

CRIMES PATTERN IN BOSTON, MA

THE RELATIONSHIP WITH CRIMES LEVEL AND POPULATION CONDITION LEVEL

Introduction

In urban analytics field, crimes are a significant phenomenon which need to be concerned about and researched, thus many researches have been done on it and gave us some references. Harries et al. (2006) pointed that most type of crime tend to increase in levels of occurrence with increasing population density, but this relationship could be moderated by socioeconomic status; Narayan et al. (2007) said that fraud, homicide and motor vehicle theft are co-integrated with male youth unemployment rate and real male average weekly earnings; Lochner et al. (2000) found age and education were more negatively correlated with crimes requiring little skills; Lafree et al.(1992) found white crime rates declined as family income and educational attainment increased, which is quite the opposite for African-Americans. As for these theories above, I want to analyze violence and property crimes pattern with the influence of population condition and give my suggest about future Boston development.

Data

For this research, I selected 2 dataset for analysis: Crime Incident Reports 2017 and ACS 2017. The first Crimes dataset contains crimes information such as crimes type and location (longitude and latitude) in 2017 from Boston police department, and I selected 6 types of crimes separately for violence and property crimes: "Auto Theft", "Fraud", "Embezzlement", "Larceny", "Larceny From Motor Vehicle", "Other Burglary", "Residential Burglary" and "Vandalism" for property crimes; "Aggravated Assault", "Ballistics", "HOME INVASION", "Homicide", "Manslaughter", "Robbery", "Simple Assault" and "Warrant Arrests" for violence crimes. Then, I aggregated these types of crimes as violence and property crimes in census tract for following usage.

And another ACS dataset contains information about population condition level in each census tract in 2017 in Boston from American Factfinder. And I selected 6 kinds of population conditions I concerned about as the factors to analyze crimes pattern: Population density, Percentage of population in white, Median income, Poverty rate, Unemployment rate and Education level.

Besides, the layer of census tract in Boston is got from Tufts GIS Data Server for MassGIS

