University of Pennsylvania
NELC 1905/6900; ANTH 1905; AAMW 6460
Spring 2025
Tuesday & Thursday 1:45-3:15 pm
Classroom: Undergraduate Data Analysis Lab (UDAL), Perelman Center (PCPSE) Room 201

Instructor: Emily Hammer
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Office: Williams Hall 836
Office Hours: Tuesday 3:30-4:30 pm in Humanities Mapping Lab, Williams 601/603 (or by appt.)

Instructional Assistant: TBA
Office Hours: TBA

GIS FOR THE DIGITAL HUMANITIES AND SOCIAL SCIENCES

Course Prospectus for Spring 2025

Course Description

This course introduces students to theory and methodology of the geospatial humanities and social sciences, understood broadly as the application of Geographical Information Systems (GIS) and spatial analysis techniques to the study of social and cultural patterns in the past and present. By engaging with spatial theory, spatial analysis case studies, and technical methodologies, students will develop an understanding of the questions driving, and tools available for, humanistic and social science research projects that explore change over space and time. We will use ESRI's ArcGIS software to visualize, analyze, and integrate historical, anthropological, and environmental data. Techniques will be introduced through the discussion of case studies and through demonstration of software skills. During supervised laboratory sessions, the various techniques and analyses covered will be applied to sample data and also to data from a region/topic chosen by the student.

Please note that this course requires significant amounts of time to be spent on lab activities and assignments, well beyond the weekly class meeting. The course is structured to be incremental: your ability to understand the material in any given week will be contingent upon your mastery of skills from the previous week's lab. It is therefore critical that you keep up with the course material.

Why choose this course over other available GIS courses at the university? Unlike many other courses that rely on downloaded and validated data (i.e., from censuses and surveys), this class will teach you to create/collect your own geospatial databases from scratch, using sources that may or may not already be digital. We also bridge the methods of urban analysis (the usual focus of Design school GIS classes, typically vector-based) and environmental analysis (the usual focus of Geology, Geography, and other programs' GIS classes, typically raster-based). We cover in depth a topic not usually presented in other introductory courses: satellite imagery as a major source of information on local and regional spatial processes in the past and present.

Curricula

This course fulfills both undergraduate and graduate requirements for the Digital Humanities program and the Data Science and Analytics program. In the past, the History Department and other departments have accepted it in lieu of language or methodological course requirements in their undergraduate or graduate programs—but please check with the advisors of specific programs for current information. For additional course attributes, see Path @Penn.

Course Aims

By the end of the semester, students will:

- Understand spatial approaches to humanities and social science data
- Be able to ask, evaluate, and answer spatial questions as well as to think through the design of a spatial research project

- Have a functional knowledge of how to create, display, and manipulate raster and vector data in ArcGIS (including pixel-based satellite imagery and digital terrain models as well as point, line, and polygon representations of data)
- Replicate models of environment, human vision, and movement in order to address anthropological and historical questions posed in case-study readings
- Practice applying more advanced spatial analyses to raster and vector data utilizing ArcGIS and Google Earth Engine
- Generate attractive, informative maps
- Make interactive web maps using ArcGIS online and embed these in websites using ESRI StoryMap

Course Format

The course is generally structured in two parts:

1) **Demonstration**: The first course meeting (Tuesday) will normally be devoted to discussion of case studies and concepts from the readings and demonstration of related techniques in the appropriate software programs. Detailed instructions will be available each week on the course website (Course Materials/Labs).
2) **Lab period**: The second meeting (Thursday) will normally be conducted as a lab period where students will work to replicate the techniques learned in the demonstration session and complete weekly assignments using sample data provided by the instructor. This period will also include further discussion time and student presentation of additional relevant case studies, including student presentation of case studies from their own disciplines. The instructor will be on hand to address questions individually during work periods. Normally this session will be insufficient to complete the lab assignment, so students should be prepared to spend additional unsupervised time on the assignments.

