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GEOG 616 Spatial Analysis

Project Progress Report

Thus far, accessing the data I need for my project has been mostly as easy as expected. The shapefiles for the EPA Level 3 Ecoregions were easy to download, though Alaska’s EPA L3 data had to be downloaded separately. The SNOTEL data has been tougher to access. The {snotelr} package that I intended to use works, but it is difficult to download data for multiple sites at once. I have recently been in the process of troubleshooting which sites successfully download and which sites produce an “arguments imply different number of rows” error. One of the sites produces this error even when I attempt to download individually, I intend to get around this by simply not using data from that site. I will do this for any other sites that produce this error as well. I have not successfully downloaded elevation data yet due to some of the setbacks in accessing SNOTEL data, though I am optimistic about a few different solutions to this. I may be able to use the {terrainr} package to access USGS 3DEP LiDAR elevation data. If this does not work or there are other issues with that dataset, I can also potentially use the {rstac} package to access a variety of elevation datasets via the Microsoft Planetary Computer, including SRTM elevation data which would be the dataset I use in that circumstance. This will require getting approved for access, but I don’t anticipate this being an issue. If the worst case scenario happens, I can easily download data from EarthExplorer.

One major issue I have run into with some of the SNOTEL data is that I am struggling to plot it spatially. I can create scatterplots and other standard non-spatial visualizations of the data, but I have so far been unable plot my SNOTEL points overlaid on top of my EPA ecoregions polygons. I believe this to be a CRS issue, as the SNOTEL points do not have a CRS when I convert it to an sf object, and the EPA ecoregions come with a CRS already. I can plot them both separately with “plot(st\_geometry(insert\_layer\_here))” and the polygons show up as expected and the points show up as dispersed as they should be. However, when I assign the same CRS to both layers, I run into issue where the points either show up as being extremely far away from my ecoregions, or I will see just one single dot vaguely in the middle of my ecoregions. This is a major problem and so far has inhibited any further spatial analysis. I will continue looking for projection-related functions in the sf, terra, and other R-spatial packages for solutions.

My next steps will include solving this CRS issue, and then moving on to plotting and evaluating spatial relationships between variables such as SWE, temperature, and precipitation over space. Previously I stated I was interested in using interpolation methods such as kriging or IDW. I believe these could be methods that are still useful if I wanted to analyze variance in a variable such as peak snow water equivalent across the whole AOI of all of my points. However, given that I also intend to analyze variance between different ecoregions, I will possibly adapt my plan to include areal analysis techniques similar to the spatial autocorrelation models or the SAR or CAR models we have used in our most recent lab.

A graph of a number of snotel

Description automatically generated with medium confidenceA map of the united states

Description automatically generatedA graph of a graph

Description automatically generatedBelow I’ve included some example plots demonstrating both my success in creating exploratory plots to look at the relationship between different non-spatial variables as well as my spatial plot issues.