

Online GIS II - Advanced GIS

GEOG 492/592, USP 592 (4 credits)

Contact Geoffrey Duh (jduh@pdx.edu) for questions on this course.

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 or hybrid 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 and assignments are managed on D2L and follow a 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). Unless you make arrangements with the instructor in advance, you will not be able to take an online quiz if the deadline has passed. See the class schedule table below for the beginning and ending dates of the weeks. **Make sure that you start working on D2L weekly module(s) at the beginning of the week.**

Textbooks

There is no required textbook for this class. Instead, students will read articles from peer-reviewed journals. These articles will be available on D2L. 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. 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

Online lab attendance is not mandatory. It is highly recommended for students that need help with their assignments. This class has a "face-to-face" lab sessions during which the instructor and TA are available for answering questions in Zoom meetings. The practical lab 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. Please refer to the Lab syllabus on D2L 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 8 weekly 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 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.

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 D2L 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 D2L. The instructor will monitor the discussion activities on D2L 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 for other graduate

students to read and facilitate online class discussion held on D2L. 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 D2L Grad Students Journal Articles module for more information). A group could 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 D2L Assignments before noon the previous Friday the article is scheduled (see D2L module).

Graduate students assigned to the week will post their discussion questions **as a group** on D2L Journal Discussion on the previous Friday before midnight. Each group will prepare 3 discussion questions and post them on the D2L 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 this activity will count towards 10% of your overall 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 course's D2L 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 Story Map 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 D2L 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 Story Maps: You will create an ArcGIS Online Story Map for your final project. Students will perform a peer-review on the story maps during the final exam period. See D2L for AGOL Story Map instructions.

Course Schedule

Week 1

- Course Overview & Basic GIS Concepts Review (Zoom Meeting)
- Basics of Raster Data (D2L Quiz - 10 points)
- Lab 1: Raster Analysis Tools in ArcGIS

Week 2:

- Raster Data Analysis Using Raster Data for Site Selection (D2L Quiz - 10 points)
- Lab 1 continued

Week 3:

- Environmental Justice Analysis (D2L Quiz - 10 points)
- Volunteered Geographic Information (D2L Online Discussion)
- Lab 2: ArcGIS Online Web Maps and Map Applications

Week 4:

- **Graduate student selected journal article due**

- Multi-Criteria Decision Making & Dasymetric Mapping (D2L Quiz - 10 points)
- Lab 3: ArcGIS ModelBuilder

Week 5:

- **Project proposal due**
- Network Analysis (D2L Quiz - 10 points)
- Lab 4: Dasymetric Mapping

Week 6:

- Exploring Spatial Patterns in Your Data Using ArcGIS (D2L Quiz - 10 points)
- Graduate student journal article D2L discussion
- Lab 5: Network Analyst

Week 7:

- Performing Spatial Interpolation Using ArcGIS (D2L Quiz - 10 points)
- Graduate student journal article D2L discussion
- Lab 6: Spatial Pattern Analysis

Week 8:

- Statistical GIS Modeling and D2L: Regression Analysis Using ArcGIS (Quiz - 10 points)
- Graduate student journal article D2L discussion
- Work on term projects

Week 9:

- Term project discussion (Zoom meeting)
- Critical GIS (D2L Online Discussion)
- Work on term projects

Week 10:

- Work on term projects (project assistance available by appointment)

Final Week:

- Online Project Story Map Peer-Review

Readings

The pdf files of the class readings are available on D2L.

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 & Multi-Criteria Decision Making

- 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)
- 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)

Week 5: Network Analysis

- Lloyd, Christopher 2010. Network Analysis. In Spatial Data Analysis. Oxford Press. (Lloyd_2010.pdf)

Week 6: 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)
- Read ArcGIS Desktop Online Help for all tools in the Spatial Statistics Toolbox.
- **Graduate student discussion journal article** TBD

Week 7: Performing Spatial Interpolation Using ArcGIS

- Pages 49-79. Using ArcGIS Geostatistical Analyst (Using_Geostatistical_Analyst.pdf)
- **Graduate student discussion journal article** TBD

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)

- Pages 81-112. Using ArcGIS Geostatistical Analyst (Using_Geostatistical_Analyst.pdf)
- **Graduate student discussion journal article** TBD

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