horizontal line

Explore and Compare two Cities

**24th May 2021**

# INTRODUCTION

This project will explore residential areas in two cities based on the most popular locations in the area. This location data will be used to create a model and cluster the locations. The same will be used to explore similar and unique areas in both cities. This will enable anyone moving between cities to understand the similar areas to live.

# DATA

Following data has been used for the project:

* List of residential sectors for Noida has been extracted from url - “<https://www.findeasy.in/noida-sectors/>”
* List of residential areas for Thane and Navi Mumbai has been extracted from following urls -

“https://www.magicbricks.com/localities-in-thane”

“https://www.magicbricks.com/localities-in-Navi-Mumbai”

* The neighborhood data for residential sectors has been extracted from Foursquare API - “https://api.foursquare.com/v2/venues/explore”
* The latitude and longitude for the residential sectors has been extracted using geolocator from Nominatim.
* The areas for which the location data was not available with Nominatim were extracted manually and updated to the data.

# METHODOLOGY

The project involved multiple steps like Exploratory Data Analysis, Model building etc. The actions performed in these steps are described below.

## 

## Exploratory Data Analysis:

In this project we have explored two different cities. To enable this following steps were performed as part of data extraction and analysis -

* We used “Selenium” and “BeautifulSoup” libraries in python to extract and parse the list of residential neighborhoods in Noida and Thane.
* This list of residential neighborhoods was then used to get the latitude and longitude. This was achieved using the “geolocator” library in python. Geolocator uses the “Nominatum” database to get the location data.
* The latitude and longitude data was used to get the data for nearby venues and venue categories from “Foursquare” using the “explore” API.
* The search radius was limited to “2000” meters to get the relevant results.
* The was appended with Neighborhood values for each venue.
* This data can now be used to generate the ML model.

**ML Model Creation:**

For this project we have used the “k-means” clustering model. This model will help us to separate the neighborhoods based on the frequency of the different types of venues around the neighborhood.

To achieve this the following steps were performed -

* Venue Categories are a set of categorical values. These values have to be converted to numerical values so that we can use them to train the model.
* We have used one-hot encoding method to convert the categorical value to numerical values.
* The dataframe containing venue categories contained values as below -

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Neighborhood** | **Neighborhood Latitude** | **Neighborhood Longitude** | **Venue** | **Venue Latitude** | **Venue Longitude** | **Venue Category** |
| Sector 11 | 28.598112 | 77.333814 | Fresh Food Factory - Accha Khao Accha Khilao | 28.580971 | 77.317292 | Indian Restaurant |
| Sector 11 | 28.598112 | 77.333814 | Lakshmi Coffee House | 28.57014 | 77.332734 | South Indian Restaurant |
| Sector 11 | 28.598112 | 77.333814 | DLF Mall Of India | 28.567503 | 77.321362 | Shopping Mall |
| Sector 11 | 28.598112 | 77.333814 | PVR Superplex | 28.574257 | 77.353622 | Multiplex |
| Sector 11 | 28.598112 | 77.333814 | Berco's Garden Restaurant | 28.594078 | 77.338786 | Chinese Restaurant |

* After one-hot encoding, we created new dataframe and the value look like below -

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Neighborhood** | **ATM** | **American Restaurant** | **Arcade** | **Asian Restaurant** | **Athletics & Sports** |
| Sector 11 | 0 | 0 | 0 | 0 | 0 |
| Sector 11 | 0 | 0 | 0 | 0 | 0 |
| Sector 11 | 0 | 0 | 0 | 0 | 0 |
| Sector 11 | 0 | 0 | 0 | 0 | 0 |
| Sector 11 | 0 | 0 | 0 | 0 | 0 |

* We then group the values by Neighborhood and calculate the mean for each column -

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Neighborhood** | **ATM** | **American Restaurant** | **Arcade** | **Asian Restaurant** | **Athletics & Sports** | **BBQ Joint** | **Bakery** |
| Sector 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0.25 |
| Sector 104 | 0 | 0 | 0 | 0 | 0 | 0.029412 | 0 |
| Sector 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0.142857 |
| Sector 107 | 0 | 0 | 0 | 0 | 0 | 0 | 0.125 |
| Sector 108 | 0 | 0 | 0 | 0 | 0 | 0 | 0.076923 |
| ... | ... | ... | ... | ... | ... | ... | ... |
| Sector 79 | 0 | 0 | 0 | 0 | 0 | 0.029412 | 0 |
| Sector 82 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 |
| Sector 92 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sector 93 | 0 | 0 | 0 | 0 | 0 | 0 | 0.076923 |
| Sector 99 | 0 | 0 | 0.111111 | 0 | 0 | 0 | 0 |

* This data is now used to generate clusters using k-means clustering.
* We tried multiple cluster sizes and decided to use a cluster size of “6”.
* The mean data for each neighborhood is used to decide the 10 most common venue categories for each neighborhood.
* Exploring the two cities helped us understand the similar areas in each city and also generate data for the next step.
* The data generated using Foursquare API for Noida and Thane was merged and above steps were applied to the merged data.
* The clusters generated from the data provided us the list of similar areas in two cities.
* Each cluster generated represents the similar areas a person can look to live if he/she is planning to move between the cities.

