Online GIS II - Advanced GIS
GEOG 492/592, USP 592 (4 credits)
Spring 2024

Course Information

- Lecture: Online, no scheduled lecture meetings. There are in-person, synchronous weekly lab sessions during TA office hours.
- Lab (TA Office hours): Wednesdays 10 am - 11:50 am at CH469 and Zoom and Friday 10 - 11:50 am Zoom only. Attendance of TA office hours is optional.
- Weekly online learning on Canvas (make sure that you go to the course Modules page and complete the tasks listed in the modules weekly)
- Course syllabus URL: https://sites.google.com/pdx.edu/geog-geoffreyduh/home/gis-ii-s

Instructor & TA

- Instructor: Geoffrey Duh (jduh@pdx.edu), Teaching Assistant: Alec Dyer (aldyer@pdx.edu)
- Instructor's Office Hours: make an appointment at https://calendly.com/jduh/30min.
- TA Office Hours: Wednesdays (at CH469 and Zoom) and Fridays (Zoom only) from 10 to 11:50 am (see the course Zoom panel for the meeting URL). Attendance to TA office hours is optional.

Course Objectives

Students will learn how to solve spatial decision problems with GIS and understand the limitations and pitfalls of using GIS. The major learning objectives of the course are that students will 1) develop problem-solving skills and 2) interpret quantitative (statistics) results of GIS analysis correctly. The course includes the theory and methods involved in multicriteria spatial analysis, network analysis, GIS modeling, spatial interpolation, and geostatistical analysis. The practical component includes the use of ESRI's ArcGIS Online, ArcGIS Pro, and its extensions, including Spatial Analyst, Network Analyst, and Geostatistical Analyst. Both the theoretical and practical components of the course are important. Students will work on a final project in which they investigate a GIS application in depth based on the concepts and techniques learned in class.

How to succeed in an online course?

More and more people in the workforce—and mostly knowledge workers—will have to manage themselves.

—Peter F. Drucker, Management Challenges for the 21st Century

Learning self-management is also one of the goals of this online GIS course. Given the open-ended nature of data science inquiries, GIS professionals must be good at self-management to be productive. Among other benefits, taking an online course is a good opportunity to learn and practice self-management. You must develop new skills (finding meanings in the tasks you are undertaking, time management, and others) to succeed in an online course. Here is one useful tip: "Students really, really need to be organized from the beginning to be successful in an online course, all assignment due dates should be in their calendar, online or paper folders should be created for each week, [and] the work area should be not only quiet but clean—keeping all coursework materials together." - Karen Stevens, chief undergraduate adviser of the University of Massachusetts—Amherst's University Without Walls program. Read the complete article here.

The course lecture materials are delivered online. The online components (readings, discussions, and quizzes) are administered automatically on Canvas based on a strict weekly schedule (midnight Sunday to 11:59 pm the following Sunday). The weekly online materials become available at the beginning of the week (Sunday). All online activities for that week must be completed by the end of the week (11:59 pm on the Sunday of the weekend). See the class schedule table below for the beginning and ending dates of the weeks. **Make sure that you start working on Canvas weekly assignment(s) at the beginning of the week.**

STEM Course Support at The Learning Center

At The Learning Center Academic Coaches offer free, personalized one-on-one sessions to enhance study strategies, time management skills, test preparation, and more. We have coaches with a variety of specializations, including STEM. Explore our Meet the Coaches page to schedule a session with a coach that aligns with your specific needs. Additionally, our tutors are available for many lower division STEM courses. Schedule a tutoring session through the Penji tutoring page to receive assistance in your STEM studies.

Textbooks

There is no required textbook for this class. Instead, students will read articles from peer-reviewed journals. These articles will be available on Canvas. See the Readings section for a complete reading list.

Diversity, Equity, & Inclusion / Title IX / Academic Accommodations Guidelines

Please read the important information on the DEI, Title IX, & Academic Accommodations and Guidelines page.

