Recommending the best location for opening new restaurants in Tokyo now

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How can I recommend the best location for restaurant owners now?

・As many people know now is the hardest time for running restaurants because of Covid19.

・This situation restaurants owners rely on take out service.

・For enjoying take out, we need some free spaces such as parks.

・An area which has enough numbers of parks and is less competitive should be recommended for new owners.

About Targeted cities

・The targeted cities are Shinjuku city, Shibuya city, Chiyoda city and Minato city.

・Shinjuku city is a typical city for office workers and there are so many companies.

・Shibuya is a young and energetic city and there are many tech and venture companies.

・Chiyoda city is a traditional city and most of bureaucrats and politicians work there.

・Minato city is an entertaining city and great places for young people.

Shinjuku city

Shibuya city

Chiyoda city

Minato city

Data acquisition and cleaning

・Data will be taken from foursquare.

・Foursquare provides service in Japan as well, so I can still use it.

・Data will be parks and restaurants in each cities.

・In case, if there are some mis-translation problems, I need to check each time.

Data frame of Parks

Shinjuku city

	name	categories	id	lat	lng
0	新宿遊歩道公園 四季の路	[{'id': '4bf58dd8d48988d1f9931735', 'name': 'R...	4bcc021a937ca593e685aa92	35.694562	139.704569
1	Kashiwagi Park (柏木公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4b5fbf2df964a52019cb29e3	35.694847	139.697556
2	公益財団法人 東京都公園協会	[{'id': '4bf58dd8d48988d124941735', 'name': 'O...	504457a2e4b037986897f270	35.696246	139.701062
3	歌舞伎町公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	532e9e27498ee94a23dfc6f3	35.694381	139.702346
4	Okubo Park (大久保公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4c36f1ed93db0f471be01e92	35.697397	139.701264
5	東大久保公園	[{'id': '4bf58dd8d48988d1e7941735', 'name': 'P...	4ed71e362c5b95fea16e59f7	35.694859	139.709118
6	Kabukicho Intersection (歌舞伎町交差点)	[{'id': '52f2ab2ebcbc57f1066b8b4c', 'name': 'I...	4db83d02cda105154123c4c4	35.693529	139.701265

Shibuya city

	name	categories	id	lat	lng
0	Kashiwagi Park (柏木公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4b5fbf2df964a52019cb29e3	35.694847	139.697556
1	新宿遊歩道公園 四季の路	[{'id': '4bf58dd8d48988d1f9931735', 'name': 'R...	4bcc021a937ca593e685aa92	35.694562	139.704569
2	公益財団法人 東京都公園協会	[{'id': '4bf58dd8d48988d124941735', 'name': 'O...	504457a2e4b037986897f270	35.696246	139.701062
3	Okubo Park (大久保公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4c36f1ed93db0f471be01e92	35.697397	139.701264
4	歌舞伎町公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	532e9e27498ee94a23dfc6f3	35.694381	139.702346
5	Little Park Bridge (公園小橋)	[{'id': '4bf58dd8d48988d1df941735', 'name': 'B...	4c0addb2ffb8c9b63e626c61	35.691905	139.693951
6	野方第一公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	502ee77de4b047ef9a394038	35.692125	139.694241
7	Kabukicho Intersection (歌舞伎町交差点)	[{'id': '52f2ab2ebcbc57f1066b8b4c', 'name': 'I...	4db83d02cda105154123c4c4	35.693529	139.701265

Chiyoda city

	name	categories	id	lat	lng
0	神保町愛全公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4b6c1461f964a520c2222ce3	35.696979	139.756293
1	Nishi-Kanda Park (西神田公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4c1c8b8c63750f472bc0b667	35.698519	139.754722
2	A2-03.Nishikanda Park(West side) - Tokyo Chiyo...	[{'id': '4e4c9077bd41f78e849722f9', 'name': 'B...	5636eee7498eaf29d53306f0	35.698277	139.754840
3	九段坂公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	51a98ec1498ec63158095450	35.694738	139.748725
4	Tayasu-mon Gate Intersection (田安門交差点)	[{'id': '52f2ab2ebcbc57f1066b8b4c', 'name': 'I...	4d64ee49072a6ea89c2ff74d	35.694969	139.748672
5	俎橋児童遊園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4e1400a86284431b53535c3b	35.695833	139.752495
6	堀留南児童遊園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4de4af6cc65b7a3e214f18b2	35.697918	139.752113

Minato city

	name	categories	id	lat	lng
0	Kamezuka Park (亀塚公園)	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4b56a3cef964a520611728e3	35.643334	139.740522
1	港区立高浜公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4de3637245dd180ae55cbda8	35.638101	139.743379
2	三田台公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4b5a5610f964a52030be28e3	35.642481	139.739210
3	三田台公園 ビオトープ	[{'id': '52e81612bcbc57f1066b7a13', 'name': 'N...	5732ef89498e7f7dfe676cd9	35.642350	139.739750
4	港区立高松くすのき公園	[{'id': '4bf58dd8d48988d163941735', 'name': 'P...	4d143bf11356a0939a73c782	35.643025	139.735990
5	大庭城址公園	[]	4dbe5e19fa8cee72737dd5d3	35.643475	139.744786
6	車町児童遊園	[{'id': '4bf58dd8d48988d1e7941735', 'name': 'P...	4c19ace5d4d9c9282b6cf129	35.637119	139.739737
7	白高児童遊園	[{'id': '4bf58dd8d48988d1e7941735', 'name': 'P...	4c0982ccffb8c9b66c0f6a61	35.644718	139.734824

