Capstone Project

Recommending Rental Properties

Aron Shirazi
August 2020

Contents

Problem!

- Many people struggle in the time of **renting a property**
- a great deal of *time and money* wasted through finding an appropriate property
- Not always ends to a suitable option
- Search engines could evolve the market, but not effective when floods home seekers with thousands of rental cases
- The question is how **AI** can assist tenants

Description

Having a city name, a recommending system is needed to explore specifications of neighborhoods and search for available rental properties to match them with the given criteria. Main parameters are the distance from a desired location, and important venues which define the appropriateness of each rental option.

Case study

Boston and Cambridge

In this project, Aron is assumed as an ordinary person who got some criteria in renting a property. The story takes him to the development of a rental property recommender system. Aron has decided to enroll a professional degree in one of the well-known universities in Boston. He is an international student who needs to explore many secrets in the real-estate sector of Boston city. However, he has no time to do much field exploration just to land on a suitable property for renting. He will arrive just one day before the semester start date. So, he is thinking of finding a comprehensive and accurate solution.

Data sources

Neighbourhoods' Coordinates

- List of neighborhoods extracted from public reports
- Coordinates of neighborhoods extracted by Geopy from Nominatim

Foursquare

for retrieving data of venues
https://foursquare.com/

Realtor API

for exploring available rental options
https://rapidapi.com/blog/best-real-estate-apis/

Methodology

STEP 1
Downloading the neighbourhoods' reports

STEP 2
Importing, cleaning, and forming the dataset

STEP 3
Finding the coordinates of neighborhoods

STEP 4
Filtering neighbourhoods by distance

STEP 5
Finding and analyzing venues in the selected neighborhoods

STEP 6
Developing scoring frame and ranking neighborhoods

STEP 7
Finding, filtering, and plotting rental properties

STEP 8
Clustering and visualization of results

Neighborhoods Scoring!

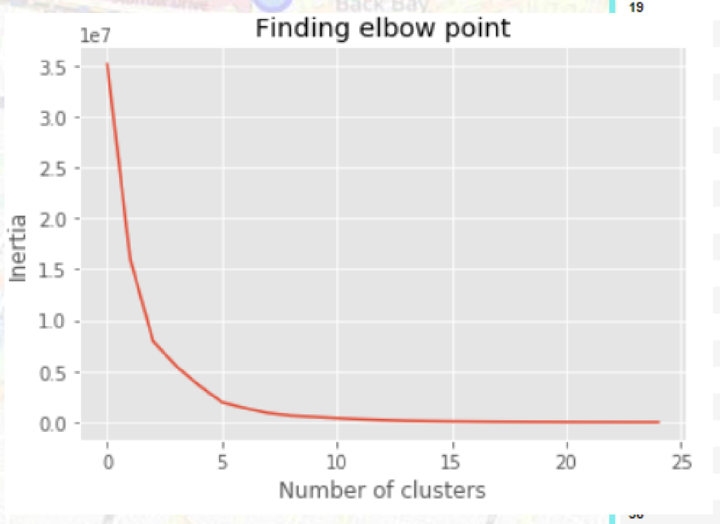
Aron has put these scores out of 10 for each class of venue:

1. Gym: 10 / 10
2. Coffee: 8 / 10
3. Restaurant: 5 / 10
4. Bar: 5 / 10

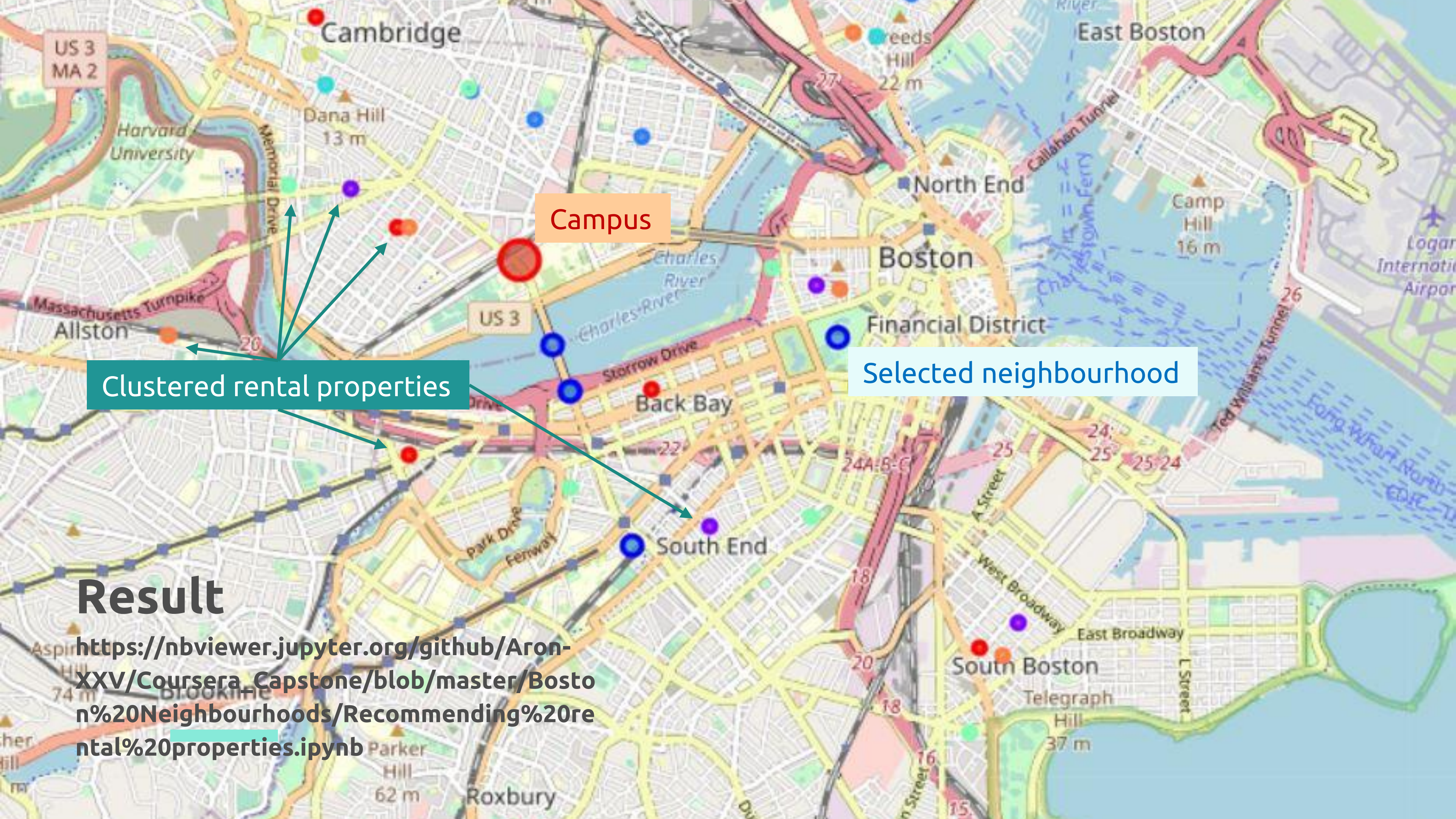
	Restaurant	Bar	Coffee	Gym	Score
neighbourhood					
Cambridgeport	0.320000	0.483871	0.653061	0.847458	2.304390
East Cambridge	0.320000	0.483871	0.653061	0.847458	2.304390
Downtown	0.280000	0.645161	0.489796	0.847458	2.262415
South End	0.440000	0.645161	0.489796	0.677966	2.252923
MIT	0.320000	0.322581	0.489796	0.847458	1.979834
Wellington-Harrington	0.386667	0.645161	0.326531	0.508475	1.866833
Longwood	0.373333	0.322581	0.489796	0.677966	1.863676
Mid-Cambridge	0.453333	0.483871	0.326531	0.508475	1.772209
Riverside	0.266667	0.161290	0.816327	0.508475	1.752758
Strawberry Hill	0.266667	0.161290	0.816327	0.508475	1.752758
West End	0.266667	0.161290	0.816327	0.508475	1.752758
Neighborhood Nine	0.360000	0.161290	0.489796	0.677966	1.689052
Beacon Hill	0.266667	0.000000	0.489796	0.847458	1.603920
Fenway	0.320000	0.161290	0.326531	0.677966	1.485787
Back Bay	0.360000	0.161290	0.326531	0.508475	1.356296

