

# Housing Search in Massachusetts Supplemented by Foursquare Venue Data

IBM Applied Data Science Capstone, Coursera

Chris Grace

May 21, 2021

# Introduction

- In the search for a new home it is easy to filter homes by things such as price, sq footage, or bedrooms using popular website such as Zillow, Realtor, or Redfin.
- However, that is only half the story. The neighborhood and the amenities around the house are also important.
- This project combines Redfin data with Foursquare data to satisfy house attributes as well as neighborhood amenity requirements.

# Purpose

- Clients approached our real estate office to help with their property search. They need a larger house for a growing family but like the amenities in their neighborhood.
- They were spending a lot of time researching each neighborhood they found a suitable house for sale.
- Developing this code to help them as well as future clients with similar needs.
- Can be used as a marketing differentiator.

# Requirements

## House Requirements

- Max Price: \$800,000
- Min Price: \$649,000
- Max sqft: 3,500
- Min sqft: 2,000
- Min Beds: 3
- County: Essex, Massachusetts
- Single Family Home

## Neighborhood Requirements

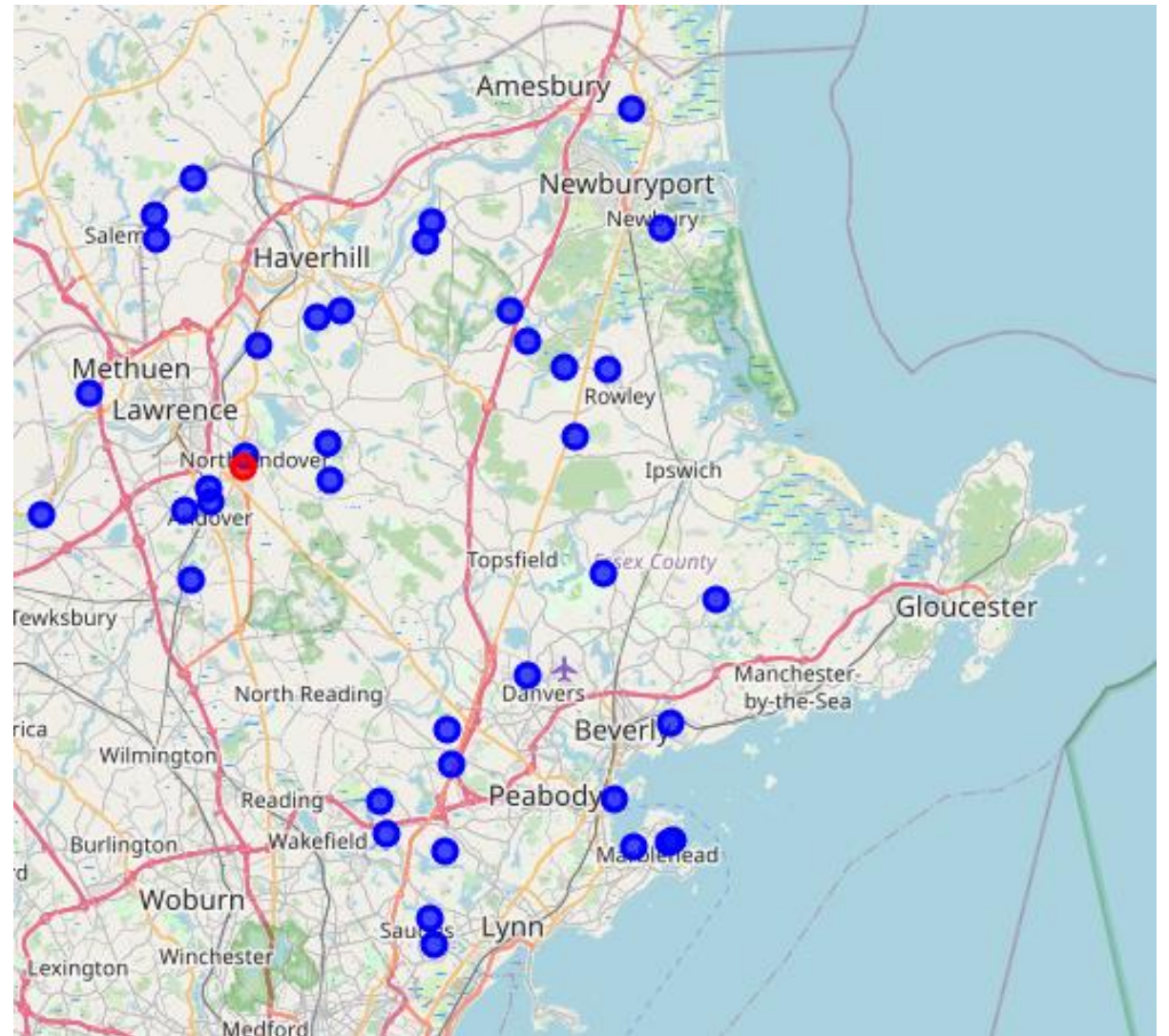
| Amenity        | Distance  | Amenity        | Distance |
|----------------|-----------|----------------|----------|
| Park           | 0.5 miles | Train Station  | 2 miles  |
| Grocery Store  | 2 miles   | Golf Course    | 4 miles  |
| Fire Station   | 2 miles   | Emergency Room | 5 miles  |
| Police Station | 2 miles   |                |          |