# RESULTS

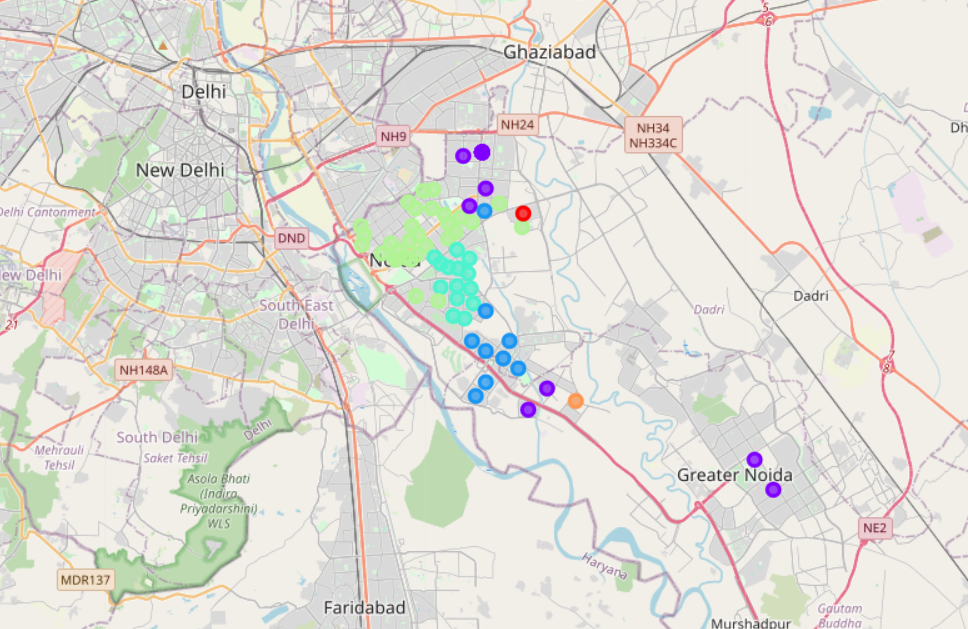
In this section we will show the data generated from exploring two cities and also after comparing the data for two cities(Noida and Thane).

## Noida:

* The data for top ten venue categories for each neighborhood was generated -

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 11 | 28.598112 | 77.333814 | 4 | Stadium | Market | Indian Restaurant | Multiplex | Sandwich Place | Butcher | Chinese Restaurant | Electronics Store | Pizza Place | Coffee Shop |
| Sector 12 | 28.595118 | 77.338486 | 4 | Stadium | Indian Restaurant | Vegetarian / Vegan Restaurant | Sandwich Place | Butcher | Chinese Restaurant | Pizza Place | Market | Coffee Shop | Restaurant |
| Sector 14 | 28.587231 | 77.308222 | 4 | Indian Restaurant | Hotel | Department Store | Pizza Place | Fast Food Restaurant | Plaza | Bakery | Restaurant | Gym | Market |
| Sector 15 | 28.582798 | 77.310222 | 4 | Indian Restaurant | Sandwich Place | Chinese Restaurant | Café | Hotel | Restaurant | Arcade | Light Rail Station | Bakery | Department Store |
| Sector 15a | 28.577997 | 77.308509 | 4 | Indian Restaurant | Café | Chinese Restaurant | Restaurant | Fast Food Restaurant | Hotel | Coffee Shop | Sandwich Place | Plaza | Fried Chicken Joint |

* A map was generated using “folium” library to show the resulting clusters -

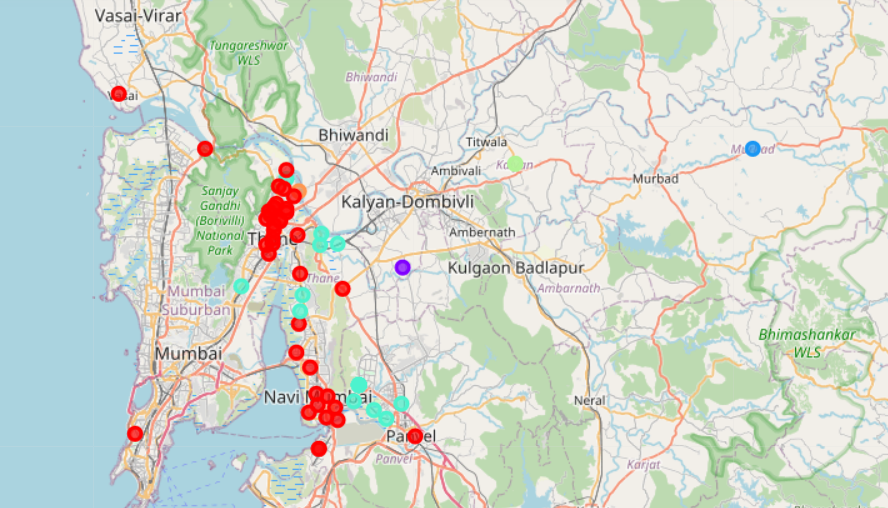


## Thane:

* The data for top ten venue categories for each neighborhood was generated -

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Thane West, Thane | 19.194329 | 72.970178 | 0 | Indian Restaurant | Fast Food Restaurant | Ice Cream Shop | Coffee Shop | Seafood Restaurant | Chinese Restaurant | Hotel | Clothing Store | Dessert Shop | Italian Restaurant |
| Ghodbunder Road, Thane | 19.288213 | 72.895574 | 0 | Indian Restaurant | Restaurant | Food Court | Smoke Shop | Diner | Gym / Fitness Center | Food | Resort | Dhaba | Hookah Bar |
| Majiwada, Thane | 19.213025 | 72.978485 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Pizza Place | Shopping Mall | Seafood Restaurant | Multiplex | Clothing Store | Sandwich Place | Bakery |
| Kalyan, Thane | 19.27163 | 73.235866 | 4 | Hotel | Trail | Wine Shop | Electronics Store | Food & Drink Shop | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant |
| Hiranandani Estate, Thane | 19.256856 | 72.984271 | 3 | Bus Station | Grocery Store | Café | Department Store | Ice Cream Shop | Restaurant | Coffee Shop | Food | Shopping Mall | Chinese Restaurant |

* A map was generated using “folium” library to show the resulting clusters -



**Comparing Neighbourhoods in Noida and Thane:**

* Comparing the two cities we decided to generate 10 clusters.
* These clusters contain similar neighborhoods from Noida and Thane along with ten venue categories in both cities.

