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Technical Report Week 12

Introduction: Calculating densities and trends over space and time, in my opinion, is arguably one of the most important analyses that can be conducted with ArcGIS. There are so many important applications that these tools can be used for, and it’s important to understand how these tools work and how we can use them to communicate important information without having to be too technical. For this week’s challenge, we will use these tools to calculate the distribution of tornados in the United States from the year 1950 to the year 2017.

Data Used: TornadoData.gdb

Methods:

* Part One: I used Select By Attribute to select all of the tornados that had an Enhanced Fujita Magnitude that was greater than 2 and exported those points into a new feature class. I then used the Dissolve tool to calculate how many points were contained within each state. Then I used a spatial join to join the tornado point layer and the state layer so I could create a cloropleth map of counts of tornados per state. Then I created two cloropleth maps: one not normalized by area and another normalized by area.
* Part Two: I transferred the tornado point layer to another map and used the Heat Map symbology to create a heat map of all of the points. Then I used the Calculate Density tool to calculate the density of all the points and then used the Optimized Hot Spot tool to calculate an analysis of all the existing hot spots. I used hexagon instead of fishnet because it’s better at covering a larger area. I set the bins at 25 miles and the neighborhood was 50 miles. Then I used the Kernel Density tool to calculate the kernel density of all the points.
* Part Three: I had to concatenate the date and time fields into another field then use the Convert Time field to convert the string to a Datetime field. I then projected the tornado point layer to the NAD 1983 HARN Contiguous USA Albers (since I didn’t really focus on Hawaii and this sounded like a decent option). Then I created a space-time cube and used the cube to create an emerging hotspot analysis.

Supplementary Questions:

* Which map would officials in Kansas prefer being shown to federal officials with money for states with high clusters? Definitely the optimized hot spot analysis map. The heat map shows a little bit of action in Kansas, but it’s not much, especially because I increased the transparency of the layer. The cluster map communicates a much higher level of activity.
* Which method(s) are just ‘eye-candy’ and which has the most rigorous and defensible statistical basis? I feel like the calculate density tools are decent, but the optimizing hot spot tool conducts an analysis dependent on the probability and z-scores of each value and I feel like that’s a much more reliable method than calculating density.
* What do 99%, 95%, and 90% confidence mean? Confidence levels mean that whomever is conducting the analysis is that confident that a value of a certain category falls within that range of values.

Conclusion: I thought that challenge was really cool. The third part had me stumped for a while, to be completely honest. I had to figure out how to concatenate the date and time values and then covert those values to an actual date-time data type. Miraculously, I stumbled across the Convert Time tool, but I tried a ton of stuff like putting code into the Python window, calculating fields, or and trying to get into the download file itself to change values. I actually feel really accomplished because I figured it all out by myself and I feel really confident for the final challenge because the process is going to be extremely similar to this exercise. This also has so many applications in so many different career fields and disciplines, especially because you can analyze trends from the past and predict future trends. If your data and outputs are accurate, this would be a good way to determine which decisions need to be made and what the future moves of an organization/company should be.

Maps:

