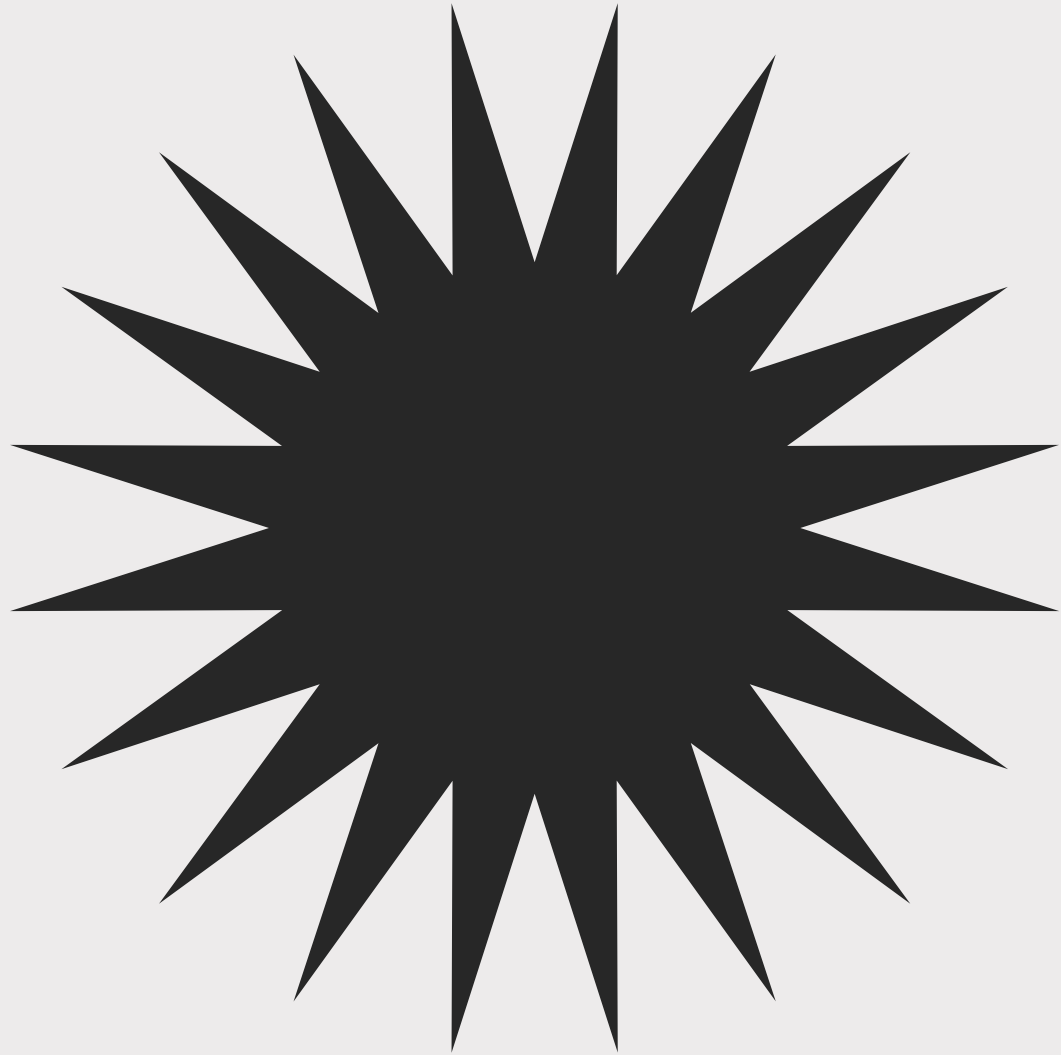


**FINAL
CAPSTONE PROJECT**

LIVING IN SINGAPORE 2021





INTRO- DUCTION

Singapore's high cost of
living

EXORBITANT HOUSE PRICES



**MATERIALISTIC
LIFESTYLE**



**LACK OF
AVAILABILITY OF
LAND**



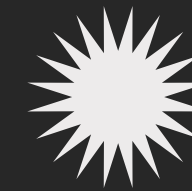
**LARGE
POPULATION SIZE**

DATA PREPARATION

- House prices: Data on prices of resale flats from <https://data.gov.sg/>
 - Assumptions: Individuals look for the cheapest option, which are 2 room flats (for practical purposes)
- Coordinates of town: Data on the coordinates of train stations in Singapore from Kaggle
 - Name of the train stations usually correspond to the towns the stations are in