Cluster 0:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 11 | Noida | 28.59811245 | 77.33381362 | 0 | Indian Restaurant | Market | Stadium | Sandwich Place | Pizza Place | Electronics Store | Multiplex | Coffee Shop | Butcher | Chinese Restaurant |
| Sector 12 | Noida | 28.59511835 | 77.33848623 | 0 | Indian Restaurant | Stadium | Pizza Place | Restaurant | Electronics Store | Vegetarian / Vegan Restaurant | Butcher | Coffee Shop | Multiplex | Market |
| Sector 14 | Noida | 28.58723095 | 77.30822174 | 0 | Indian Restaurant | Hotel | Plaza | Bakery | Department Store | Restaurant | Fast Food Restaurant | Pizza Place | BBQ Joint | Market |
| Sector 15 | Noida | 28.58279785 | 77.31022209 | 0 | Indian Restaurant | Hotel | Chinese Restaurant | Sandwich Place | Café | Light Rail Station | Department Store | Arcade | Restaurant | Bakery |
| Sector 15a | Noida | 28.5779969 | 77.30850904 | 0 | Indian Restaurant | Café | Chinese Restaurant | Restaurant | Fast Food Restaurant | Hotel | Coffee Shop | Sandwich Place | South Indian Restaurant | Shopping Mall |
| Sector 17 | Noida | 28.5737469 | 77.32003759 | 0 | Indian Restaurant | Café | Coffee Shop | Chinese Restaurant | Fast Food Restaurant | Sandwich Place | Clothing Store | Restaurant | South Indian Restaurant | Pizza Place |
| Sector 19 | Noida | 28.5783966 | 77.32476922 | 0 | Indian Restaurant | Café | Coffee Shop | Chinese Restaurant | Sandwich Place | Fast Food Restaurant | Shopping Mall | Clothing Store | Restaurant | Pizza Place |
| Sector 21 | Noida | 28.58682275 | 77.33616219 | 0 | Indian Restaurant | Market | Sandwich Place | Stadium | Pizza Place | Coffee Shop | Department Store | Chinese Restaurant | Multiplex | Restaurant |
| Sector 22 | Noida | 28.5952028 | 77.34727924 | 0 | Indian Restaurant | Pizza Place | Gym | Coffee Shop | Shopping Mall | Vegetarian / Vegan Restaurant | Chinese Restaurant | Convenience Store | Department Store | Multiplex |
| Sector 23 | Noida | 28.5923544 | 77.35381332 | 0 | Indian Restaurant | Pizza Place | Gym | Vegetarian / Vegan Restaurant | Coffee Shop | Electronics Store | Butcher | Market | Restaurant | Multiplex |
| Sector 25 | Noida | 28.5830083 | 77.33981906 | 0 | Indian Restaurant | Market | Multiplex | Sandwich Place | Hotel | Gym | Metro Station | Middle Eastern Restaurant | Shopping Mall | Snack Place |
| Sector 26 | Noida | 28.57946555 | 77.33512252 | 0 | Indian Restaurant | Chinese Restaurant | Multiplex | Sandwich Place | Coffee Shop | Café | Shopping Mall | Fast Food Restaurant | Clothing Store | Bakery |
| Sector 27 | Noida | 28.5746768 | 77.32872811 | 0 | Indian Restaurant | Café | Coffee Shop | Chinese Restaurant | Sandwich Place | Shopping Mall | Clothing Store | Fast Food Restaurant | South Indian Restaurant | Restaurant |
| Sector 28 | Noida | 28.57160795 | 77.3318283 | 0 | Indian Restaurant | Chinese Restaurant | Café | Coffee Shop | Sandwich Place | Clothing Store | Fast Food Restaurant | Restaurant | Bakery | South Indian Restaurant |
| Sector 29 | Noida | 28.5708315 | 77.33582067 | 0 | Indian Restaurant | Café | Coffee Shop | Chinese Restaurant | Pizza Place | Multiplex | Clothing Store | Hotel | Sandwich Place | Fast Food Restaurant |
| Sector 30 | Noida | 28.57330205 | 77.33917321 | 0 | Indian Restaurant | Chinese Restaurant | Coffee Shop | Café | Multiplex | Pizza Place | Sandwich Place | Fast Food Restaurant | Hotel | Bakery |
| Sector 31 | Noida | 28.57720495 | 77.34370348 | 0 | Indian Restaurant | Multiplex | Pizza Place | Sandwich Place | Bakery | Market | Gym | Metro Station | Shopping Mall | Hotel |
| Sector 33 | Noida | 28.58839945 | 77.35633363 | 0 | Indian Restaurant | Gym | Convenience Store | Multiplex | Pizza Place | Hotel | Vegetarian / Vegan Restaurant | Coffee Shop | Stadium | Market |
| Sector 34 | Noida | 28.58372415 | 77.36046749 | 0 | Pizza Place | Gym | Indian Restaurant | Multiplex | Vegetarian / Vegan Restaurant | Convenience Store | Stadium | Sandwich Place | Café | Restaurant |
| Sector 37 | Noida | 28.5707841 | 77.3271074 | 0 | Indian Restaurant | Café | Chinese Restaurant | Sandwich Place | Coffee Shop | Clothing Store | Fast Food Restaurant | Market | Shopping Mall | Pizza Place |
| Sector 44 | Noida | 28.5531837 | 77.3381716 | 0 | Chinese Restaurant | Indian Restaurant | Pizza Place | Sandwich Place | Coffee Shop | Golf Course | Bus Station | Fast Food Restaurant | Cafeteria | Café |
| Sector 45 | Noida | 28.55060205 | 77.35051279 | 0 | Sandwich Place | Golf Course | Chinese Restaurant | Indian Restaurant | Thai Restaurant | Coffee Shop | Pizza Place | Convenience Store | Café | Restaurant |
| Sector 52 | Noida | 28.5885198 | 77.36890648 | 0 | Pizza Place | Gym | Vegetarian / Vegan Restaurant | Indian Restaurant | Convenience Store | Park | Food Truck | Tea Room | Dessert Shop | Coffee Shop |
| Sector 55 | Noida | 28.6043261 | 77.34802934 | 0 | Indian Restaurant | Pizza Place | Gym | Food | Vegetarian / Vegan Restaurant | Stadium | Café | Tea Room | Bank | Coffee Shop |
| Sector 56 | Noida | 28.60387165 | 77.34257203 | 0 | Indian Restaurant | Coffee Shop | Pizza Place | Restaurant | American Restaurant | Shopping Mall | Multiplex | Music Store | Bank | Chinese Restaurant |
| Sector 70 | Noida | 28.59763785 | 77.38432381 | 0 | Indian Restaurant | Pizza Place | Gym | Convenience Store | Vegetarian / Vegan Restaurant | Park | Tea Room | Diner | English Restaurant | Electronics Store |
| Sector 74 | Noida | 28.5707841 | 77.3271074 | 0 | Indian Restaurant | Café | Chinese Restaurant | Sandwich Place | Coffee Shop | Clothing Store | Fast Food Restaurant | Market | Shopping Mall | Pizza Place |
| Sector 120 | Noida | 28.58623125 | 77.39659348 | 0 | Indian Restaurant | Recording Studio | Dry Cleaner | Wine Shop | Donut Shop | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Sector 128 | Noida | 28.5707841 | 77.3271074 | 0 | Indian Restaurant | Café | Chinese Restaurant | Sandwich Place | Coffee Shop | Clothing Store | Fast Food Restaurant | Market | Shopping Mall | Pizza Place |
| Sector 168 | Noida | 28.5707841 | 77.3271074 | 0 | Indian Restaurant | Café | Chinese Restaurant | Sandwich Place | Coffee Shop | Clothing Store | Fast Food Restaurant | Market | Shopping Mall | Pizza Place |
| Thane West | Thane | 19.1943294 | 72.9701779 | 0 | Indian Restaurant | Fast Food Restaurant | Ice Cream Shop | Coffee Shop | Seafood Restaurant | Chinese Restaurant | Hotel | Italian Restaurant | Dessert Shop | Donut Shop |
| Ghodbunder Road | Thane | 19.2882132 | 72.8955745 | 0 | Indian Restaurant | Restaurant | Food | Gym / Fitness Center | Food Court | Diner | Dhaba | Resort | Hookah Bar | Smoke Shop |
| Majiwada | Thane | 19.2130251 | 72.9784852 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Pizza Place | Seafood Restaurant | Multiplex | Shopping Mall | Clothing Store | Sandwich Place | Hotel |
