



Going Green in Garden City

VEGANISM IN THE SINGAPORE

Business Problem

Singapore was named the second most **vegan**-friendly city in Asia by PETA and sixth most **vegan**-friendly city in the world by HappyCow.

Given a growing vegan movement in Singapore, where should new vegan food entrepreneurs consider opening their new municipalities?

Solving the Problem

1. Determine if there is a relationship between population density and number of vegan restaurants available in the area
2. If there is an association, find out which areas are lacking in vegan restaurants which could serve as potential areas for entrepreneurs to open new vegan restaurants

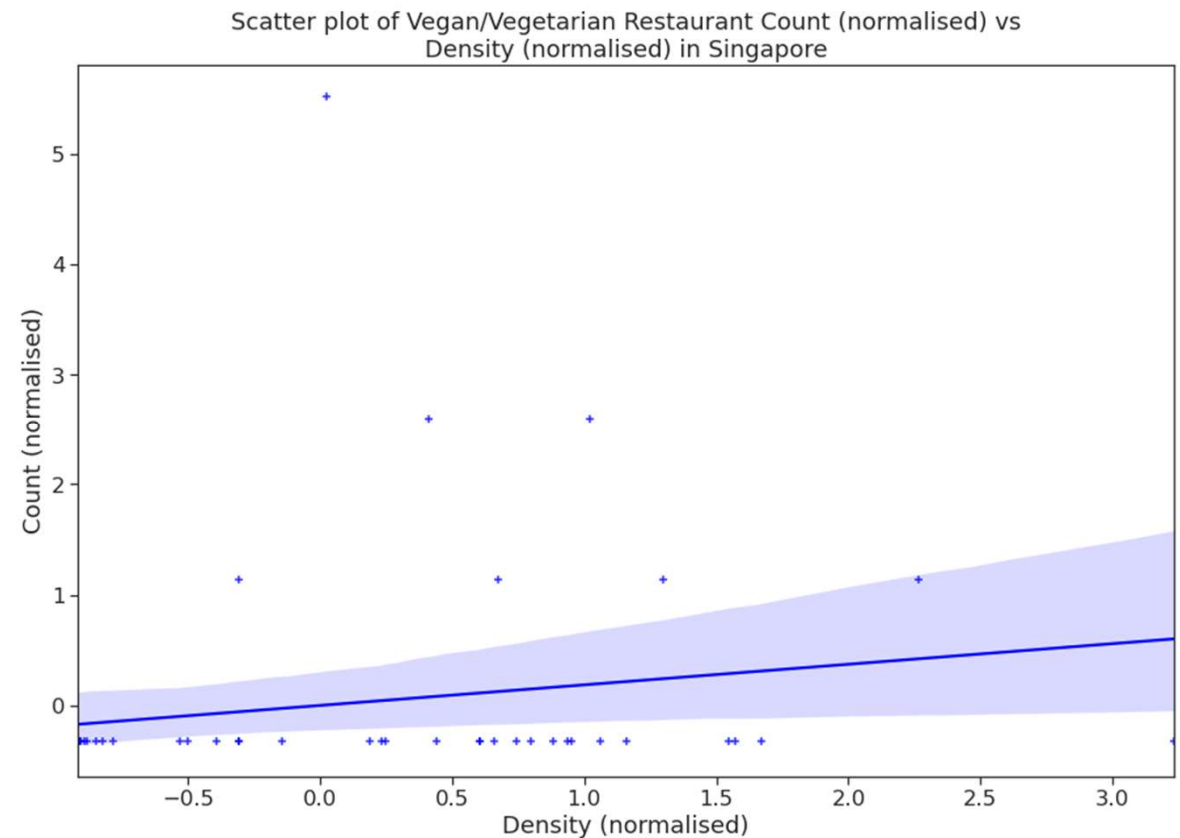
Top 10 Most Populated Areas

	Name (English)	Region	Area (km2)	Search Radius	Population[7]	Density (/km2)	Latitude	Longitude
1	Bedok	East	21.69	2628	279380.0	13000.00	1.324250	103.952970
17	Jurong West	West	14.69	2162	264860.0	18000.00	1.339490	103.707390
46	Tampines	East	20.89	2579	256730.0	12400.00	1.368190	103.929480
53	Woodlands	North	13.59	2080	254730.0	18700.00	1.435850	103.786980
39	Sengkang	North-East	10.59	1836	244600.0	23000.00	1.392440	103.894700
15	Hougang	North-East	13.93	2106	226240.0	16000.00	1.371240	103.891620
54	Yishun	North	21.24	2600	220320.0	10100.00	1.436210	103.835820
11	Choa Chu Kang	West	6.11	1395	190890.0	30000.00	1.386160	103.746180
33	Punggol	North-East	9.34	1724	170560.0	17800.00	1.402460	103.906860