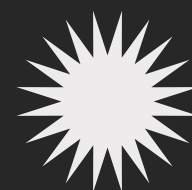
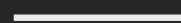
We will then compare the amenities around every town using Foursquare location data

DATA PREPARATION



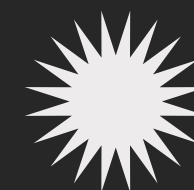
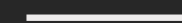
	town	lat	lng
0	JURONG EAST	1.333207	103.742308
1	BUKIT BATOK	1.349069	103.749596
2	BUKIT GOMBAK	1.359043	103.751863
3	CHOA CHU KANG	1.385417	103.744316
4	YEW TEE	1.397383	103.747523

**COORDINATES
OF TOWN**



	town	resale_price
0	ANG MO KIO	213859.154930
1	BEDOK	219469.014085
2	BOON LAY	220723.525424
3	BUKIT PANJANG	233255.307692
4	CHOA CHU KANG	230084.848485

**HOUSE PRICES
IN TOWN**

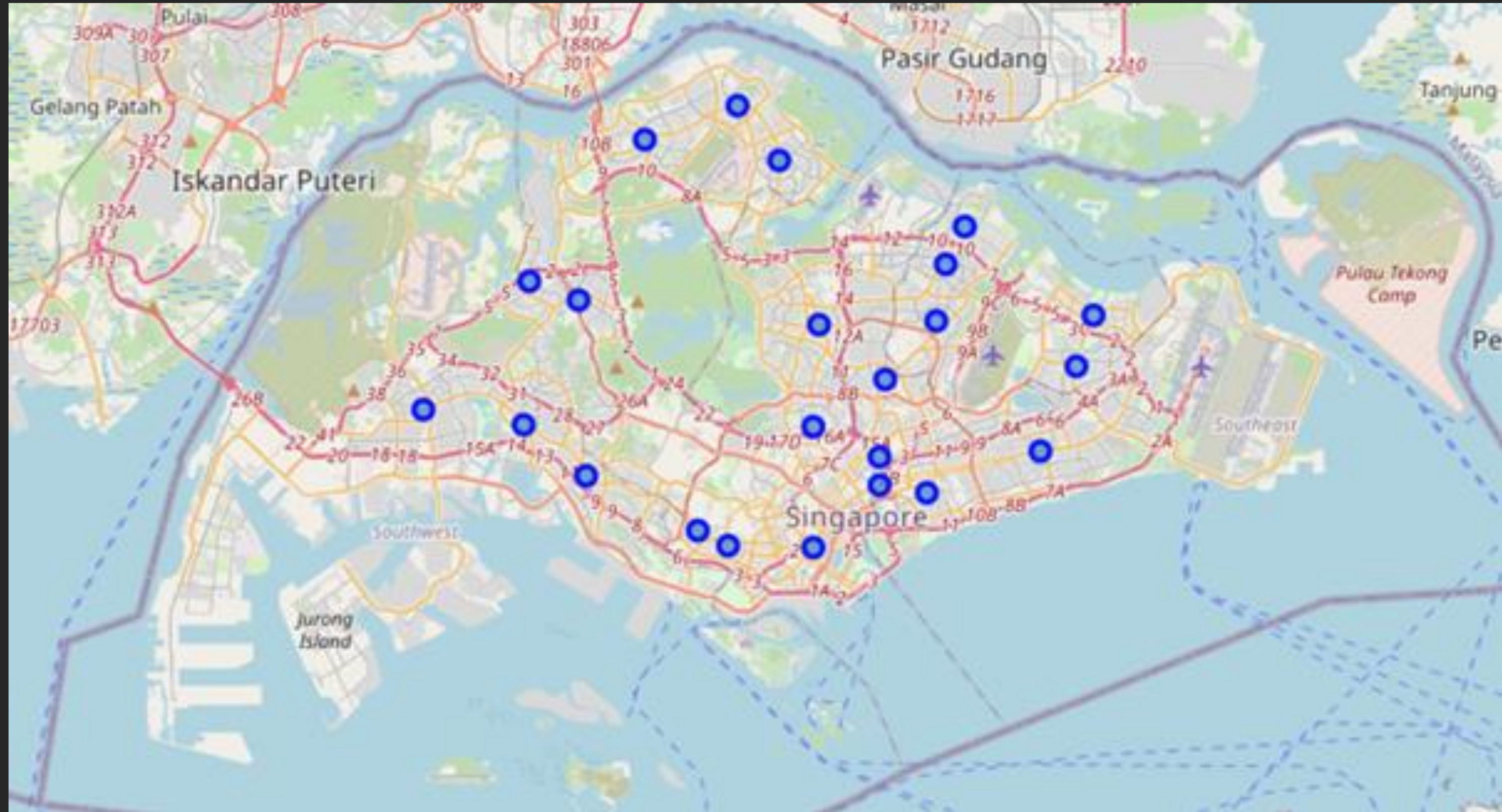


DATA PREPARATION

