Seattle Gentrification Atlas

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Project Overview

Problem: The gentrification process is studied by policymakers, real estate developers, investors, and researchers. However, there is no consensus about how to measure gentrification and no interactive mapping tool to visualize gentrification trends.

Research Question:

What's the best way to measure and visualize gentrification in Seattle?

Objectives:

- Develop an interactive Seattle Gentrification Atlas to observe the disparate impact of socio-economic changes on Seattleites.
- Compare the gentrification status of block groups neighborhoods over time using definitions of gentrification from Sociology, Economics, and Urban Planning, and visualize trends across the city.
- Predict the gentrification status for each block group in 2018.

Gentrification Definitions

Gentrification Definition -- Sociology

Based on: Freeman, Lance. 2005. Displacement or succession? Residential mobility in gentrifying neighborhoods. Urban Affairs Review, 40(4), pp.463-491.

Eligible for Gentrification

- Median household income is in the bottom 40th percentile compared to all block groups in Seattle at the beginning of time span.
- Median home value is in the bottom 40th percentile compared to all block groups in Seattle at the beginning of time span.

Gentrified

- Percent of residents with bachelor degrees is in the top third of all block groups in Seattle.
- Inflation-adjusted median home value is in the top third of all block groups in Seattle.

Gentrification Definition -- Financial & Economics

Based on: Florida, Richard. 2017. The New Urban Crisis; Hartley, Daniel. 2013. Gentrification and Financial Health. Federal Reserve Bank of Cleveland.

Currently Gentrifying

- Household income levels are below 40% of median in Seattle.
- Rent increased more than the median rent increase in Seattle.

Gentrified

- Median home value moved from the bottom to the top half in the distribution of home values across Seattle.

Gentrification Definition -- Urban Planning

Based on: Chapple, Karen. 2009. Mapping Susceptibility to Gentrification: The Early Warning Toolkit. Center for Community Innovation.

In Danger of Gentrifying

- Percent of workers taking public transit increased.
- Percent of non-family households increased.
- Percent of housing units in buildings with 3-4 units increased.
- Percent of housing in buildings with five or more units increased.
- Percent of renter-occupied housing units increased.
- Percent of renters paying >30% of household income increased.
- Percent of of dwelling units with three or more cars decreased.
- Percent of married couples with minor children decreased.
- Percent of white, Non-Hispanic population decreased.
- Income diversity increased.

