# GEOG 653: Lab 2 (Point Pattern Analysis)

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## Overview

For lab 2, we explore Point Pattern Analysis.

## Question 1.

PG_PublicSchools

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

| COUNTY | STATE | ZIP | PHONE | CATEGORY | NEAR_FID | NEAR_DIST | NEAR_X | NEAR_Y |
|---|---|---|---|---|---|---|---|---|
| 'rince George's | MD | 20783 | 301-431-6250 | public elementary sch | 6444 | 135.312295 | 402455.588043 | 148197.055718 |
| 'rince George's | MD | 20748 | 301-702-3931 | public elementary sch | 18 | 203.279567 | 405924.251186 | 126352.180532 |
| 'rince George's | MD | 20744 | 301-449-4966 | public elementary sch | 930 | 264.368875 | 402837.764765 | 124712.024237 |
| 'rince George's | MD | 20774 | 301-925-1311 | public elementary sch | 5398 | 0 | 413249.275101 | 140980.332564 |
| 'rince George's | MD | 20774 | 301-499-7071 | public elementary sch | 3257 | 233.511389 | 413713.698748 | 132544.800719 |
| 'rince George's | MD | 20744 | 301-449-4970 | public elementary sch | 114 | 531.453082 | 405390.712974 | 124911.994845 |
| 'rince George's | MD | 20613 | 301-888-1188 | public elementary sch | -1 | -1 | -1 | -1 |
| 'rince George's | MD | 20745 | 301-702-7560 | public elementary sch | 4625 | 174.295909 | 403050.522979 | 127749.234759 |

Figure 1: Car accidents nearest to each school (within 1 mi.)

## Question 2.

PG_Hospitals_Projected

Field: Add Delete Calculate Selection: Zoom To Switch Clear Delete Copy

| OBJECTID | Shape | NAME | FCC | Sequence | NEAR_FID | NEAR_DIST | NEAR_X | NEAR_Y |
|---|---|---|---|---|---|---|---|---|
| 1 | Point | GREATER SOUTHEAS... | D31 | 5 | 4 | 11398.094157 | 406475.3543 | 140074.0178 |
| 2 | Point | FT WASHINGTON ME... | D31 | 3 | 3 | 10517.487107 | 410901.9675 | 120305.7506 |
| 3 | Point | SOUTHERN MARYLA... | D31 | 7 | 2 | 10517.487107 | 400671.6206 | 117864.9439 |
| 4 | Point | PRINCE GEORGES H... | D31 | 6 | 5 | 4087.860396 | 405084.5829 | 143918.0206 |
| 5 | Point | EUGENE LELAND ME... | D31 | 2 | 4 | 4087.860396 | 406475.3543 | 140074.0178 |
| 6 | Point | DOCTOR'S COMMU... | D31 | 1 | 5 | 6733.491257 | 405084.5829 | 143918.0206 |
| 7 | Point | GREATER LAUREL BEL... | D31 | 4 | 6 | 11515.266823 | 411548.4981 | 145804.2085 |