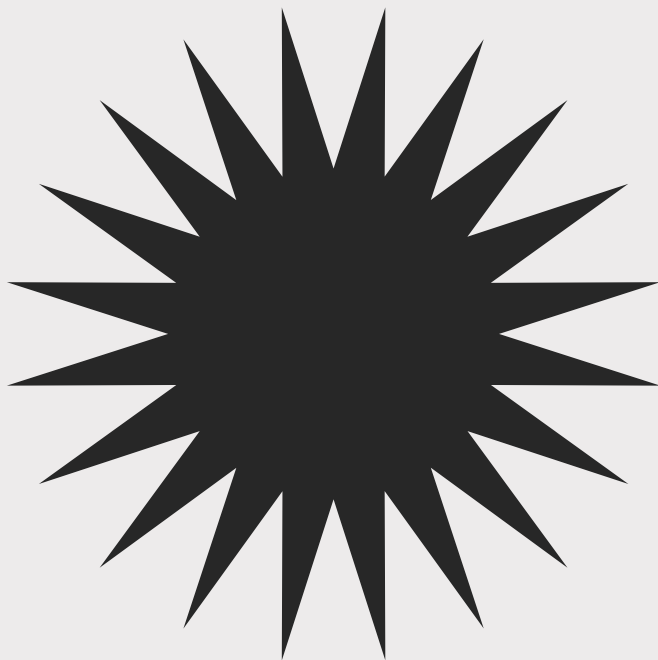
Combined data:
The dataframe has 23
towns

	town	resale_price	lat	lng
0	ANG MO KIO	213859.154930	1.370025	103.849588
1	BEDOK	219469.014085	1.324043	103.930205
2	BOON LAY	220723.525424	1.338620	103.705817
3	BUKIT PANJANG	233255.307692	1.378340	103.762452
4	CHOA CHU KANG	230084.848485	1.385417	103.744316

LET US LOOK AT SINGAPORE



EXPLORING ANG MO KIO



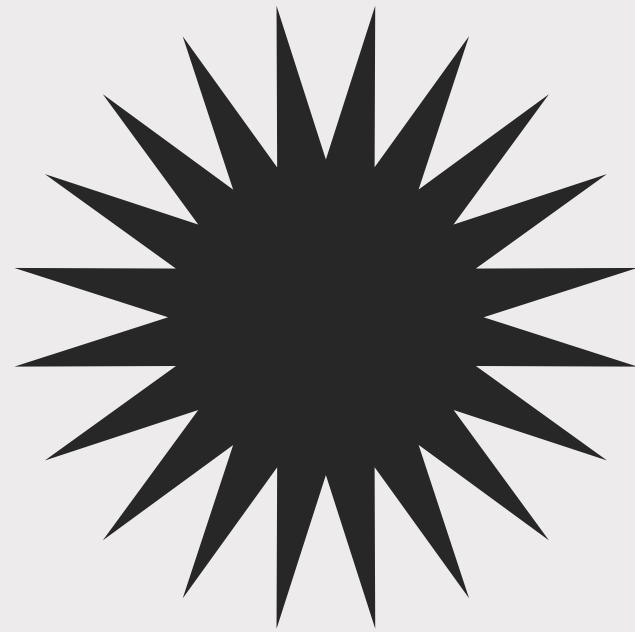
40 venues were returned by Foursquare

	name	categories	lat	lng
0	Old Chang Kee	Snack Place	1.369094	103.848389
1	FairPrice Xtra	Supermarket	1.369279	103.848886
2	MOS Burger	Burger Joint	1.369170	103.847831
3	A&W	Fast Food Restaurant	1.369541	103.849043
4	Face Ban Mian 非板面 (Ang Mo Kio)	Noodle House	1.372031	103.847504