# Data

- Redfin API
  - Allows up to 350 houses to be returned in a CSV file based on requested criteria.
- Foursquare API
  - Many request options available, we will leverage the venue search function
  - Allows venues based on a specific category to be returned for a specific geolocation.
- Data will be processed using python code from within a Jupyter Notebook

# Methodology

- Define current residence and geolocation
  - 201 Andover ST, N. Andover
- Retrieve Redfin data from API
  - Returned 39 properties
    - Red = Current Residence
    - Blue = For Sale Home



# Sample of Returned Amenities

- This house at 107 Jericho Rd only met 4 of the 7 required amenities.
- It is not a suitable property per the requirements.

|   | Address        | City      | Venue_Name                     | Latitude  | Longitude  | Miles_Away | Type           | Category_ID              |
|---|----------------|-----------|--------------------------------|-----------|------------|------------|----------------|--------------------------|
| 0 | 107 Jericho Rd | Haverhill | AFC Urgent Care Methuen        | 42.748010 | -71.129980 | 4.7        | Emergency Room | 4bf58dd8d48988d194941735 |
| 1 | 107 Jericho Rd | Haverhill | None                           | NaN       | NaN        | NaN        | None           | 4bf58dd8d48988d12e941735 |
| 2 | 107 Jericho Rd | Haverhill | None                           | NaN       | NaN        | NaN        | None           | 4bf58dd8d48988d163941735 |
| 3 | 107 Jericho Rd | Haverhill | atkinson fire station          | 42.839152 | -71.151867 | 1.7        | Fire Station   | 4bf58dd8d48988d12c941735 |
| 4 | 107 Jericho Rd | Haverhill | Atkinson Resort & Country Club | 42.820483 | -71.179901 | 1.5        | Golf Course    | 4bf58dd8d48988d1e6941735 |
| 5 | 107 Jericho Rd | Haverhill | None                           | NaN       | NaN        | NaN        | None           | 4bf58dd8d48988d118951735 |
| 6 | 107 Jericho Rd | Haverhill | NorEaster Amtrack Train 685    | 42.815300 | -71.113312 | 2.0        | Train          | 4bf58dd8d48988d129951735 |

# Comparison to Current Residence

- Current residence meets all amenity requirements.
- However, as stated previously, the house is too small

|   | Address        | City          | Venue_Name                      | Latitude  | Longitude  | Miles_Away | Type           | Category_ID              |
|---|----------------|---------------|---------------------------------|-----------|------------|------------|----------------|--------------------------|
| 0 | 201 Andover ST | North Andover | North Andover Town Common       | 42.684259 | -71.115001 | 0.4        | Park           | 4bf58dd8d48988d163941735 |
| 1 | 201 Andover ST | North Andover | Market Basket                   | 42.684600 | -71.136469 | 0.9        | Grocery Store  | 4bf58dd8d48988d118951735 |
| 2 | 201 Andover ST | North Andover | North Andover Fire Department   | 42.682369 | -71.110961 | 0.5        | Fire Station   | 4bf58dd8d48988d12c941735 |
| 3 | 201 Andover ST | North Andover | North Andover Police Department | 42.692820 | -71.119249 | 0.9        | Police Station | 4bf58dd8d48988d12e941735 |
| 4 | 201 Andover ST | North Andover | MBTA Andover Station            | 42.659738 | -71.144101 | 1.9        | Train Station  | 4bf58dd8d48988d129951735 |
| 5 | 201 Andover ST | North Andover | Andover Country Club            | 42.672571 | -71.167067 | 2.4        | Golf Course    | 4bf58dd8d48988d1e6941735 |
| 6 | 201 Andover ST | North Andover | AFC Urgent Care North Andover   | 42.675541 | -71.130661 | 0.6        | Emergency Room | 4bf58dd8d48988d194941735 |



