ENV H 465 A Au 19: Geographic Information Systems (GIS) In Public Health

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ENVH 465A / 565A: Geographic Information Systems (GIS) in Public Health

3 credits, graded

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Office hours available by appointment

Lectures on Tuesdays 3:30-4:50pm in Health Sciences Center (HST), Room T473

Computer Labs on Fridays in Health Sciences Library, Computer Commons, Room C
(**http://hsl.uw.edu/topics/learning-commons**   **(http://hsl.uw.edu/topics/learning-commons)**)
465 Students at 12:30-1:50pm
565 Students at 2:00-3:20pm

Both 465/565 will meet for one combined 90-minute lecture session each week. Additionally, each course
will meet separately for a 90-minute hands-on lab session in a computer lab in the Health Sciences Library.

Note: there is no final exam for this course. Students will present the final projects in the last week of
classes during the lecture period.

Course Overview

The goal of this course is to familiarize students with the applications of Geographic Information Systems
(GIS) in Public Health, and to provide students with practical experience using GIS methods to conduct spatial
analyses. Lectures, case studies, and hands-on computer lab exercises will highlight the principles, methods,

and techniques of spatial analysis to solve practical public health problems within a variety of health sub-disciplines, focusing on environmental health, but also exploring infectious diseases, health services and community health. Topics covered by this course include spatial data representation and management, visualization of spatial data using traditional GIS-based maps or newer interactive mapping technologies, and exploratory spatial data analyses.

Undergraduate students (ENV H 465) will focus on using existing health related datasets to conduct practical GIS analyses that solve common spatial analyses that might be encountered in daily public health practice.

Graduate students (ENV H 565) will focus on conducting original independent GIS analyses, using data that they have sourced themselves, to address a public health issue that they have identified.

Learning Objectives

At the end of this course, students in **both ENV H 465 and 565** will be able to:

- Solve practical Public Health spatial problems using GIS methods
- Differentiate between different spatial object representations, such as raster versus vector data, different map projections and coordinate systems
- Describe major sources of spatial data used in the Public Health, including those that come from the census, satellite imagery, street address geocoding, global positioning system, and health services
- Critique and produce maps
- Use spatial joins, buffer analyses, spatial overlays and map algebra, basic spatial statistics and cluster analyses
- Explain the value of GIS, and be able to cite key studies in which GIS was used in environmental health, infectious disease, health services, and community health
- Demonstrate the ability to work effectively and co-operatively as part of a team

Additionally, graduate students (**ENV H 565 only**) will be able to:

- Work independently to develop their own GIS project
- Effectively communicate the findings of a spatial data analysis
- Demonstrate fluency in technical writing and oral presentation

Class Format

Instruction will consist of a 90-minute lecture and a 90-minute supervised computer lab session each week. Each week will examine a specific public health topic with lecture, discussion, and readings demonstrating the use of GIS for spatial problem solving. The same topic will be explored with a hands-on computer lab exercise, which will provide practical experience with using GIS. The exercises will be conducted in two-person student teams to allow for peer- learning and teamwork.

For undergraduate students (ENV H 465), the last two weeks of the course will be devoted to each student (individually, not in teams) conducting a final project assignment – an analysis of an instructor-provided GIS dataset to answer a set of provided questions. Students will be expected to apply the GIS skills they have learned in the class exercises in order to finish their final project assignment. The deliverable for the final project assignment will consist of concise answers to the questions provided. It will be due on the day after the last class at noon.

For graduate students (ENV H 565), the last two weeks of the course will be devoted to each graduate student (individually, not in teams) conducting an original GIS analysis final project. Unlike the projects undertaken by the undergraduate students, graduate students will be expected to:

1. Identify a real-world public health question or research hypothesis that involves spatial data analysis
2. Identify and collect spatial data to address their question/hypothesis
3. Use the methods acquired from the lab exercises to analyze their project data
4. Write a clear and concise (no more than 5-pages, not including figures & tables) final project report summarizing their hypothesis, methods and findings.
5. Share what they learned from their project with the rest of the ENV H 565 class, by presenting a 1-slide oral summary on the last day of class.

The instructor will be available to advise on the analysis. The final project report will be due on the day after the last class at noon.

Student Assignments and Grading

> **For undergraduate students (ENV H 465):**
> Lab exercise reports = 50%
> Final project assignment = 50%
>
> **For graduate students in (ENV H 565):**
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> Lab exercise reports = 50%
> Final project assignment = 35%
> Final presentation = 15%

For all students in both courses, lab exercise reports will be prepared and submitted to the course website by each team (each student should submit their own copy of the lab report to Canvas -- it can be the identical lab report for the team). The reports are due one week after the lab (at noon 12pm). Reports will be graded on the completeness of work, validity of findings, and quality of explanation. Specific questions asked in the lab assignments should be answered in the lab reports. Maps should be of good quality (e.g., with symbol legends, scale bars). The reports should be concise, typed, clearly organized, and submitted on time. 10% of each lab report score will be deducted for each day late.