Data frame of Restaurants

Shinjuku city

	name	categories	id	lat	lng
0	Robot Restaurant (ロボットレストラン)	[{'id': '56aa371be4b08b9a8d573538', 'name': 'T...	5053222fe4b055f81ad14a41	35.694319	139.702843
1	レストランはやしや	[{'id': '55a59bace4b013909087cb36', 'name': 'Y...	4c7e2ce510916dcb636f2b96	35.693436	139.701892
2	Bakery Restaurant Saint Marc (ベーカリーレストラン サンマルク)	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	4d12cc1dffa1224b3a1a9cad	35.692443	139.698503
3	J'z (フレンチバル&レストラン ジェイズ)	[{'id': '4bf58dd8d48988d10c941735', 'name': 'F...	50160a5ee4b0ad6ab3763d4b	35.693103	139.704352
4	タイレストラン ヤカ	[{'id': '4bf58dd8d48988d149941735', 'name': 'T...	4dee19867d8bb2167432e890	35.694872	139.705330

Shibuya city

	name	categories	id	lat	lng
0	Bakery Restaurant Saint Marc (ベーカリーレストラン サンマルク)	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	4d12cc1dffa1224b3a1a9cad	35.692443	139.698503
1	レストランはやしや	[{'id': '55a59bace4b013909087cb36', 'name': 'Y...	4c7e2ce510916dcb636f2b96	35.693436	139.701892
2	Robot Restaurant (ロボットレストラン)	[{'id': '56aa371be4b08b9a8d573538', 'name': 'T...	5053222fe4b055f81ad14a41	35.694319	139.702843
3	Beer Restaurant Lion (ビヤレストラン ライオン)	[{'id': '4bf58dd8d48988d155941735', 'name': 'G...	5952448cbed4834674282fc3	35.691105	139.702500
4	J'z (フレンチバル&レストラン ジェイズ)	[{'id': '4bf58dd8d48988d10c941735', 'name': 'F...	50160a5ee4b0ad6ab3763d4b	35.693103	139.704352

Chiyoda city

	name	categories	id	lat	lng
0	オークラ カフェ&レストラン メディコ	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	59e59dccb3d8e257351c3822	35.693775	139.752140
1	PARK RESTAURANT (パークレストラン)	[{'id': '4bf58dd8d48988d128941735', 'name': 'C...	53c1fd1a498eb88f6affefe2	35.691426	139.752939
2	Restaurant Alaska (レストラン アラスカ)	[{'id': '4bf58dd8d48988d10c941735', 'name': 'F...	4cbbbdda90c9a143bd3097d6	35.691104	139.757134
3	レストラン 鳴海	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	4b621897f964a52027352ae3	35.697248	139.755422
4	Restaurant Budo (レストラン武道)	[{'id': '4bf58dd8d48988d16d941735', 'name': 'C...	4ccfcd1448b837044c22eede	35.692881	139.750045

Minato city

	name	categories	id	lat	lng
0	レストラン クラウン	[{'id': '4bf58dd8d48988d143941735', 'name': 'B...	4c47b974417b20a171bcdea9	35.641460	139.741545
1	レストランカフェ グレース	[{'id': '4bf58dd8d48988d16d941735', 'name': 'C...	4bee2b1c767dc9b67424d4e9	35.647321	139.740043
2	レストラン 菊	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	4c3fd7fbcc410f47efdea861	35.642179	139.742463
3	レストラン 樫ノ木	[{'id': '4bf58dd8d48988d1c4941735', 'name': 'R...	4fe53520e4b0ef8f177786db	35.638876	139.738311
4	プール&レストランバー ワンポイント	[{'id': '4bf58dd8d48988d147941735', 'name': 'D...	4be2467421d5a593fd581611	35.644856	139.743815