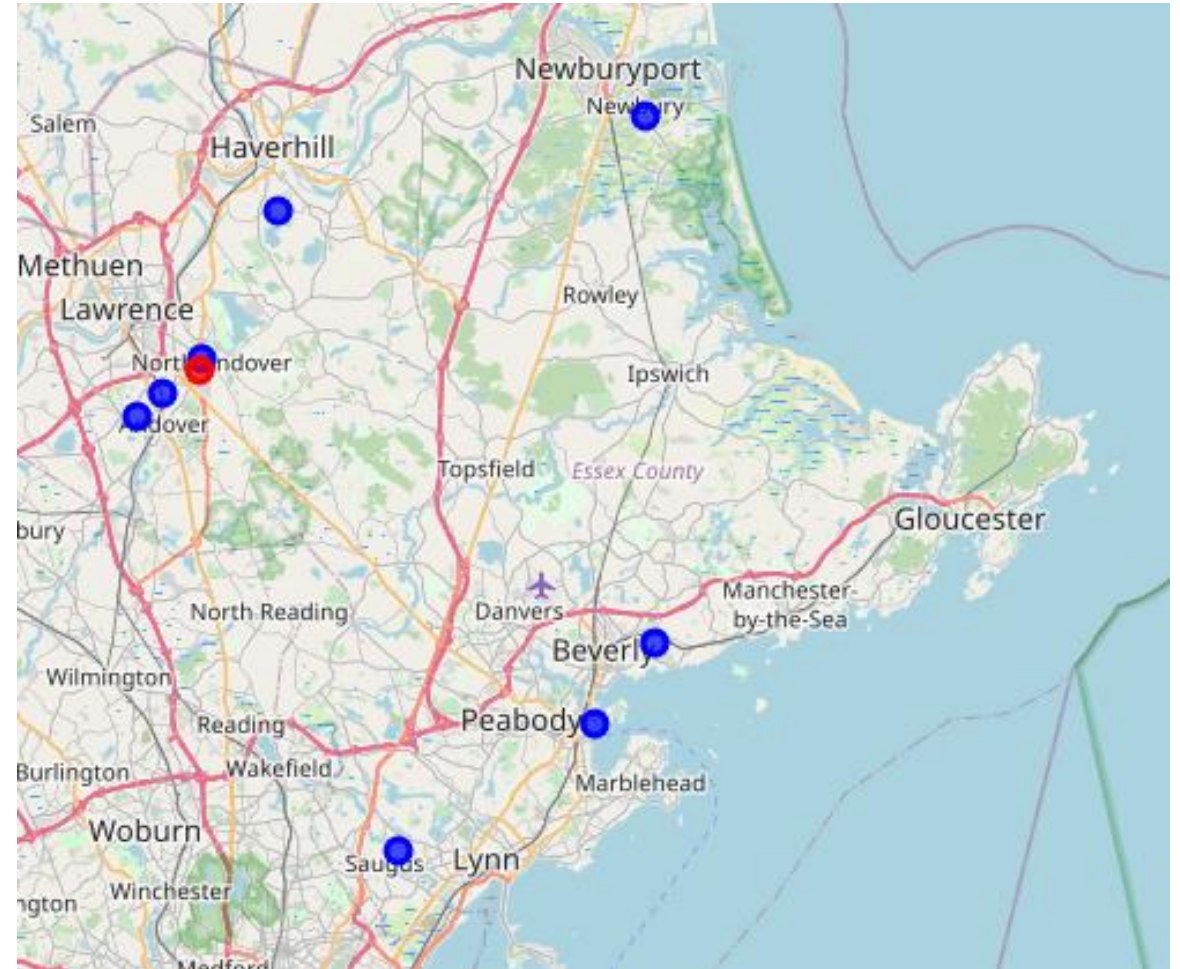
# Combine Redfin and Filtered Foursquare Data

- These are the 8 properties out of the original 39 which meet all client criteria.