WE NOW CONSIDER THE OTHER TOWNS TOGETHER:

172 unique venue
categories

	Town Lat	Town Lat	Venue	Venue Lat	Venue Lng	Venue Category
Town						
ANG MO KIO	40	40	40	40	40	40
BEDOK	58	58	58	58	58	58
BOON LAY	74	74	74	74	74	74
BUKIT PANJANG	48	48	48	48	48	48
CHOA CHU KANG	20	20	20	20	20	20
CLARKE QUAY	100	100	100	100	100	100
CLEMENTI	63	63	63	63	63	63



ONE HOT ENCODING

Categorical data
becomes
more expressive

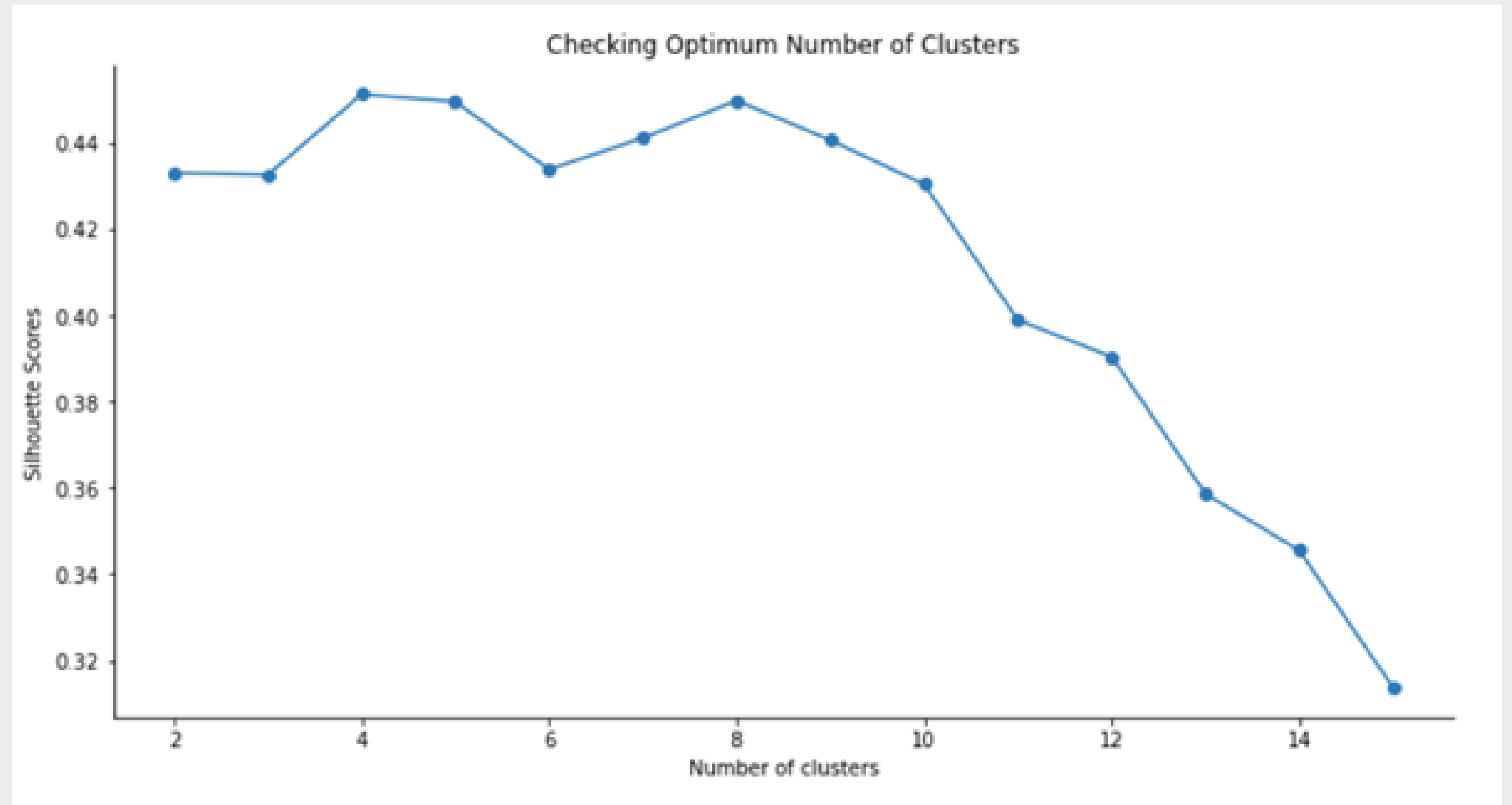
	Town	ATM	Accessories Store	American Restaurant	Arcade	Art Gallery	Arts & Crafts Store	Asian Restaurant	Athletic & Sports
0	ANG MO KIO	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.025000	0.000000
1	BEDOK	0.000000	0.000000	0.017241	0.000000	0.00	0.000000	0.034483	0.000000
2	BOON LAY	0.000000	0.000000	0.013514	0.000000	0.00	0.000000	0.094595	0.000000
3	BUKIT PANJANG	0.000000	0.000000	0.020833	0.000000	0.00	0.000000	0.083333	0.000000
4	CHOA CHU KANG	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.050000	0.000000
5	CLARKE QUAY	0.000000	0.000000	0.000000	0.000000	0.02	0.000000	0.010000	0.000000
6	CLEMENTI	0.000000	0.000000	0.015873	0.000000	0.00	0.015873	0.047619	0.000000
7	DAKOTA	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.093750	0.000000
8	GEYLANG	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000