The Result of Data

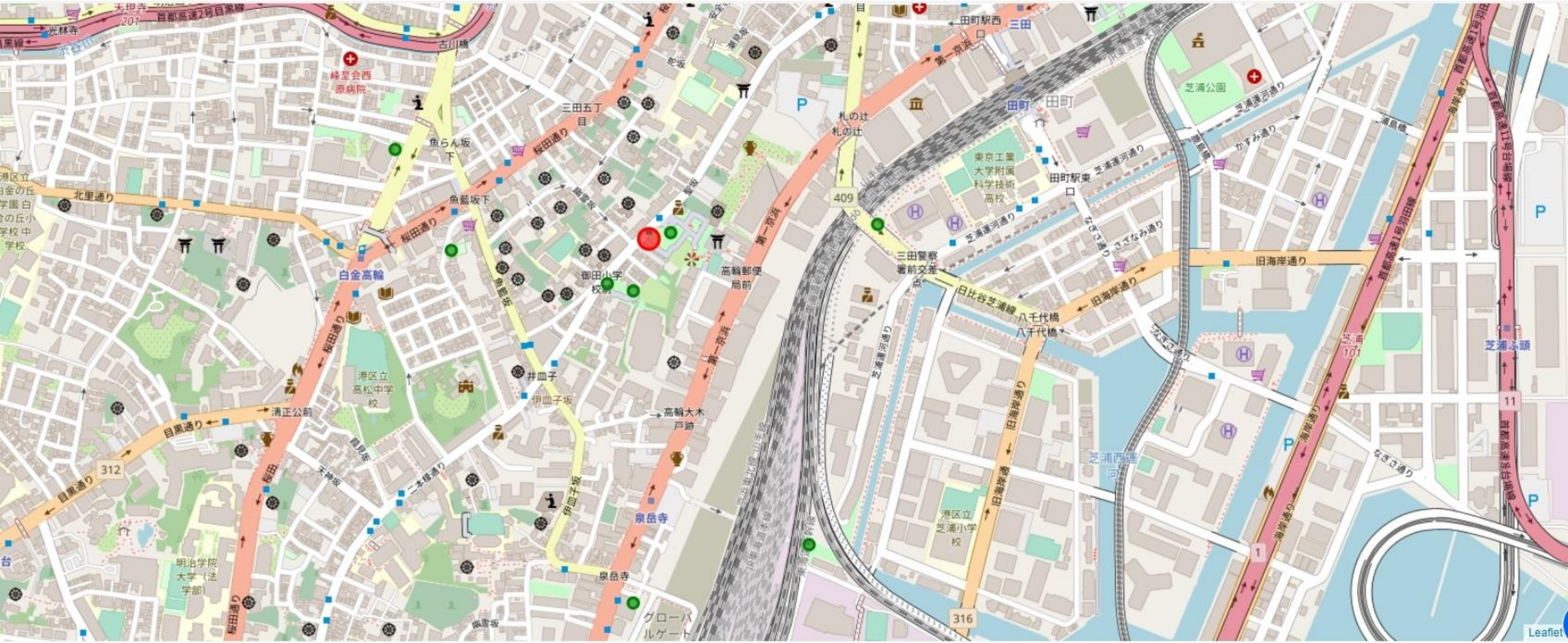
- Shinjuku:7 parks, 31 restaurants.
- Shibuya:8 parks, 31 restaurants.
- Chiyoda:7 parks, 15 restaurants.
- Minato: 8 parks, 8 restaurants.
- From above results, I will recommend Minato city for owner who want to open new restaurant in Tokyo.

(Less competitive and enough numbers of parks which are good for take out service)

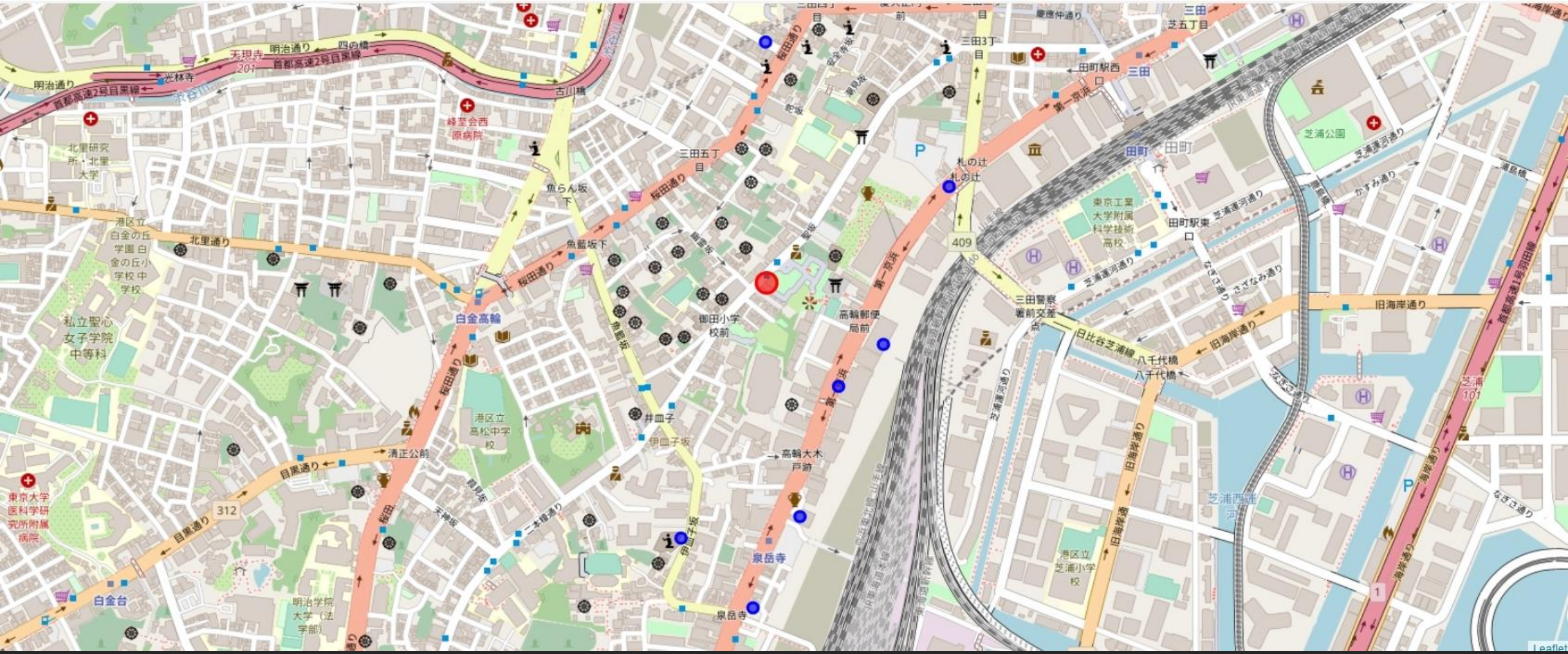
The additional research for which location is the best for new owners