|   | ADDRESS            | CITY          | STATE | ZIP  | PRICE  | BEDS | BATHS | LATITUDE  | LONGITUDE  | Total_Criteria_Met |
|---|--------------------|---------------|-------|------|--------|------|-------|-----------|------------|--------------------|
| 0 | 9 Allison Cir      | Haverhill     | MA    | 1835 | 695000 | 4    | 2.5   | 42.749880 | -71.073292 | 7                  |
| 1 | 8 Rock O Dundee Rd | Andover       | MA    | 1810 | 649000 | 3    | 1.5   | 42.669856 | -71.141811 | 7                  |
| 2 | 76 High Rd         | Newbury       | MA    | 1951 | 649900 | 3    | 2.0   | 42.790985 | -70.855265 | 7                  |
| 3 | 50 Cobblestone Cir | North Andover | MA    | 1845 | 739900 | 3    | 2.5   | 42.685932 | -71.119205 | 7                  |
| 4 | 37 Biscayne Ave    | Saugus        | MA    | 1906 | 649900 | 5    | 2.0   | 42.469664 | -71.002022 | 7                  |
| 5 | 2 Robin Rd         | Beverly       | MA    | 1915 | 799900 | 4    | 2.5   | 42.561573 | -70.848841 | 7                  |
| 6 | 19 Emerton St #19  | Salem         | MA    | 1970 | 684900 | 4    | 3.5   | 42.525309 | -70.885780 | 7                  |
| 7 | 119 Shawsheen Rd   | Andover       | MA    | 1810 | 799900 | 3    | 2.5   | 42.660239 | -71.156665 | 7                  |

# Final Property List and Map

1. 9 Allison Cir, Haverhill
2. 18 Rock O Dundee Rd, Andover
3. 276 High Rd, Newbury
4. 350 Cobblestone Cir, N. Andover
5. 437 Biscayne Ave, Saugus
6. 52 Robin Rd, Beverly
7. 619 Emerton St #19, Salem
8. 7119 Shawsheen Rd, Andover



# Explore Individual Properties

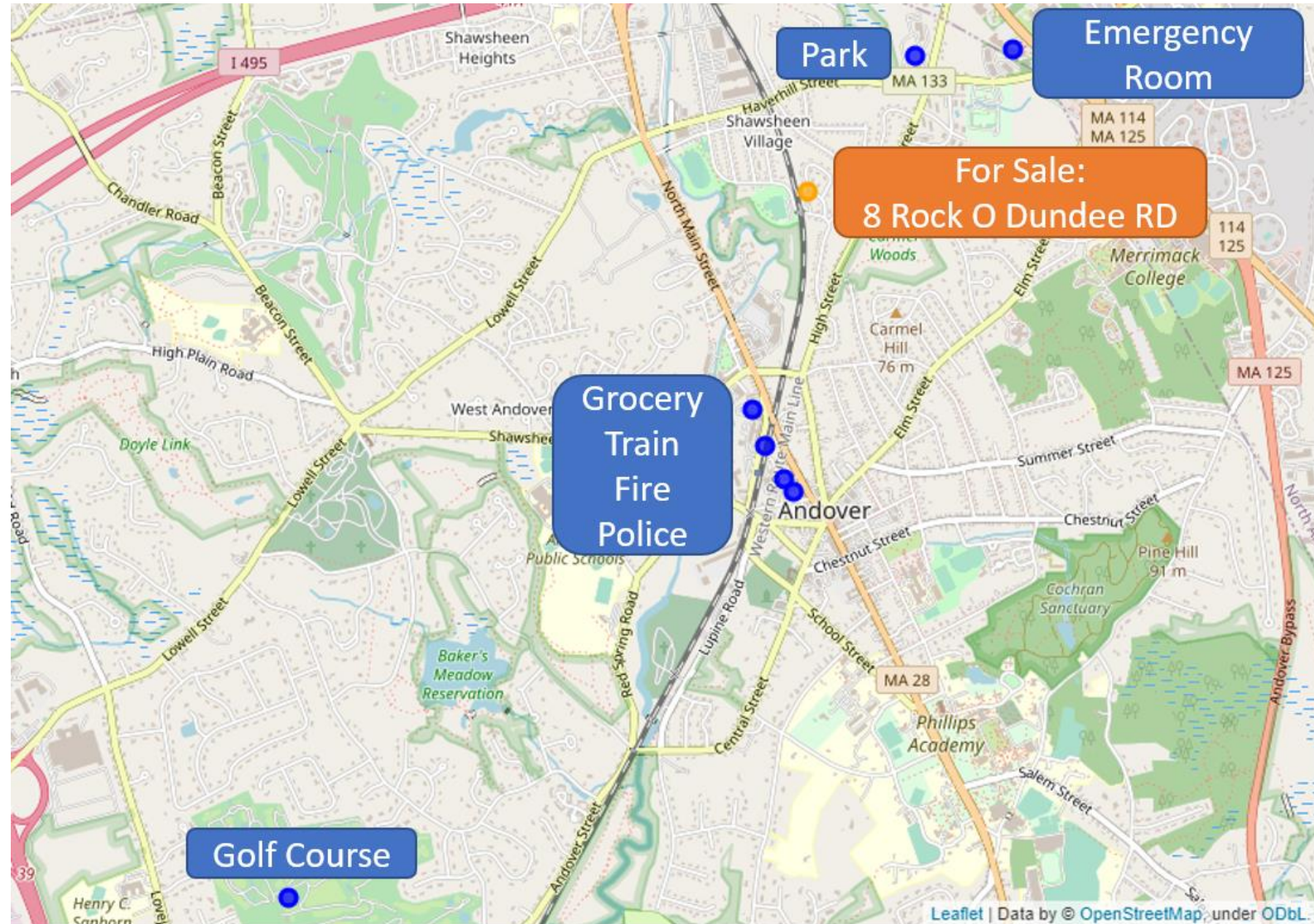
- Jupyter Notebook is coded to allow each house to be viewed individually. This is an example of the results for 8 Rock O Dundee Rd:

| Address |                    | City    | Venue_Name                    |      |        | Latitude  | Longitude  | Miles_Away | Type           | Category_ID              |
|---------|--------------------|---------|-------------------------------|------|--------|-----------|------------|------------|----------------|--------------------------|
| 231     | 8 Rock O Dundee Rd | Andover | Doctors Park                  |      |        | 42.675334 | -71.135925 | 0.5        | Park           | 4bf58dd8d48988d163941735 |
| 232     | 8 Rock O Dundee Rd | Andover | Whole Foods Market            |      |        | 42.661179 | -71.144769 | 0.6        | Grocery Store  | 4bf58dd8d48988d118951735 |
| 233     | 8 Rock O Dundee Rd | Andover | Indian Ridge Country Club     |      |        | 42.641669 | -71.170020 | 2.4        | Golf Course    | 4bf58dd8d48988d1e6941735 |
| 234     | 8 Rock O Dundee Rd | Andover | AFC Urgent Care North Andover |      |        | 42.675541 | -71.130661 | 0.7        | Emergency Room | 4bf58dd8d48988d194941735 |
| 235     | 8 Rock O Dundee Rd | Andover | Central Station               |      |        | 42.658373 | -71.143096 | 0.8        | Fire Station   | 4bf58dd8d48988d12c941735 |
| 236     | 8 Rock O Dundee Rd | Andover | Andover Police Dept           |      |        | 42.657890 | -71.142580 | 0.8        | Police Station | 4bf58dd8d48988d12e941735 |
| 237     | 8 Rock O Dundee Rd | Andover | MBTA Andover Station          |      |        | 42.659738 | -71.144101 | 0.7        | Train Station  | 4bf58dd8d48988d129951735 |
|         |                    |         |                               |      |        |           |            |            |                |                          |
| ADDRESS |                    | CITY    | STATE                         | ZIP  | PRICE  | BEDS      | BATHS      | LATITUDE   | LONGITUDE      |                          |
| 0       | 8 Rock O Dundee Rd | Andover | MA                            | 1810 | 649000 | 3         | 1.5        | 42.669856  | -71.141811     |                          |



# Explore Individual Properties

- Neighborhood of:
  - 8 Rock O Dundee Rd



# Discussion

- Difficulties encountered:
  - Redfin API not officially supported
  - Foursquare API:
    - Has some venues miscategorized
    - Query limit on free unverified version is only 950 per day
- Suggestions:
  - Final deliverable to view neighborhood maps is within Jupyter Notebook which does not make it easily accessible. Suggest putting it in a more user friendly dashboard such as on Tableau Public.

# Conclusion

- This project was able to achieve its goal of cutting down on the arduous search process and reducing the number of houses to explore in this example from 39 down to only 8.
- Of that 8 houses that need to be explored further, the neighborhoods are all mapped out with the required amenities for easy comparison.
- This will significantly reduce the burden for our clients in their search for suitable homes.