Report: Using Open Source Data and Python Data Analysis to Measure Urban Nightlife Intensity in Tel-Aviv

Applied Data Science Capstone by IBM/Coursera

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Introduction: Business Problem

In this project we will segment neighborhoods in **Tel-Aviv** based on the average **closing hour** of recreational venues, with which I hope to help people and agencies make informed decisions. We will use open-source data resources and data analysis tools for this project. The potential stakeholders of such information include:

1. Families looking for a quiet neighborhood to live in
2. Young adults looking for a neighborhood with rich nightlife
3. An entrepreneur looking to open a late-night venue in an area with a large amount of such activity already

Data

Based on the goals of this project we will require an open data source with information about venues, including their type, location, and closing hours. For this we will use the following sources:

1. Google Geocoding API to retrieve locations based on names

   https://developers.google.com/maps/documentation/geocoding/start

2. Foursquare API to retrieve all the venues and related information

   https://developer.foursquare.com/

3. Neighborhood polygons from the Tel-Aviv Municipality GIS website:

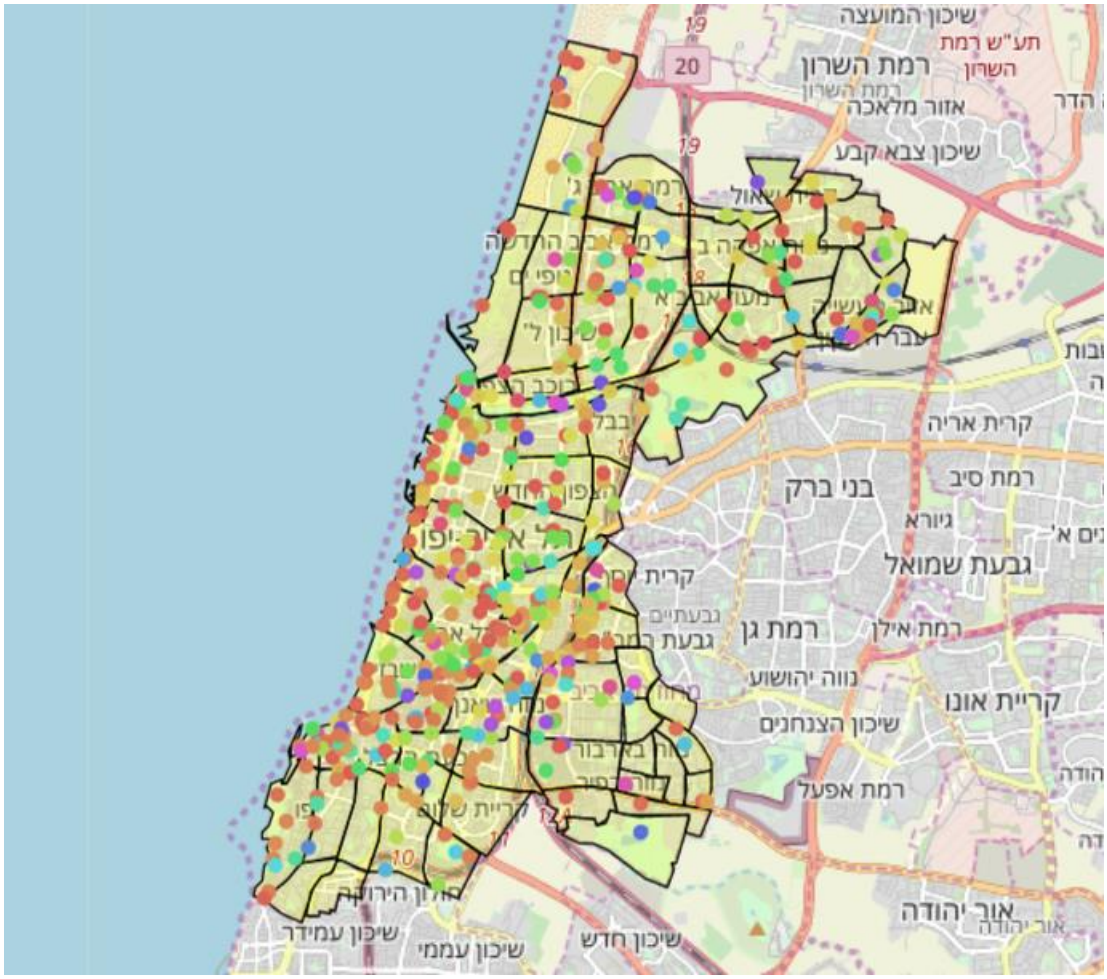
   Download the neighborhood polygons shapefile from the Tel Aviv Municipality GIS website: https://gisn.tel-aviv.gov.il/

   Open as GeoDataFrame (with the geometry column) and get the centroid from each for the Foursquare API search.