Grading

The final grades will be assigned **based on separate curves** for graduate and undergrad students. Please note that Canvas grade book only keeps track of some of the grading components. Its reported grade/scores might not reflect your final grade in this class. The components of the grade are:

Undergraduates

- Lab assignments: 30%
- Class quizzes: 25%
- Class participation: 15%
- e-Portfolio: 5%
- Final project: 25%

Graduate Students

- Lab assignments: 25%
- Class quizzes: 25%
- Graduate student article review & discussion: 10%
- Class participation: 15%
- e-Portfolio: 5%
- Final project: 20%

Lab Exercises

The course has reserved a specific time slot for CH469 for students in this class. Students are welcome to use CH469 during these hours. TA and the instructor has maintained separate office hours. TA office hours' attendance is not mandatory but highly recommended for students that need help with their assignments. This class has two TA office hour sessions (Wednesday and Friday over Zoom) during which TA is available for answering questions. Students can attend either one or both. These practical exercises provide a way to acquire skills using ArcGIS and to apply the course concepts to real data. All exercises require a significant amount of time to finish, so make sure you pace your lab exercises appropriately so that you keep

up with their schedule. The lab instructions are available on Canvas. You can do the labs on your own computer or using CH 475 or Ch469. Please refer to the Lab syllabus for lab submission, due dates, and late policies.

Students should post lab questions on GIS II Slack channel. Students are encouraged to answer questions posted by their peers.

Exams

There are 5 quizzes throughout the term (see the schedule table for the exact quiz schedule). There is no final exam. Students have one week to complete the quizzes, from Monday morning to Sunday midnight. All quizzes are open-book and do not have a time limit to complete them, as long as they are submitted by Sunday midnight. Students are allowed to have two attempts on these quizzes. Some quiz questions are specific to ArcGIS software. Feel free to try out the answers in ArcGIS before providing an answer.

Class Participation

You are expected to read the weekly readings. There are several quizzes associated with the technical readings and ESRI online courses for the instructor to evaluate your progress in class. We will also read a couple non-technical, but important GIS articles this term. To facilitate the exchange and sharing of your thoughts and opinions on these articles (weeks 3 and 9), there are Canvas online discussions that you must participate. You need to respond to all the posted questions **by the end of the week** and are encouraged (and welcome) to engage in any follow-up discussions on Canvas. The instructor will monitor the discussion activities on Canvas and use the information for grading the class participation component of the final grade.

Graduate Student Journal Article Summary and Discussion (graduate students only)

Graduate students will be divided into groups by the instructor based on students' research interests. Each group is required to select one article to read, review, and facilitate online class discussion held on Canvas Journal Discussion. The selected article should be related to the topics covered in this course or a topic approved by the instructor. A group must give the title and an electronic copy of the selected article to the instructor by the due date (see the Schedule Table). A group should submit more than one article if they are unsure of the relevance/suitability of the article chosen.

Within each group, **each individual** graduate student needs to prepare an article summary. The summary should take the form of a written critique of the article (2

page max.) and include **3** discussion questions and answers. The summary must be submitted electronically to Canvas assignment submission before noon the previous Friday the article is scheduled (see the schedule table).

Graduate students assigned to the week will post their discussion questions **as a group** on Canvas Discussion on the previous Friday before midnight. Each group will prepare 3 discussion questions and post them on the Canvas discussions. Graduate students are required to read the articles before the Discussion started on Monday and participate in the online discussion (by posting responses to the 3 questions). The online discussion of journal articles will start in the 6th week. Your participation in the online discussion will count towards your class participation grade.

e-Portfolio

By the end of Week 9, students must create an e-portfolio as an ArcGIS Online story map using the materials from their lab work. The portfolio should highlight the key GIS techniques of each lab. Each e-Portfolio entry, which represents a specific GIS technique that students learned in the labs, includes a short paragraph (with 3 to 4 sentences) and a one-page images/pictures/maps. Each lab in the e-Portfolio must have at least one but no more than four e-Portfolio entries. An e-Portfolio counts towards 5% of a student's overall grade.

Students have the option to correct the errors they made in their labs and reclaim some of the deducted points by including the corrected materials in their e-Portfolio. If a student plans to use their e-Portfolio materials to make up for their lab points, then for each lab they must write an email to the instructor (jduh@pdx.edu) with a narrative stating how the issues are addressed in the portfolio and the number of points they request to be reinstated. See the course's Canvas e-Portfolio module for more information.

Project

A GIS project is required for all students. Students could work alone or as a group depending on the scale of the project. The project should investigate a particular research problem using the GIS software packages that we use in class. You will acquire spatial data and, if necessary, digitize the data yourselves. The project must involve some types of spatial analysis with a quantitative component. The deliverable is an ArcGIS Online StoryMap that will be reviewed by your classmates during the final exam period. Please visit the instructor's student project page for examples of previous GIS student projects.

There are two major milestones of the project:

Project proposal: (see Schedule Table for the due date): Submit a one-page project proposal in Google Doc format. See Canvas for proposal preparation instructions. If you have any questions, please meet with the instructor before the due date to discuss your proposal.