- First, I will see map of Minato city with marks of the parks and restaurants.
- I will consider the best location for take out service.
- The location should be close or next to parks.
- The location should be less or no restaurants around.
- By achieving the two points, it will be the best for take out service and no rivals for now.
- If it is difficult to judge by geographical information, should be used statistical methods such as collecting distance by clustering.

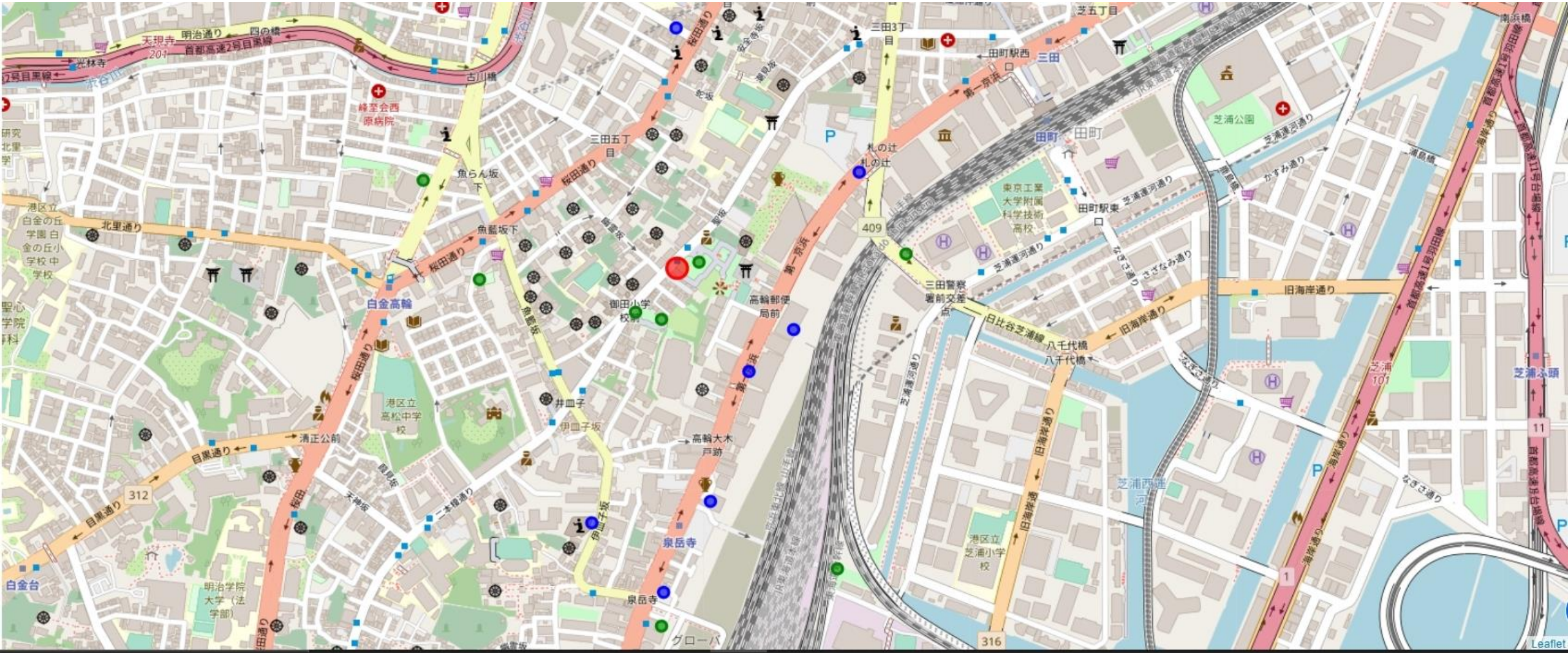
The locations of parks in Minato city



The locations of restaurants in Minato city



The locations of parks and restaurants in Minato city

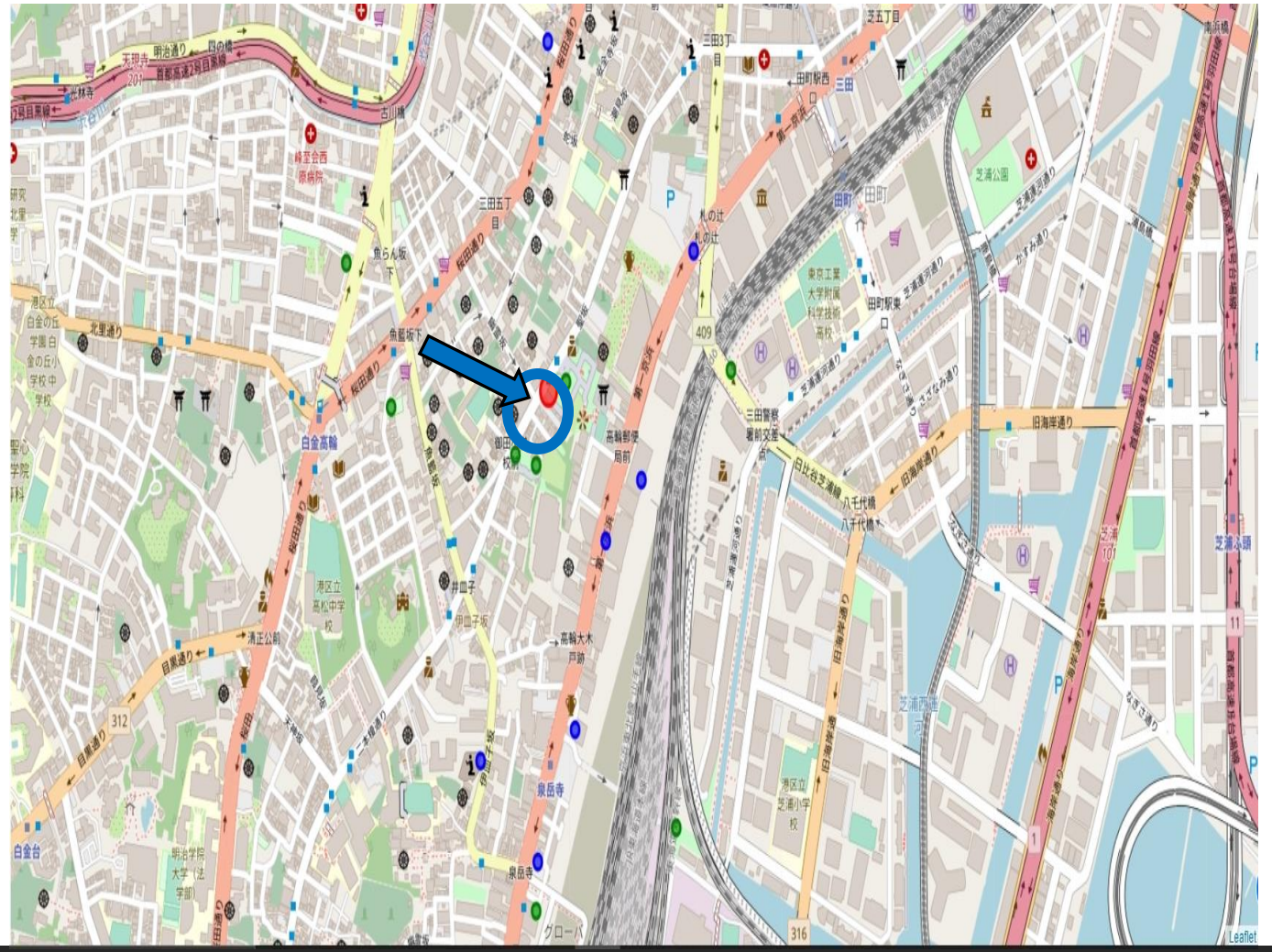


Finding the best location by geographical information

・In the blue circle which are surrounded by 3 parks and no restaurants.

・The location's latitude is around 35.64 and around longitude is 139.74.

・The location looks idealistic.