Clustering Properties

- Kmeans algorithm used for clustering
- Elbow point is found to be 5
- Cluster number set 7, trial tests are conducted to diverge classes if they include dissimilar properties
- Features selected to be independent
- Minimum distance from selected neighborhoods is used



	Cluster Labels	price	beds	bath	distance	address.line	address.lat	address.lon	address.line
0	0	1695.0	0	1.0	1.262326	856 Beacon St	42.347276	-71.104035	856 Beacon St
1	0	2000.0	1	1.0	1.419777	94 Pearl St	42.362262	-71.105042	94 Pearl St
2	0	2000.0	2	1.0	2.759420	36 Mozart St	42.321511	-71.104501	36 Mozart St
3	0	2050.0	1	1.0	2.949377	10 Sumner Rd	42.376035	-71.112334	10 Sumner Rd
4	0	2200.0	1	1.0	2.491432	147 W 8th St Unit 147	42.334595	-71.053620	147 W 8th St Unit 147
5	0	2250.0	1	1.0	0.586108	274 Marlborough St # #ph	42.351547	-71.082650	274 Marlborough St # #ph
6	0	2350.0	2	1.0	2.590577	5 Badger Pl Unit 1	42.378234	-71.062758	5 Badger Pl Unit 1
7	1	6800.0	2	1.0	0.411751	87 MT Vernon Unit Carriageh	42.358455	-71.067997	87 MT Vernon Unit Carriageh
8	1	6995.0	5	2.0	1.855454	158 Western Ave	42.364736	-71.109149	158 Western Ave
9	1	7500.0	2	2.0	0.582007	149 West Newton St	42.342501	-71.077431	149 West Newton St
10	1	7600.0	6	2.0	2.463433	226 W 5th St	42.336252	-71.050169	226 W 5th St
11	2	4600.0	3	1.0	1.947019	45 Tremont St	42.371224	-71.098578	45 Tremont St
12	2	4600.0	3	2.0	2.555949	12 Lexington Ave	42.377544	-71.059577	12 Lexington Ave
13	2	4700.0	4	3.0	1.644588	9 Hamlin St	42.369303	-71.092936	9 Hamlin St
14	2	5000.0	3	2.0	1.646613	185 Charles St	42.368173	-71.083430	185 Charles St
15	3	6000.0	5	3.0	2.512167	365 Harvard St	42.371572	-71.111376	365 Harvard St
16	3	6000.0	7	3.0	2.788076	11 Hartford St	42.317518	-71.073618	11 Hartford St
17	3	6500.0	3	2.0	2.206961	24 Pleasant St Unit 24	42.374755	-71.062725	24 Pleasant St Unit 24
18	4	2450.0	2	1.0	0.621358	51 Hemenway St Apt 1	42.345150	-71.089823	51 Hemenway St Apt 1
19	4	2500.0	1	1.0	2.253069	22 Hingham St Unit Cottage	42.365009	-71.114732	22 Hingham St Unit Cottage
	4	2500.0	3	1.0	2.915346	11 Forbes St	42.321905	-71.108102	11 Forbes St
	4	2550.0	2	1.0	0.691124	141A Revere St	42.359529	-71.071861	141A Revere St
	4	2600.0	2	1.0	2.836399	223 Boston St Unit House	42.322284	-71.061392	223 Boston St Unit House
	4	2600.0	2	1.0	2.955105	93 Kirkland St	42.378228	-71.107649	93 Kirkland St
	4	2600.0	3	1.0	2.880514	21 Elder St Unit 1	42.320580	-71.063353	21 Elder St Unit 1
	4	2650.0	3	2.0	2.860958	63 Mozart St	42.320423	-71.104588	63 Mozart St
	4	2800.0	1	1.0	1.960426	12 Murdock St Unit 12	42.371300	-71.098788	12 Murdock St Unit 12
	4	2900.0	3	2.0	2.857780	2 Pearl Street Pl	42.380660	-71.062880	2 Pearl Street Pl
	4	2950.0	2	1.0	2.672002	114 Bartlett St	42.379094	-71.066384	114 Bartlett St
	4	3000.0	2	2.0	2.823994	NaN	42.328977	-71.054366	NaN
	4	3200.0	2	1.0	1.325639	258 Shawmut Ave	42.343205	-71.068428	258 Shawmut Ave
	5	9800.0	7	4.0	2.762905	25 Ware St	42.373627	-71.112819	25 Ware St
	6	3500.0	2	1.0	1.343464	11 Watson St	42.362163	-71.103970	11 Watson St
	6	3575.0	4	1.0	2.620255	7 Grimes St Unit 2	42.334083	-71.051457	7 Grimes St Unit 2
	6	3700.0	3	1.0	2.216910	12 Austin St	42.374972	-71.064670	12 Austin St
	6	3750.0	2	2.0	0.344067	34 Mount Vernon St # #ph	42.358136	-71.065899	34 Mount Vernon St # #ph
	6	3950.0	3	2.0	2.983811	442 Main St	42.381594	-71.071524	442 Main St
	6	4000.0	5	2.0	2.800970	30 Wadsworth St	42.355079	-71.125291	30 Wadsworth St
	6	4100.0	5	2.0	2.258699	NaN	42.322459	-71.094523	NaN