Figure 2: Nearest Hospital for each Hospital

## Question 3.

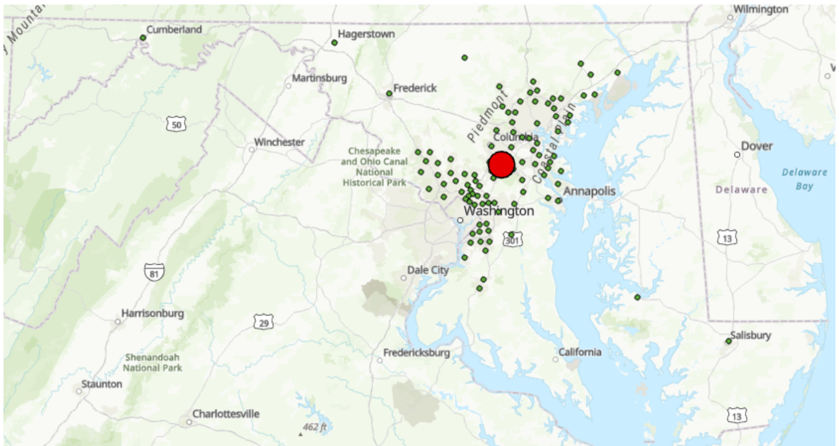


Figure 3: Mean center for the Maryland Cities Layer

## Question 4.

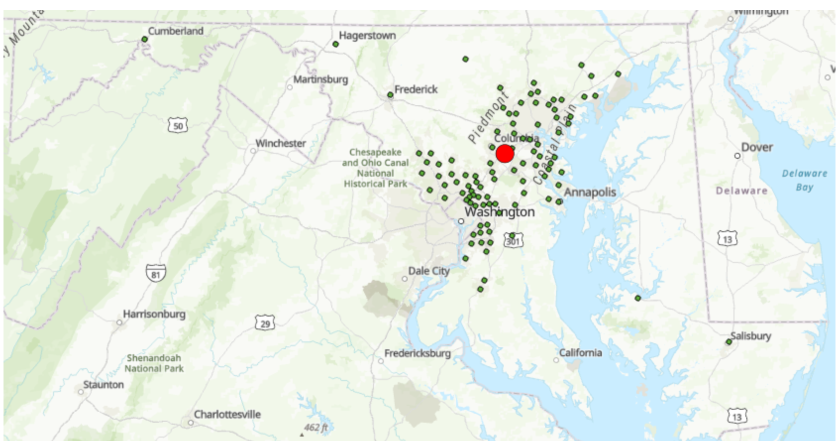


Figure 4: Mean center for the Maryland Cities Layer weighted by 1990 Population

## Question 5.

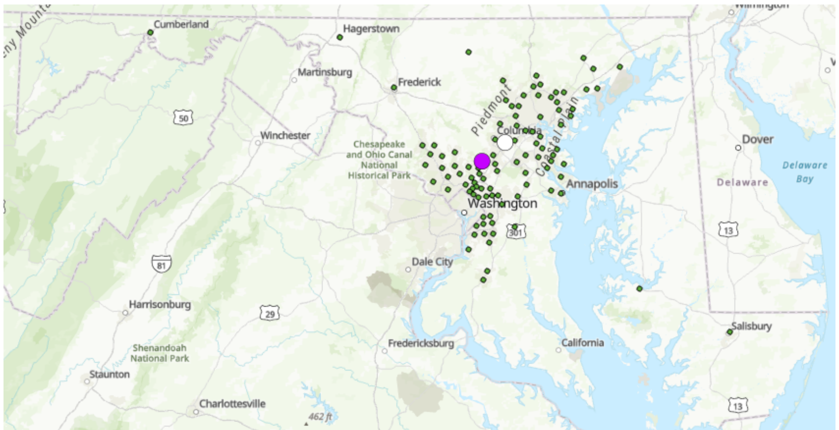


Figure 5: Mean center for the Maryland Cities Layer weighted by race. *White=White, Purple=Asian/PI

## Question 6.

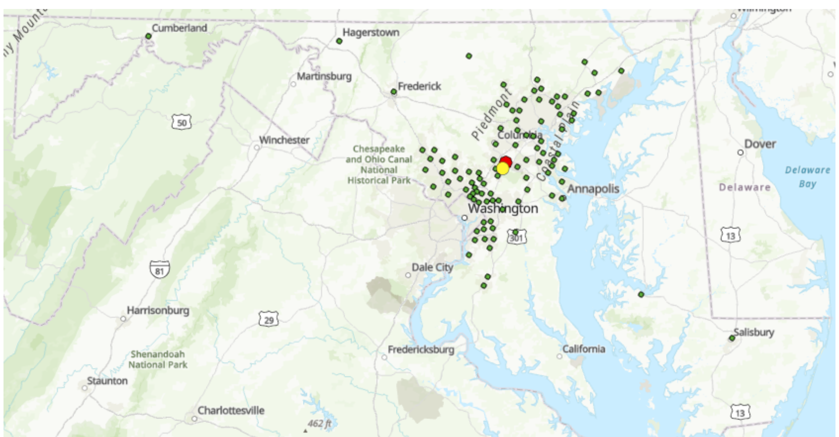


Figure 6: Median and Mean for the Maryland Cities Layer (Unweighted). *Red=Mean, Yellow=Median