Top 5 Areas with Vegan Restaurants

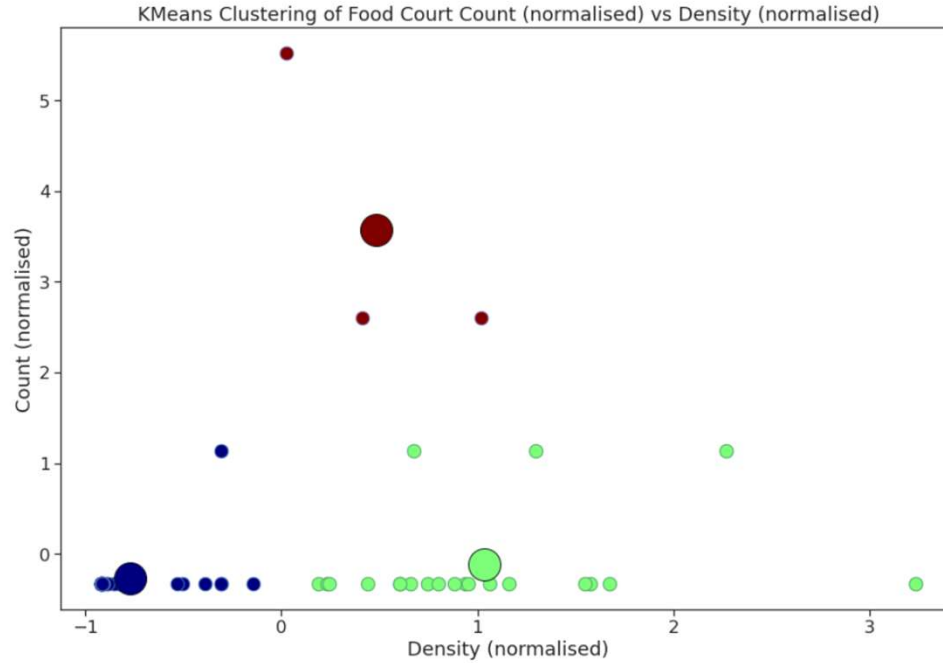
	Neighborhood	Count
35	Rochor	4
30	Paya Lebar	2
4	Bukit Batok	2
15	Hougang	1
39	Serangoon	1

Correlation between Population Density and Number of Vegan Restaurants



There is a positive but weak relationship between the population density of the neighborhood in Singapore and the number of vegan restaurants.

K-Means Clustering based on Density



Number of Vegan/Vegetarian Restaurants per cluster

	Neighborhood	Density (/km2)	Count	Cluster Label
35	Rochor	6800.0	4	2
4	Bukit Batok	14000.0	2	2
30	Paya Lebar	9600.0	2	2

	Neighborhood	Density (/km2)	Count	Cluster Label
40	Simpang	11500.0	1	1
39	Serangoon	23000.0	1	1
15	Hougang	16000.0	1	1
0	Ang Mo Kio	13400.0	0	1
23	Marine Parade	8000.0	0	1
49	Tuas	14300.0	0	1
46	Tanglin	12400.0	0	1
38	Sengkang	8400.0	0	1
36	Seletar	8300.0	0	1
33	Queenstown	17800.0	0	1
29	Pasir Ris	13500.0	0	1
18	Kallang	11000.0	0	1
1	Bedok	13000.0	0	1
17	Jurong West	18000.0	0	1
14	Geylang	11400.0	0	1
12	Clementi	9800.0	0	1
11	Choa Chu Kang	30000.0	0	1
6	Bukit Panjang	15000.0	0	1
5	Bukit Merah	11000.0	0	1
2	Bishan	12000.0	0	1
53	Yishun	18700.0	0	1

	Neighborhood	Density (/km2)	Count	Cluster Label
16	Jurong East	4400.00	1	0
3	Boon Lay	3.80	0	0
31	Pioneer	3.40	0	0
51	Western Water Catchment	0.25	0	0
50	Western Islands	2.30	0	0
48	Toa Payoh	1.40	0	0
47	Tengah	2800.00	0	0
45	Tampines	53.20	0	0
44	Sungei Kadut	0.00	0	0
43	Straits View	244.00	0	0
42	Southern Islands	3000.00	0	0
41	Singapore River	0.00	0	0
37	Sembawang	28.30	0	0
34	River Valley	4400.00	0	0
32	Punggol	8.30	0	0
28	Outram	980.30	0	0
7	Bukit Timah	4400.00	0	0
27	Orchard	5600.00	0	0
26	Novena	1.20	0	0
25	Newton	3800.00	0	0
24	Museum	480.00	0	0
22	Marina South	0.00	0	0
21	Marina East	0.00	0	0
20	Mandai	180.20	0	0
19	Lim Chu Kang	5.20	0	0
13	Downtown Core	680.00	0	0
10	Changi Bay	0.00	0	0
9	Changi	80.82	0	0
8	Central Water Catchment	0.00	0	0
52	Woodlands	13.00	0	0

Discussions

The accuracy of the K means algorithm is sufficiently high given the frequency of overlapping density between cluster 1 and 2. However, based on our observations we observe that majority of vegan/vegetarian restaurants are present in cluster 2, with the highest count being in Rocher. While there is a need for more data to safely conclude that opening a vegan restaurant is advisable for a vegan restaurant entrepreneur given the weak correlation and sufficiently accurate clustering algorithm, this finding seems to point towards the direction of bukit batok and paya lebar being potential areas.