Lab4 Report

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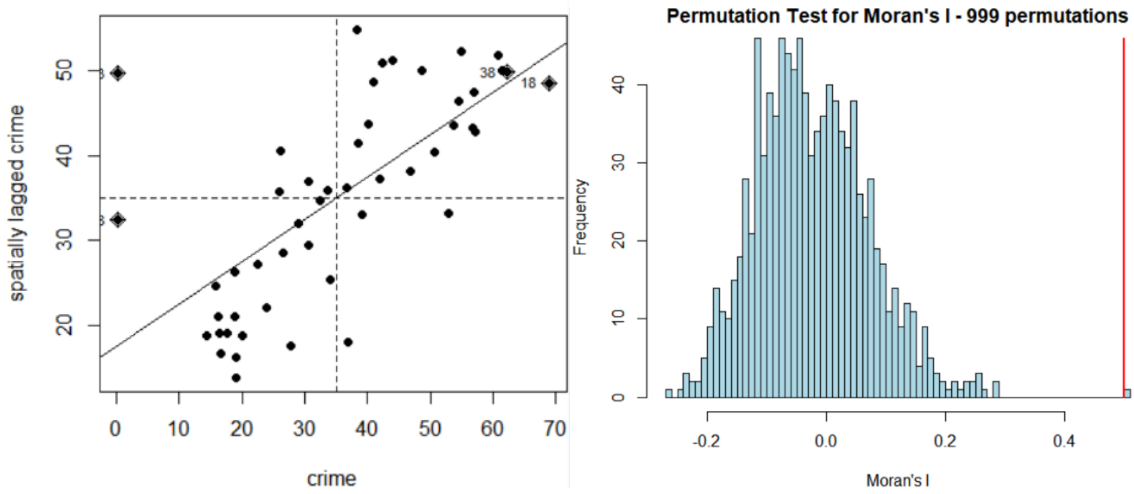
Assignment1:

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        Moran I test under randomisation

data:  crime
weights: col.W

Moran I statistic standard deviate = 5.5894, p-value =
1.139e-08
alternative hypothesis: greater
sample estimates:
Moran I statistic       Expectation          Variance
      0.500188557      -0.020833333       0.008689289
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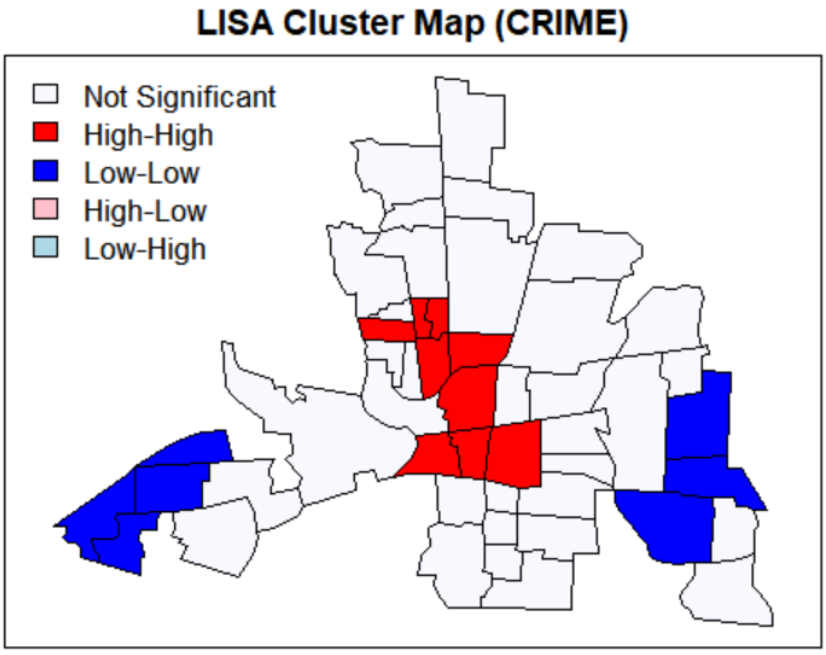
Yes, the crime rate shows positive spatial autocorrelation. For the Moran's I scatterplot, most of the points are at the location of positive spatial associations, which arsQ1(High/High positive SA) and Q3(Low/Low positive SA). So, the crime rate is positive spatial autocorrelation.

Additionally, according to the calculated data, the slope of the line, also the value of Moran's I is 0.500188557 which is bigger than 0. This also shows the crime rate is positive spatial autocorrelation. The bigger the value, the stronger the positive spatial auto correlation. So, the crime data has a relatively strong positive spatial autocorrelation.

As for the permutation plot, the red line is on the right side of 0 which also means the crime rate shows positive spatial autocorrelation. Additionally, p-value equals to 1.139e-08. The smaller the p-value, the, stronger the positive spatial autocorrelation is. The p-value is extremely small, so, the crime rate shows strong positive spatial autocorrelation.

