Chris Gernon

GEOG0120

Exam 1: GIS Analysis of Harris County

Many believed the passing of the Civil Rights Act of 1961 marked the end of systemic and acute racism; however, systemic racism and injustice are prevalent in society today. This essay will use data collected from Harris County to answer the question: do urban heat islands disproportionally affect minority groups in Harris County, and if so, are the heat islands a biproduct of patterns and processes of urban segregation?

Houston and the surrounding Harris County is segregated by race. Segregation is defined as the spatial seperation of subgroups within a larger population (Knox and Marston) and is the manifestation of both congregation and discrimination (Knox and Marston). Congregation is defined as the clustering of specific groups (Knox and Marston). In 2010, of the 1793 block groups, 1283 (Table 1) of the block groups contained a racial group that comprised 60% of the population. In addition, those relatively homogenous block groups are congregated together into distinct parts of Harris County (Map 1). Now, while congregation is evident in Harris County, that is only half of the definition of segregation mentioned above. Discrimination in Harris County becomes apparent when considering the average monthly rent of each block group. By cross referencing Map 1 with Map 2, Majority Black and Majority Latinx block groups comprise the majority of block groups in low rent areas. There are only spikes in monthly rent in the direction that contain majority White block groups (Map 1 and Graph 1). Moreover, block groups where Black and Latinx peoples are the majority make up only 13 of the 424 block groups with a monthly rent great than $800, yet Whites comprise 322 of the block groups (Map

3). The block groups that pay greater than $800 for monthly rent, of which the majority is White, live on the outskirts of the county—far from the Central Business District (CBD), where most people in the county would work—because those residents can afford the luxury of commuting far distances to their jobs (Map 3 and graph 2). This type of segregation is indicative of Burgess's 1925 concentric zones model (Knox and Marston) because people prefer to live far from the chemical and noise pollutants assoicated with living close to the CBD, and Whites are the main group that can choose to do so. The large portion of majority White block groups (Map 1) 225 degrees from the CBD that pay a high rent and live near the CBD (Map 2) is the result of gentrification. Gentrification happens when renovation occurs in a historically poorer area, leading to a higher rent and forcing the people who had historically lived in the area to move because the rent is too high. Congregating Black and Latinx populations into poorer areas of a county is discriminatory because poorer areas are associated with access to worse elmentary and secondary education, worse healthcare, and worse infrastructure—all of which trap people in a cycle of poverty.

The patterns of segregation intersect with patterns of urban heart islands, constituting environmental injustice during heat waves. The median and mean temperatures for the majority White block groups are lower than the mean and median temperatures for majority Black, majority Latinx, and mixed block groups (table 1). The temperature during the Harris County heat wave in 2000 was hotter (map 4) in areas where minority groups comprise the majority of the block groups (Map 1). The lowest temperatures can be found on the outskirts of the county (Map 4) where Whites comprise the majority of each block group (Map 1). This phenonoman can be explained by the presence of heat islands[1], a result of increased temperatures due to the

[1] https://middlebury.instructure.com/courses/3038/pages/exam1-heat-is-on-in-houston

infrastructure, energy consumption, and impervious surfaces in surface areas. Since minorities are forced to live near the CBD (Map 1) because the rent is lower (Map 2), they are more likely to live near impervious surfaces—such as concrete—that raise the sourrounding temperature, espcially during heat waves. Heat island impacts include increased emission of air polluants and greenhouse gases, compromised human health and comfort, and impaired water quality[2]. Although a significant proportion of majority white blocks (Map 1) live in gentrified areas that showed some of the highest mean temperatures during the heat wave Southwest of the CBD (Map 4), they are not as severely effected by the heat islands because those are the areas with higher rent which means there is likely better air conditioning and ventilating in those homes (Map 2 and graph 1). Similar to the environmental justice issue in Milwaukee concerning access to green spaces, the systemic issue of heat islands disproportionally hurting minority communities is an environmental injustice present in Harris County Texas.