Result

https://nbviewer.jupyter.org/github/Aron-XXV/Coursera_Capstone/blob/master/Boston%20Neighbourhoods/Recommending%20rental%20properties.ipynb

Conclusion

- Promising results
- Wide range of clustering
- User can easily compare few clusters (7 versus 63) then decide which one he should go for
- A great deal of time and money saved
- User is getting trained through the process
- The project would give better results if there was no API calls limitation
- Future development, online interface

Cluster 0					
No.	price	beds	bath	distance	address.line
0	1695	0	1	1.262326	856 Beacon St
1	2000	1	1	1.419777	94 Pearl St

Cluster 1					
No.	price	beds	bath	distance	address.line
7	6800	2	1	0.411751	87 MT Vernon Unit Carriageh
8	6995	5	2	1.855454	158 Western Ave

Cluster 2					
No.	price	beds	bath	distance	address.line
11	4600	3	1	1.94701895	45 Tremont St
12	4600	3	2	2.555948514	12 Lexington Ave

Cluster 3					
No.	price	beds	bath	distance	address.line
15	6000	5	3	2.512167	365 Harvard St
16	6000	7	3	2.788076	11 Hartford St

Cluster 4					
No.	price	beds	bath	distance	address.line
18	2450	2	1	0.621358	51 Hemenway St Apt 1
19	2500	1	1	2.253069	22 Hingham St Unit Cottage
20	2500	3	1	2.915346	11 Forbes St
21	2550	2	1	0.691124	141A Revere St
22					
23					
24					
25					
26					
27					
28					
29					
30					

Cluster 6					
	price	beds	bath	distance	address.line
32	3500	2	1	1.343464	11 Watson St
33	3575	4	1	2.620255	7 Grimes St Unit 2
34	3700	3	1	2.21691	12 Austin St
35	3750	2	2	0.344067	34 Mount Vernon St # #ph
36	3950	3	2	2.983811	442 Main St
37	4000				
38	4100				

Cluster 5					
No.	price	beds	bath	distance	address.line
31	9800	7	4	2.762905	25 Ware St