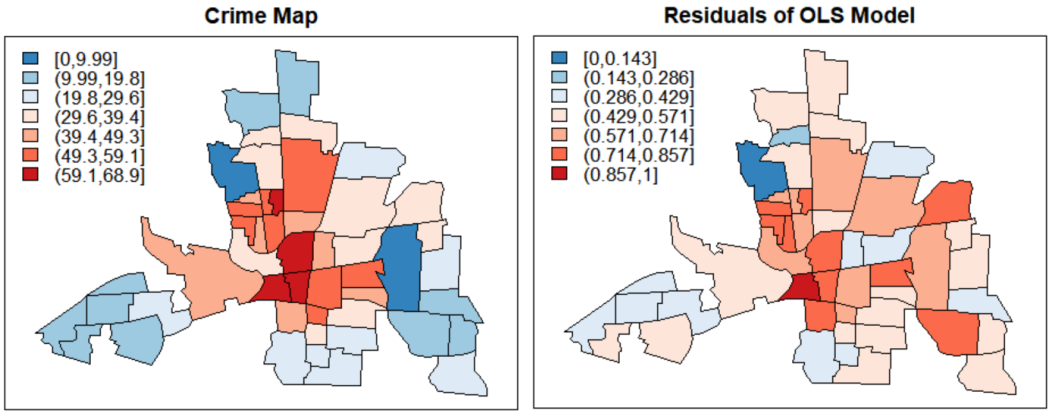
Assignment2:



The red area is High-High area which means the value of CRIME rate is high at the center part and the rate at its surrounding areas are also high. The blue area is Low-Low area which means the value of CRIME rate is low at the left and right parts and the rate at theirs surrounding areas are also low. White areas indicate no typical features.
For the blue part and red part, because they are the same as the surrounding features, all at a high level or all at a low level, the central part and the left and right parts of the map are all positive local spatial autocorrelation.

Assignment3：

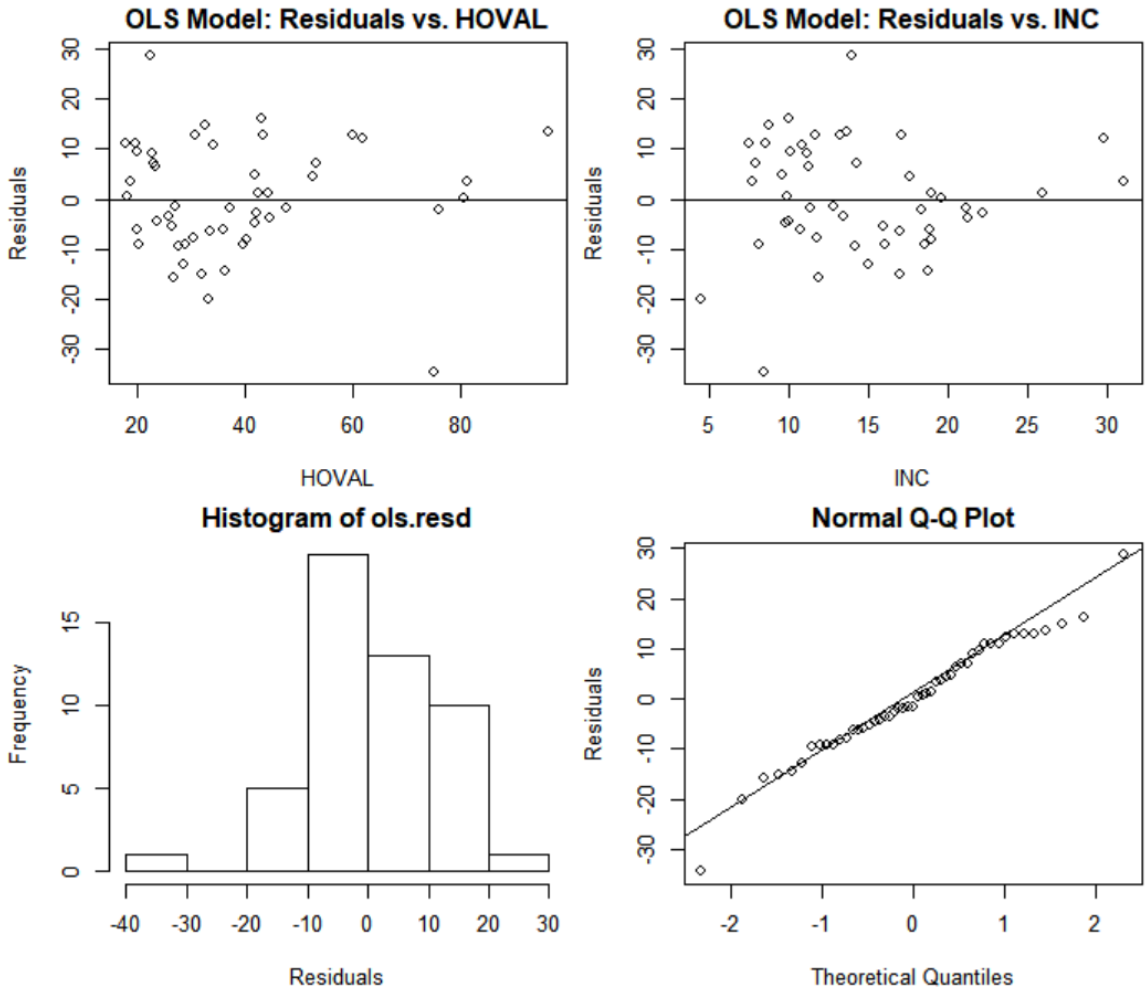
1.