For undergraduate students (ENV H 465), their final project assignment should completely and concisely address each of the questions asked in the assignment using the data provided. The work should be done independently of other students. Responses will be graded on accuracy, quality of the work (e.g., maps should

be of good quality with symbol legends, scale bars, legible text), and should be submitted on time. 10% of the score will be deducted for each day late.

For graduate students (ENV H 565), a final project report should be prepared as described above. The report should have a clear structure (Using the following headings: Introduction, Methods, Results, Discussion, References), using tables and figures judiciously to support and communicate findings. Maps should be of good quality (e.g., with symbol legends, scale bars, legible text). The final report should be concise, typed, clearly organized, and submitted on time. 10% of the score will be deducted for each day late.

Graduate students (ENV H 565) will also prepare a final project presentation consisting of a single PowerPoint slide and 5-minute summary of the main public health question that was addressed and the findings. This presentation will be delivered during one of the ENV H 565 lab sessions. The presentation will be given a full score if the student gives an oral presentation. If a presentation is not given, the student will receive a score of zero.

Student Responsibilities

Students in both ENV H 465 and 565 are expected to:

1. Participate in class discussions.
2. Read the assigned readings.
3. Prepare and submit lab reports on time. Reports should be concise and clearly written.
4. Prepare and submit final project work on time.
5. Learn how to use citations: Give credit, when and where credit is due: if you mention other people's data, studies, etc., please be sure to cite it appropriately (see: **http://guides.lib.uw.edu/research/citations/citation-basics) (http://guides.lib.uw.edu/research/citations/citation-basics))**

Access and Accommodations

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course.

If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but are not limited to mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or **uwdrs@uw.edu (mailto:uwdrs@uw.edu)** or **disability.uw.edu (http://depts.washington.edu/uwdrs/)**. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at **Religious Accommodations Policy** **(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/)** (**https://registrar.washington.edu/staffandfaculty/religious-accommodatio…** **(https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/)**). Accommodations must be requested within the first two weeks of this course using the **Religious Accommodations Request form** **(https://registrar.washington.edu/students/religious-accommodations-request/)** (**https://registrar.washington.edu/students/religious-accommodations-requ…** **(https://registrar.washington.edu/students/religious-accommodations-request/)**).

Safety

Call SafeCampus at 206-685-7233 anytime – no matter where you work or study – to anonymously discuss safety and well-being concerns for yourself or others. SafeCampus's team of caring professionals will provide individualized support, while discussing short- and long-term solutions and connecting you with additional resources when requested.

SPH Land Acknowledgment

The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

Academic Integrity

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of **the University of Washington Student Conduct Code (https://www.washington.edu/studentconduct/)** (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and **the SPH Academic Integrity Policy (https://sph.washington.edu/students/academic-integrity-policy)** . Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

Equity, Diversity and Inclusion

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In SPH, students are expected:

1. To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
2. To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
3. To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or SPH EDI Committee, the Assistant Dean for EDI, or the program's director.

Bias Concerns

The Office of the Dean has a student concern policy, a faculty concern policy and standard HR procedures for staff concerns. Our 2018 climate survey states that most people in SPH do not report bias incidents because they do not know where to go. Students are encouraged to report any incidents of bias to someone they feel comfortable with, including instructors, advisers or department staff. They can email **dcinfo@uw.edu (mailto:dcinfo@uw.edu)** for immediate follow up. Bias concerns can be anonymously and confidentially reported at this link **https://sph.washington.edu/about/diversity/bias-concerns (https://sph.washington.edu/about/diversity/bias-concerns)** . Data is collected by the Assistant Dean for EDI and the Director of Program Operations for Student and Academic Services and tracked for resolution and areas are identified for further training.

GIS Software, Texts and Readings:

GIS software

We will be using ESRI ArcGIS. **http://www.esri.com/software/arcgis** **(http://www.esri.com/software/arcgis)**

You will be able to access this software on the computers in the Health Sciences Library computer lab. You can access the lab outside of class hours, when the library is open and others aren't using the computer lab.

UW students can also use ArcGIS by remotely logging into their CSDE accounts, which are paid for by the Student Technology Fee (this works well for both PC and Mac users): **https://csde.washington.edu/computing/accounts/** **(https://csde.washington.edu/computing/accounts/)**

UW maintains a site license for ArcGIS for use on department machines: **https://depts.washington.edu/arcgis/pages/** **(https://depts.washington.edu/arcgis/pages/)**

While our course will focus on ArcGIS, the GIS skills are applicable to other GIS software, some of which are open source and freely available:

Maptitude (**http://www.caliper.com/** **(http://www.caliper.com/)**)
GRASS (**http://grass.osgeo.org/)**

 (http://grass.osgeo.org/)) QGIS (http://www.qgis.org/en/site/   (http://www.qgis.org/en/site/))

And increasingly R (http://www.r-project.org/   (http://www.r-project.org/)) is being used to perform spatial data analyses, with the following useful packages: sp, rgeos

Recommended (<u>but not required</u>) course texts:

Cromley and McLafferty (2011) GIS and Public Health, 2nd Edition, The Guilford Press, New York. (*Pretty much the only overarching GIS textbook that focuses on Public Health that's relatively current. ~$52 used on Amazon*).