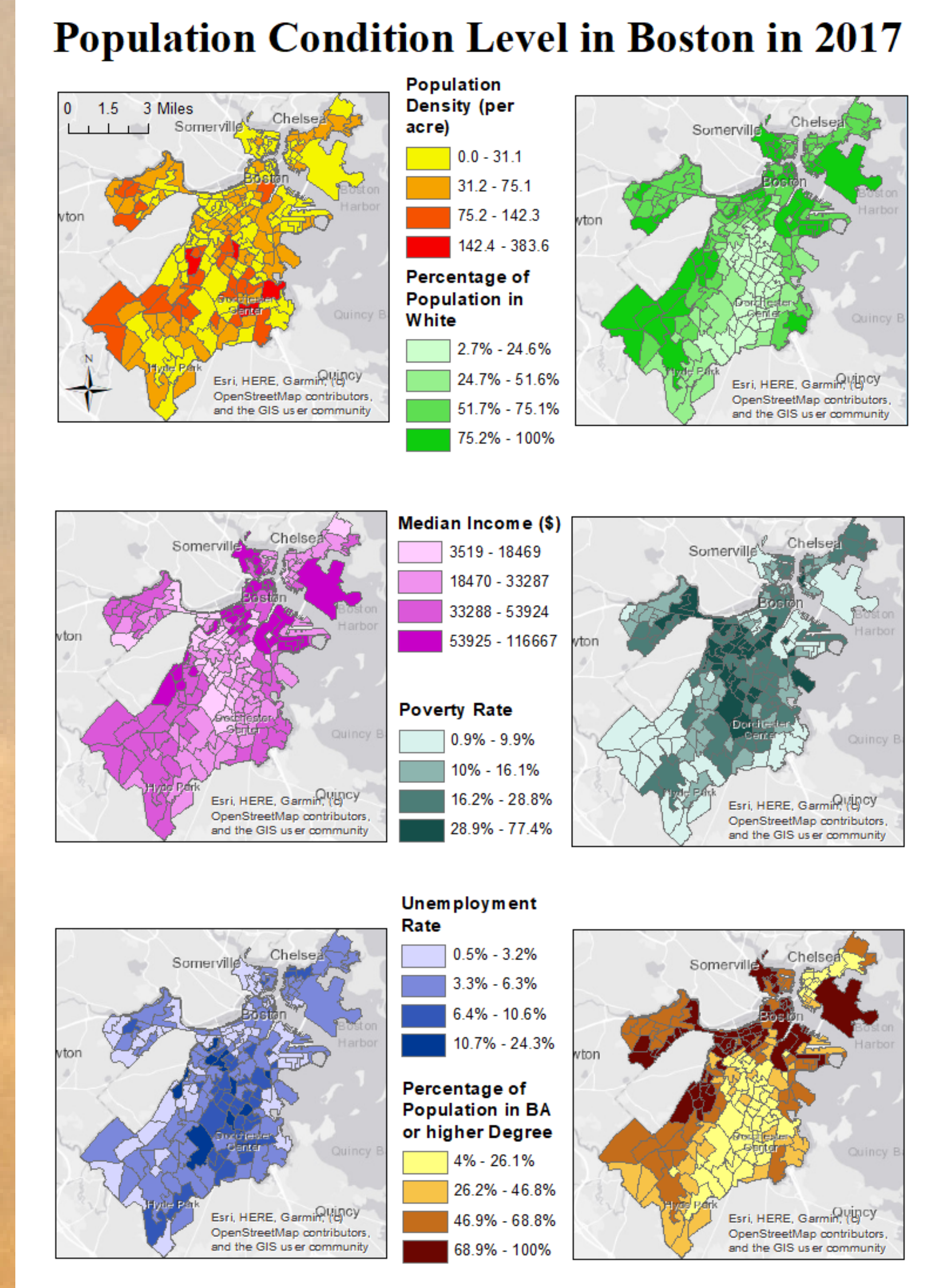
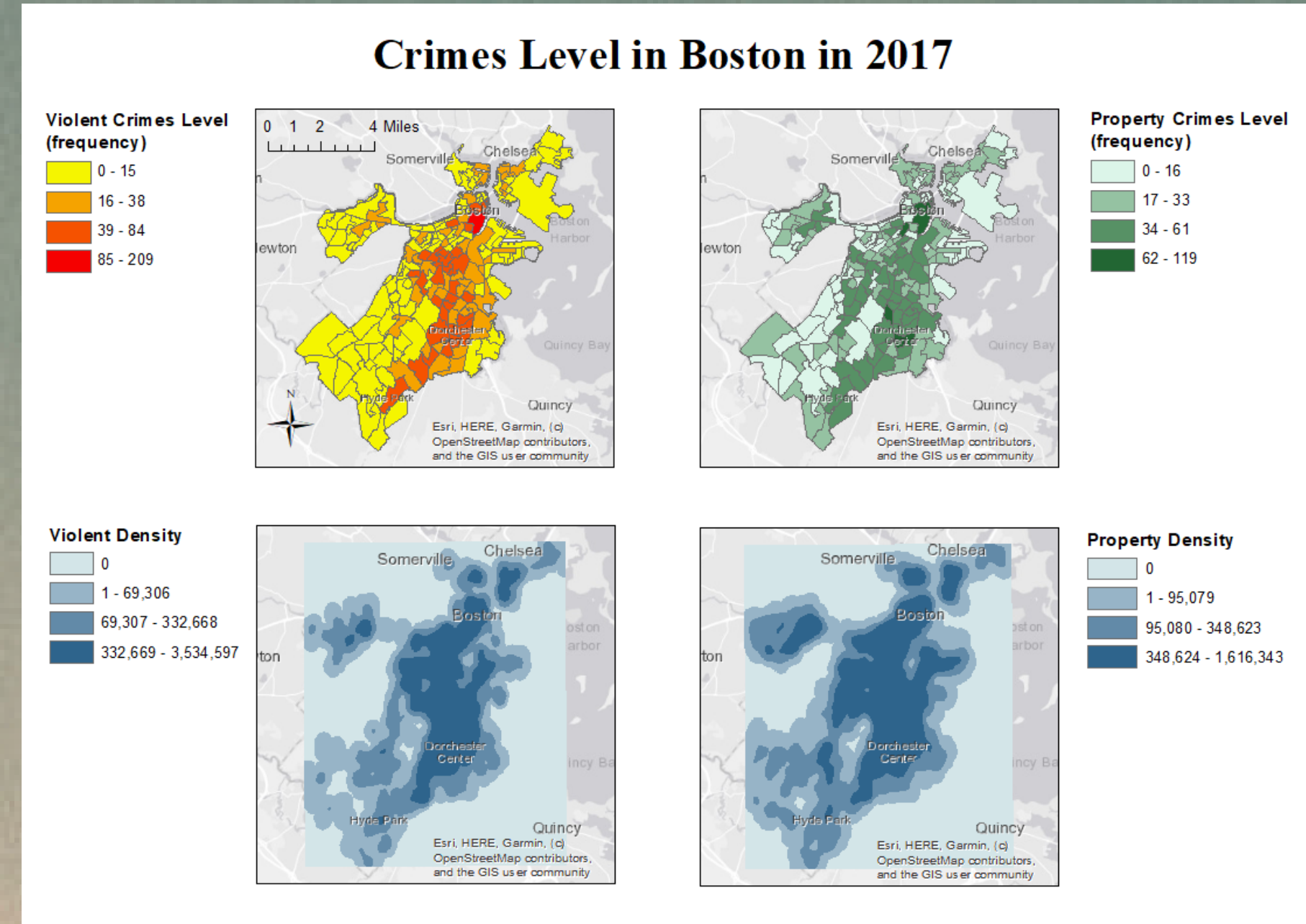
Reference