| Hiranandani Estate | Thane | 19.25685595 | 72.98427052 | 0 | Grocery Store | Bus Station | Café | Bakery | Food | Pizza Place | Restaurant | Chinese Restaurant | Bar | Coffee Shop |
| Manpada | Thane | 19.2314156 | 72.9738156 | 0 | Indian Restaurant | Pizza Place | Coffee Shop | Dessert Shop | Bakery | Vegetarian / Vegan Restaurant | Café | Lounge | Fast Food Restaurant | Shopping Mall |
| Balkum village | Thane | 19.22169075 | 72.98449242 | 0 | Pizza Place | Coffee Shop | Indian Restaurant | Fast Food Restaurant | Bakery | Shopping Mall | Multiplex | Clothing Store | Dessert Shop | Chinese Restaurant |
| Naupada | Thane | 19.1890469 | 72.9692339 | 0 | Indian Restaurant | Fast Food Restaurant | Ice Cream Shop | Dessert Shop | Chinese Restaurant | Coffee Shop | Seafood Restaurant | Hotel | Italian Restaurant | Pizza Place |
| Anand Nagar | Thane | 19.178556 | 72.966004 | 0 | Indian Restaurant | Fast Food Restaurant | Ice Cream Shop | Dessert Shop | Pizza Place | Snack Place | Italian Restaurant | Café | Chinese Restaurant | Shopping Mall |
| Waghbil | Thane | 19.2659668 | 72.9847705 | 0 | Pizza Place | Café | Grocery Store | Food Court | Department Store | Dessert Shop | Diner | Chinese Restaurant | Restaurant | Sandwich Place |
| Teen Hath Naka | Thane | 19.1883779 | 72.9635894 | 0 | Indian Restaurant | Fast Food Restaurant | Ice Cream Shop | Dessert Shop | Coffee Shop | Chinese Restaurant | Italian Restaurant | Pizza Place | Sandwich Place | Seafood Restaurant |
| Dhokali | Thane | 19.2255786 | 72.9845436 | 0 | Indian Restaurant | Coffee Shop | Pizza Place | Fast Food Restaurant | Shopping Mall | Bakery | Lounge | Dessert Shop | Café | Pub |
| Vartak Nagar | Thane | 19.2155371 | 72.9627101 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Seafood Restaurant | Pizza Place | Chinese Restaurant | Clothing Store | Shopping Mall | Department Store | Multiplex |
| Vasant Vihar | Thane | 19.2224897 | 72.9663424 | 0 | Indian Restaurant | Pizza Place | Fast Food Restaurant | Coffee Shop | Shopping Mall | Chinese Restaurant | Clothing Store | Lounge | Seafood Restaurant | Café |
| Pokhran Road | Thane | 19.2191453 | 72.9674865 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Pizza Place | Shopping Mall | Seafood Restaurant | Clothing Store | Lounge | Department Store | Multiplex |
| Shilphata | Thane | 19.1430394 | 73.0467879 | 0 | Indian Restaurant | Tea Room | Fast Food Restaurant | Art Gallery | Train Station | Restaurant | Wine Shop | Farmers Market | English Restaurant | Electronics Store |
| Kapurbawdi | Thane | 19.2142578 | 72.9778462 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Pizza Place | Shopping Mall | Multiplex | Seafood Restaurant | Clothing Store | Bakery | Italian Restaurant |
| Patlipada | Thane | 19.2493501 | 72.9760694 | 0 | Indian Restaurant | Bakery | Ice Cream Shop | Café | Bus Station | Wine Shop | Bar | Department Store | Coffee Shop | Chinese Restaurant |
| Hiranandani Meadows | Thane | 19.22734225 | 72.9718477 | 0 | Indian Restaurant | Coffee Shop | Pizza Place | Fast Food Restaurant | Shopping Mall | Lounge | Dessert Shop | Bakery | Café | Electronics Store |
| Brahmand | Thane | 19.2469649 | 72.9818412 | 0 | Indian Restaurant | Coffee Shop | Bus Station | Café | Pizza Place | Ice Cream Shop | Lounge | Bakery | Restaurant | Shopping Mall |
| Kolshet | Thane | 19.2389025 | 72.9932692 | 0 | Pizza Place | Wine Shop | Thai Restaurant | Pub | Coffee Shop | Electronics Store | Bus Station | Shopping Mall | Fast Food Restaurant | Lounge |
| Khopat | Thane | 19.2033291 | 72.9717815 | 0 | Indian Restaurant | Fast Food Restaurant | Coffee Shop | Ice Cream Shop | Chinese Restaurant | Pizza Place | Seafood Restaurant | Hotel | Multiplex | Italian Restaurant |
| Palghar | Thane | 19.3453756 | 72.8007115 | 0 | Seafood Restaurant | Indian Restaurant | Flea Market | Café | Bus Station | Surf Spot | Restaurant | Snack Place | Dhaba | Diner |
| Jeejamata Nagar | Thane | 18.9922889 | 72.81878651 | 0 | Indian Restaurant | Coffee Shop | Italian Restaurant | Café | Pub | Lounge | Shopping Mall | Fast Food Restaurant | Seafood Restaurant | Spa |
| Louis Wadi | Thane | 19.20886565 | 72.97167426 | 0 | Indian Restaurant | Coffee Shop | Fast Food Restaurant | Ice Cream Shop | Pizza Place | Seafood Restaurant | Chinese Restaurant | Dessert Shop | Clothing Store | Donut Shop |
| Hiranandani Road | Thane | 19.22734225 | 72.9718477 | 0 | Indian Restaurant | Coffee Shop | Pizza Place | Fast Food Restaurant | Shopping Mall | Lounge | Dessert Shop | Bakery | Café | Electronics Store |
| Panvel | Navi Mumbai | 19.0067566 | 73.04075004 | 0 | Indian Restaurant | Fast Food Restaurant | Café | Italian Restaurant | Pizza Place | Restaurant | Asian Restaurant | Bus Station | Chinese Restaurant | Electronics Store |
| Nerul | Navi Mumbai | 19.0336118 | 73.01813957 | 0 | Indian Restaurant | Fast Food Restaurant | Coffee Shop | Chinese Restaurant | Snack Place | Garden | Shopping Mall | Café | Bakery | Ice Cream Shop |
| Airoli | Navi Mumbai | 19.1585147 | 72.99940185 | 0 | Fast Food Restaurant | Pizza Place | Indian Restaurant | Gym | Bus Station | Burger Joint | Café | Restaurant | Chinese Restaurant | Cocktail Bar |
| Seawoods | Navi Mumbai | 19.0221923 | 73.01873757 | 0 | Indian Restaurant | Café | Fast Food Restaurant | Coffee Shop | Sandwich Place | Restaurant | Chinese Restaurant | Pizza Place | Diner | Garden |
| Kopar Khairane | Navi Mumbai | 19.1056227 | 72.9988648 | 0 | Fast Food Restaurant | Department Store | Indian Restaurant | Ice Cream Shop | Hotel | Pizza Place | Train Station | Café | Coffee Shop | Diner |
| Vashi | Navi Mumbai | 19.075784 | 72.9952364 | 0 | Indian Restaurant | Ice Cream Shop | Coffee Shop | Hotel | Fast Food Restaurant | Restaurant | Department Store | Café | Bar | Multiplex |
| Sanpada | Navi Mumbai | 19.0607337 | 73.0116775 | 0 | Indian Restaurant | Fast Food Restaurant | Hotel | Chinese Restaurant | Café | Coffee Shop | Pizza Place | Restaurant | Italian Restaurant | Bookstore |
| CBD Belapur | Navi Mumbai | 19.01898695 | 73.03909472 | 0 | Indian Restaurant | Fast Food Restaurant | Café | Pizza Place | Restaurant | Asian Restaurant | Plaza | Tea Room | Chinese Restaurant | Seafood Restaurant |
| Belapur | Navi Mumbai | 19.0088205 | 73.028701 | 0 | Indian Restaurant | Café | Fast Food Restaurant | Pizza Place | Dessert Shop | Chinese Restaurant | Sandwich Place | Restaurant | Bakery | Coffee Shop |
| Uran | Navi Mumbai | 19.0307053 | 73.0300046 | 0 | Fast Food Restaurant | Indian Restaurant | Coffee Shop | Diner | Garden | Chinese Restaurant | Bakery | Pizza Place | Dessert Shop | Café |
| Sector 36 | Navi Mumbai | 19.01371895 | 73.00999035 | 0 | Café | Shopping Mall | Fast Food Restaurant | Sandwich Place | Indian Restaurant | Chinese Restaurant | Dessert Shop | ATM | Pizza Place | Clothing Store |