Kurland and Gorr (2012) GIS Tutorial for Health: Fourth Edition, ESRI Press, New York. (*An "exercise" oriented book with health services related examples. ~$20 used on Amazon*).

Course Summary:

Date	Details	
Tue Oct 1, 2019	📅 **ENVH 465/565 - Introductions (you, me, the course, the GIS Lab, and someone named John Snow)** **(https://canvas.uw.edu/calendar? event_id=1292459&include_contexts=course_1320276)**	3:30pm to 5:20pm
Fri Oct 4, 2019	📅 **ENVH 465/565 Meet the GIS Lab!** **(https://canvas.uw.edu/calendar? event_id=1292451&include_contexts=course_1320276)**	12:30pm to 3:20pm
Tue Oct 8, 2019	📅 **ENVH 465/565 - Exploratory Data Analysis, Environmental Health (https://canvas.uw.edu/calendar? event_id=1292460&include_contexts=course_1320276)**	3:30pm to 4:50pm
Fri Oct 11, 2019	📝 **Exercise 1** **(https://canvas.uw.edu/courses/1320276/assignments/5024851)**	due by 12pm
Tue Oct 15, 2019	📅 **ENVH 465/565 - Spatial Stats, Infectious Disease** **(https://canvas.uw.edu/calendar? event_id=1292456&include_contexts=course_1320276)**	3:30pm to 4:50pm
Fri Oct 18, 2019	📝 **Exercise 2** **(https://canvas.uw.edu/courses/1320276/assignments/5024852)**	due by 12pm
Tue Oct 22, 2019	📅 **ENVH 465/565 - Community Health and Built Environment (https://canvas.uw.edu/calendar? event_id=1292457&include_contexts=course_1320276)**	3:30pm to 4:50pm

Date	Details	
Fri Oct 25, 2019	📝 **Exercise 3** **(https://canvas.uw.edu/courses/1320276/assignments/5024853)**	due by 12pm
Tue Oct 29, 2019	📅 **ENVH 465/565 - Healthcare services, Location-Allocation** **(https://canvas.uw.edu/calendar?** **event_id=1292458&include_contexts=course_1320276)**	3:30pm to 4:50pm
Fri Nov 1, 2019	📝 **Exercise 4** **(https://canvas.uw.edu/courses/1320276/assignments/5024854)**	due by 12pm
Tue Nov 5, 2019	📅 **ENVH 465/565 (Discuss final project)** **(https://canvas.uw.edu/calendar?** **event_id=1292455&include_contexts=course_1320276)**	3:30pm to 4:50pm
	📅 **ENVH 465/565 - GPS and Mobile GIS** **(https://canvas.uw.edu/calendar?** **event_id=1292461&include_contexts=course_1320276)**	3:30pm to 4:50pm
Fri Nov 8, 2019	📝 **Exercise 5** **(https://canvas.uw.edu/courses/1320276/assignments/5024855)**	due by 12pm
Tue Nov 12, 2019	📅 **ENVH 465/565 (should be working on final project)** **(https://canvas.uw.edu/calendar?** **event_id=1292450&include_contexts=course_1320276)**	3:30pm to 4:50pm
	📅 **ENVH 465/565 - Spatial Sampling and Spatial Interpolation** **(https://canvas.uw.edu/calendar?** **event_id=1292452&include_contexts=course_1320276)**	3:30pm to 4:50pm
Fri Nov 15, 2019	📝 **Exercise 6** **(https://canvas.uw.edu/courses/1320276/assignments/5024856)**	due by 12pm
Fri Nov 22, 2019	📝 **Exercise 7** **(https://canvas.uw.edu/courses/1320276/assignments/5024857)**	due by 12pm
Fri Nov 29, 2019	📅 **ENVH 465/565 (Optional open lab today to work on your final** **projects) (https://canvas.uw.edu/calendar?** **event_id=1292454&include_contexts=course_1320276)**	12:30pm to 3:20pm
Mon Dec 2, 2019	📝 **Project Presentation** **(https://canvas.uw.edu/courses/1320276/assignments/5025021)**	due by 12pm
Tue Dec 3, 2019	📅 **ENVH 465/565 - Last day of class (Project presentations for** **565 students) (https://canvas.uw.edu/calendar?** **event_id=1292453&include_contexts=course_1320276)**	3:30pm to 4:50pm

Date	Details	
Mon Dec 9, 2019	**ENVH 465/565 Final Project** **(https://canvas.uw.edu/courses/1320276/assignments/5024850)**	due by 12pm