Do Municipally Subsidized Housing Development Projects result in lower rents for the surrounding areas in Palo Alto?

Palo Alto Free Datasets

City of Palo Alto subsidized Rental Housing Developments - January 2016

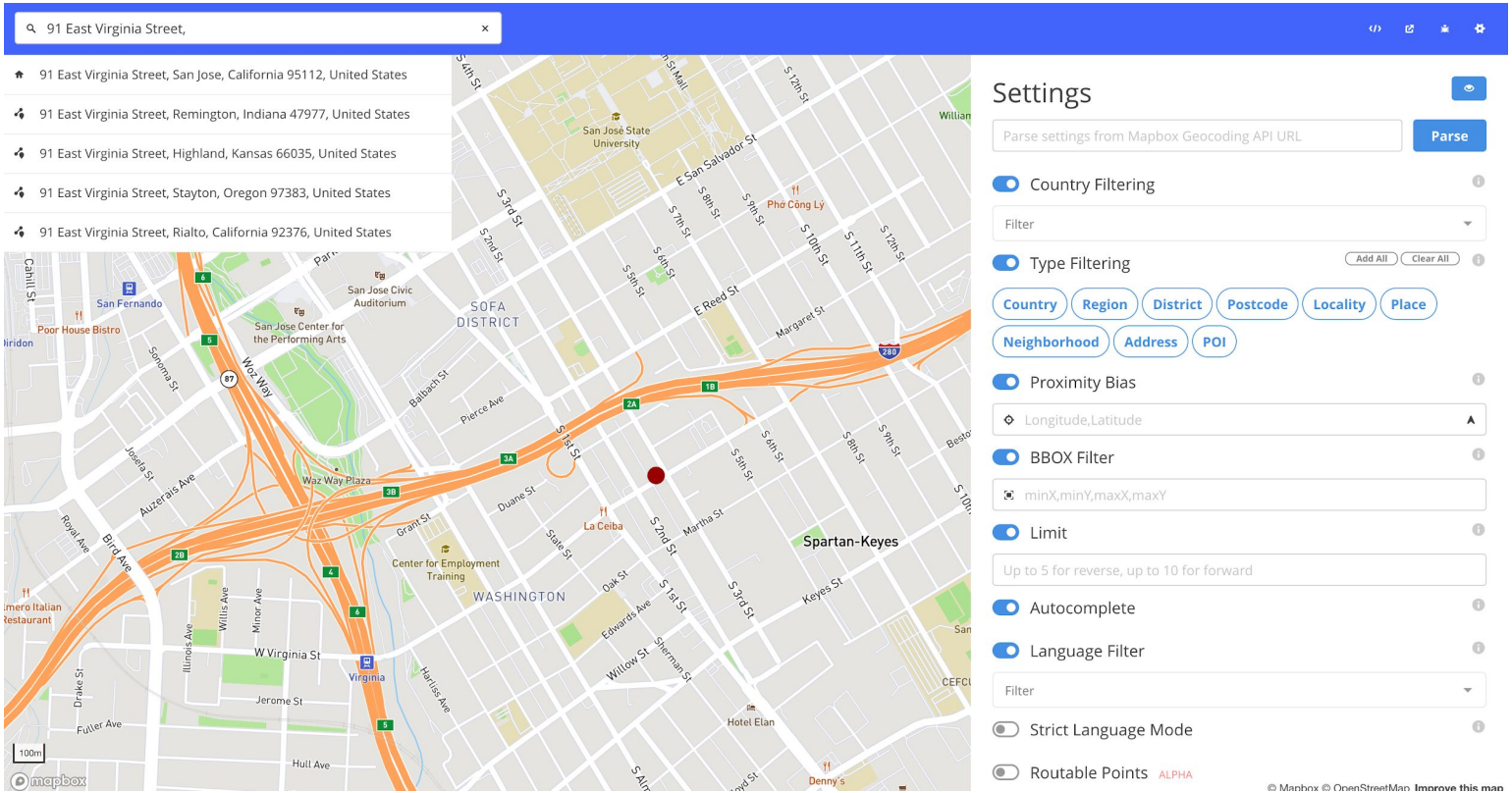
SI #	Project Name & Location	Construction Completion Date	Units	Type of Households Served / Notes
1	Stevenson House, 455 East Charleston	1968	120	Seniors
2	Colorado Park, 1141 Colorado Ave	1972	60	Families / Seniors (17 units Section 8)
3*	Palo Alto Gardens, 648 San Antonio	1999/1973**	156	1999 Preservation; Families / Seniors
4	Arastradero Park, 574 Arastradero	1995 / 1974**	66	1995 Preservation (47 units Section 8) F…
5	Lytton Gardens I, 656 Lytton Ave	1975	218	Seniors
6	Webster Wood Apts, 941 Webster St	2001 / 1978**	68	2001 Preservation Families / Handicappe…
7	Lytton Gardens II, 656 Lytton Ave	1979	100	Seniors (50 Independent Living; 50 Resid…
8*	Sheridan Apartments, 360 Sheridan	1998 / 1979 **	57	1998 Preservation (56 units Section 8) S…
9	Elm Apartments, 129 Emerson St	1980	11	Families (8 units Sec. 8 Mod. Rehab)
10	Pine Street House 1259 Pine St	1981	1	Families
11*	Ferne Apts, 101-131 Ferne Ave	1981	16	Families (6 units Sec. 8 Mod. Rehab)
12	Terman Apartments, 655 Arastradero	1985	92	Families / Seniors (72 Units Section 8)
13	Emerson South, 3067 Emerson	1985	6	Small Families / Single Adults