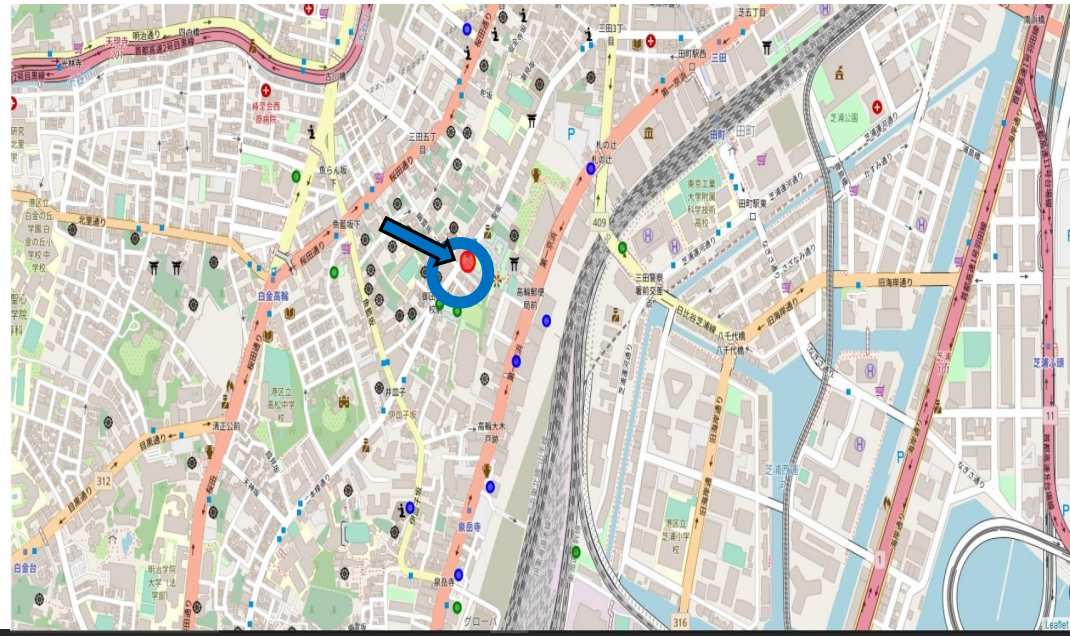
Result of graphical data

・I found the great location for owners who want to open new restaurants in Tokyo.

(Latitude : around **35.6432274**, Longitude : around **139.7400553**)

・However, I need to collect mathematical result for more persuasive recommendation.

・I continue to use the data and find the best location.



Mathematical Methodology

・I use Euclidean distance formula for analyzing the desirable location.

$$d(p,q)=d(q,p)=\sqrt{(q1-p1)^2+(q2-p2)^2+\ldots+(qn-pn)^2}=\sqrt{\sum_{i=1}^{n}(qi-pi)^2}$$

・New restaurants should be next to park. Thus, I attempt to the best park's location for opening new restaurants.

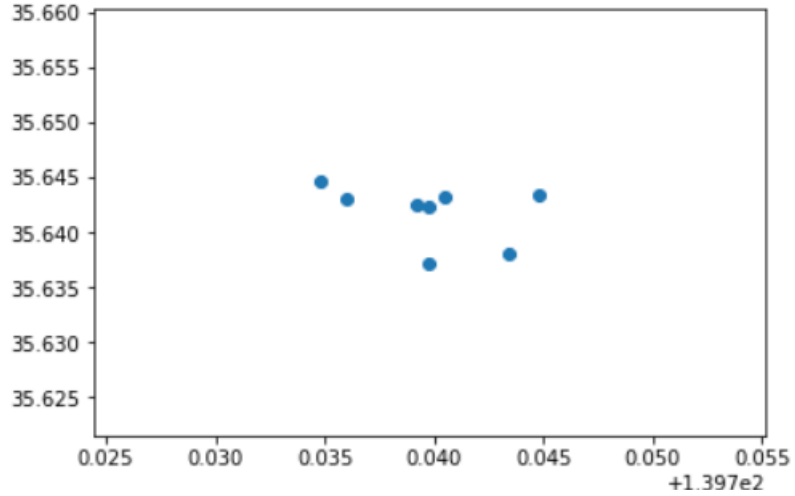
・If the park is closer to other parks, it is better because customers can take foods there as well.

・If the park is far from restaurants, owners can attract customers more easily.

Location of parks and restaurants

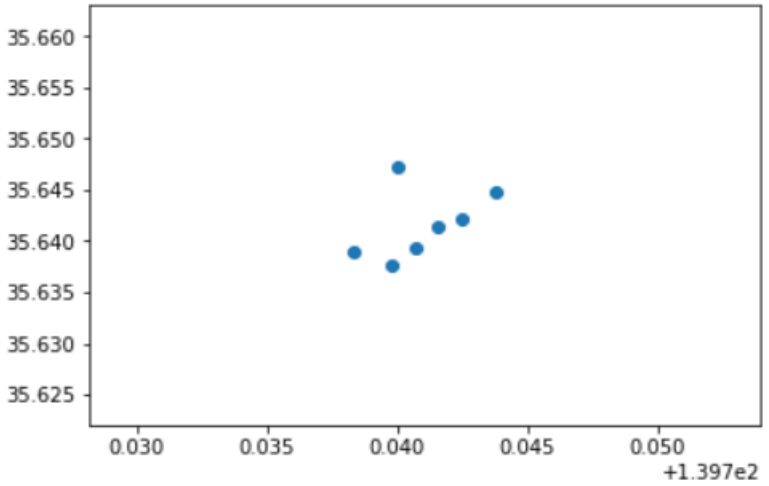
・*Location of parks*

(Latitude: y , Longitude x)



・*Location of restaurants*

(Latitude: y , Longitude x)



The result of Euclidean distance 1

・I sum up for all parks in Minato city, total Euclidean distance to each park and restaurants.

・I still need to use this results for finding the best location.

	Distance_parks	Distance_restaurants
0	0.029714	0.026777
1	0.046621	0.036199
2	0.027409	0.028009
3	0.027072	0.026134
4	0.038365	0.043599
5	0.047611	0.035693
6	0.044816	0.034613
7	0.048215	0.053797

・For the best location, total distance to parks should be the least and total distance to restaurants should be the biggest.

・It means distance to parks is negative and distance to restaurants is positive.

The result of Euclidean distance2

distance to parks : negative

distance to restaurants : positive

・I calculate distance to restaurants minus total distance to parks and obtain this result.