Peer-Review of StoryMaps: You will create an ArcGIS Online StoryMap for your final project. Students will perform a peer-review on the story maps during the final exam period. See Canvas for AGOL StoryMap instructions.

Course Schedule

Week 1
- Course Overview & Basic GIS Concepts Review
- Lab 1: Raster Analysis Tools in ArcGIS

Week 2:
- Raster Data Analysis
- ESRI Online course: Raster Data Analysis Using Raster Data for Site Selection
- Lab 1 continued

Week 3:
- Environmental Justice Analysis (Online Quiz - 10 points)
- Canvas Online Discussion: Volunteered Geographic Information
- Lab 2: ArcGIS Online Web Maps and Map Applications

Week 4:
- **Graduate Student journal Article Selection due by Tuesday midnight**
- Dasymetric Mapping
- Lab 3: ArcGIS ModelBuilder

Week 5:
- **Project Proposal due by Tuesday midnight**
- Multi-Criteria Decision Making (Online Quiz -5 points)
- ESRI Online course: Performing Spatial Interpolation Using ArcGIS (Online Quiz -5 points)
- Lab 4: Dasymetric Mapping

Week 6:
- ESRI Online course: Network Analysis (Online Quiz - 10 points)
- Graduate student Canvas Online Discussion: Graduate student journal article discussion
- Lab 5: Network Analyst

Week 7:

- Spatial Pattern Analysis
- ESRI Online course: Mapping Clusters: Introduction to Statistical Cluster Analysis (Online Quiz - 10 points)
- Graduate student Canvas Online Discussion: Graduate student journal article discussion
- Lab 6: Spatial Pattern Analysis

Week 8:

- Statistical GIS Modeling
- ESRI Online course: Introduction to Regression Analysis Using ArcGIS Pro (Online Quiz - 10 points)
- Graduate student Canvas Online Discussion: Graduate student journal article discussion
- Work on final project

Week 9:

- Term project discussion (during Wednesday lab session)
- Canvas Online Discussion: Online: Critical GIS
- Work on term project

Week 10:

- Work on term project

Final Week:

- Online Project Story Map Peer-Review (see course schedule table below for due date)

Readings

The pdf files of the class readings are available on Canvas.

Week 1: Course Overview

- ESRI. 2013. The Language of Spatial Analysis.

Week 2: Raster Data Analysis

- ArcGIS Pro Spatial Analyst Online Documents - Performing Analysis (https://pro.arcgis.com/en/pro-app/latest/help/analysis/spatial-analyst/performing-analysis). Read all subtopics in the Performing Analysis container.

Week 3: Environmental Justice Analysis & Volunteered Geographic Information

- Chakraborty, J. and Armstrong, M.P. (2001). Assessing the impact of airborne toxic release on populations with special needs. Professional Geographer, 53(1):119-131. (ChakrabortyArmstrong_2001.pdf)
- Elwood, S., et al. 2012. Researching Volunteered Geographic Information: Spatial Data, Geographic Research, and New Social Practice. Annals of the Association of American Geographers, 102(3): 571–590. (Elwood_2012.pdf)

Week 4: Dasymetric Mapping

- Eicher, Cory and Brewer, Cynthia 2001. Dasymetric mapping and areal interpolation: Implementation and evaluation. Cartography in Geographic Information Science, Vol. 28, No. 2 pp. 125-138. (EicherBrewer_2001.pdf)
- Holloway, S. R.,J. Schumacher, and R. Redmond. 1996. People and place: Dasymetric mapping using Arc/Info. Missoula: Wildlife Spatial Analysis Lab, University of Montana.

Week 5: Multi-Criteria Decision Making & Performing Spatial Interpolation Using ArcGIS

- Fuller, D.O., Williamson. R., Jeffe, M., and James, D. 2003. Multi-criteria evaluation of safety and risks along transportation corridors on the Hopi Reservation. Applied Geography, 23 (2-3): 177-188. (Fuller_etal_2003.pdf)
- Pages 49-79. Using ArcGIS Geostatisical Analyst (Using_Geostatistical_Analyst.pdf)

Week 6: Network Analysis

- ESRI E-Learning course: ArcGIS Network Analyst: An Introduction
- ESRI online documentation on Network Analyst
- **Graduate student discussion journal article**

Week 7: Spatial Pattern Analysis & Exploring Spatial Patterns in Your Data Using ArcGIS

