GIS & SPATIAL ANALYSIS - SOC SCI, 2023

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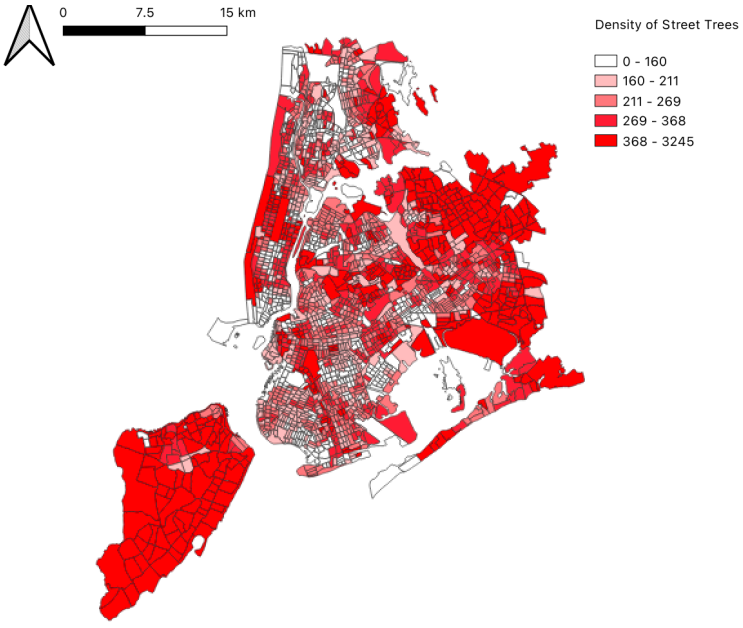
Homework 5: Exploratory Spatial Data Analysis for Your Research Project

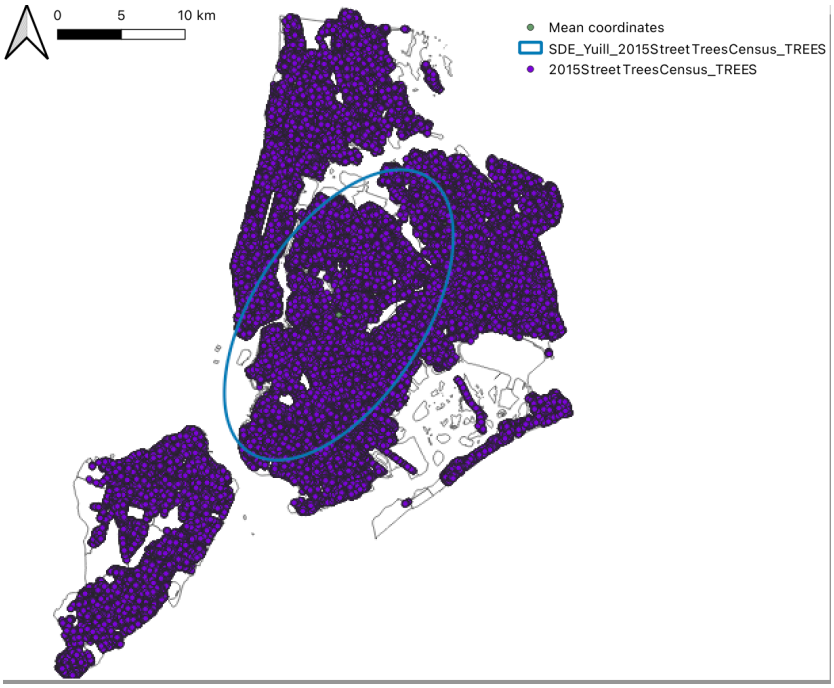
Introduction:

I have conducted an extensive analysis using two key datasets: the 2015 Street Tree Census and the 2010 Census Tracts of New York. The Street Tree Census provided a detailed record of street and sidewalk trees across New York City, offering valuable data on their species, size, condition, and precise locations. Utilizing this dataset, I've been able to map the spatial distribution and trends in tree populations across different boroughs and neighborhoods. Concurrently, the 2010 Census Tracts dataset has been instrumental in overlaying demographic and socioeconomic contexts, such as income levels, population density, and living conditions, with the tree data. This dual-dataset approach has allowed for a nuanced analysis of how various factors correlate with tree density and socioeconomic characteristics in New York City.