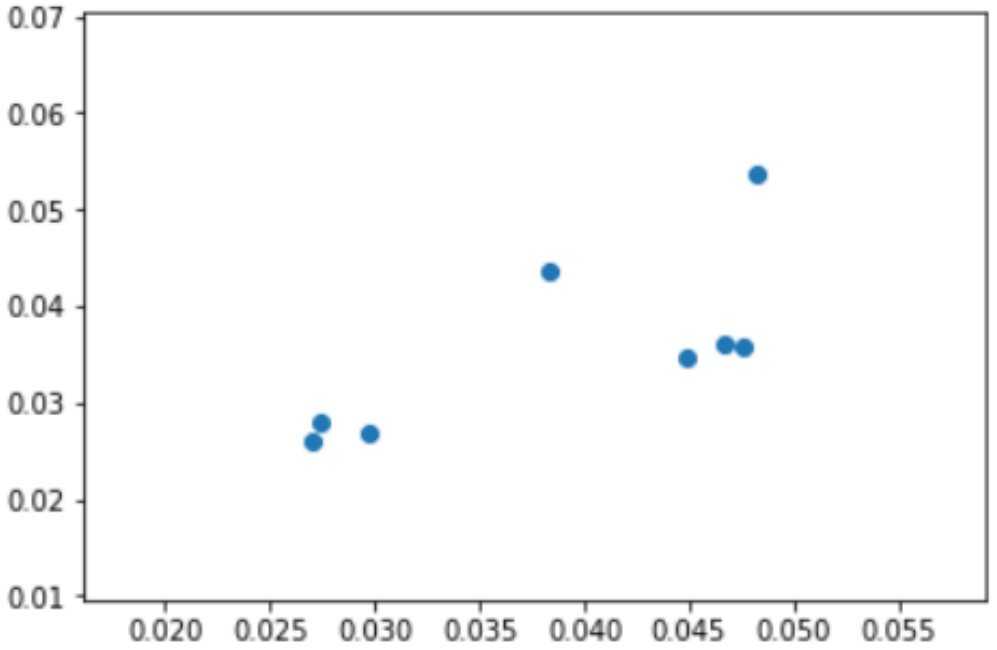
・Thus, 6th(No.5) park is the best from calculation.

	the_best_park
0	0.002937
1	0.010422
2	-0.000599
3	0.000937
4	-0.005234
5	0.011918
6	0.010203
7	-0.005582

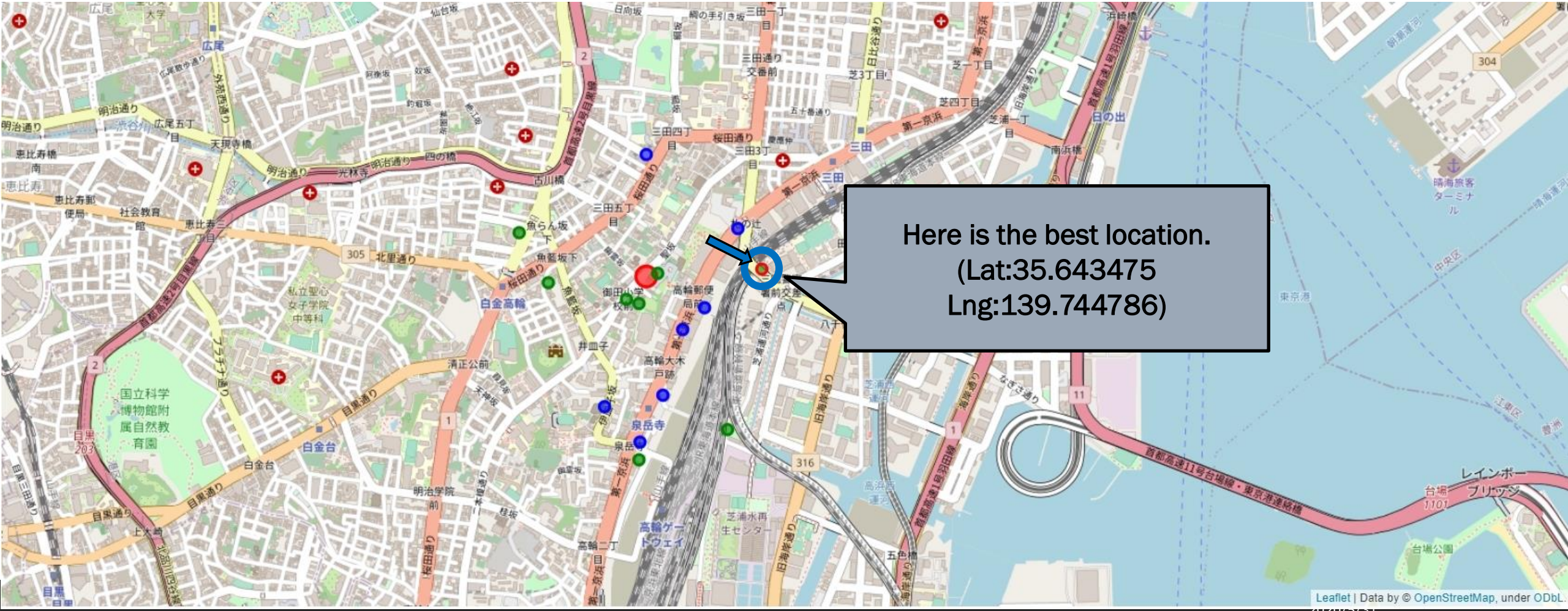
The result of Euclidean distance 3

・There are 3 close points parks in the bottom.