Forward Geocoding for location data

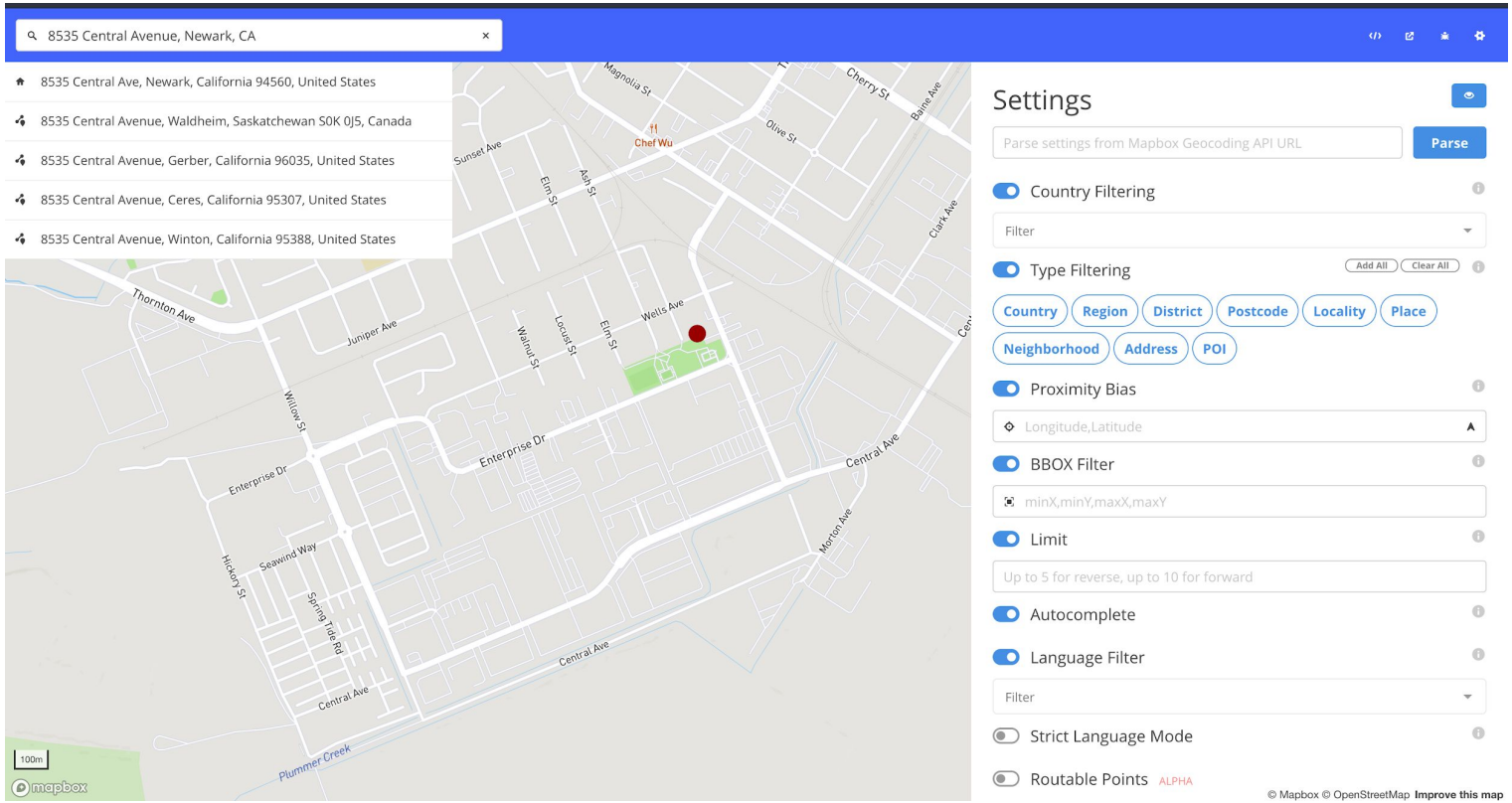
In order to correlate the location of the houses and the housing projects, I had to shop around for an API provider that could provide accurate **latitude** and **longitude** coordinates for my text queries. There are multiple providers here each with their own problem:

- **OpenCage**: Often estimates one latitude and longitude for the entire city.
- **MapBox**: There is variation in the results, but there is often a lot of inaccuracy.
- **Google Maps API**: Incredibly accurate down to the tee, but requires payment.

Mapbox Guess 1



Mapbox Guess 2



Clustering Algorithm

Nearest Neighbor Approach

- Checked the nearest location of a housing development project. If closest project exceeds a mile, grouped into different class.

```
import math

def haversine(coord1, coord2):
    R = 6372800  # Earth radius in meters
    lat1, lon1 = coord1
    lat2, lon2 = coord2

    phi1, phi2 = math.radians(lat1), math.radians(lat2)
    dphi       = math.radians(lat2 - lat1)
    dlambda    = math.radians(lon2 - lon1)

    a = math.sin(dphi/2)**2 + \
        math.cos(phi1)*math.cos(phi2)*math.sin(dlambda/2)**2

    return 2*R*math.atan2(math.sqrt(a), math.sqrt(1 - a))
```

Difference between the two groups

Looking at the mean average it looks like the houses closer to the housing projects are more expensive. But looking at the median, it is a lot more clear that the housing projects that are further away are definitely more expensive.

Correlation between the year of construction of Housing Project and surrounding areas

As it can be seen, the older the housing project, the lesser the price of the house in its surrounding area.