Patterns of segregation and environmental injustice plague Harris County Texas. Majority Black and majority Latinx populations of Harris County are segregated in poorer areas (Map 1 and Map 2), trapping them in a cycle of poverty that forced them live in areas that are disproportionaly effected by heat islands that occur during heat waves. Due to the health risks associated with heat islands, it is evident that systemic racism and environemntal inequality are alive and well in Harris County Texas today.

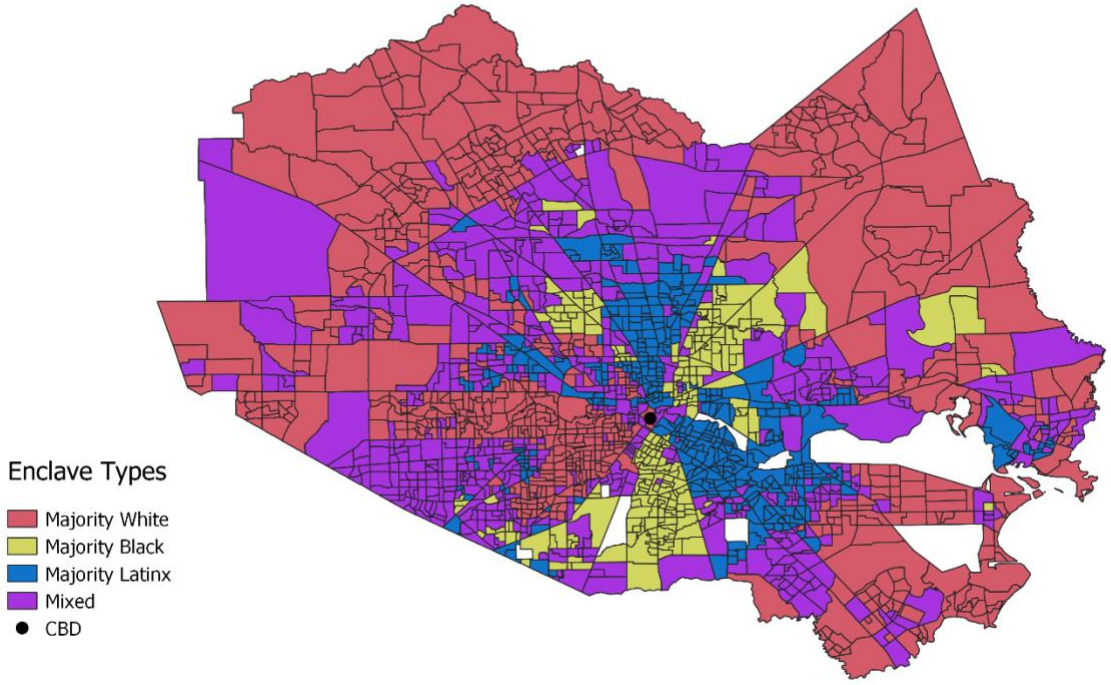
[2] https://www.epa.gov/heat-islands/heat-island-impacts

Enclave Type	Number of Block Groups (count)	Minimum Temp	Median Temp	Maximum Temp
1: Majority White	656	80.3967101	89.39384433	97.25098039
2: Majority Black	236	82.56287031	90.54726809	96.5498008
3: Majority Latinx	391	81.76391921	90.30837438	98.7027027
4: Mixed	610	80.72237381	91.7347613	97.55