Example of all the venues data extracted and assigned to neighborhoods by location:

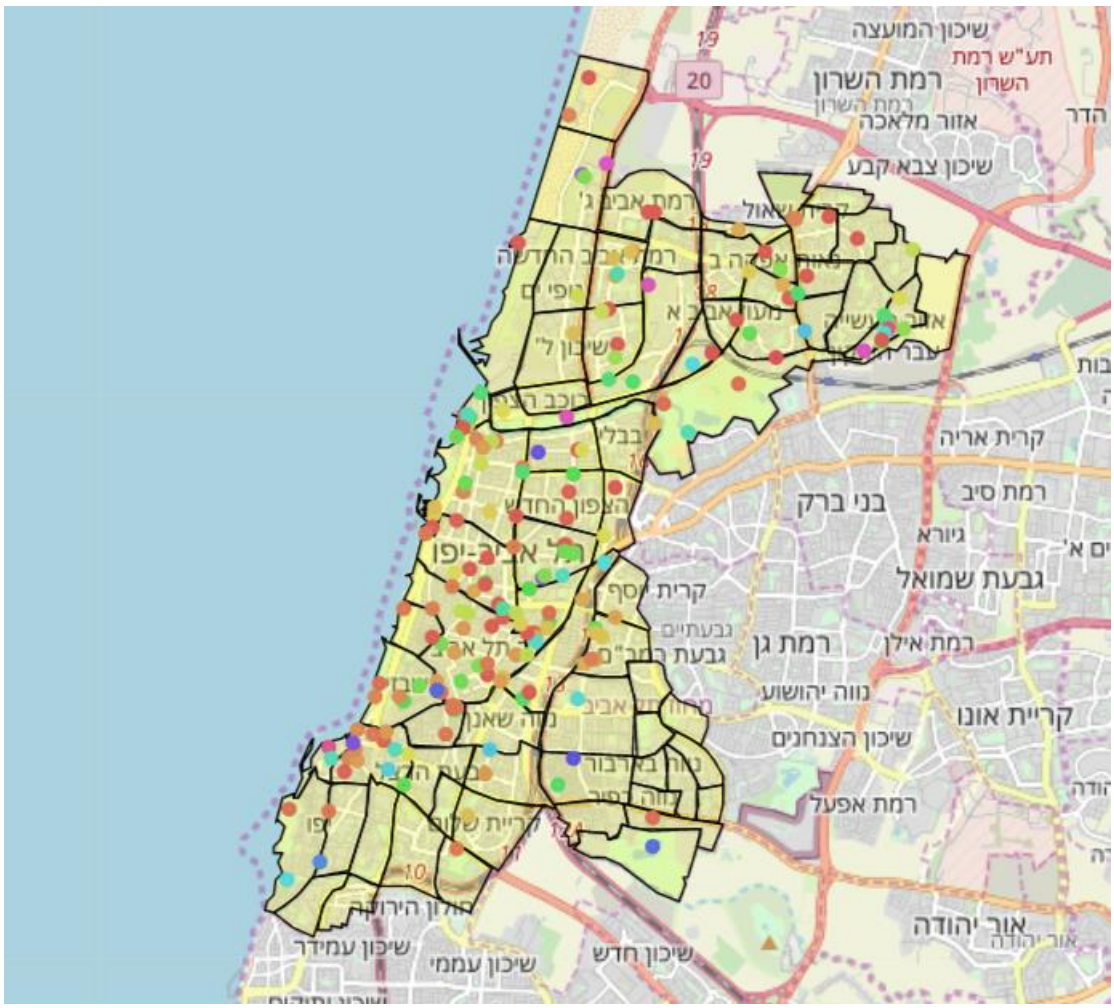
	Name	id	Latitude	Longitude	Category	Point
0	TAU Sports Center (מרכז הספורט באוניברסיטת תל ...	4be516bf7e2a76b01dc21c9b	32.115798	34.802301	College Gym	POINT (34.80230116921697 32.11579830741788)
1	Tel Baruch Beach (חוף תל ברוך)	4bdadb15c79cc928cef87fe9	32.121031	34.782308	Beach	POINT (34.78230813888089 32.12103144668588)
2	חניון רידינג	4c75fe952db5236ae3b9be79	32.099068	34.779724	Parking	POINT (34.77972439929739 32.09906843522906)
3	Super Yuda	59a0912e9b04732957d43d76	32.112197	34.787434	Grocery Store	POINT (34.787434 32.112197)
4	Ramat Aviv Mall (קניון רמת אביב)	4b1aaf4ff964a52055ef23e3	32.112136	34.795028	Shopping Mall	POINT (34.79502775093275 32.11213600651605)
5	Eretz Israel Museum (מוזיאון ארץ ישראל)	4b0588e5f964a52089de22e3	32.103254	34.796234	Museum	POINT (34.79623417929791 32.10325422086625)
6	Super Yuda (סופר יודה)	524fa80193cd62672e5d17e8	32.095039	34.778606	Grocery Store	POINT (34.77860648476365 32.09503917386075)
7	Sporteck (ספורטק)	4bb1fc69f964a520bfaf3ce3	32.098395	34.789433	Basketball Court	POINT (34.78943324700622 32.09839461161492)