## Question 7.

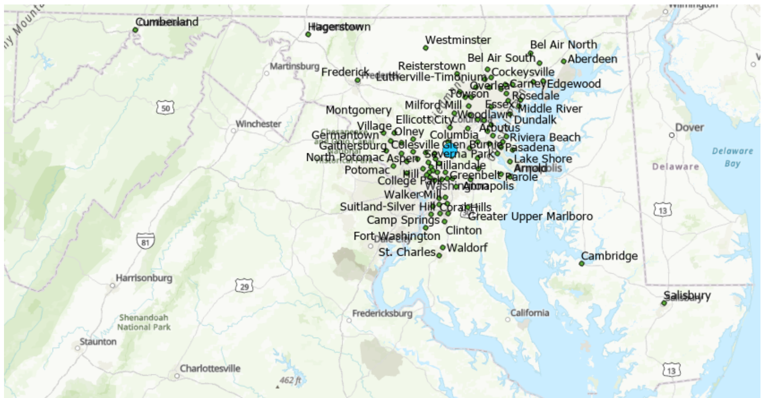


Figure 7: Central Feature of MD Cities Layer (In Blue - Laurel,MD)

## Question 8.

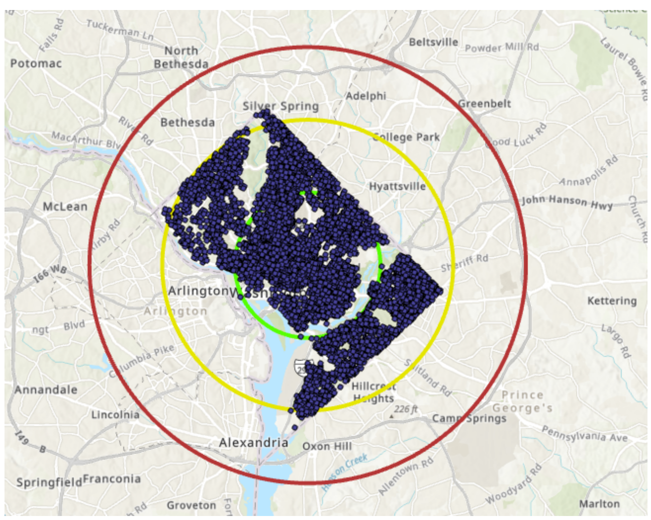


Figure 8: Standard Distance for the DC Crimes Layer.
*Green= 1 SD, Yellow = 2 SD, Red = 3 SD

## Question 9.

To analyze the spatial dispersion of the DC Crimes layer, I decided to make intersections between the original DC Crimes layer and the individual Standard Distance layers. A quick look at the attribute table for the Standard Distance Layers shows that it treats the data as a polygon (as opposed to a single 2-d curve), thus making it possible to yield this intersection. After intersecting, the layer should yield only crime points that fall within its corresponding Standard Distance layer.

| Spatial Dispersion | Count | Percentage |
|---|---|---|
| 1 SD | 19,395 | 61.724% |
| 2 SD | 31,217 | 99.348% |
| 3 SD | 31,422 | 100.000% |
| **Total** | **31,422** | **100%** |

Table 1: Table showing Spatial Dispersion of the DC Crimes Layer
(Organized by n-Standard Deviations).

From our results, we can see that while not perfectly a normal distribution, the Spatial Dispersion follows a similar behaviour. There are most likely some geographical features that contribute to some form of directional bias.

## Question 10.

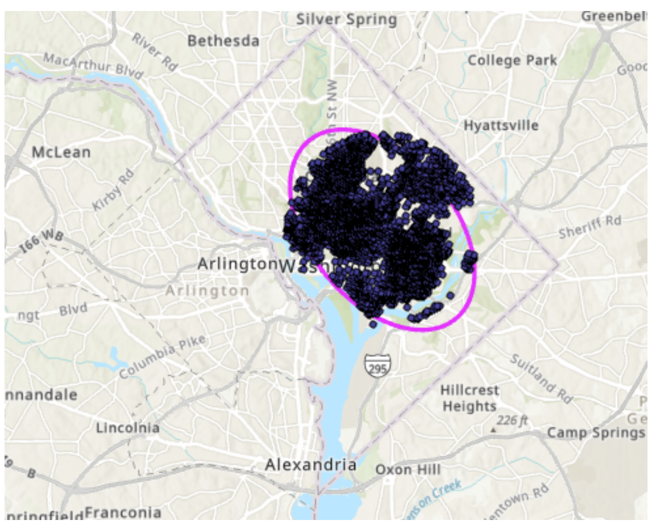


Figure 9: Directional Distribution at 1 Standard Deviation
(1 SD Spatial Dispersion layer overlayed for comparison)