・The bottommost is the 6th(No.5) park.



Graphical data for the result



Conclusion

・I found the great location for owners who want to open new restaurants in Tokyo.

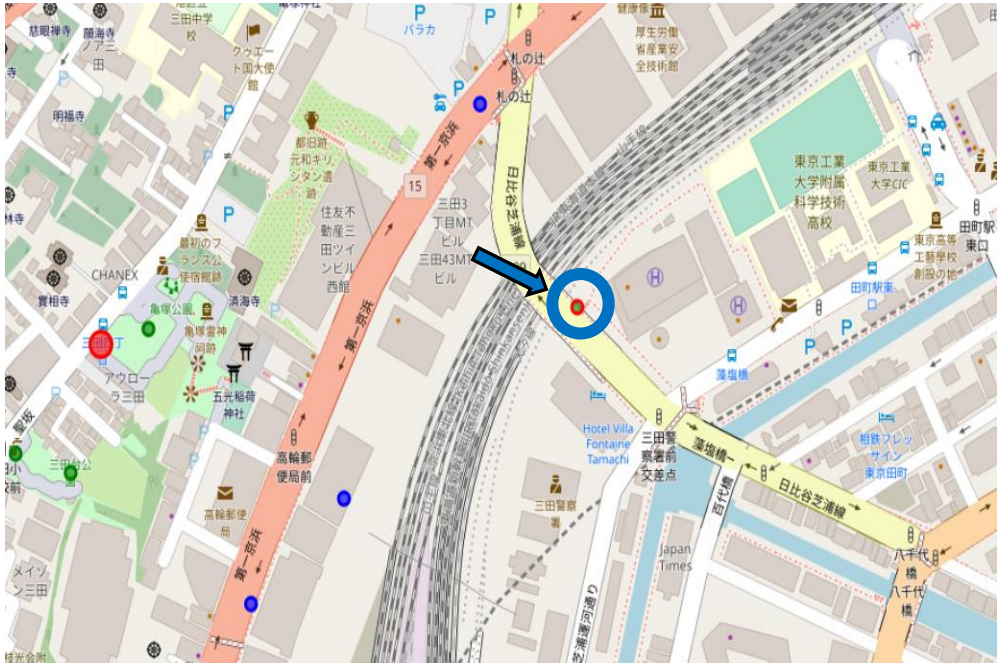
(Latitude：**35.6432274** , Longitude：**139.7400553**)

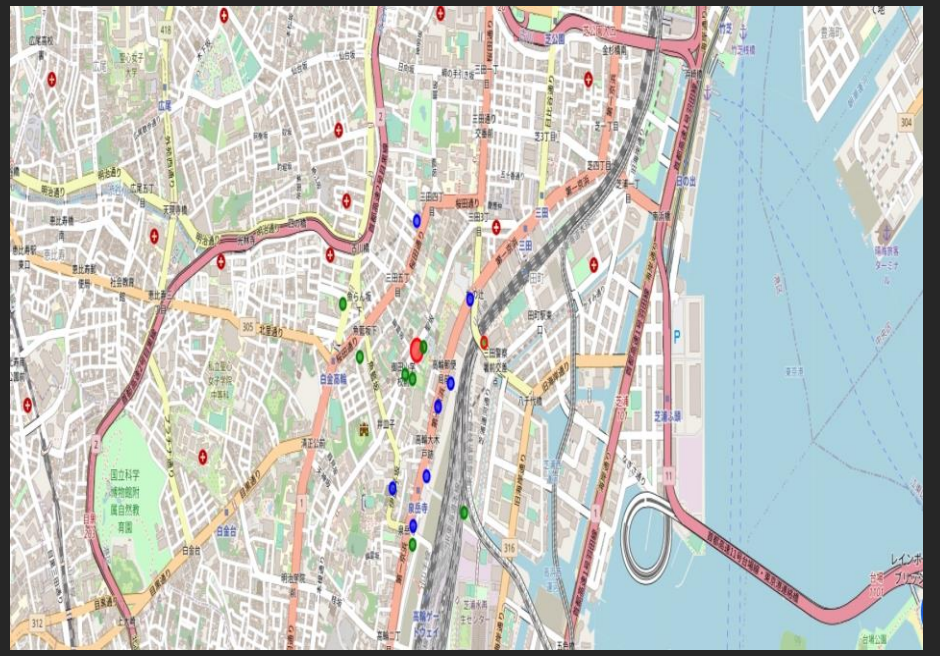
・However, after I did use mathematical methods, I found the best location.

Latitude :**35.643475**

Longitude: **139.744786**

I could not get this result if I did not calculate not just looking map.





The END

Thank you so much for reading!

2020/5/31