Through the analyses before, we already know that there is positive local spatial autocorrelation at the central and the left and right parts of the Crime map which means these parts have the same features, both high and low. We can see this from the Crime Map too. The central parts are all red which means high crime rate. The edge areas are all blue which means low crime rate.
However, in the residuals of OLS Model, there are blue areas at the central. Also, there are red areas at the edge. Both features are contradictory with the original.

Residuals of OLS Model is not as clustered as Crime map.
Spatial autocorrelation is determined by the numerical characteristics of the crime rate itself. The residuals do not affect the crime rate value itself in a large extent. And the residual is not directly related to the crime rate itself. The residual is caused by errors in the survey measurement, fitting process and so on. The residual is simply the difference between the observed and regression values. The residual has nothing to do with the observed value. Residuals of small observations may be large, and residuals of large observations may be small. The residual depends on the effect of the regression. Therefore, the crime rate having spatial autocorrelation in the local does not mean that the residual of the crime rate also has spatial autocorrelation. As a result, the spatial dependence of the residuals and the dependence of the crime rate will be different.

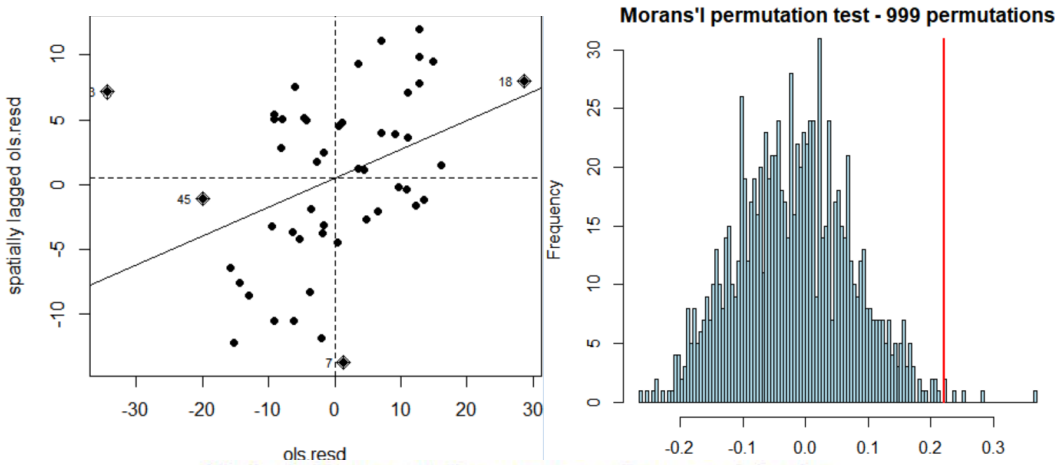
2.



I think the residuals are normally distributed. In the first two pictures, we can see most points are around the line and about linear symmetry. The farther away from the line, the fewer points. This is consistent with the characteristics of a normal distribution.
In the third picture, the shape of the histogram is the same as the normal distribution.

The frequency is the largest at 0, with 0 as the axis of symmetry. As the distance from the axis of symmetry increases, the frequency decreases. The farther away from the axis of symmetry, the fewer points.
In the last picture, most points are on the line. According to the principle of the QQ plot, the residuals are in accordance with the normal distribution.

3.

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Global Moran I for regression residuals

data:
model: lm(formula = CRIME ~ INC + HOVAL, data =
ColData)
weights: col.W

Moran I statistic standard deviate = 2.8393, p-value =
0.00226
alternative hypothesis: greater
sample estimates:
Observed Moran I      Expectation         Variance
     0.222109407     -0.033418335      0.008099305
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From the above figures, I think the residuals are not completely independent in spatial. The data of residual is relatively independent as we have analyzed. But the residual data's spatial distribution is not completely independent.
In the Moran's I scatterplot, points which are at the location of positive spatial associations(Q1(High/High positive SA) and Q3(Low/Low positive SA)) are more than that at the negative spatial associations(Q2(Low/High positive SA) and Q4(High/Low positive SA)).Additionally, the slope of the line, also the value of Moran's I is 0.222109407 which is bigger than 0 although not very big. So, the residual maybe is weak positive spatial autocorrelation.
As for the permutation plot, the red line is on the right side of 0 which also means the residual shows positive spatial autocorrelation. Additionally, p-value equals to 0.008099305. The smaller the p-value, the, stronger the positive spatial autocorrelation is. The p-value is small, so, the crime rate shows positive spatial autocorrelation.