## Question 11.

Using the equation:

$$e = \frac{\sqrt{a^2 - b^2}}{a}$$

Where:

$$e : eccentricity$$

$$a : length\ of\ the\ semi - major\ axis$$

$$b : length\ of\ the\ semi - minor\ axis$$

We arrive at the calculation:

$$e = \frac{\sqrt{5518.72281149^2 - 3456.43584305^2}}{5518.72281149} = 0.77957$$

## Question 12.

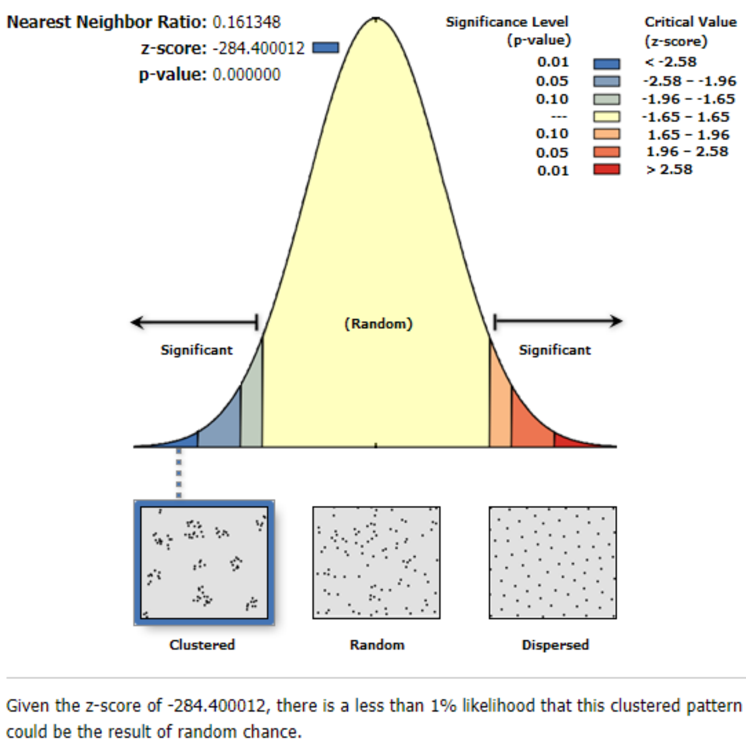


Figure 10: Nearest Neighbour Analysis of the DC Crimes layer

## Question 13.

From the figure, we see that these farms are quite clustered. Geographically speaking, we should expect this because cows require specific types of geographies (mainly grass or fields) to be farmed.