TOP VENUES IN EACH TOWN

	Town	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	
0	ANG MO KIO	Coffee Shop	Dessert Shop	Food Court	Japanese Restaurant	Bubble Tea Shop	Supermarket	Snack Place	A
1	BEDOK	Coffee Shop	Sushi Restaurant	Japanese Restaurant	Sandwich Place	Food Court	Chinese Restaurant	Dessert Shop	B
2	BOON LAY	Japanese Restaurant	Asian Restaurant	Fast Food Restaurant	Dessert Shop	Chinese Restaurant	Coffee Shop	Indian Restaurant	C
3	BUKIT PANJANG	Fast Food Restaurant	Asian Restaurant	Coffee Shop	Sushi Restaurant	Shopping Mall	Korean Restaurant	Supermarket	D
4	CHOA CHU KANG	Fast Food Restaurant	Coffee Shop	Food Court	Bakery	Café	Bookstore	Supermarket	E

METHODOLOGY: K-MEANS CLUSTERING

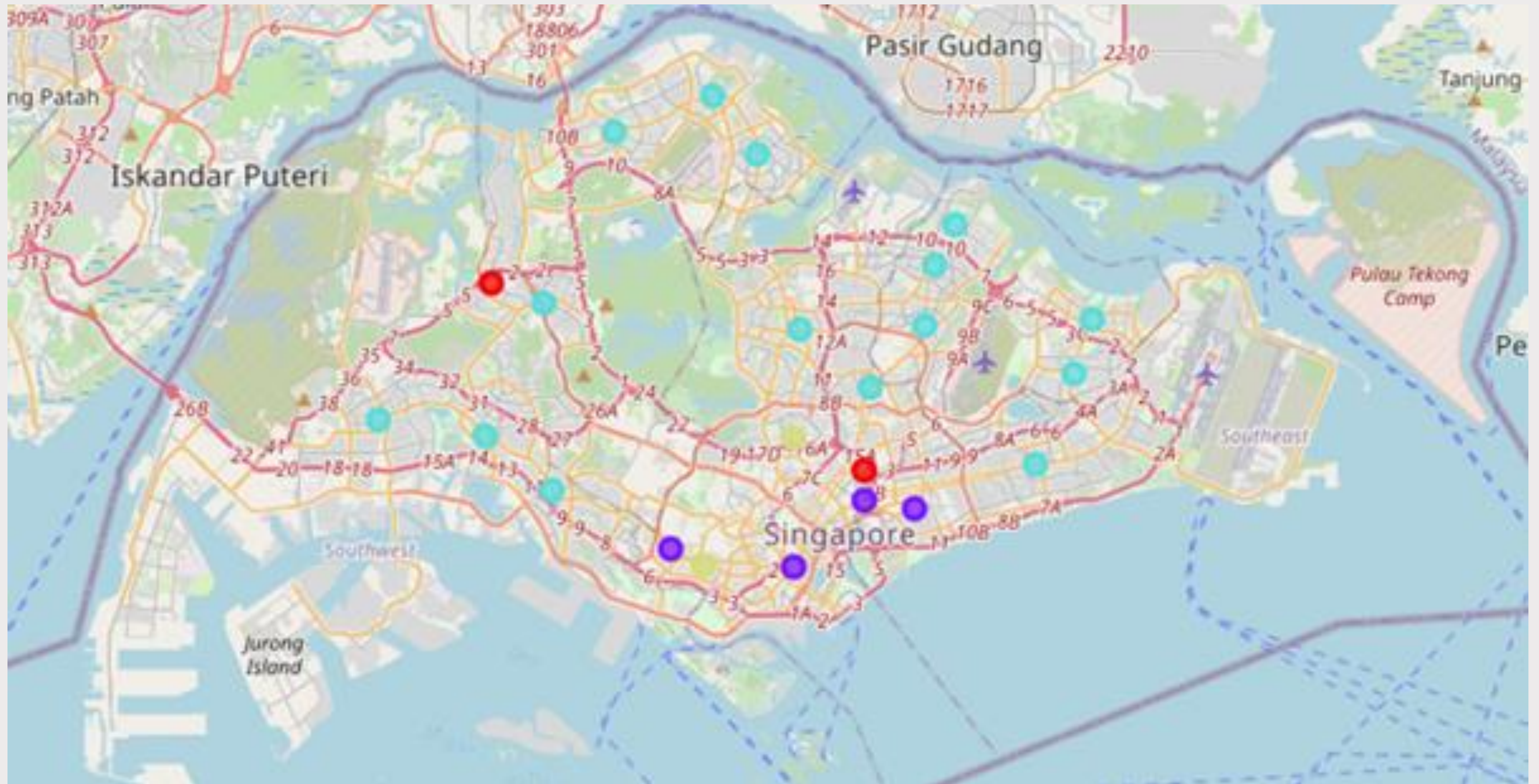
Silhouette
method:
Optimal k
value is 4



K-MEANS CLUSTERING

	town	resale_price	lat	lng	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	
0	ANG MO KIO	213859.154930	1.370025	103.849588	2	Coffee Shop	Dessert Shop	Food Court	Japanese Restaurant	Bubble Tea Shop	Supermarket	Snack Place	A F
1	BEDOK	219469.014085	1.324043	103.930205	2	Coffee Shop	Sushi Restaurant	Japanese Restaurant	Sandwich Place	Food Court	Chinese Restaurant	Dessert Shop	M H
2	BOON LAY	220723.525424	1.338620	103.705817	2	Japanese Restaurant	Asian Restaurant	Fast Food Restaurant	Dessert Shop	Chinese Restaurant	Coffee Shop	Indian Restaurant	C
