1. **Describe in your own words how Moran’s I is calculated.**

In weight matrix row standardization, each neighboring polygon is assigned equal weight ‘W’. These observations contribute to equal weight in computing a spatial correlation.

Text, letter

Description automatically generated

The above formula defines Moran’s I calculation. For instance, in the above formula, the number of regions is divided by the sum of all the weights (i and j regions), where wij refers only for regions that are neighbors.

The difference between the region i and the mean value is multiplied by the difference between the region j and the mean value.

If both i and j values are above the average value, it shows a positive correlation and Moran’s I is positive.

If both I and j values are below the average value, it shows a negative correlation, and Moran’s I is negative.

The standardization bound spatial correlation between -1 and +1, if not standardize the co-relation values can be out of bound.

1. **Describe in your own words: what is a spatially lagged variable?**

The spatially lagged variable is a weighted average of neighboring values. Dependent variables are associated with neighboring values.

1. **How does your analysis in this lab (as simple as it is) diffr by how you have formalized W (e.g., space, neighbors) in two different methods? How might it affect analysis?**
2. Spatial weights for neighbors lists (nb2listw)

This function assigned equal spatial weight to each neighboring polygon. This is achieved by dividing the number of neighbors by 1 and then summing the values. This represents the spatial relationship between features in the dataset.

1. Inverse distance weighted (IDW)

The IDW method estimated that values that are closer are more related than the values that are further from the point of estimation.

For the IDW method, the distances are measured from the neighboring values to the point of estimation. The distances are then converted into weights, where weights have added to equal to 1. The neighboring values are multiplied by distance weights and added to get the interpolated values

If the weights added up to more than 1, it would end up overestimating neighboring values and weights added up to less than 1 will be under estimating values for neighbors.

1. **What does it mean if an observation falls in the “H-L” quadrant? Why might it be useful to detect such occurrences?**

If an observation falls in the “H-L” quadrant, it means that it has a positive or negative spatial relationship with other surrounding variables. For instance, if we take a Moran Scatter Plot an example.

The first quadrant shows a variable High-High values (HH), for example a county with high x values surrounded by other variables with high x values.

The second quadrant shows a Low-High value (LH), a county with low values encircled by other high values counties. Similarly, the third quadrant shows a Low-Low values (L-L) and the fourth quadrant shows High-Low (HL) values.

It is useful because it defines the position of a point or a variable of an interest in the quadrant.