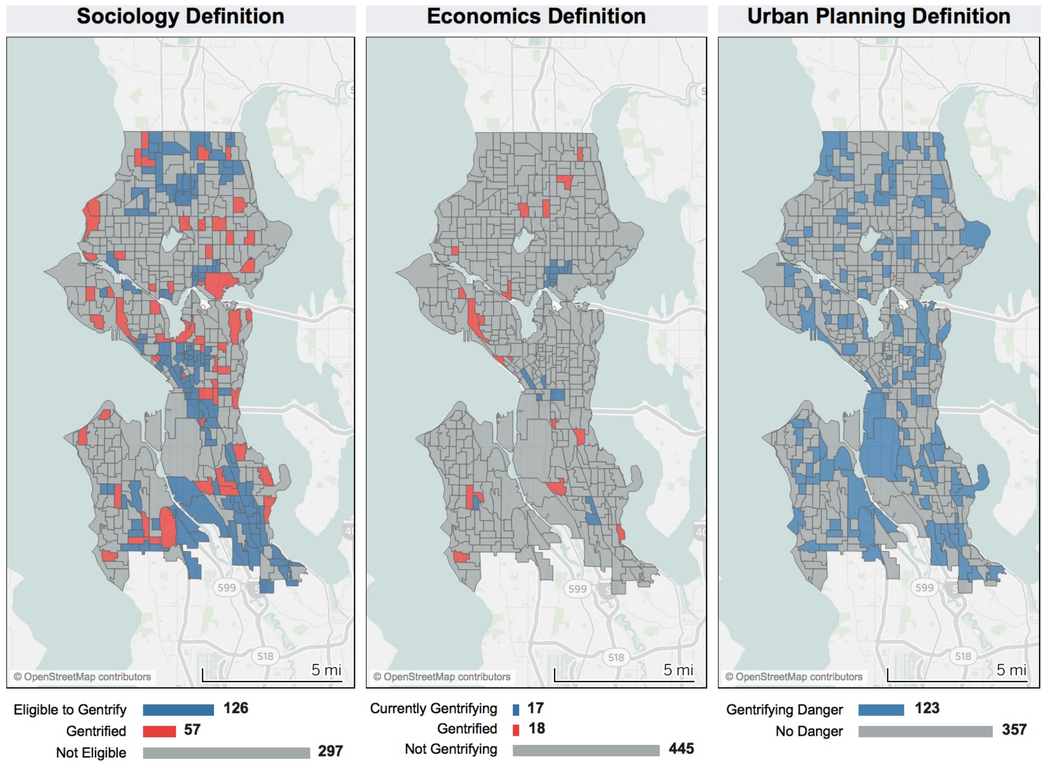
About the Data

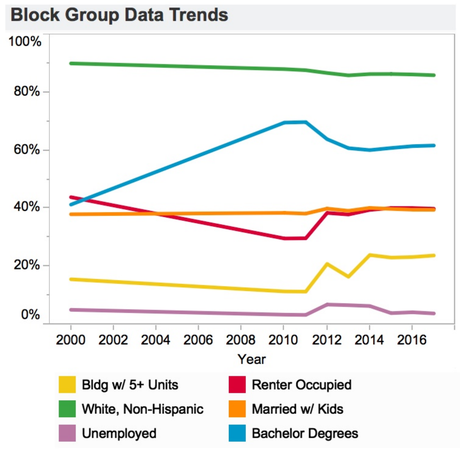
- The feature variables (listed in the table) summarize the demographic, housing, income and transportation data for each of the 480 block groups in Seattle for the year 2000 and from 2010 to 2017.
- Missing values were imputed by taking the mean value from the other block groups within the census tract.
- The gentrification status for each block group was calculated by tracking the feature variable changes each year and comparing the values against the full Seattle distribution.

Final Product

The Seattle Gentrification Atlas maps (shown below) apply the criteria described in the Gentrification Definitions section to Seattle's demographic data at the block group level. Then, both the demographic data and three sets of gentrification status labels were mapped for each year.

The Gentrification Atlas allows users to compare trends at the block group level, the neighborhood level and across the entire city. The final set of interactive dashboards are available on Tableau Public.





The line plot compares the estimated percent of the block group population: who live in buildings with more than 5 units (apartments and condos); are white, Non-Hispanic; are unemployed; rent their home; are married with minor children; and earned bachelor degrees.

Feature Variables

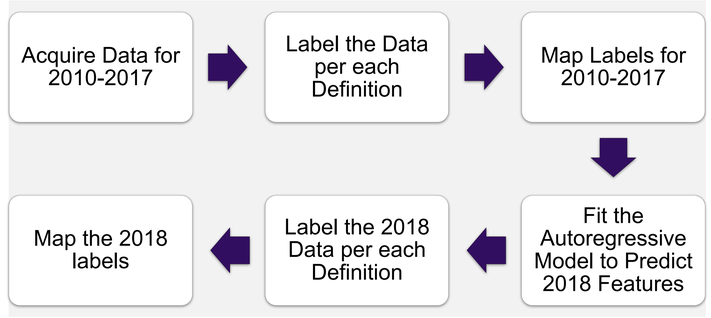
Demographic	population
	% non-Hispanic white
	% married couples with minor children
	% residents with a bachelor's degree
Housing	median home value
	housing units
	% of dwelling units in buildings with 3-4 units
	% of dwelling units in buildings with 5+ units
	% renter-occupied
	median gross rent
Income	median household income
Transportation	% of workers taking public transit
	% of dwelling units with 3 cars available
	% of dwelling units with 4+ cars available

Project GitHub Repository: https://github.com/dipsuw/Capstone590.

Data Sources: U.S. Census Bureau; Seattle Public Utilities; King County GIS Open Data; and SimplyAnalytics (2017). EASI/AGS Data 2000, 2010-17. Retrieved February 8-17, 2017 from SimplyAnalytics database.

Prediction Model

Goal: Predict the gentrification status for each block group in 2018.



Autoregressive Model: First predicts the values for each feature variable in 2018, and then we use the operationalized definitions to set the gentrification labels for each block group.

Findings

Demographic Trends

1. Median rent increased dramatically from 2011 to 2017, and is significantly higher than the percent increase in home values.
2. Strong positive correlation (>0.6) between following features:
   - education, household income, & non-Hispanic whites
   - renters, structures with 5+ Units, & household income < $25,000
3. Strong negative correlation (<-0.6) between following features:
   - households with 3+ vehicles & renter occupied units
   - structures with 5+ Units & percent of family households

Definition Trends

1. The Sociology definition was the most sensitive indicator of gentrification even though it relies in part on home values. But, the home value criteria is static, unlike the Economics definition.
2. Although the Economics definition only has a single criteria for gentrification, it made gentrification significantly less common since home values do not change much over a single year.

Challenges

1. Gathering accurate block group or census tract level data was very difficult. The American Community Survey (ACS) sample size is too small to yield accurate estimates. Even the most accurate, 5-year ACS estimates frequently include 0 in the 90% confidence intervals for essential variables like median rent or income.
   - **Solution**. We considered expanding our scope to all of King County and using tract level data. However, the estimated demographic data provided by Simply Analytics appeared to be roughly as accurate as the ACS 5-year estimates. So, we elected to use the annual estimates from Simply Analytics.
2. Consistent with motivation for our project, there is no resource to find the 'real' gentrification status of Seattle neighborhoods. This makes it difficult to calculate the accuracy of model and to determine which of the three gentrification definitions is best.
   - **Solution**. We compared our results with the City of Seattle's 2035 Plan and Simply Analytics' 2020 estimates.

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