ANALYSIS OF HOUSING IN ST. LOUIS BY RACE, INCOME, AND PARCEL VACANCY RATES

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Major Findings

- Census tracts in St. Louis City clustered into three definitive groups.
- These three groups exhibited strikingly contrast values among racial and socioeconomic indicators, particularly between African Americans and other groups.
- Through unsupervised machine learning, we have identified census tracts in St. Louis City that are most disadvantaged.
- A map of building vacancy mirrored the map of violent crime, confirming that long-term building vacancy has a negative impact on the surrounding community.

Overview

The St. Louis Metropolitan Area is, regrettably, a historical focal point of racial tensions and socioeconomic disparities. Although great strides have been made to overcome the atrocities of the past, not all barriers can be removed overnight. Over the last century, research has emerged that has linked the frequency of vacant buildings with negative public crime and health impacts.[1-2] While some have suggested a causal relationship due to fire and material hazards,[3] the relationship is more likely correlative and simply indicative of the health and vitality of a community. Vacant buildings often serve as a localized source of crime, whether that crime be arson, substance abuse, or assault.[4] As the frequency of abandoned and dilapidated buildings increases and vacancy issues continue to go unaddressed, it sends a message to the community that no one cares;[5] those that can often flee the area, and those that cannot are trapped as the lawlessness that was harbored in the vacant buildings spills over into the surrounding community.[6]

Unfortunately, as the downward spiral of building vacancy followed by dilapidation and community flight unfolds, it is the community's most socioeconomically disadvantaged that remain trapped. As communities become progressively less desirable places to live, housing prices drop, creating a barrier for people who may not be financially able to relocate. As crime spreads into the community, the area becomes less desirable for businesses, dealing yet another economic blow to the community and its remaining residents. Unfortunately, in urban areas with histories of racism and discrimination against various groups, this series of events often perpetuates historical racial divides.

In light of St. Louis' historical racial issues, we have compiled an analysis of the relationship between racial demographics, household income, building vacancy, and the average change in the housing price index (HPI) across each of St. Louis City's census tracts. To facilitate appropriate classification of the census tracts through unsupervised machine learning approaches, we standardized each of these values, so as to ensure that no variable singularly swayed the classification of the census tracts. Census tracts were classified using a k-means clustering procedure, and the optimal number of clusters was identified to be three. The exact variables used in the clustering analysis were:

YRSVACANTME = The mean number of years vacant buildings in the census tract have been vacant. Overall mean of 2.8.

BLACKMEAN = The African American population. Overall mean of 1,285.4.

MEDIANINCOM = The median household income. Overall mean of $37,361.

WHITEMEAN = The white population. Overall mean of 1,540.1.

GEOMEANHPI = The geometric mean of the housing price index for a given census tract. In instances where HPI was not reported for a census tract due to small number of households, the HPI associated with that zip code was used. The geometric mean was used so as to better reflect percentage changes in HPI. Twenty year average of 154.5.

HISP_LATMEA = The Hispanic and Latin American population. Overall mean of 88.9.

ASIANMEAN = The Asian population. Overall mean of 88.7.

The results of the clustering analysis are summarized in Figure 1 below. Based on these three clusters, it is easy to see that there are racial disparities across St. Louis City. In North St. Louis and many of the inner-city areas, the Red cluster clearly indicates that the areas that are characterized by long-term vacant buildings and low HPI are also the same areas that are characterized by not only low income, but also the largest portion of African American residents across the city. The Blue and Green clusters, while not as strikingly different, do possess some differences that are of note. The census tracts belonging to the Green cluster are characterized by the lowest vacancy rates, a high HPI, the highest income levels, and predominantly white neighborhoods, although these neighborhoods are also home to a sizeable number of Hispanic/Latinx residents. The census tracts in the Blue cluster have the highest Asian population by far, and a relatively higher population of Hispanic/Latinx residents, with a moderate income. The average HPI is very similar between the Blue and Green clusters.

Although Figure 1 paints a clear picture of the neighborhoods based on housing, economic, and racial demographics, the disparities between these neighborhoods becomes increasingly evident when examining the crime statistics in St. Louis. In Figure 2, we see that crime, particularly that involving assault (red dots) or substance abuse (blue dots) mirrors the building vacancy data. The clustering analysis, examined in conjunction with crime incidence statistics compared to vacant building data, suggest that the long-term vacancy of buildings in St. Louis is a threat to nearby communities' health and vitality; furthermore, this data suggests that African Americans are disproportionately affected by long-term vacancy issues.

Next Steps

We are interested in moving forward and can envision multiple directions this research could take. Now that we have the primary dataset established, the next question becomes what other data could be incorporated into that base vacancy, race, income, and HPI dataset to derive real meaning and action. For instance, how are these areas disproportionately affected by COVID-19? What is the overlap between these clusters and other socioeconomic indicators such as family and household structure, unemployment, educational attainment and long-term health conditions? We believe that the census tracts identified through this and (very near) future cluster analysis shed light on the St. Louis neighborhoods which are in most dire need of assistance and revitalization.