Harries, Keith. "Property Crimes and Violence in United States: An Analysis of the influence of Population density." International Journal of Criminal Justice Sciences 1, no. 2 (2006).

Narayan, Paresh Kumar, and Russell Smyth*. "Crime rates, male youth unemployment and real income in Australia: evidence from Granger causality tests." Applied Economics 36, no. 18 (2004): 2079-2095.

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LaFree, Gary, Kriss A. Drass, and P. A. T. R. I. C. K. O'DAY. "Race and crime in postwar America: Determinants of African-American and white rates, 1957-1988." Criminology 30, no. 2 (1992): 157-188.



Conclusion

In this research, I successfully find the difference of geo-distribution of violence and property crimes, and the relationship between crimes level and population condition level. Besides, I also build a sufficient model to summarize crimes pattern with population condition and predict the crimes level in Boston. For my future study, I may pay attention to add more factors in this research and analysis the crimes pattern in longer time period and larger area. Besides, as for the results I get from my research, I think the Boston government should pay attention to improve the education level of population and reduce the poverty rate and unemployment rate to reduce the crimes level in Boston and make our society safer and better.

Methods

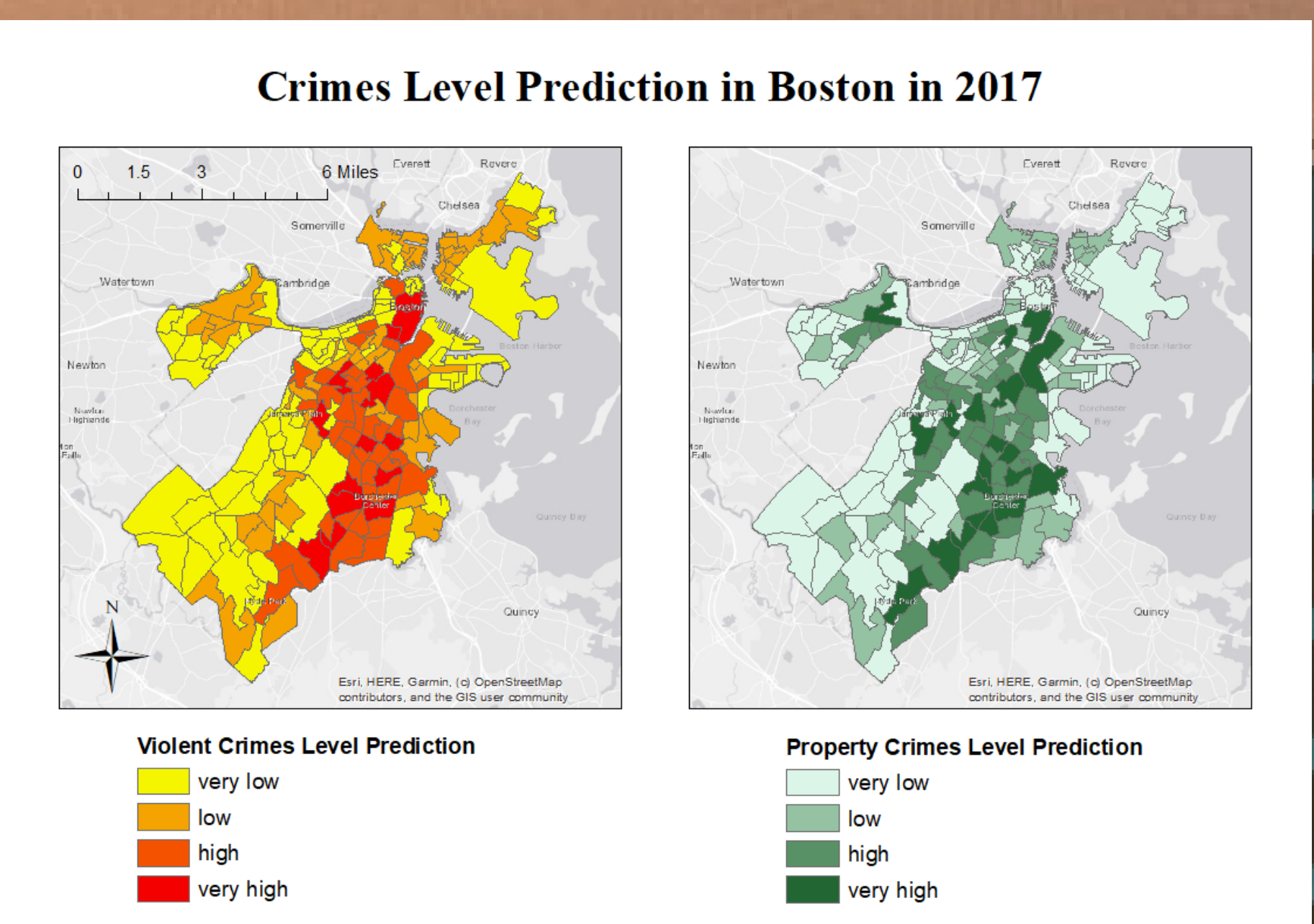
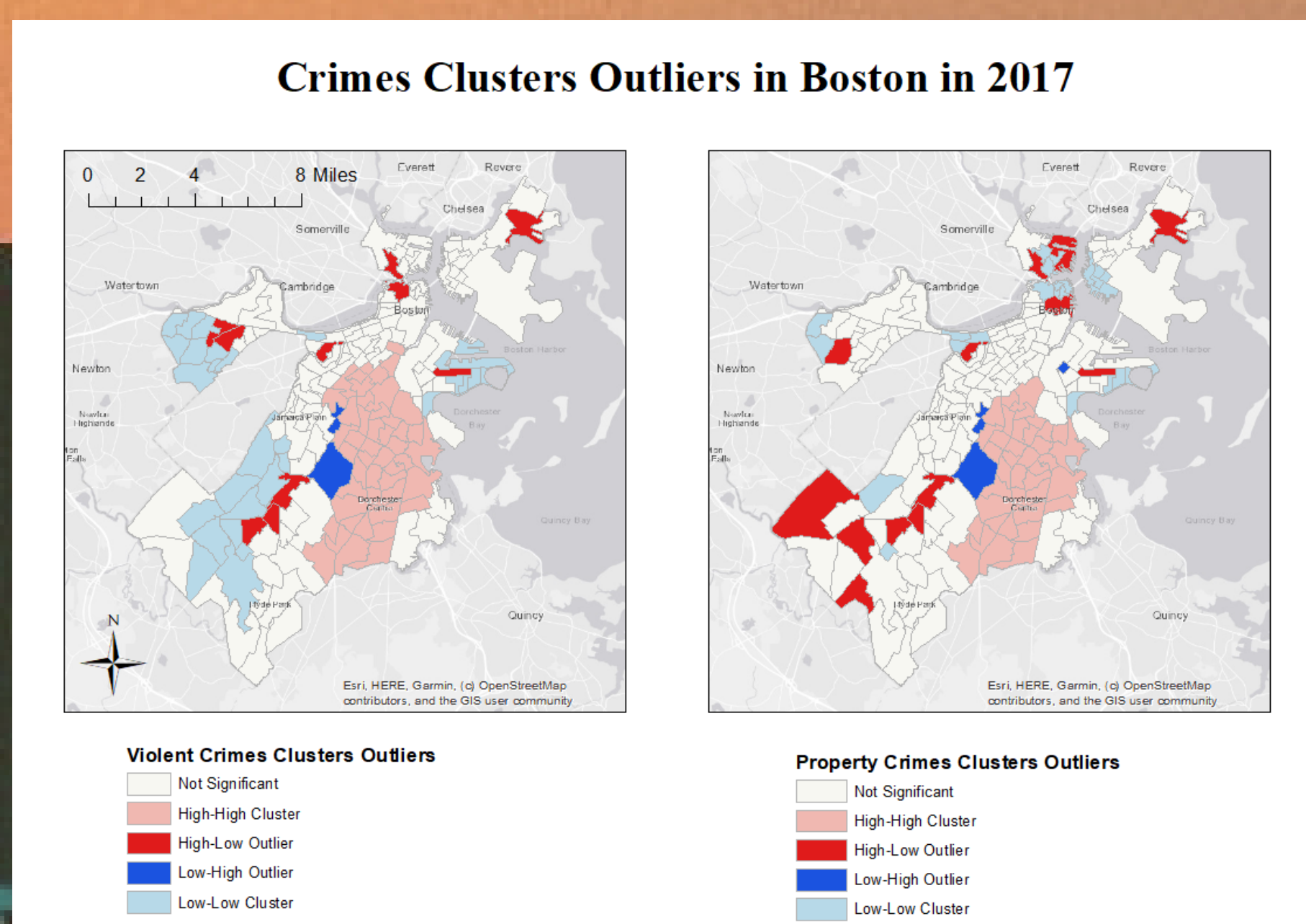
To analyze the crimes pattern, I firstly tried to geocode the crimes points in the map and then spatial join them to census tract level in order to get the violence and property crimes level in each census tract in Boston. Then, I also did the similar operation for population condition level data, thus the figure which shows the crimes and population condition geo-distribution could be made.

Then I create the kernel density raster map for violence and property crimes, and also calculate the Global Moran's I and create a map for Local Moran's I to show the cluster of violence and property crimes. Finally, I used machine learning algorithm - Random Forest - to summarize the crimes pattern by analyzing the model of crimes level and population condition level and give a prediction map about the violence and property crimes level in Boston.

Results and Analysis

As the figure shows, the geo-distribution of violence and property crimes is similar, and the difference between them is that property crimes distribute more disseminated than violence crimes. And the geo-distribution of crimes are also similar with the geo-distribution of percentage of population in white, median income, poverty rate, unemployment rate and percentage of population in BA or higher degree, which means these population conditions have high relationship with crimes. And as for this related factors, crimes level increase with the increase of poverty rate and unemployment, and crimes decrease with the increase of percentage of population in white, median income and percentage of population in BA or higher degree, which is the same as the conclusion in those literature.

And in my machine learning model, the prediction of violence and property crimes level in Boston is also similar with the reality, thus could be a useful model to analysis the future crimes pattern.



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UEP 232 Intro to GIS

Projection: Lambert Conformal Conic