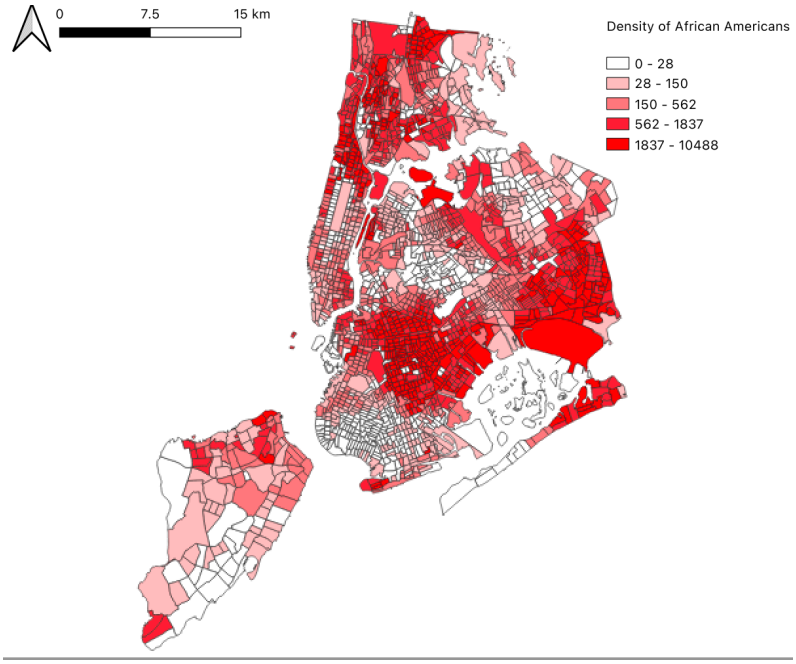
Maps:



According to the map above, it is evident that almost all the residential areas in NYC are densely populated with trees whereas non-residential places like the financial district and industrial areas are less dense in contrast. We can observe that Queens, Staten Island, Upper Manhattan are very densely populated with trees. However, looking in more depth in the residential areas, we can see that Midtown, some areas in Brooklyn, and the Bronx are less dense.

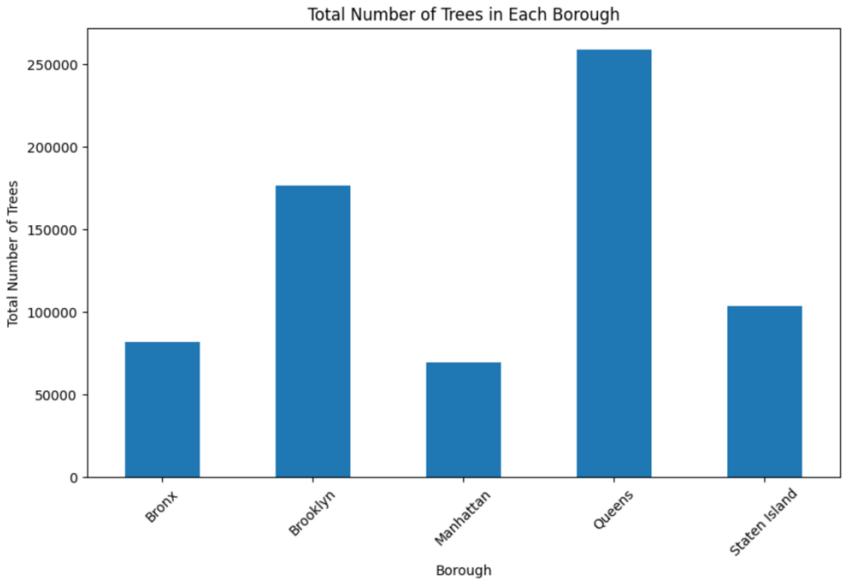


This map presents the mean coordinates and standard deviational ellipse for individual trees in New York City. It clearly illustrates that NYC has a dense population of trees, with the mean coordinate located centrally in Queens. While this map effectively highlights the general concentration of trees in the middle of the city, it offers limited insight into the broader context of tree distribution within New York City as a whole.



