Assignment 4 – GGS590 GeoAI – Ensuring Spatial Validity

Due February 25th 2026

In week 5, we spent time considering whether your results are valid, with useful comparative examples via GeoPandas, exploring various types of intersections/overlays. The intention in this assignment is to build on this concept, by exploring the various operations available in GeoPandas.

Select your own datasets and conduct two structured spatial experiments using GeoPandas, one involving LineString–Polygon relationships and one involving Polygon–Polygon relationships. Your datasets must be spatially compatible and appropriate for intersection analysis.

Part 1 (20 points)

For the LineString–Polygon analysis, choose one line dataset and one polygon dataset and apply any four different GeoPandas spatial operations from the following categories, including spatial join (sjoin with a chosen option such as intersects, within, touches, or crosses), clip, overlay (with a mode such as intersection, difference, union, identity, etc.), or direct geometric operations such as intersection() or difference(). For each operation, produce a clearly labeled subplot map, with the final output being a 1x4 panel plot. You should pick operations that clearly show different outcomes, so that you can color them appropriately in your map, and then describe them in the final task.

Part 2 (20 points)

For the Polygon–Polygon analysis, select two polygon datasets and apply any four spatial overlay operations, which may include intersection, union, difference, symmetric_difference, identity, or spatial joins where appropriate. Produce a subplot map for each operation, and add each to a 1x4 panel plot. Your goal is to demonstrate how overlay mode changes geometry structure and attributes. You should pick operations that clearly show different outcomes, so that you can then describe them.

Part 3 (60 points)

Write a single 600-word reflective summary in your own words where you describe the difference in outcomes from the previous two tasks. The bulk of the points are awarded here as you are to use your critical thinking skills, and research capabilities, to demonstrate your understanding. While AI is commonly used to support coding tasks, this part should be your own work, and own writing voice. If you previously submitted a reflective summary which was flagged for possible AI-style writing, then you should make sure this is in your own writing style (the point here is to develop your own critical thinking skills).

Submission format

Please write your analysis in a Google Colab notebook and then use the print function to save it to a .pdf file for submission on Canvas. You can also submit a Word document rendered to PDF, if you desire (e.g., if you have formatting issues with images/maps). Without submitting your code files like this, you will receive a 50-point penalty to your overall grade (as you need to provide both the code and the answers).

The Mason Honor code applies. Please also remember to follow the Mason Student AI use policy (this is being monitored closely, and some students are currently not complying because they do not indicate when/where they are using AI).