Assignment 3 – GGS590 Spatial Computing

Due September 29th 2024

Please find the 5 assignment questions enclosed, totaling 100 available points.

Remember, if you just rely on genAI, you will not learn the fundamental basics, and thus fail the graded closed-book test/exam planned for later in the semester. So, the important thing here is to really make a good attempt at solving these problems without any assistive tools, based on the materials you have learnt in the first few weeks of the class.

To submit the work, you need to write your answers in a colab .ipynb notebook and then:

1. Print the .ipynb notebook to a .pdf and submit for review on blackboard.
2. Submit also the actual .ipynb notebook on blackboard allowing your code to be easily run.

Without submitting both of these files like this, you will receive a 50-point penalty to your overall grade.

Submitted work may be checked for plagiarism, including for GenAI usage. The Mason honor code applies.

1. Create three Shapely objects for a point, a linestring and a polygon. Add these to a list, and then iterate over the contents. Print the bounds and area of each geometry object. Explain the results you obtain for the different geometry types (using at least 30 words of explanation per type) (20 points).
2. Iterate over your list of geometry objects and check the geometry type. Using loop control logic, print the bounds of any points, print the length of any linestring, and print the area of any polygon (20 points).
3. Using a nested loop and the range function, write a set of 20 points using values for the coordinates between 20 and 40, and a step value of at least 2 (20 points).
4. Write a user defined function which accepts a list of points and returns a Shapely polygon geometry consisting of these points. Also write a function which does the same processing but for linestrings (20 points).
5. Write a program based on a real-world problem for a set of geometries demonstrating the use of at least three geometric operations (e.g., union, intersection, buffer etc.). It would be wise to try apply these as a demonstrator for a topic of interest that you might utilize in your final coursework project (20 points).