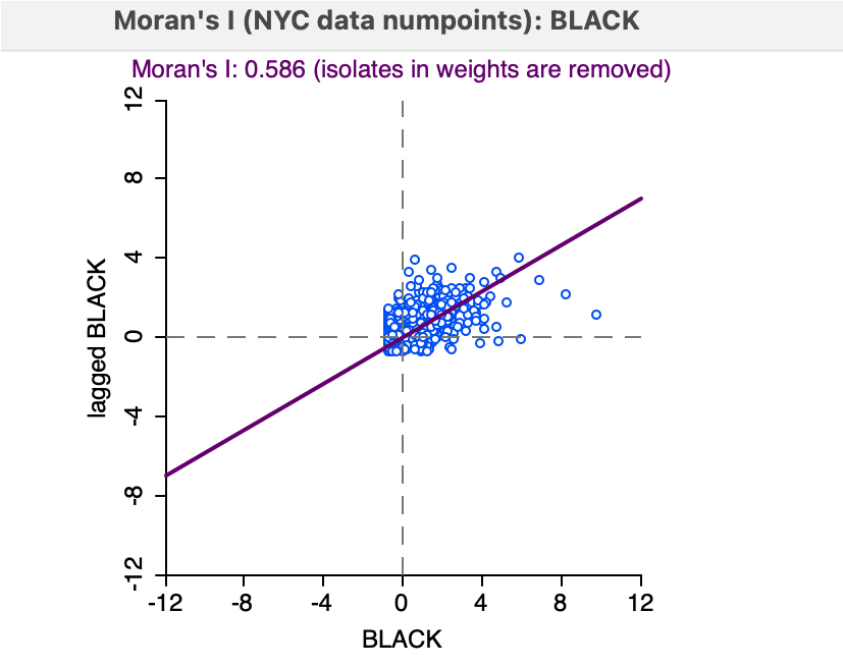
Examining the map that depicts the distribution of African American populations in New York City, it becomes apparent that there exists an inverse relationship with tree density. This observation potentially points to a form of environmental inequality affecting the residents of the city. Areas with higher concentrations of African American communities appear to have fewer trees, suggesting disparities in access to urban green spaces and the benefits they provide.

Data Analysis:



This is a Histogram showing the number of trees based on Boroughs in NYC. According to this graph, Queens has the most trees among all boroughs and Manhattan has the least trees with Bronx in close second. Although, this map does not show the density of trees in the boroughs, so spatially bigger boroughs have more trees, even if they are less dense per square meter.

In depth analysis reveals that the correlation coefficient is -0.1048 for the African American population and the number of trees in tracts, suggesting a slight negative correlation on average. Conversely, the correlation between the white population and the number of trees in tracts is positively correlated with 0.2506 being the correlation coefficient. This suggests a racial division between the racial groups in NYC. Looking at household income and the number of trees in tracts we can observe a correlation coefficient of 0.1749, again suggesting a division of natural resources among civilians.



A Moran's I value close to +1 suggests a strong positive spatial autocorrelation. In your case, 0.59 is a substantial positive value. This means that areas with high concentrations of Black

residents are likely to be surrounded by areas with similarly high concentrations, and areas with low concentrations are surrounded by areas with similarly low concentrations. This makes sense as racial segregation patterns are evident in NYC.

Conclusion:

Throughout our analysis of New York City's urban landscape using spatial statistics and geographic data, several key insights have emerged. Our investigation, grounded in datasets like the 2015 Street Tree Census and the 2010 Census Tracts, focused on understanding the spatial distribution of trees and the demographic makeup of the city, particularly the distribution of the Black population.

The analysis revealed a noticeable disparity in tree density across different boroughs and neighborhoods. Residential areas, particularly in boroughs like Queens, Staten Island, and Upper Manhattan, showcased a higher density of trees, contrasting sharply with the sparser tree coverage in non-residential areas like the Financial District and industrial zones. However, within residential areas, places like Midtown, certain parts of Brooklyn, and the Bronx exhibited a noticeably lower tree density.

Furthermore, our spatial autocorrelation analysis using Univariate Moran's I, which yielded a value of 0.59 for the distribution of the Black population, indicated a significant positive spatial autocorrelation. This suggests that areas with high concentrations of Black residents tend to be clustered together, potentially pointing to patterns of urban segregation. This finding underscores the need to consider the interplay between urban green spaces and demographic distributions in city planning and policy-making.

In conclusion, our study highlights the intricate relationship between urban greenery, demographic distribution, and spatial patterns in New York City. The insights point towards potential environmental inequality, particularly in access to urban green spaces, and underscore the importance of integrating environmental justice and equitable urban planning into city development strategies. While these findings offer a crucial understanding of the city's urban fabric, they also open the door for further research and action to address the disparities and enhance the livability and sustainability of New York City.