All venues data on Tel-Aviv neighborhoods map:



All venues data after requesting the closing hours for each venue and calculating the average closing hour. Many venues lacked data or appeared to close before 18:00 PM:

	Name	id	Latitude	Longitude	Category	geometry	shemshchun	avg_closing_hour
0	TAU Sports Center (מרכז הספורט באוניברסיטת תל ...	4be516bf7e2a76b01dc21c9b	32.115798	34.802301	College Gym	POINT (34.80230116921697 32.11579830741788)	אוניברסיטת ת"א	1900-01-01 21:46:00
1	Eretz Israel Museum (מוזיאון ארץ ישראל)	4b0588e5f964a52089de22e3	32.103254	34.796234	Museum	POINT (34.79623417929791 32.10325422086625)	אוניברסיטת ת"א	1900-01-01 21:34:00
10	Yitzhak Rabin Center	4bd5843e6798ef3b9968638d	32.102804	34.799790	History Museum	POINT (34.7997895016733 32.10280371086083)	אוניברסיטת ת"א	1900-01-01 18:30:00
14	Blue (בלו)	4bb5c3a06edc76b0a601301c	32.121126	34.782023	Café	POINT (34.78202262416243 32.12112637799614)	אזור שדה דב	1900-01-01 20:51:00
16	חניון רידינג	4c75fe952db5236ae3b9be79	32.099068	34.779724	Parking	POINT (34.77972439929739 32.09906843522906)	פארק הירקון	1900-01-01 22:00:00