Cluster 1:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Kalyan | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Kalyan West | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |

Cluster 2:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 35 | Noida | 28.5806152 | 77.35630307 | 2 | Multiplex | Pizza Place | Stadium | Market | Sandwich Place | Gym | Italian Restaurant | Restaurant | Lounge | Park |
| Sector 36 | Noida | 28.57190815 | 77.34853224 | 2 | Bakery | Indian Restaurant | Multiplex | Market | Metro Station | Sandwich Place | Café | Pizza Place | Gym | Middle Eastern Restaurant |
| Sector 39 | Noida | 28.5686223 | 77.35210967 | 2 | Bakery | Gym / Fitness Center | Pizza Place | Multiplex | Café | Sandwich Place | Market | Indian Restaurant | Park | Gym |
| Sector 40 | Noida | 28.5670239 | 77.3561036 | 2 | Multiplex | Gym | Sandwich Place | Bakery | Pizza Place | Convenience Store | Bistro | Park | Dessert Shop | Movie Theater |
| Sector 41 | Noida | 28.5662237 | 77.36174561 | 2 | Gym / Fitness Center | Multiplex | Bakery | Italian Restaurant | Food Truck | Café | Shopping Mall | Metro Station | Movie Theater | Pizza Place |
| Sector 42 | Noida | 28.5580927 | 77.36117784 | 2 | Café | Gym / Fitness Center | Multiplex | Bakery | Pizza Place | Food Truck | Sandwich Place | Metro Station | Movie Theater | Market |
| Sector 43 | Noida | 28.55759455 | 77.35167905 | 2 | Pizza Place | Indian Restaurant | Multiplex | Café | Golf Course | Bakery | Sandwich Place | Lounge | Movie Theater | Gym |
| Sector 46 | Noida | 28.55216265 | 77.36060566 | 2 | Café | Golf Course | Lounge | Arcade | Pizza Place | Gym / Fitness Center | Bakery | Thai Restaurant | Wine Shop | Farmers Market |
| Sector 48 | Noida | 28.55671025 | 77.36874453 | 2 | Bakery | Café | Gym / Fitness Center | Pizza Place | Sandwich Place | Market | Lounge | Golf Course | Thai Restaurant | Italian Restaurant |
| Sector 49 | Noida | 28.5640158 | 77.36719145 | 2 | Gym / Fitness Center | Multiplex | Bakery | Pizza Place | Food Truck | Café | Sandwich Place | Metro Station | Movie Theater | Market |
| Sector 50 | Noida | 28.5711552 | 77.36748745 | 2 | Bakery | Pizza Place | Multiplex | Gym / Fitness Center | Dessert Shop | Sandwich Place | Café | Italian Restaurant | Golf Course | Lounge |
| Sector 51 | Noida | 28.57540685 | 77.36124549 | 2 | Pizza Place | Bakery | Multiplex | Arcade | Vegetarian / Vegan Restaurant | Train Station | Park | Gym / Fitness Center | Gym | Lounge |
| Sector 99 | Noida | 28.54345895 | 77.35892385 | 2 | Sandwich Place | Market | Arcade | Coffee Shop | Café | Gym / Fitness Center | Park | Golf Course | Wine Shop | English Restaurant |
| Sector 100 | Noida | 28.5422873 | 77.36509586 | 2 | Golf Course | Gym / Fitness Center | Bakery | Market | Wine Shop | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Kalwa | Thane | 19.197722 | 72.9978735 | 2 | Seafood Restaurant | Multiplex | Pizza Place | Dessert Shop | Wine Shop | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Mumbra | Thane | 19.188536 | 73.0215253 | 2 | Flea Market | Multiplex | Restaurant | Bakery | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant |

Cluster 3:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 20 | Noida | 28.4741497 | 77.5244982 | 3 | Fast Food Restaurant | ATM | Golf Course | Hotel | Park | Coffee Shop | Café | Business Center | Shopping Mall | Shopping Plaza |
| Sector 62 | Noida | 28.62083675 | 77.36453701 | 3 | Fast Food Restaurant | Coffee Shop | Café | Food | Pizza Place | Indian Restaurant | Hotel | BBQ Joint | Food Court | Clothing Store |
| Sector 72 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 73 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 75 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 76 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 77 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 78 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 79 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 104 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 110 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 112 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 113 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 115 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 116 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 117 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 118 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 119 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 121 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 130 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 131 | Noida | 28.4594351 | 77.5346972 | 3 | Shopping Mall | Hotel | Golf Course | Indian Sweet Shop | Shopping Plaza | Gym / Fitness Center | Fast Food Restaurant | English Restaurant | Electronics Store | Dumpling Restaurant |
| Sector 134 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 135 | Noida | 28.49800465 | 77.40003259 | 3 | Sandwich Place | Fast Food Restaurant | Coffee Shop | Café | Donut Shop | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Sector 137 | Noida | 28.50863715 | 77.41045258 | 3 | Sandwich Place | Hotel | Fast Food Restaurant | Coffee Shop | Dog Run | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Sector 141 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 142 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 143 | Noida | 28.50266325 | 77.42625566 | 3 | Fast Food Restaurant | Health & Beauty Service | South Indian Restaurant | Wine Shop | Donut Shop | Flea Market | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant |
| Sector 150 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 151 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 158 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Sector 162 | Noida | 28.6225753 | 77.3743146 | 3 | Fast Food Restaurant | Indian Restaurant | Café | Coffee Shop | Food | Pizza Place | Hotel | Gym | Food Court | Clothing Store |
| Kolshet Road | Thane | 19.24332 | 72.9983196 | 3 | Coffee Shop | Vegetarian / Vegan Restaurant | Furniture / Home Store | Food | Wine Shop | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |

Cluster 4:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Palava | Thane | 19.16460915 | 73.11278411 | 4 | Salon / Barbershop | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner | Donut Shop |

Cluster 5:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 122 | Noida | 28.59290615 | 77.39756613 | 5 | ATM | Dry Cleaner | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Donut Shop |
| Murbad | Thane | 19.28787405 | 73.49742831 | 5 | ATM | Convenience Store | American Restaurant | Food Court | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |

Cluster 6:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 132 | Noida | 28.5116887 | 77.37677006 | 6 | Café | Plaza | Golf Course | Ice Cream Shop | Snack Place | Coffee Shop | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant |
| Sector 133 | Noida | 28.5051604 | 77.3714564 | 6 | Café | Plaza | Golf Course | Ice Cream Shop | Snack Place | Coffee Shop | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant |
| Kasarvadavali | Thane | 19.1452859 | 72.9352214 | 6 | Indian Restaurant | Train Station | Ice Cream Shop | Café | Multiplex | Gym / Fitness Center | Sports Bar | Big Box Store | Pizza Place | Restaurant |
| Pokharan Road No. 2 | Thane | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Bhayanderpada | Thane | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Owale | Thane | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Diva | Thane | 19.1887564 | 73.0414169 | 6 | Flea Market | Bookstore | Train Station | Café | Wine Shop | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Kasheli | Thane | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Pokharan Rd No 1 | Thane | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Boisar | Thane | 19.8034827 | 72.754363 | 6 | Ice Cream Shop | Train Station | Athletics & Sports | Indie Movie Theater | Snack Place | Pizza Place | Dry Cleaner | Flea Market | Fast Food Restaurant | Farmers Market |
| Kausa | Thane | 19.1998112 | 73.0228704 | 6 | Chinese Restaurant | Flea Market | Pizza Place | Multiplex | Bookstore | Café | Bakery | Big Box Store | Electronics Store | Fast Food Restaurant |
| Kharghar | Navi Mumbai | 19.0257731 | 73.05918478 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Plaza | Department Store | Hotel | Multiplex | Bakery | Sandwich Place |
| New Panvel | Navi Mumbai | 18.9893311 | 73.12577075 | 6 | Fast Food Restaurant | Shopping Mall | Ice Cream Shop | Indian Restaurant | Multiplex | Theater | Diner | Snack Place | Soccer Field | Men's Store |
| Taloja | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Kamothe | Navi Mumbai | 19.0164338 | 73.0806552 | 6 | Train Station | Asian Restaurant | Ice Cream Shop | Dog Run | Snack Place | Toll Plaza | Gym | Pizza Place | Comfort Food Restaurant | Deli / Bodega |
| Ghansoli | Navi Mumbai | 19.1193307 | 72.9995096 | 6 | Fast Food Restaurant | Café | Indian Restaurant | Department Store | Restaurant | Diner | Juice Bar | Coffee Shop | Food Court | Track Stadium |
| Kalamboli | Navi Mumbai | 19.0235062 | 73.11060919 | 6 | Bus Station | Diner | Pizza Place | Café | Fast Food Restaurant | Lake | Movie Theater | Platform | Indian Restaurant | Hotel |
| Karanjade | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Road Pali | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Palm Beach Road | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Taloje Panchanand | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Khopoli | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Sector 12-Khargar | Navi Mumbai | 19.04256 | 73.06451 | 6 | Café | Indian Restaurant | Fast Food Restaurant | Pizza Place | Multiplex | Restaurant | Department Store | Gym | Ice Cream Shop | Fried Chicken Joint |
| Khandeshwar | Navi Mumbai | 19.0073498 | 73.0952827 | 6 | Asian Restaurant | Ice Cream Shop | Toll Plaza | Bus Station | Movie Theater | Multiplex | Café | Dog Run | Gym | Train Station |
| Rabale | Navi Mumbai | 19.1366355 | 73.00278237 | 6 | Café | Pizza Place | Fast Food Restaurant | Department Store | Gym | Dumpling Restaurant | Seafood Restaurant | Juice Bar | Coffee Shop | Sandwich Place |

Cluster 7:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Ulwe | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Ulwe Village | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |

Cluster 8:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 53 | Noida | 28.5911007 | 77.3628053 | 8 | Pizza Place | Food | Indian Restaurant | Vegetarian / Vegan Restaurant | Coffee Shop | Dessert Shop | Gym | Donut Shop | Fast Food Restaurant | Farmers Market |
| Sector 61 | Noida | 28.59645805 | 77.36756438 | 8 | Pizza Place | Food | Coffee Shop | Café | Indian Restaurant | Multiplex | Dessert Shop | Sandwich Place | Dry Cleaner | Farmers Market |
| Sector 66 | Noida | 28.6052229 | 77.3764073 | 8 | Pizza Place | Coffee Shop | Food | Café | Breakfast Spot | Sandwich Place | Multiplex | Fast Food Restaurant | Diner | Dog Run |
| Sector 71 | Noida | 28.59425315 | 77.37619464 | 8 | Pizza Place | Convenience Store | Coffee Shop | Dessert Shop | Shopping Mall | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Sector 82 | Noida | 28.5311541 | 77.38993356 | 8 | Pizza Place | Ice Cream Shop | Golf Course | Plaza | Coffee Shop | Diner | Bakery | Café | Market | Farmers Market |
| Sector 92 | Noida | 28.5181771 | 77.39489696 | 8 | Pizza Place | Ice Cream Shop | Pharmacy | Café | Sandwich Place | Golf Course | Diner | Coffee Shop | Plaza | Department Store |
| Sector 93 | Noida | 28.5229507 | 77.38611653 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |
| Sector 105 | Noida | 28.5315704 | 77.36917722 | 8 | Pizza Place | Café | Pharmacy | Diner | Bakery | Market | Wine Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Sector 107 | Noida | 28.545932 | 77.37656097 | 8 | Pizza Place | Café | Gym / Fitness Center | Diner | Bakery | Market | Thai Restaurant | Wine Shop | Fast Food Restaurant | Farmers Market |
| Sector 108 | Noida | 28.52660665 | 77.37679363 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |

Cluster 9:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Sector 47 | Noida | 28.5498284 | 77.37006993 | 9 | Bakery | Arcade | Gym / Fitness Center | Wine Shop | Dry Cleaner | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant |

* We also generated a set of clusters which do not have neighborhoods from both the cities -