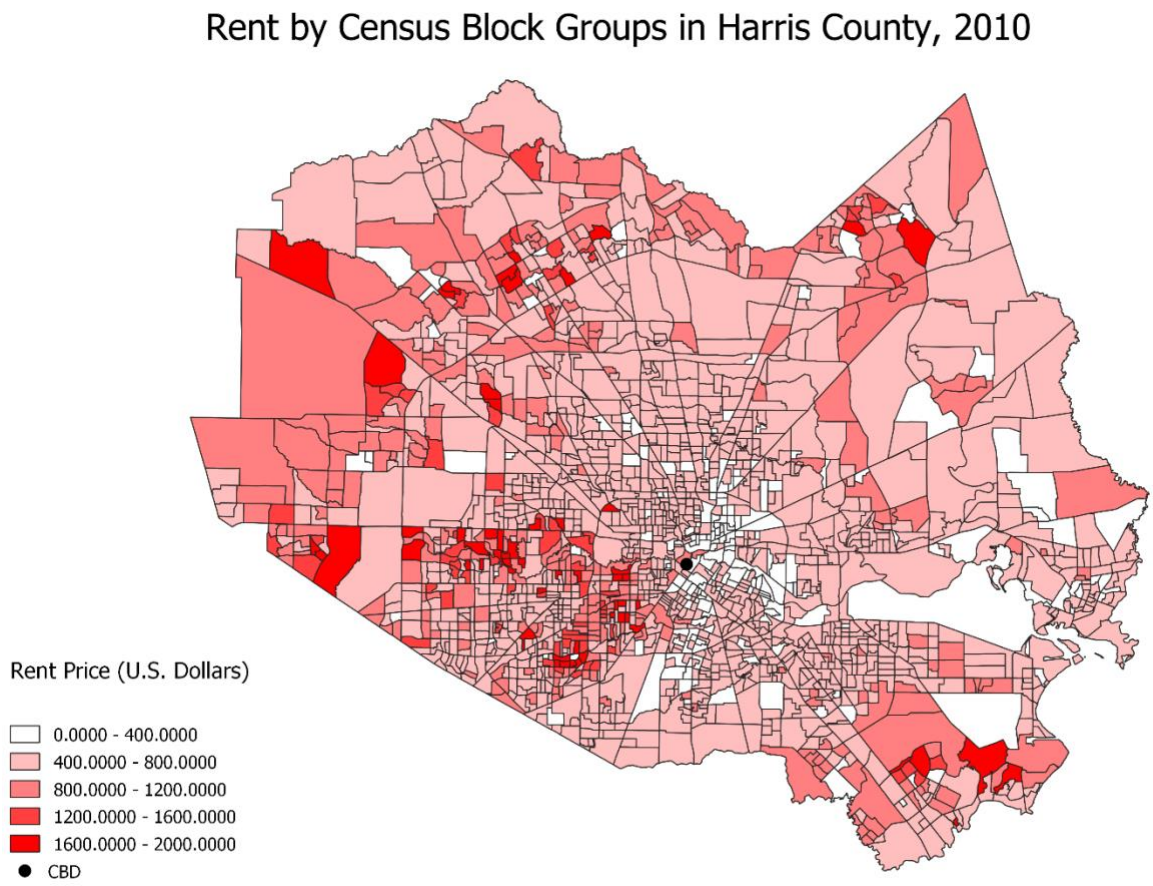
Table 1- This table represents data provided by NHGIS[3] and the Landsat 7 satellite program[4]. The table shows the count of the number of block groups based on whether they are mixed or contain a majority race, the Minimum Temperature for Enclave Types based on race majority, Median Temperature based on race majority, and Maximum Temperature based on race majority. (Table created by Chris Gernon)

[3] Mason, Steven, Jonathan Schroeder, David Van Riper, and Steven Ruggles. 2018. *IPUMS National Historical Geographic Information System: Version 13.0* [Database]. Minneapolis: University of Minnesota.
[4] *Landsat 7 image courtesy of U.S. Geological Survey and NASA*