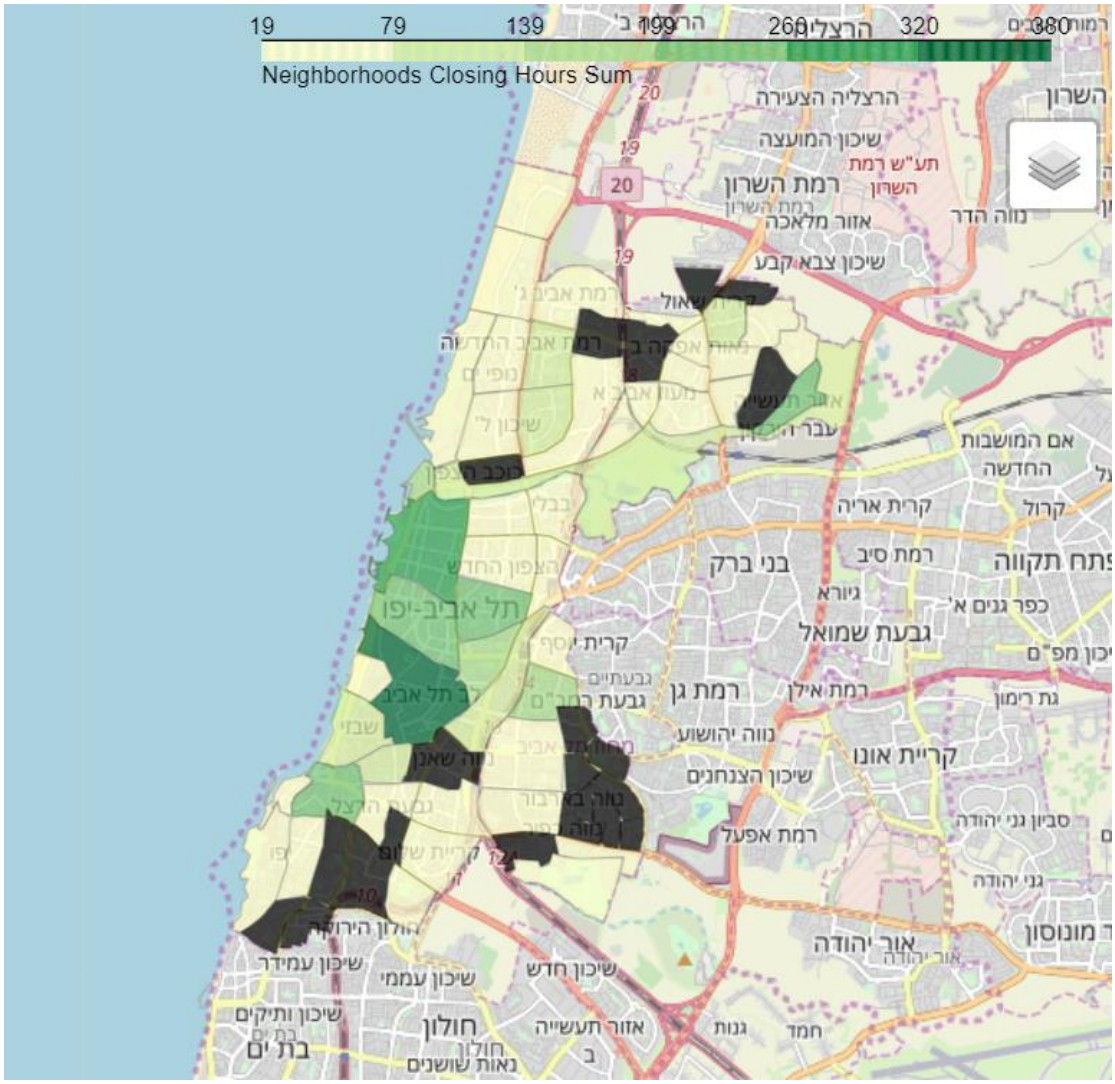


Analysis

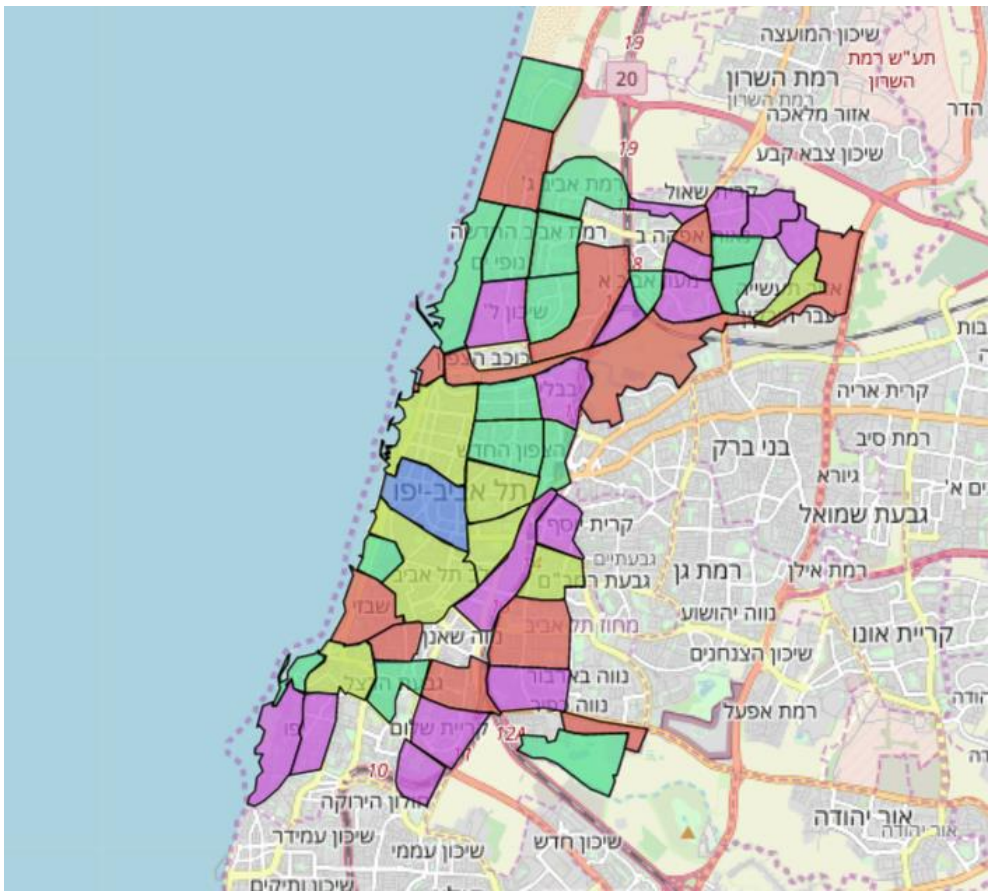
Neighborhood intensity as measured by combining all the venues closing hours:

Top 15:

	shemshchun	num_avg_closing_hour
0	לב תל-אביב	380.066667
1	הצפון הישן - החלק הצפוני	283.150000
2	הצפון הישן-החלק הדרומי	256.500000
3	צפון יפו	255.683333
4	הצפון החדש-החלק הדרומי	224.200000
5	עתידים	211.566667
6	גני שרונה	198.183333
7	נמל תל-אביב	164.950000
8	ביצרון ורמת ישראל	150.700000
9	פלורנטין	126.550000
10	נוה צדק	113.383333
11	פארק הירקון	105.816667
12	נוה אביבים וסביבתה	105.500000
13	רמת-אביב	102.700000
14	גני צהלה, רמות צהלה	82.700000


19
79
139
199
260
320
380
Neighborhoods Closing Hours Sum
הרצליה הצעירה
השרון
שיכון המועצה
תע"ש רמת השרון
רמת השרון
אזור מלאכה
נווה הדר
שיכון צבא קבע
עבר ה
אם המושבות החדשה
קרית אריה
קרול
בני ברק
רמת סיב
פתח תקווה
כפר גנים א'
גבעת שמואל
קרית
רמת גן
רמת אילן
נווה יהושוע
קריית אונו
שיכון הצנחנים
רמת אפעל
סביון גני יהודה
גני יהודה
אור יהודה
מונוסון
שיכון עמידר
שיכון עמי
שיכון חדש
שיכון ותיקים
בת ים
חולון
אזור תעשייה
גנות
חמד

K-means Clustering: (k=5)



Top labels (1 and 3):

Labels	shemshchun	18	19	20	21	22	23	24
3	הצפון הישן-החלק הדרומי	0.0	0.0	3.0	3.0	5.0	1.0	0.0
1	ביצרון ורמת ישראל	0.0	2.0	0.0	1.0	1.0	3.0	0.0
1	גני שרונה	0.0	0.0	0.0	4.0	2.0	2.0	1.0
1	הצפון החדש-החלק הדרומי	1.0	3.0	2.0	3.0	1.0	1.0	0.0
1	הצפון הישן - החלק הצפוני	0.0	2.0	1.0	2.0	3.0	3.0	2.0
1	לב תל-אביב	1.0	3.0	3.0	4.0	1.0	5.0	1.0
1	עתידים	2.0	0.0	2.0	1.0	1.0	4.0	0.0
1	צפון יפו	1.0	2.0	1.0	1.0	3.0	2.0	2.0

Results and Discussion

It is important to understand the limits of this analysis. Mainly, we don't know how reliable and statistically credible the Foursquare Data is. However, it perfectly matches my experience with Tel-Aviv and that is a good direction. Further research and comparison with other data sources should be pursued.

Conclusion

We set out to discover and analyze the nightlife intensity in Tel-Aviv, by neighborhood. In conclusion, we found there is a great variety in the intensity of nightlife throughout the city. From the initial data exploration, with help from the choropleth map, is seems that the strongest nightlife intensity in Tel-Aviv is in the neighborhood 'לב העיר' (in the yellow category, in the center.) Later, the K-means Cluster Analysis singled out a different neighborhood, 'הצפון הישן-החלק הדרומי' (in the blue category.)

From inspecting the most intense clusters (above), we can see that labels 1 and 3 were applied to the most intense neighborhoods in the city. It also appears that the unique neighborhood, given label 3, was singled out for having a very intense nightlife scene (like some others in the yellow category - label 1,) while also closing relatively early, mostly by around 22:00 PM. This may be a very interesting conclusion for our stakeholders. Perhaps people looking for a vibrant neighborhood to live in, but not one that will keep them up too late. University students for example.

This was interesting, thank-you very much!