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Kalyan | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Kalyan West | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Palava | Thane | 19.16460915 | 73.11278411 | 4 | Salon / Barbershop | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner | Donut Shop |
| Ulwe | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Ulwe Village | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Sector 53 | Noida | 28.5911007 | 77.3628053 | 8 | Pizza Place | Food | Indian Restaurant | Vegetarian / Vegan Restaurant | Coffee Shop | Dessert Shop | Gym | Donut Shop | Fast Food Restaurant | Farmers Market |
| Sector 61 | Noida | 28.59645805 | 77.36756438 | 8 | Pizza Place | Food | Coffee Shop | Café | Indian Restaurant | Multiplex | Dessert Shop | Sandwich Place | Dry Cleaner | Farmers Market |
| Sector 66 | Noida | 28.6052229 | 77.3764073 | 8 | Pizza Place | Coffee Shop | Food | Café | Breakfast Spot | Sandwich Place | Multiplex | Fast Food Restaurant | Diner | Dog Run |
| Sector 71 | Noida | 28.59425315 | 77.37619464 | 8 | Pizza Place | Convenience Store | Coffee Shop | Dessert Shop | Shopping Mall | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Sector 82 | Noida | 28.5311541 | 77.38993356 | 8 | Pizza Place | Ice Cream Shop | Golf Course | Plaza | Coffee Shop | Diner | Bakery | Café | Market | Farmers Market |
| Sector 92 | Noida | 28.5181771 | 77.39489696 | 8 | Pizza Place | Ice Cream Shop | Pharmacy | Café | Sandwich Place | Golf Course | Diner | Coffee Shop | Plaza | Department Store |
| Sector 93 | Noida | 28.5229507 | 77.38611653 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |
| Sector 105 | Noida | 28.5315704 | 77.36917722 | 8 | Pizza Place | Café | Pharmacy | Diner | Bakery | Market | Wine Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Sector 107 | Noida | 28.545932 | 77.37656097 | 8 | Pizza Place | Café | Gym / Fitness Center | Diner | Bakery | Market | Thai Restaurant | Wine Shop | Fast Food Restaurant | Farmers Market |
| Sector 108 | Noida | 28.52660665 | 77.37679363 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |
| Sector 47 | Noida | 28.5498284 | 77.37006993 | 9 | Bakery | Arcade | Gym / Fitness Center | Wine Shop | Dry Cleaner | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant |

# DISCUSSION

In this section we will discuss the results and observations we can see from the results.

* After exploring the cities Noida and Thane we can see that there are at least two large clusters in both cities to which maximum neighborhoods belong.
* This shows the maximum residential areas in the cities have just two sets of distinct characteristics.
* After comparing the data from two cities we can see the neighborhoods in large clusters in both cities also form large clusters when analysed together. This shows many areas in Noida are similar to areas in Thane.
* Comparing the data we can also see that some clusters have areas which belong to either Noida or Thane but, not both. This shows that venues around these areas are unique to these cities.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Neighborhood | City | Latitude | Longitude | Cluster Labels | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue |
| Kalyan | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Kalyan West | Thane | 19.2716301 | 73.23586553 | 1 | Hotel | Trail | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner |
| Palava | Thane | 19.16460915 | 73.11278411 | 4 | Salon / Barbershop | Wine Shop | Dog Run | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store | Dumpling Restaurant | Dry Cleaner | Donut Shop |
| Ulwe | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Ulwe Village | Navi Mumbai | 18.97686135 | 73.02013111 | 7 | Mobile Phone Shop | Playground | Home Service | Historic Site | Athletics & Sports | Paper / Office Supplies Store | Donut Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Sector 53 | Noida | 28.5911007 | 77.3628053 | 8 | Pizza Place | Food | Indian Restaurant | Vegetarian / Vegan Restaurant | Coffee Shop | Dessert Shop | Gym | Donut Shop | Fast Food Restaurant | Farmers Market |
| Sector 61 | Noida | 28.59645805 | 77.36756438 | 8 | Pizza Place | Food | Coffee Shop | Café | Indian Restaurant | Multiplex | Dessert Shop | Sandwich Place | Dry Cleaner | Farmers Market |
| Sector 66 | Noida | 28.6052229 | 77.3764073 | 8 | Pizza Place | Coffee Shop | Food | Café | Breakfast Spot | Sandwich Place | Multiplex | Fast Food Restaurant | Diner | Dog Run |
| Sector 71 | Noida | 28.59425315 | 77.37619464 | 8 | Pizza Place | Convenience Store | Coffee Shop | Dessert Shop | Shopping Mall | Dry Cleaner | Fast Food Restaurant | Farmers Market | English Restaurant | Electronics Store |
| Sector 82 | Noida | 28.5311541 | 77.38993356 | 8 | Pizza Place | Ice Cream Shop | Golf Course | Plaza | Coffee Shop | Diner | Bakery | Café | Market | Farmers Market |
| Sector 92 | Noida | 28.5181771 | 77.39489696 | 8 | Pizza Place | Ice Cream Shop | Pharmacy | Café | Sandwich Place | Golf Course | Diner | Coffee Shop | Plaza | Department Store |
| Sector 93 | Noida | 28.5229507 | 77.38611653 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |
| Sector 105 | Noida | 28.5315704 | 77.36917722 | 8 | Pizza Place | Café | Pharmacy | Diner | Bakery | Market | Wine Shop | Fast Food Restaurant | Farmers Market | English Restaurant |
| Sector 107 | Noida | 28.545932 | 77.37656097 | 8 | Pizza Place | Café | Gym / Fitness Center | Diner | Bakery | Market | Thai Restaurant | Wine Shop | Fast Food Restaurant | Farmers Market |
| Sector 108 | Noida | 28.52660665 | 77.37679363 | 8 | Café | Pizza Place | Plaza | Bakery | Market | Golf Course | Snack Place | Diner | Coffee Shop | Pharmacy |
| Sector 47 | Noida | 28.5498284 | 77.37006993 | 9 | Bakery | Arcade | Gym / Fitness Center | Wine Shop | Dry Cleaner | Food | Flea Market | Fast Food Restaurant | Farmers Market | English Restaurant |

# CONCLUSION

After analysing the data from both cities we can conclude the following -

* There is a high probability that someone living in one city will have similar experience living in the other city. To understand exactly which areas are similar, one can go through the cluster data we were able to generate after comparing both the cities.
* We can also conclude that some areas are unique to each city. Thus, someone living in those areas will have a different experience if they move to any area in other city.