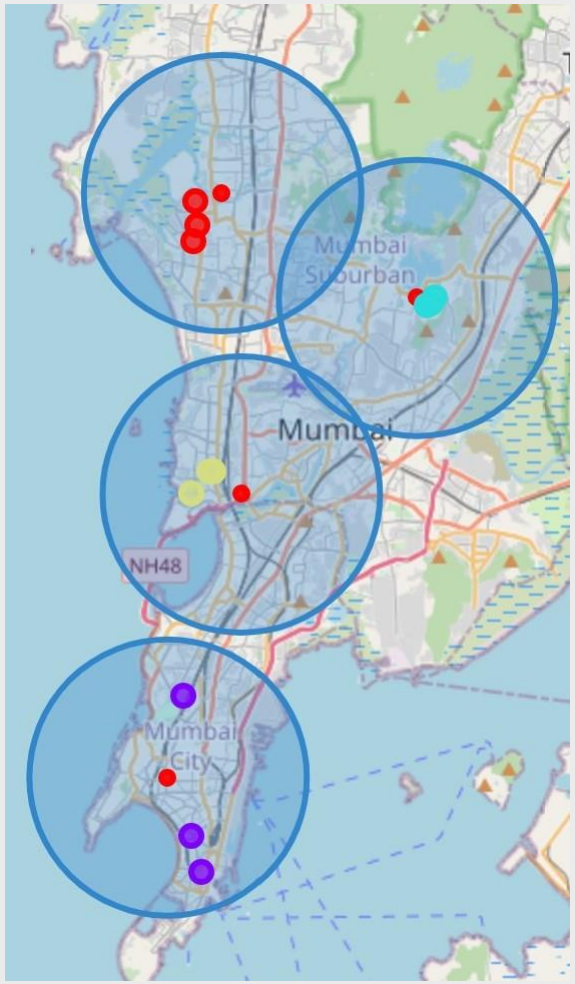
- All the applicant’s locations are distributed in the same way as the all-existing pizza places .
- There won’t be any difficulty in finding an applicant at desired place after analysis.

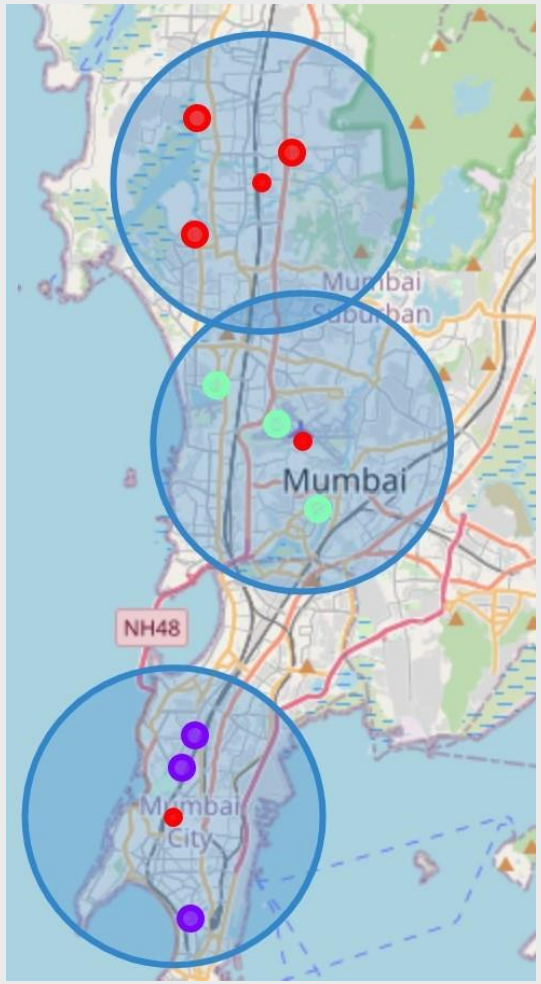
All pizza places in the city clustred into 3 and 4 zones.



- For K= 3 many places are out of the 5 km radius
- K=4 Almost all places are covered within 5km range
- With 4 zones has little overlapping but still both centers are more than 30 min away from each other.