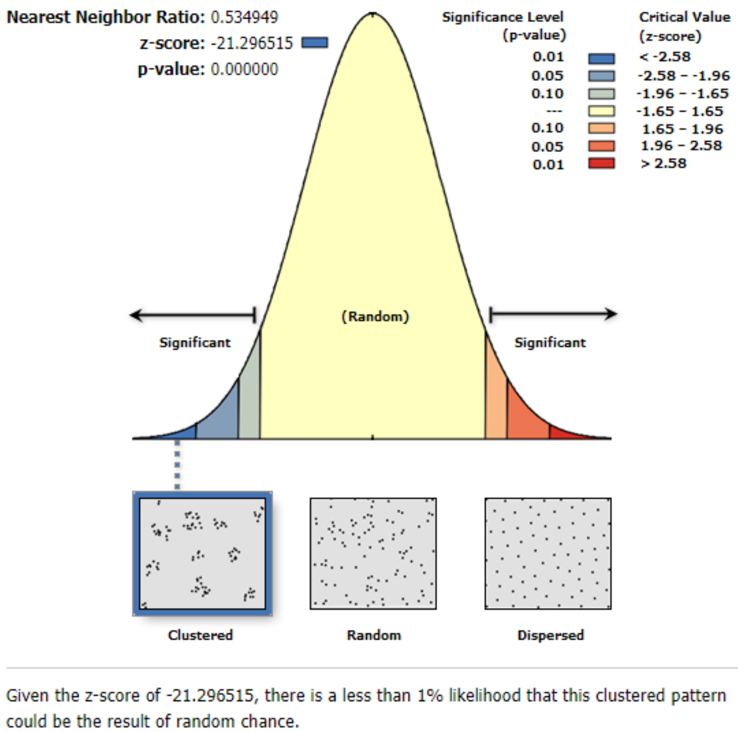


Figure 11: Nearest Neighbour Analysis for the Dairy Farms layer

## Question 14.

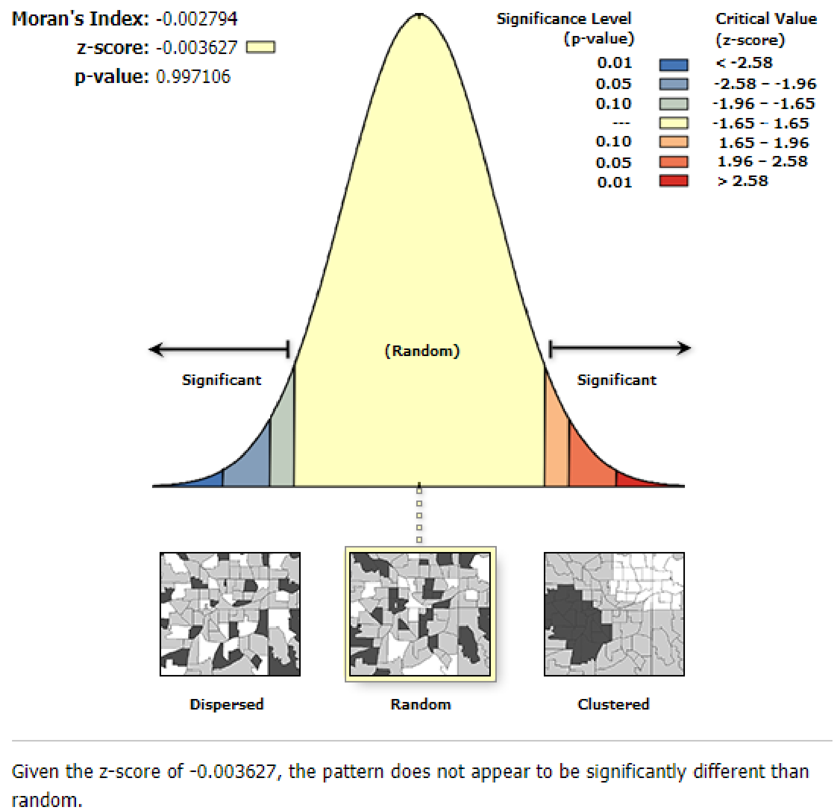


Figure 12: Spatial Autocorrelation using Moran's I statistic

## Question 15.

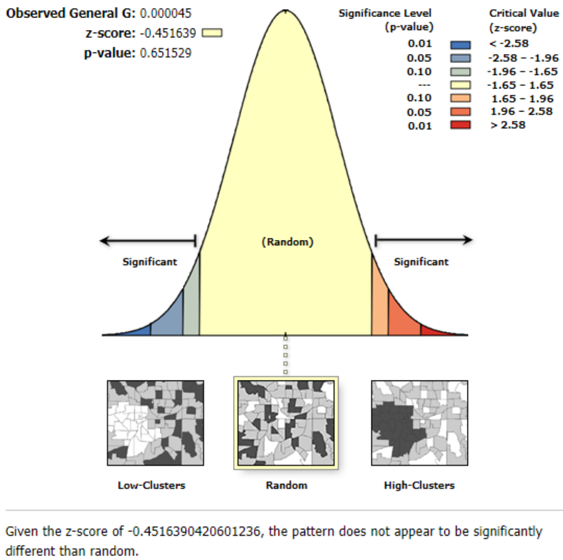


Figure 13: High/Low Clustering using Getis-Ord General G statistic

## Question 16.

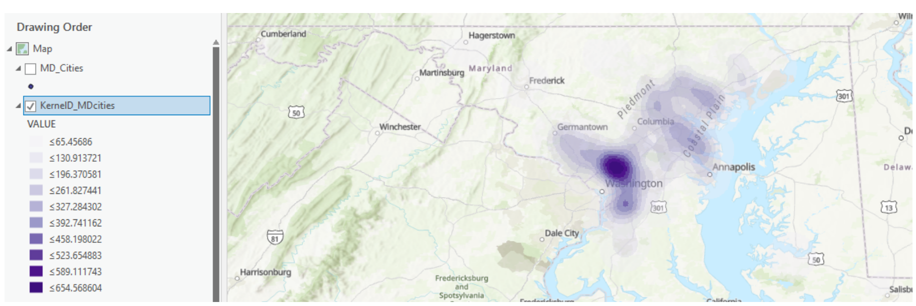


Figure 14: Kernel Density Analysis of the MD Cities layer

## Question 17.

Here we can see results very different from our previous Kernel Density Analysis.

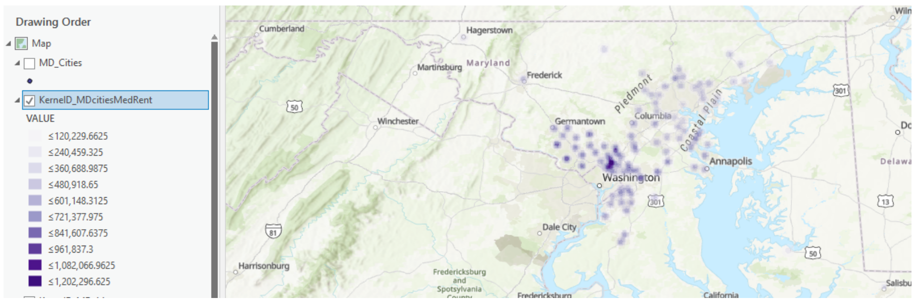


Figure 15: Kernel Density of the MD Cities layer with Median Rent set as population field

## Question 18.

Question 18 involved many steps of which many additional methods were required. The first step requires a change of projection. For the eventual calculation, we will need to use radians, to arrive at this step however, we require converting