3	BUKIT PANJANG	233255.307692	1.378340	103.762452	2	Fast Food Restaurant	Asian Restaurant	Coffee Shop	Sushi Restaurant	Shopping Mall	Korean Restaurant	Supermarket	l F
4	CHOA CHU KANG	230084.848485	1.385417	103.744316	0	Fast Food Restaurant	Coffee Shop	Food Court	Bakery	Café	Bookstore	Supermarket	S F

MAP CLUSTERS



CLUSTER O

	resale_price	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
4	230084.848485	Fast Food Restaurant	Coffee Shop	Food Court	Bakery	Café	Bookstore	Supermarket	Sandwich Place	Food Truck	Thai Restaurant
8	201506.097561	Coffee Shop	Indian Restaurant	Café	Food Court	Supermarket	Noodle House	Park	Dog Run	Donut Shop	Dumpling Restaurant

CLUSTER 1

	resale_price	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
5	243653.846154	Bar	Nightclub	Hotel	Japanese Restaurant	Food Court	Noodle House	Café	Mexican Restaurant	Lounge	Italian Restaurant
7	216000.000000	Noodle House	Dessert Shop	Asian Restaurant	Chinese Restaurant	Seafood Restaurant	Snack Place	BBQ Joint	Coffee Shop	Food Court	Dim Sum Restaurant
11	225843.478261	Hostel	Food Court	Snack Place	BBQ Joint	Thai Restaurant	Historic Site	Noodle House	Chinese Restaurant	Rock Club	Seafood Restaurant
14	250556.338028	Food Court	Chinese Restaurant	Café	Noodle House	Indian Restaurant	Seafood Restaurant	Thai Restaurant	Stadium	Italian Restaurant	Train Station