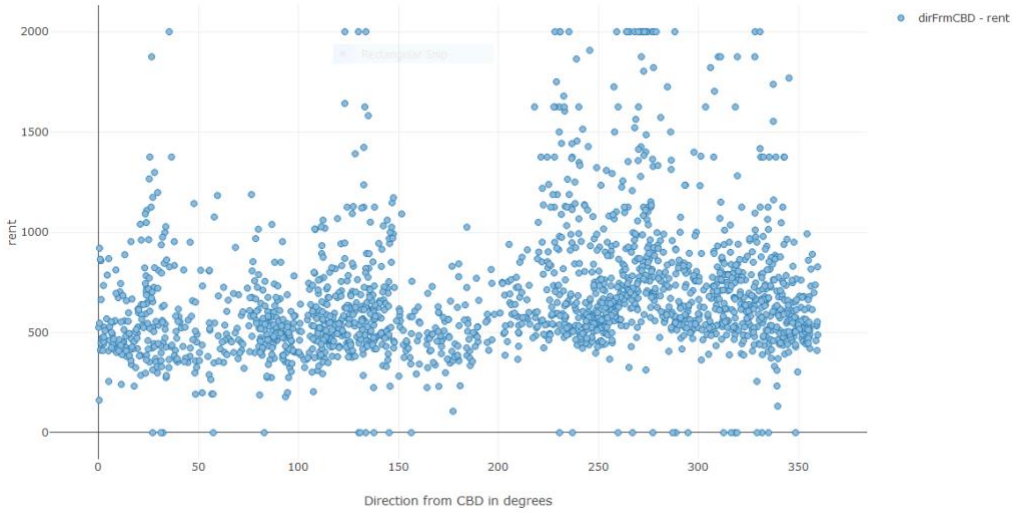
Harris County Census Block Groups By Race Majority, 2010



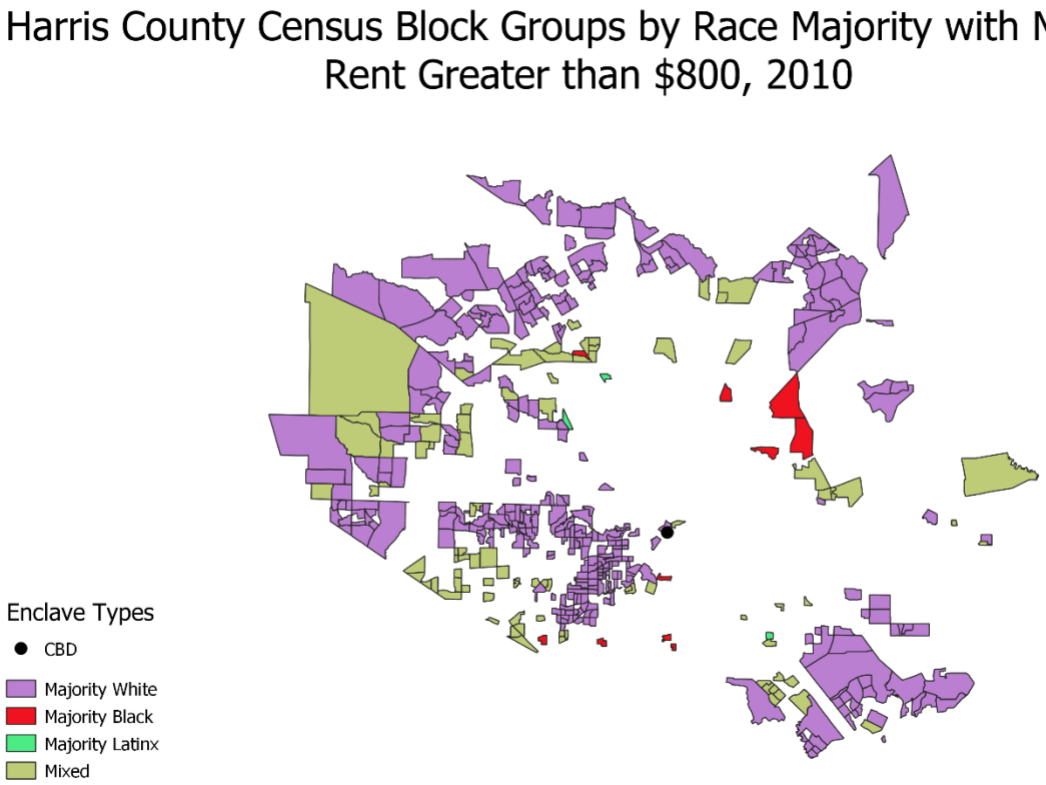
Map 1- This map shows the racial make up of block groups in Harris County in 2010. For a block group to be considered a majority, more than 60% of the population living in the block group had to identify as the same race. The red represents the block groups that are majority White, the blue represent block groups that are majority Latinx, yellow represents block groups that are majoroity, and purple represents mixed block groups where there is no racial majority. This map also contains the Central Business District (CBD) of Harris County. This map shows that minorities are segregated in Harris County based on the high concentration of several block groups in one specific area.(Map created by Christopher Gernon, data provided by Mason, Steven, Jonathan Schroeder, David Van Riper, and Steven Ruggles. 2018. *IPUMS National Historical Geographic Information System: Version 13.0* [Database]. Minneapolis: University of Minnesota.)



