Coursework Research Project for GGS416 Satellite Image Analysis

Submission Date: Monday 11th May, 2026

To succeed in GGS416 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 uses script-based processing of satellite imagery.

The aim of this exercise is for each class participant to understand and apply the basic script-based processing steps required to use satellite imagery in a piece of analytical research, thereby achieving the course learning objectives.

To recap, the learning objectives for GGS416 are as follows:

1. Understand practical computer programming techniques for processing satellite imagery.
2. Develop introductory Python script-based approaches for object detection and extraction.
3. Become proficient in using essential computer programming tools and software (Google Colab, Jupyter Notebooks, GitHub 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 these projects. 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 script-based satellite image analysis techniques with a total paper length of at least 2,000 words (not including references) and >200 lines of code need to be submitted.
- 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 (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 20 peer-reviewed citations (10 points).
- A high-quality methodology section which details the data sources and processing steps involved in the analysis. This must include a box diagram illustrating the sequencing of the processing steps, from input data to results output (10 points).
- Fully written-up results of the satellite image analysis undertaken, including graphs (e.g., using Matplotlib) or other data plots, and if necessary, any example imagery (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 20 citations (10 points).
- Submission of the Python satellite image processing 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, 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.