Syllabus

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Welcome to Open Geographic Information Science!

Middlebury College Geography Course GEOG0361

Contact and Availability

- Email: josephh@middlebury.edu
- Office: McCardell Bicentennial Hall 6th Floor: room 634 or GIS labs
- Availability: Tuesday 1:00–3:00 and Wednesday 11:00–12:00
- Lecture: TR 11:15–12:30 in BiHall 538
- Lab: R 1:30–4:15 in BiHall 632

For assistance outside of office hours, your resources include: 1. The GitHub issues for any assignment repository 2. Classmates 3. Documentation, Issues, Forums, or Support/FAQs for the data or software we are using 4. Stack Exchange or similar 5. Centralized course Issues 6. Liam Smith will assist with the course, details forthcoming. 7. *Only private/confidential concerns should be sent to email*

Course Description

In this course we will study geographic information science (GIS) with open-source software and critical GIS scholarship. In labs, we will practice techniques to include: data acquisition and preparation for analysis, spatial SQL database queries, automating analysis, spatial interpolation, testing sensitivity to error and uncertainty, and data visualization. We will read and apply critical research of GIS as a subject and with GIS as a methodology. Spatial data sources for labs and independent research projects may include remote sensing, micro-data, smart cities and open government data, and volunteered geographic information (e.g. OpenStreetMap and social media).

Prerequisite: *Human Geography with GIS* or *Mapping Global Environmental Change* or *Data Sciences Across the Disciplines (Geography)* or approval based on other experience in geographic analysis. Programming experience is *not assumed or required*! You just need to be willing to learn how to translate the spatial analysis that you know from desktop GIS (QGIS, ArcGIS, etc.) into code.

The major emphasis this fall will be learning how to **manage a full GIScience research workflow** in an **open science framework**. We"'ll achieve this through: - Three **tutorials**, in essential open science research practices: version control, and codified research workflows using Rmarkdown and Python Jupyter Notebooks. - **readings**, **debates**, and **blogs** about open GIScience - Four **reproduction/reanalysis studies**, in which we will read, repeat, critique, and modify a published GIScience study, producing a reproduction study report. - One **open science project** in which we will replicate a prior study in a new geographic context, temporal context, or with a new computational approach.

Learning Goals

- Become familiar with open science and open source GIS in terms of software/infrastructure, organizations and projects, and radically unique form of knowledge production.

- Expand your functional knowledge of the nature of geographic information with respect to data standards, structures, metadata, provenance, error, and uncertainty.
- Apply Open GIScience to address compelling questions in human geography and problems in social and environmental sustainability.
- Gain scientific literacy, including the ability to understand and implement the methods described in published research papers and critically evaluate scientific results and claims.
- Learn how to reproduce existing geographic research and to produce geographic research that is open, reproducible and replicable.
- Design and communicate research effectively in multiple media, including digital media, reports, presentations, maps, graphs, tables, data, and code.
- Become competent and confident in conducting research, learning new methods, and overcoming errors, uncertainty, and technical difficulties.

Expectations

- **Inclusivity**: Consciously and actively include yourself and others in learning, participation, collaboration, and discussions. Inclusivity may be achieved through academic accomodations and/or student resources for learning and research. Accommodations and correspondence about them are confidential.
- **Academic Honesty**: Open source and open science have a different ethos about intellectual property and its value than most of us are accustomed to. In the first two weeks of class, we will discuss and update our expectations for the honor code and academic honesty in a course focused on open science.
- **Deadlines**: You must always commit the progress that you have made on assignments by the assignment deadline. In case unforeseen challenges or delays have prevented full completion of an assignment, you are required to record the progress that you have made, describe the barrier(s) encountered and anything you have learned about it/them, and propose a solution.
- **End of Semester**: Your body of work for the course must be complete on GitHub Pages by the end of finals week. Incomplete grades can only be considered if extreme/unexpected circumstances arise in the final weeks of the semester and if the majority of assignments have already been satisfactorily completed.

Student Work & Evaluation

Open science requires researchers, universities, and publishers to change the way they value intellectual work and intellectual property, and the same goes for instructors and students. Traditional means of evaluating and grading student work that are based on individualism, competition, and secrecy are counterproductive to an open science learning environment.

Throughout this course you will develop a set of your own personal pages and repositories on GitHub, containing all of your work for the course. You will receive qualitative feedback on your GitHub portfolio work from peers and from your professor throughout the semester, and you will be given opportunities to self-evaluate as-well. My goal and expectation for your work is that through revision based on feedback, most students should develop a portfolio suitable to show potential employers or graduate schools, earning at least a B+ or A-.

We will have least two one-on-one meetings during the semester: one in the first two weeks and one at the end. Through these meetings and interim written self- and peer-evaluations, you will set goals and accrue qualitative feedback to serve as a roadmap to your personal level of achievement. At the end of the semester, you will submit a final self-evaluation and proposed grade for the course based on your personal goals and the general expectations outlined below. The instructor reserves the right to adjust the final grade determination. Some people call this an ungrading approach to assessment.

We will interpret the quality of work as follows:

Gr	Description
A	Work is excellent, complete, and timely. Your work is ready to show to employers or graduate schools. In addition, you have contributed positively to the collective learning and knowledge base of the class.*
A-	Work is excellent, complete, and timely. Your work is ready to show to employers or graduate schools with *very* minor revisions.
B+	High quality work. Your work is ready to show to parents and friends, and almost ready to show employers or graduate schools—pending minor revisions.
B	Good work. Your work needs a fair amount of revision to remedy errors and/or full effort to some more cursory components. You could use one more round of feedback and revision before sharing with employers.
B-	Decent work. There are a few significant errors and/or gaps that need addressing before you can share the work with a potential employer.
C's	You have demonstrated learning and intellectual growth, but important components of your GitHub portfolio are not working or in need of complete revisions. C+ needs at least one additional round of feedback prior to sharing work with a potential employer, whereas C or C- may need more.
D	Work is incomplete and/or cursory
F	Not attempted

* The best way to ensure a public record of your contributions is to post and reply to GitHub Issues.

Approach to learning

- **Theory** and **context** in which open GIScience research is practiced
- **Introduction** workshop/tutorial to research tools/platforms
- **Study** the research paper and compendium of a GIScience research project
- **Reproduce** the project by acquiring the same data and executing the same procedures
- **Reanalyze** the project by adjusting and improving some components of the research design
- **Replicate** the project by applying it to a new context (thematic, geographic, or temporal)
- **Communicate** results with a research compendium, report, and highlights blog

Materials & resources

There is no required textbook. We are writing a book here: Reproducible open geographic research workflows with compenia

Expectations for Reproduction/Reanalysis Studies

- Complete a research compendium in the form of a GitHub repository for each analysis. We'll have specific training on this.
- Update computational notebooks (Rmarkdown or Jupyter Notebooks) with explanations of changes and additions you make to the study.
- Visualize results with maps and/or graphs.

- Interpret results with support of references to class readings.
- Generate a webpage result of your work and link to it from a blog post highlighting your contributions.

Expectations for blog posts

In weeks in which no spatial analysis is due (roughly biweekly), please write a short blog post reflecting on new class content (readings, discussions, activities, workshops) connecting them to their significance for you, in terms of any internships, independent research, other courses, personal experience, or career aspirations you may have. You will have reminders and suggested prompts with the associated lessons.

A draft of the posts should be committed to GitHub prior to the relevant class meeting. As is the case for all of your content on GitHub, revisions are permitted until the end of the course.

Posts should include references to relevant readings by listing them at the end (similar to how I have done in this course site) and linking to their DOI, if one is available.