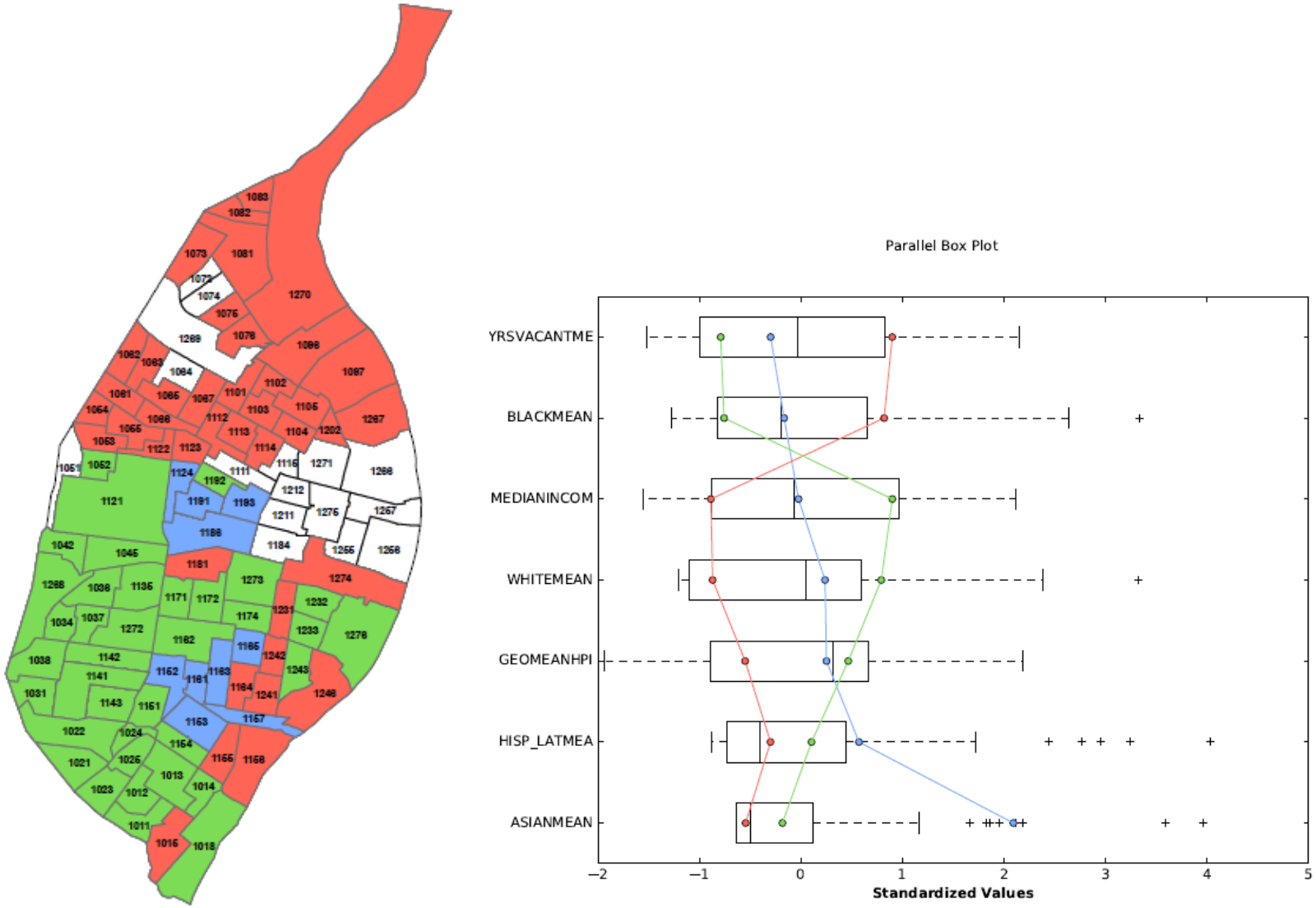

Figure 1. Clustering Analysis of Vacancy, Housing, and Demographic Data. Note: In the plot above, a census tract that is white is an instance where the census tract was primarily commercial, and HPI and residential statistics were not relevant.