CLUSTER 2

12	263368.421053	Food Court	Diner	Sandwich Place	Fast Food Restaurant	Italian Restaurant	Coffee Shop	Pool	Recreation Center	Restaurant	Fruit & Vegetable Store
13	253139.742857	Japanese Restaurant	Bubble Tea Shop	Chinese Restaurant	Café	Bakery	Fast Food Restaurant	Supermarket	Sushi Restaurant	ATM	Light Rail Station
16	224294.800000	Coffee Shop	Asian Restaurant	Fast Food Restaurant	Chinese Restaurant	Shopping Mall	Bus Station	Sporting Goods Shop	Food	Supermarket	Bistro
17	248427.587097	Fast Food Restaurant	Coffee Shop	Sushi Restaurant	Food Court	Bakery	Bus Station	Sculpture Garden	Sandwich Place	Café	Candy Store
18	218608.500000	Coffee Shop	Chinese Restaurant	Korean Restaurant	Noodle House	Clothing Store	Ice Cream Shop	Asian Restaurant	Japanese Restaurant	Fast Food Restaurant	Multiplex
19	264170.000000	Bakery	Coffee Shop	Café	Gym	Chinese Restaurant	Japanese Restaurant	Asian Restaurant	Bubble Tea Shop	Fast Food Restaurant	Shopping Mall
21	221511.466667	Japanese Restaurant	Café	Indian Restaurant	Shopping Mall	Frozen Yogurt Shop	Food Court	Fast Food Restaurant	Electronics Store	Coffee Shop	Clothing Store
22	223834.506667	Food Court	Chinese Restaurant	Fried Chicken Joint	Coffee Shop	Supermarket	Fast Food Restaurant	Tea Room	Hainan Restaurant	Italian Restaurant	Shopping Mall

CLUSTER 2

	resale_price	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
0	213859.154930	Coffee Shop	Dessert Shop	Food Court	Japanese Restaurant	Bubble Tea Shop	Supermarket	Snack Place	Asian Restaurant	Fried Chicken Joint	Noodle House
1	219469.014085	Coffee Shop	Sushi Restaurant	Japanese Restaurant	Sandwich Place	Food Court	Chinese Restaurant	Dessert Shop	Noodle House	Fast Food Restaurant	Supermarket
2	220723.525424	Japanese Restaurant	Asian Restaurant	Fast Food Restaurant	Dessert Shop	Chinese Restaurant	Coffee Shop	Indian Restaurant	Café	Gym / Fitness Center	Karaoke Bar
3	233255.307692	Fast Food Restaurant	Asian Restaurant	Coffee Shop	Sushi Restaurant	Shopping Mall	Korean Restaurant	Supermarket	Indonesian Restaurant	Bus Station	Café
6	302217.391304	Coffee Shop	Food Court	Chinese Restaurant	Dessert Shop	Asian Restaurant	Chinese Breakfast Place	Fried Chicken Joint	Shopping Mall	Bus Station	Fast Food Restaurant
9	235102.857143	Fast Food Restaurant	Coffee Shop	Chinese Restaurant	Food Court	Supermarket	Café	Frozen Yogurt Shop	Shopping Mall	Soup Place	Pharmacy
10	240772.704545	Café	Coffee Shop	Chinese Restaurant	Japanese Restaurant	Food Court	Shopping Mall	Pharmacy	Clothing Store	Bubble Tea Shop	Multiplex

CLUSTER 3

	resale_price	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
15	249547.293103	Chinese Restaurant	Asian Restaurant	Coffee Shop	Supermarket	Malay Restaurant	Gym	Hainan Restaurant	Park	Food Court	Train Station
20	204460.367816	Chinese Restaurant	Coffee Shop	Snack Place	Dessert Shop	Cosmetics Shop	Grocery Store	Monument / Landmark	Café	Frozen Yogurt Shop	Bubble Tea Shop