our data to decimal degrees. Using a GCS, we can gain the format we need. The next step is to calculate the centroids, which I chose to use the "Add Geometry Attributes" function. From there, we can export the layer as an excel sheet that includes the centroid coordinates. Next we must assemble a dataset that contains all the information we need. After some data-organization, the next step is to convert the centroid coordinates from degrees to radians which can be performed quite easily in excel. From here, we use the equations provided to calculate the population mean center. After we calculate the points, we must convert back to decimals, and the table is ready to be displayed on ArcGIS. After converting from excel to table, we can then transform xy features into points thus displaying our final product.

See figure in the next page:

## Question 18.

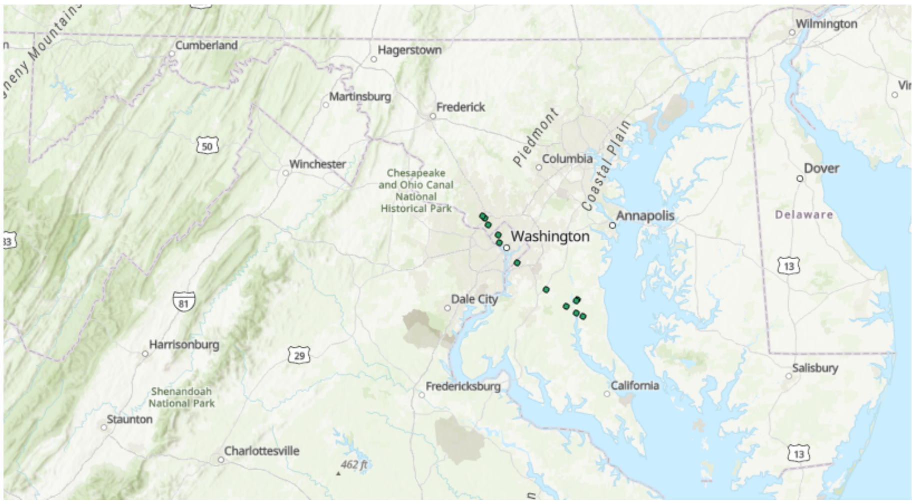


Figure 16: Population Mean Center of Maryland from 1900-2008