- Zhang, C. et al. 2008. Use of local Moran's I and GIS to identify pollution hotspots of Pb in urban soils of Galway, Ireland. Science of the Total Environment, 398, pp. 212-221. (Zhang_etal_2008.pdf)
- ESRI E-Learning course: Mapping Clusters: Introduction to Statistical Cluster Analysis
- Read ArcGIS Online Help for all tools in the Spatial Statistics Toolbox.
- **Graduate student discussion journal article**

Week 8: Statistical GIS Modeling

- Lee, S. and Pradhan, P. 2007. Landslide hazard mapping at Selangor, Malaysia using frequency ratio and logistic regression models. Landslides, 4: 33-41. (LeePradhan_2007.pdf)
- ESRI E-Learning course: Introduction to Regression Analysis Using ArcGIS Pro
- **Graduate student discussion journal article**

Week 9: Critical GIS

- Schuurman, Nadine (2006). Formalization matters: Critical GIS and Ontology research Annals of the Association of American Geographers, 96(4), 2006, pp. 726-739. (Schuurman_2006.pdf)

Week 10:

- No reading

GIS II LAB SYLLABUS

GIS II (Spring 2024)
GEOG 492/592 & USP 592

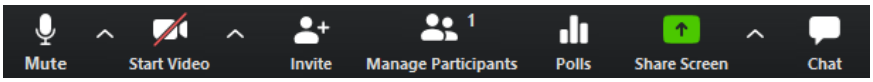
TA: Alec Dyer (aldyer@pdx.edu)
Lab Hours (i.e., TA's Office Hours):

- Wednesdays 10 – 11:50 am (at CH469 and Zoom); Friday 10 – 11:50 am (Zoom only). Zoom URL: https://pdx.zoom.us/j/83603251952
- Or by appointment only. You can also post your lab questions on the course's Slack channel.

Email: Please communicate using the course's Slack lab channel for lab related questions. For non-lab class-related questions, feel free to email your TA. TA typically checks their email from 9:00 am to 5:00 pm, Monday through Fridays. Do not expect a prompt reply outside of these hours.

Online Lab Session Communication: During the online lab sessions, you can contact your TA with real-time questions via Slack's lab channel. Additionally, there is an option to use the Zoom Meetings feature to facilitate video/audio chats. Use the following instructions to start a Zoom Meetings video/audio call:

1. Log on to Canvas (https://canvas.pdx.edu/). Select 'Zoom" from the navigation bar on the left.
2. Follow the prompted instructions to install the Zoom application the first time you use the Zoom Meetings feature on your computer.
3. Start Zoom and go to the dashboard. Join the meeting and wait for the TA to admit you to the live audio/video call. You can use the Zoom main panel to share your computer screen if necessary. See the Zoom Support page (https://support.zoom.us/) for software instructions.



ODIN Account and Access Badges: In order to participate in class, you need to have an ODIN account. In the lobby of Fariborz Maseeh Hall (FMH) is the PSU IT User Support Services (aka IT Helpdesk). They can help you set up your account. There will be no in-person lab meetings at CH469, but you could use CH469 during Wednesday's lab reservation time (10 to 11:50 am) or when it's not used. See https://www.pdx.edu/geography/gis-labs for CH469 availability.

Grading: Maps and answers to questions contribute equally to the total score. The total lab score for the term will account for 30% of Undergraduates' and 25% of Graduates' final grades. Labs must be submitted by the listed due dates (or earlier) on Canvas (see instructions below).

How to submit an assignment: Lab instructions are available on Canvas, under the module for the week each one is assigned. Please submit your completed labs to the Assignment in Canvas. All answer sheets and maps must be submitted to Canvas by their respective due dates (before midnight). Lab grades will usually be posted on Canvas within a week of the due date (although this is subject to change).

Late work: Each lab is due according to the date it is assigned below. Labs are not considered complete until they have been submitted on Canvas. Unless prior arrangements have been made with me, all late work will be docked 10% for each day that the assignment is late. Assignments that are more than a week late will not be accepted. Please speak with TA if you are having trouble finishing your lab due to difficult life circumstances.