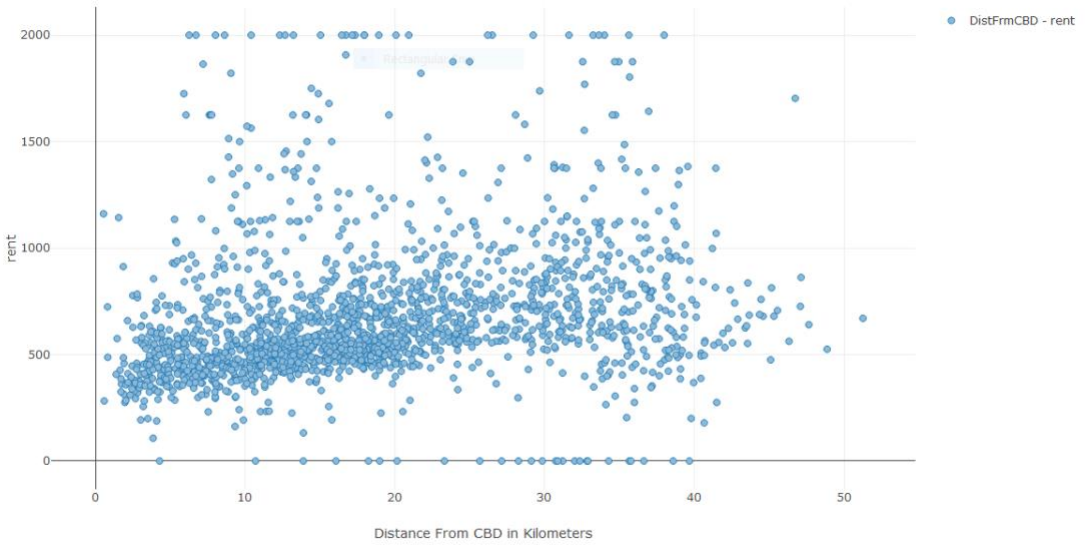
Map 2- This map uses data collected from the 2010 U.S. census. It shows the average monthly rent for each block group in Harris County. The more red the block group is the higher the the monthly cost. This map shows that blocks with higher average monthly rent cost appear in the periherals of Harris County or in the areas that have been gentrified near the CBD. It also shows that rent is cheaper closer to the CBD. (Map created by Christopher Gernon, data provided by Mason, Steven, Jonathan Schroeder, David Van Riper, and Steven Ruggles. 2018. *IPUMS National Historical Geographic Information System: Version 13.0* [Database]. Minneapolis: University of Minnesota.)