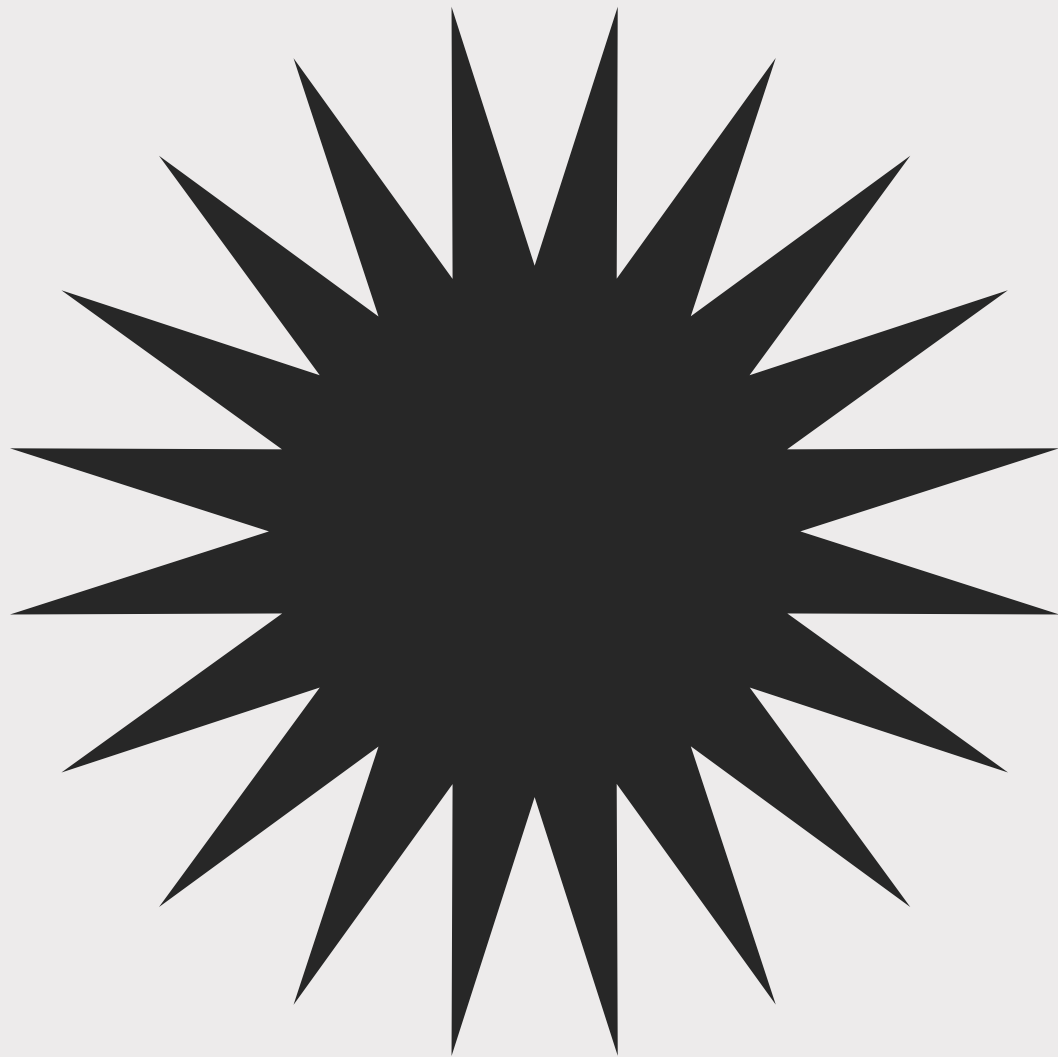
RESULTS AND DISCUSSION

- **Cluster 2 consists** of flats of relatively higher prices
- **All** the clusters are populated with a variety of food options
- Some venues like parks are only found in cluster 0 and cluster 3
- **Cluster 1 does not have any groceries or supermarkets**
- **Cluster 0 does not have any train stations**

RESULTS AND DISCUSSION

- **Cluster 3 seems to be a suitable option for living, with transport, amenities like gym, park etc. while having lower prices**
- **If flexibility in prices is allowed, cluster 2 is the better choice, with a better variety in venues**
- **Based on our assumptions that the individual is looking for the cheapest options, cluster 3 is the better choice, with the basic amenities like transport, park, and supermarket**

CONCLUSION



Other factors NOT considered for:

The different types of flats (which we made an assumption), ethnic quota etc.