You will be expected to demonstrate that you have completed the assignment for the previous week by *submitting a lab assignment digitally via the course website*. Each lab assumes that the previous lab skills have been mastered. Failing to complete a lab will therefore hamper you in completing other course assignments.

Course Requirements and Grading

Student evaluation will be based on the following five criteria:

1) **Attendance and active participation in discussion** (10%). Students are expected to attend all class meetings and to actively participate in discussions. Given the laboratory nature of a lot of the course, I have found that students often do not do the readings and therefore struggle to participate in discussions and to develop their own research questions for the independent project. Reading is a critical part of succeeding in this course because it introduces you to case studies and concrete question-driven applications of the methods taught in lab!
2) **Laboratory assignments** (40%). For each of the demonstration/laboratory weeks, students will complete a lab-based assignment on the week's particular GIS or remote sensing topic. Unless otherwise announced, assignments for labs 2-13 are due Sunday of the following week (by midnight).
3) **Final project** (35%). Early on in the term, students will choose a geographic region and topic that will be the subject of an independent project that he/she/they will design and carry out during the remainder of the term. Undergraduate students are encouraged to work together on a single project unless they already have a clearly defined research interest that they wish to pursue independently. Graduate students are encouraged to choose a topic that furthers their thesis or dissertation research. Students must clearly define research question(s) that can be answered through spatial analysis and lay out a plan for project completion/project goals in a project prospectus (5%). The instructor must approve this prospectus. The product of the final project will be a webpage with interactive maps, generated with ESRI StoryMap, that displays data and results (30%). Further instructions for the final project will be posted on the course website.

4) **Case study presentation/discussion** (10%). This component of the course sits at the interface of class participation and the labs and/or final project. Beginning in week 4/5, during the Thursday laboratory sessions, students will take turns presenting an example of spatial analysis/GIS visualization study that they have found online or in academic publications from their disciplines of study. Presenters will briefly summarize the research questions and results of the study that they choose. The presenter will then lead a class discussion in which students as a group attempt to break down the steps that the study would have needed to follow to produce the results (e.g., sources of data, how these were digitized and/or spatialized, specific GIS tools or analysis concepts applied). Students are encouraged to choose studies that relate to their personal or academic interests and, if possible, the topic of their final projects.
5) **Peer Critique of poster or online presentation draft** (5%). In the penultimate week of the semester, students will exchange drafts of their final projects with classmates (partners will be assigned by the instructor). Each student will submit to the instructor and their partner a 1-2-page critique that provides their partner with ideas and advice for improving the final project. The due date for the draft is Tuesday 22 April and the due date for the critique is Friday 25 April.

Each student is allowed up to 2 excused absences for the semester by writing to the instructor in advance. Any additional absences, regardless of the reason, will affect your attendance grade. If you miss a demonstration course meeting, it is your responsibility to work through the written laboratory directions and approach the instructor or instructional assistant with specific questions, should you have any.

All work for the course should follow page limits and should be submitted via the course website by midnight of the due date. In written work, be sure to cite class readings where appropriate. You may use whichever citation system you are most familiar with, but please be consistent.

Plagiarism is not tolerated and will be reported to the Penn Center for Community Standards and Accountability (CSA). Plagiarism includes, but is not limited to: representing others' ideas or work as your own, copying text from any source without using quotation marks and citations, and using material generated by large language models (such as ChatGPT). All student submissions are automatically submitted through plagiarism and AI detection software. Any plagiarism will result in a failing grade for the assignment; serious cases will result in a failing grade for the course.

If you are in doubt about proper citation practices, please come see the instructor. Read Penn's definition and explanation of plagiarism here: https://catalog.upenn.edu/pennbook/code-of-academic-integrity/. For more explicit guidance on how to avoid plagiarism, I recommend the Purdue Online Writing Lab's resources, which you will find on their website (https://owl.purdue.edu/owl/purdue_owl.html) under "Avoiding Plagiarism" (menu on the left).

Late assignment will be marked down 5% per day; assignments more than 5 days late will not be accepted.