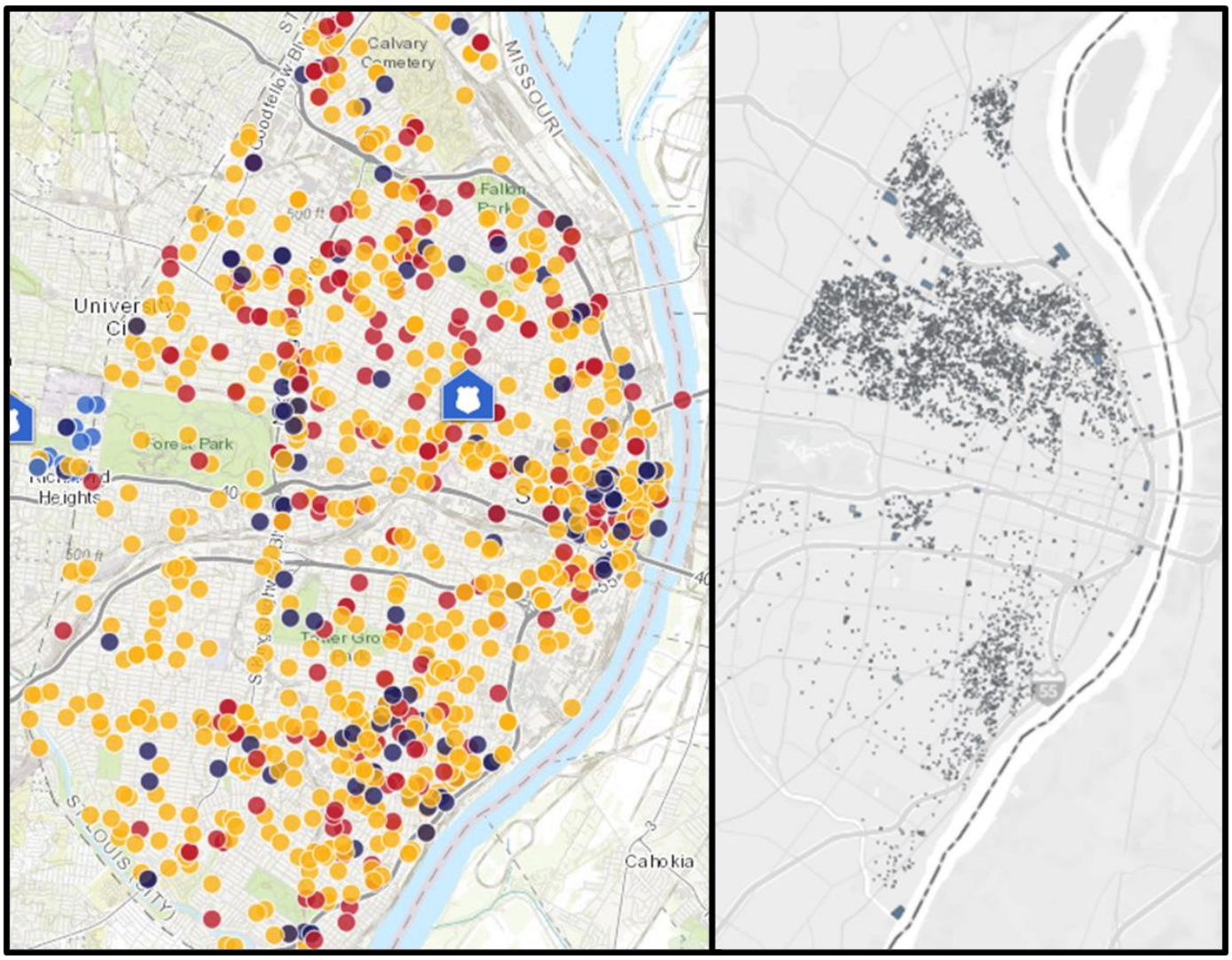

Figure 2. Map of 2019 Crime Statistics (left) Compared to Building Vacancy Data (right).
In the crime map, yellow dots indicate property damage or robbery, red dots indicate assault, and dark blue dots indicate social issues, such as drug overdose. Light blue dots indicate precautionary police patrols, while the blue "pentagon" with white badge indicates a police station. In the building vacancy data on the right, known and suspected vacant lots are shown as the darker polygons. As can be seen from these maps, although crime takes place all throughout St. Louis City, assault (red dots) and substance abuse (blue dots) tend to occur either in the heart of downtown St. Louis or near areas with a higher proportion of vacant buildings. Crime statistic data provided by the County of St. Louis, MO Dept. of Conservation (https://www.cityprotect.com/map/list/incidents?pageSize=2000&parentIncidentTypeIds=149,150,148,8,97,104,165,98,100,179,178,180,101,99,103,163,168,166,12,161,14,16,15&zoomLevel=12&latitude=38.62915215556792&longitude=-90.25074980233958&days=1,2,3,4,5,6,7&startHour=0&endHour=24&timezone=-06:00&fromDate=2019-06-13T00:00:00.000Z&toDate=2020-06-12T23:59:59.999Z), and vacancy data provided by the St. Louis Vacancy Collaborative (https://www.stlvacancy.com/portal.html).

Works Cited

1. Shaw, C.; Zorbaugh, F.; McKay, H.; Contrell, L., *Delinquency Areas*. University of Chicago Press: Chicago, 1929.

2. Krieger, J.; Higgins, D. L., Housing and Health: Time Again for Public Health Action. *American Journal of Public Health* **2002,** *92* (5), 758-768.

3. Bashir, S. A., Home is Where the Harm Is: Inadequate Housing as a Public Health Crisis. *2002* **2002,** *92* (5), 733-738.

4. Accordino, J.; Johnson, G. T., Addressing the Vacant and Abandoned Property Problem. *Journal of Urban Affairs* **2000,** *22* (3), 301-315.

5. Wilson, J.; Kelling, G., Broken Windows. *The Atlantic* 1982.

6. Bernasco, W.; Block, R., Robberies in Chicago: A Block-Level Analysis of the Influence of Crime Generators, Crime Attractors, and Offender Anchor Points. *Journal of Research in Crime and Delinquency* **2011,** *48* (1), 33-57.