Due dates of labs:

Lab 1: Raster Analysis Tools (147 points)	Due by 04/12 (midnight)
Lab 2: ArcGIS Online Web Maps and Map Applications (50 points)	Due by 04/19 (midnight)
Lab 3A&B: ArcGIS ModelBuilder (A: 10 points; B: 72 points)	Due by A: 04/24, B: 04/26 (midnight)
Lab 4: Dasymetric Mapping (78 points)	Due by 05/03 (midnight)
Lab 5A&B: Network Analysis (A: 10 points; B: 71 points)	Due by 05/10 (midnight)
Lab 6: Spatial Pattern Analysis (121 points)	Due by 05/17 (midnight)

Data management: Proper data management is always important. Create folders with descriptive names to save your lab files and reports, and to back up your data. Pay attention to file structure and names. Organization can save a lot of time and trouble.

Lab reports: You will be held to a higher standard than in GIS I for format and content. Proper grammar is mandatory, and concise explanations are imperative. Make sure to describe the operations you are performing. By now you should be familiar with basic GIS terminology, so you are expected to use it in your lab answers. When answers to questions are not placed directly on the maps, please include the answers with the questions. For conceptual questions, consider definition, example, and detail. Generate your maps as indicated in the instructions – some maps must be in grayscale only. Proper page formatting and layout are expected.

Maps: Maps should be properly labeled with their corresponding exercise number. It is better to embed maps in your lab report rather than including them all at the end. However, I will need to be able to read them. Take this into consideration with print size (especially for labels). They do not need to be a full page in size if included with the lab write-up but use the space effectively.

Maps should always stand alone and include the basic elements: title, name & date, data source(s), legend (and/or appropriate labels), scale bar, north arrow. While this is not a course in cartography, maps are the most common communication tool you will employ as a GIS practitioner to report your analyses. To communicate effectively, symbology must be properly designed. The default symbology of many GIS programs is not always the best one. Consider the number of levels and significant digits. A "metadata" text box including author, date, data sources, and information about the analysis will lend credibility to your maps and is **required**. Please note that "Geog. 492," "PSU," and "I drive" are NOT data sources.

Academic honesty: All answers on lab assignments must be your own. This means that you must use your own words and make your own maps. Cut-and-paste answers from the book (or a lab partner) will not be given credit. Feel free to work together in labs and help out your classmates but understand that duplicate answers or maps will be considered as cheating, and these will receive no credit. PSU policies toward academic honesty and integrity apply.

GIS II Lab Work Expectations (Spring 2024)

Alec Dyer

You should expect to spend at least between 4 to 6 hours on any given lab assignment. Labs in GIS II are fairly in depth. You should allow for plenty of time to complete the assignments. I strongly recommend working on a given lab over multiple days. Getting started early makes it easier to get help when you need it and spreading the work out can greatly help in avoiding frustration.

Answering Questions:

1. Always use complete sentences. Partial sentences will receive partial credit. One-word answers are not acceptable.
2. Do not copy answers from the book, internet, or a classmate. If your answers are not your own, written in your own words, you will not receive credit.
3. When answers to questions are not placed directly on the maps, please include the answers with the questions. For questions not answered directly on a map, differentiate your answers from the questions. This can be by using bolding, italics, or underlining. Using a different font color is okay, but please use a dark color (avoid a bright one).
4. Please export your maps in EMF format or in other formats that you are familiar with. If saving the maps as images, then the output image should have at least a 150 dpi resolution. You can insert EMF files as images directly into Word documents. If you have trouble incorporating maps into your answer sheets, let me know. You may submit your answer sheets in Word or PDF format, but PDF is preferred. If you are asked to make multiple maps for a lab assignment, please merge them into one document. If your maps are in PDF format, then PDF merge is a good online utility for merging them (https://www.pdfmerge.com/).

Making Maps:

1. Maps should be properly labeled with their corresponding exercise number.
2. Always include your name, date, and data source(s), plus a title, north arrow, scale bar, and map legend in your maps. Any map missing any one of these elements will lose points. Make sure to include them!
3. TA grades on map legibility, not by aesthetic taste. If text, symbols, or any other map components are not displayed so that an ordinary person can read them, points may be deducted from your map.
4. Make sure that your page is set up correctly to avoid any cutoffs when you print your maps. You will be deducted points for cutoffs.
5. Avoid using decimals in your map scales. Adjust your scale so that all the numbers are integers.

Tips for Earning Maximum Credit:

1. Always follow the directions. Example: Sometimes you are asked for specific info or symbols in your legends. If directions are not followed, full credit will not be given.
2. Try to answer the question according to the amount of points it is worth. Example: A 6-point question answered with one brief statement will rarely receive full credit.
3. If you are having trouble with a lab, please ask your TA for help. (That's why I am here.)
4. Look at your Canvas Assignment submission for TA lab feedback.