Course website

Available via Canvas. Readings for the course are drawn from a variety of sources. For your convenience, pdfs of the readings will be uploaded to the course website. For the labs, you will be expected to download GIS data from the course website and from various data sources online. Links to these outside sources can be found on the course website.

Software Access, Data Storage, and Help

Classroom. The computer classroom has workstations running the software necessary for the course (ArcGIS and Google Earth Pro).

GIS Computer Labs: UDAL and the Humanities Mapping Lab. The classroom (UDAL) is booked at some points during the day but when it is not booked, it is open for community use. Despite what the

name implies, the UDAL lab is open to the whole Penn community. Please see the lab's website for its opening hours and policies: https://computing.sas.upenn.edu/labs/udal_schedule. The Price Lab for the Digital Humanities has a Humanities Mapping Lab (Williams Hall, 6th floor, room 601/603, turn left as you exit the elevators) with 4 workstations with ArcGIS and Google Earth Pro. Out-of-class help times will be held here, and you can also schedule to use these machines at other times.

Other Computer Labs. A number of departments have their own GIS computing facilities (e.g., Anthropology, in the Penn Museum/CAAM); check with your department about availability. GIS is available in a number of other places, including computers in Van Pelt Library and other walk-in labs in the David Rittenhouse Labs (Room PC1); a relatively complete list is available via the Libraries: https://guides.library.upenn.edu/introtoarcgis.

Installing Software on Your Own Computer.
Google Earth Pro: A free application for both Mac and PC platforms that interactively displays satellite imagery of the earth's surface. The software is a fantastic resource for visualizing and understanding landscapes, both ancient and modern. If you do not already have Google Earth Pro on your personal computer, you should download it at https://www.google.com/earth/about/versions/#earth-pro. Installing the Pro version of Google Earth (rather than using the web application) allows you to download higher resolution versions of imagery and allows Google Earth to interface with ArcGIS.
ArcGIS Pro: The instructor will provide students with directions for installing ArcGIS Pro 3.2 on their own computers, if they are interested in doing so. The software copy provided is free to students enrolled in the course and is valid for the current academic year. You will need a PC running certain versions of Windows 10 or 11. For full minimum system requirements, see ESRI's webpage: https://pro.arcgis.com/en/pro-app/latest/get-started/arcgis-pro-system-requirements.htm. Macintosh users: be aware that ArcGIS does not run on OSX. If you own a Macintosh and want to run the software on your computer, you can use the Virtual Computer Lab set-up offered by Penn Libraries: https://guides.library.upenn.edu/vlab.

Backing Up Your Data. Each student is responsible for backing up his or her own data files. This is a critical component of any computer project and should be second nature to all computer users. *Computer crashes are not valid excuses for late assignments*. Therefore, students should save their data frequently (ArcGIS is prone to frequent crashes) and should back up their data after every lab or work session.
External USB drives: The best option for backing up is the use of an external USB hard drive. Portable drives with 2TB capacity are now available for under $70 and drives with 4TB capacity for around $100. I personally use Western Digital and Seagate brand portable drives, and these have a good reputation, but other brands may also be fine.
Cloud storage: It is possible to use Box, Dropbox, Google Drive, or other cloud options that you may already be using to back up your course data but be aware that you will need a lot of free space (Penn gives you unlimited space with Box). *These cloud options are not ideal for storing data that you are actively working with*. *Your primary computer space for course files needs to be on a local hard drive (on your personal computer) or on an external USB hard drive (if you plan to use university machines or multiple computers). Please be sure to back up data on your local hard drive or external hard drive in a second spot.*

Help. Help with laboratory assignments will be available during the Lab Period (Thursday) of each demonstration/laboratory week. For additional help outside of class with assignments or individual projects, students should attend the instructor's or the assistant's office hours (listed on the first page of the syllabus). *Please direct non-GIS-analysis-related problems with your personal computer to the IT specialists in your school/department/program rather than to the instructor or assistant.*