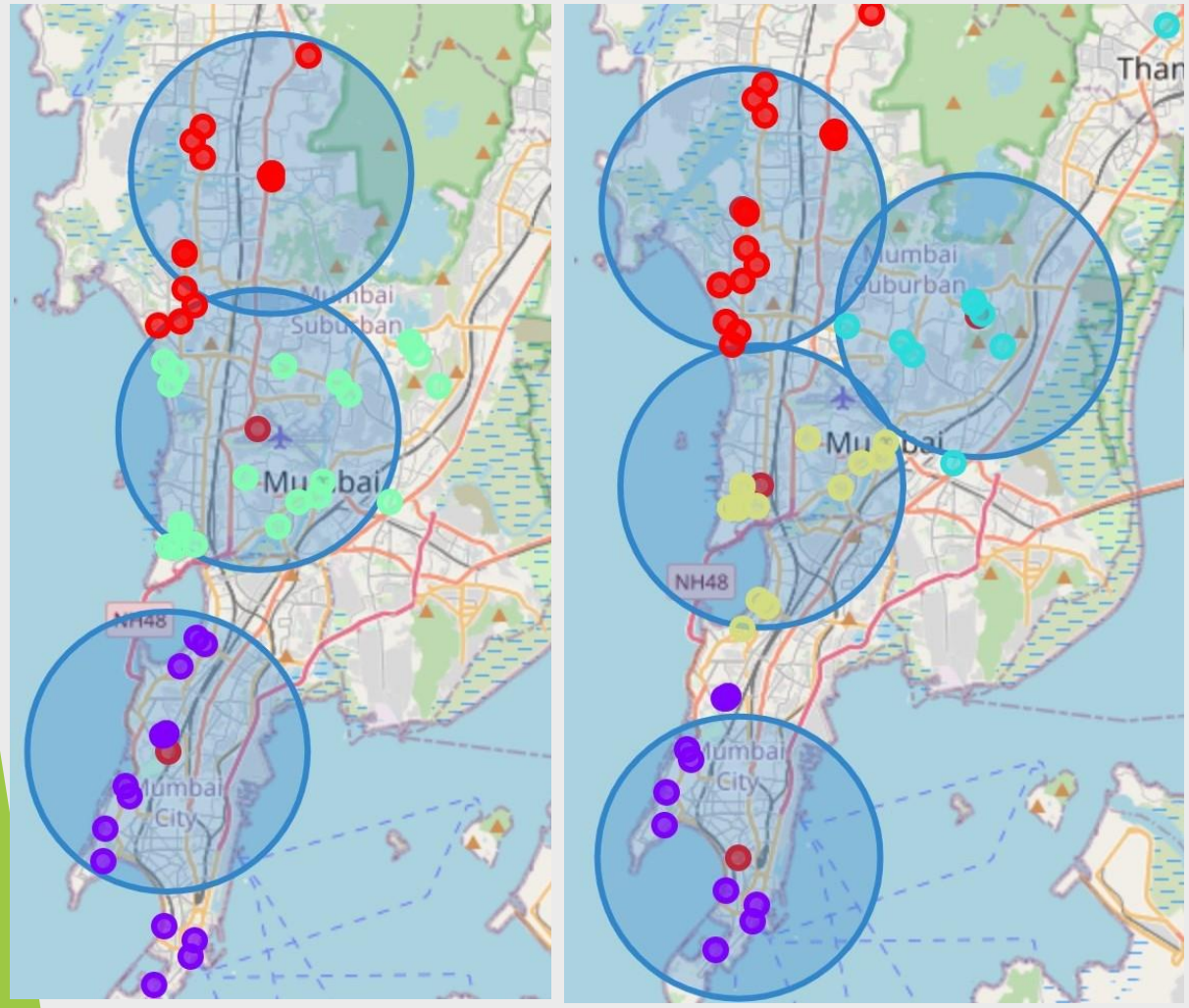
Top 3 nearest applicants around the center .





- For K=3 its impossible to find the applicant precisely at the center so if the circle shifts its hard to cover all the pizza places from shifted center
- With K=4 almost all centers has multiple applicants available at the center except for the south most cluster.

After Shifting the center to nearest applicant in each cluster and visualize all pizza places around them



- For K= 3 again more place left out of reach
- For K=4 gave optimum coverage of pizza places within 20 minute reach zone.
- This time after shifting the centers to overlap is also reduced compared to original centers .

Conclusion

Dividing the city into four zones/clusters using the k-means algorithm, I achieved the following desired results.

- All pizza places are within 20min (5km) reach from at least one of the selected franchise locations.
- Less overlapping evenly distributed zones.
- Successfully achieved to keep the minimum distance between two franchises, i.e., about 10km

Referances

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3. https://www.brightlocal.com/research/local-business-travel-times/
4. https://www.statista.com/statistics/659362/time-consumers-would-use-to-drive-to-a-place-to-eat-us/