Coursework Research Project for GGS590 GeoAI

Submission Date: Monday, May 11th, 2026

To succeed in GGS590 GeoAI it is important to submit a high-quality research project on a topic of your choosing. This coursework will consist of submitting a research paper that utilizes GeoAI on a topic of your choice.

The aim of this exercise is for each class participant to understand and apply the GeoAI concepts and methods covered in a piece of analytical research, thereby achieving the course learning objectives.

To recap, the learning objectives for GGS590 are as follows:

1. Explain the role of AI in geospatial analysis, including how AI-assisted workflows differ from and extend traditional GIS and spatial computing approaches.
2. Use AI tools effectively to design, write, debug, and refactor geospatial code, demonstrating the ability to translate geographic problems into computational tasks.
3. Integrate AI-generated code with established geospatial libraries and platforms (e.g., Python-based GIS ecosystems) to automate GIS workflows.
4. Critically evaluate AI-assisted geospatial solutions, including assessing correctness, spatial validity, computational efficiency, and potential sources of error or bias.
5. Develop and implement testing and validation strategies for AI-augmented GIS spatial workflows.
6. Formulate geographic questions and solve them using AI-enhanced geospatial methods, selecting appropriate tools.
7. Reflect on the limitations of AI in geospatial practice, including issues of transparency, reliability, data quality, and over-reliance on automated solutions.

Students are allowed to choose whichever methods best suit their topic. Seek advice if you are unsure which path to take. Indeed, plenty of time is allocated in the course to help refine your project. Tasks set in class will complement the necessary processing steps for your chosen topic. Those who start early have a much higher probability of success.

Students are advised to consider this exercise as a piece of work that could constitute a potential job market paper, consequently demonstrating key competencies when applying for future positions beyond GMU. Indeed, the most successful students can potentially convert this research into a future published paper, or even a funded position/project.

The project requirements include:

- Submission of a scientific research paper which utilizes spatial computing techniques with a total paper length of at least 4,000 words (not including references) and >600 lines of code.
- Students are encouraged to focus on their key current/future interests (e.g., geospatial aspects of the environment, national security and intelligence, economy and society, etc.).
- The paper should be submitted on Canvas (as both a Microsoft Word (.docx) and PDF document), and potentially also uploaded to a GitHub repository with the developed code. LaTeX/Markdown documents can also be submitted if you prefer, just make sure to also provide a .pdf file of the final submission.

The paper needs to include:

- A properly written research abstract which summarizes the paper, including the motivation, research question, results, and findings (5 points).

- An introductory section which provides background information, the motivation for the analysis and a stated research question(s) which the analysis aims to answer (5 points).
- A comprehensive literature review on your chosen topic summarizing past theoretical and empirical research in this area, with at least 25 peer-reviewed citations (10 points).
- A high-quality methodology section which details the data sources and GeoAI steps involved in the analysis. This must include a box diagram illustrating the sequencing of the processing steps, from input data to final outputs (10 points).
- Fully written-up results of the analysis, including graphs (e.g., using Matplotlib) or other data plots (10 points).
- A discussion section which critically evaluates the ramifications of the results in relation to the research question(s) specified in the introduction. Areas of future research could also be discussed. There must be a subsection on the limitations of the analysis (10 points).
- A conclusion section containing a summary of the purpose of the paper, and then the main findings (5 points).
- A fully documented bibliography which states the citations used in the paper. To reiterate, there needs to be at least 25 citations (10 points).
- Submission of the Python GeoAI codebase (35 points).

Should a submission not meet any of the key criteria, then this will have a subsequent impact on the overall grade of the final project.

Importantly, please remember this is a GeoAI class and you will be graded on the Python code you write. Writing a paper using a standard piece of GUI GIS software (e.g., ESRI/QGIS) will likely result in failing the class.

Finally, any project submitted must adhere to the Mason Honor Code and consist entirely of a student's own work. If using the work of others, ensure a comprehensive citation is provided. To avoid plagiarism, students attempting to work on highly similar topics will be discouraged.