**Lab Report**

Title: Lab 2-Part 1

Notice: Dr. Bryan Runck

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**Project Repository:**https://github.com/mmarsole/GIS5571

**Google Drive Link:** NA

**Time Spent:** 10hrs (?)

**Abstract**

This lab required us (students) to use our previous practice of building ETL’s to download lidar data and PRISM data, and then construct python Notebooks that visualized the data via python code. From the lidar data I created a DEM and TIN file and explored the various visualizations tools with ArcGIS Pro for lidar data (which has the capabilities for both 2d and 3d displays). After downloading the PRISM data, I converted it to Space Time cubes, and then made a GIF to summarize the average monthly precipitation values for the continental US.

**Problem Statement***.*

Building ETL’s to download lidar and PRISM data. Converting the data to relevant exploratory formats for analysis (lidar to DEM/TIN and PRISM to Space-Time cube/GIF).

*Table 1. Information Represented in Data*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **#** | **Requirement** | **Defined As** | **(Spatial) Data** | **Attribute Data** | **Dataset** | **Preparation** |
| 1 | Elevation data | Points returned to sensor (elevation extracted from time traveled) | Point (lidar) data | Intensity, class, ground point, etc. | [MN DNR](https://resources.gisdata.mn.gov/pub/data/elevation/lidar/examples/lidar_sample/las/) | Converted to a DEM/TIN |
| 2 | Precipitation data | Monthly average precipitation measures (over 30 years) for 4km cells over the continental US | raster | Precipitation value (measured in inches) | [PRISM Climate Group](https://prism.oregonstate.edu/normals/) | Converted to tif, added to mosaic, merged into a multidimensional layer then a Space time cube |

**Input Data**

Las data, contains several additional attributes (intensity, classification, return, etc.). The area extant covers St. Paul MN, and has the ability to create a DEM, DSM, and TIN model (which can be used to make contour maps, slopes maps, or elevations). This one file contains approximately 13,000 points but could be combined with other las files to broaden its spatial extant.

The PRISM data, encompasses the entire continental US, and has a cell raster size of 4km. This data summarizes precipitation over a given area over a span of 30 years for each month. Thus, through an analysis you should be able to detect seasonal changes over the year.

*Table 2. Data Downloaded via ETL*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Title** | **Purpose in Analysis** | **Link to Source** |
| 1 | 4342-12-05.las | Las file used to construct a DEM and TIN model | [MN DNR](https://resources.gisdata.mn.gov/pub/data/elevation/lidar/examples/lidar_sample/las/) |
| 2 | PRISM\_ppt\_30yr\_normal\_4kmM2\_01\_bil.zip (12 files for each month) | 12 files were converted to a tif, and used to build a mosaic then used to make a Space Time Cube (basically rasters layered by time representing months) | [PRISM Climate Group](https://prism.oregonstate.edu/normals/) |

**Methods**

*Figure 1: Work process for Both lidar and PRISM outputs.*

Diagram

Description automatically generated

*Figure 2: 2D and 3D visualizations of TIN models made from lidar.*

![Graphical user interface, application

Description automatically generated]()

**Results**

*Figure 3. PDFs for DEM and TIN layers*

Map

Description automatically generated A picture containing text

Description automatically generated

*Figure 4. A quick view of Space Time Cubes in ArcPro*

![Graphical user interface, application

Description automatically generated]()

*Figure 5. GIF of precipitation data.*

A picture containing map

Description automatically generated

**Results Verification**

I was able verify the monthly raster images produced in the gif, by visually inspecting the raster files within the ArcPro interface (the visuals were slightly different due to ArcPro’s utilization of stretching raster values such as ‘Percent Clip’). This corroboration confirmed my GIF output. The Space Time cube was harder to corroborate, since I couldn’t easily inspect the output visually (the data often crashed the computer or took a very long time to load).

The DEM and TIN models produced from the lidar data corroborated each other visually (the elevation data was comparable, although each type of layer emphasized different geological features).

**Discussion and Conclusion**

*What did you learn? How does it relate to the main problem?*

**References**

*Use a common format*

**Self-score**

*Fill out this rubric for yourself and include it in your lab report. The same rubric will be used to generate a grade in proportion to the points assigned in the syllabus to the assignment.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Description** | **Points Possible** | **Score** |
| **Structural Elements** | All elements of a lab report are included **(2 points each)**:  Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data, Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score | 28 |  |
| **Clarity of Content** | Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level **(12 points)**. There is a clear connection from data to results to discussion and conclusion **(12 points)**. | 24 |  |
| **Reproducibility** | Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified. | 28 |  |
| **Verification** | Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated **(10 points)**, the method of comparison is clearly stated **(5 points)**, and the result of verification is clearly stated **(5 points)**. | 20 |  |
|  |  | 100 |  |