Coursework Research Project for GGS590 Spatial Computing

Submission Date: Friday December 6th, 2024

To succeed in GGS590 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 which utilizes spatial computing on a topic of your choice.

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

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

1. Understanding the basics of computer programming (e.g., variables, functions, iteration etc.), as well as different design approaches (scripting versus object-oriented), with relevance to the spatial sciences.
2. Developing critical thinking skills with regard to spatial computing uses, design approaches, and methodological choices.
3. Mastering important programming applications (e.g., Google Colab) and key spatial computing packages (e.g., shapely, geopandas etc.).

Students are allowed to choose whichever programing method best suits 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 which constitutes a potential job market paper, consequently demonstrating key competences when applying for future positions beyond GMU. Indeed, the most successful students can potentially convert this research into future funded projects.

The project requirements include:

- Submission of a scientific research paper which utilizes spatial computing techniques with a total paper length of at least 2,000 words (not including references) and >200 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 MyMason BlackBoard (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 (~150 words) (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 (~250 words) (5 points).
- A comprehensive literature review on your chosen topic summarizing past theoretical and empirical research in this area, with at least 10 peer-reviewed citations (~500 words) (10 points).
- A high-quality methodology section which details the data sources and spatial computing steps involved in the analysis. This must include a box diagram illustrating the sequencing of the processing steps, from input data to results output (~300 words) (10 points).

- Fully written-up results of the analysis, including graphs (e.g., using Matplotlib) or other data plots (~400 words) (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 (~250 words) (10 points).
- A conclusion section containing a summary of the purpose of the paper, and then the main findings (~150 words) (5 points).
- A fully documented bibliography which states the citations used in the paper. To reiterate, there needs to be at least 15 citations (10 points).
- Submission of the Python spatial computing code (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 spatial computing class and you will be graded on the Python code you write to undertake a piece of spatial processing. 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.