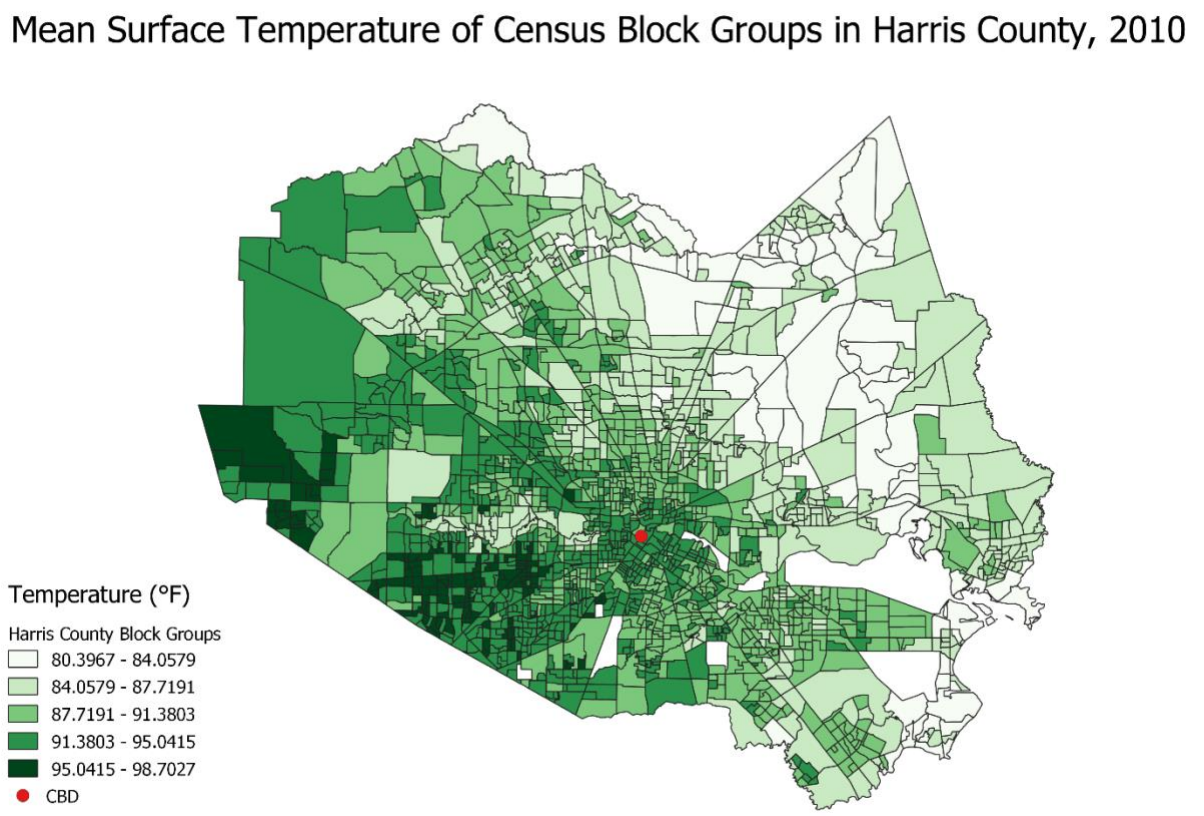
Graph 1- Using data collected from the U.S. census, this graph shows the relationship between rent cost per month and direction of the center of each block group in reference to the Central Businceess District in degrees. This graph shows there are specific spikes in the cost of rent at certain directions around the CBD. (Scatterplot and distance calculations performed by Christopher Gernon)



Map 3- This map uses data collected from the 2010 Census and shows block groups where the average monthly rent is greater than $800. This map shows the disparity between racial minorities and the average monthly cost of rent. There is significantly more block groups that are majority white, represented by purple on the map, than any other race. Majority Black block groups are represented by the color red, majority Latinx block groups are represented by green, and mixed block groups are represented by yellow. (Map created by Chris Gernon)



Graph 2- This graph shows the relationship between average monthly rent in Harris County (collected from 2000 US census) and the distance from the Central Business District (CBD) in Kilometers. This graph shows that there is a small correlation between how close someone lives to the CBD and the cost of rent. Rent increases as you move farther from the CBD. (Scatterplot created by Christopher Gernon and distance from CBD was calculated by Christopher Gernon)



Map 4- This map was created by Christopher Gernon using data about Harris County taken from the Landsat 7 satellite program[5] on September 6, 2000 at 4:42 p.m. It shows the mean surface temperature of block groups on on September 6, 2000 at 4:42 p.m. The whiter regions represent lower temperatures while the darker green represent high temperatures. The red dot represents the Central Business District (CBD).

Methods:

My workflow and solutions were correct for part 1.

*Correction: all text referring to census data collected in 2010 concerning average monthly rent should be changed to census data collected in 2000 concerning average monthly rent

Sources:

Knox, P., and S. Marston. 2013. City spaces : Urban structure. In Human geography : places and regions in global context, 384–413. Boston, MA: Pearson.

[5] *Landsat 7 image courtesy of U.S. Geological Survey and NASA*