ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health

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

3 credits, graded

Instructor: Edmund Seto (He, Him, His), Professor of Env & Occ Health Sciences
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Teaching Assistant: In previous years, there was a TA. But this year, the department did not provide a TA position for this course.

Office hours available by appointment

Lectures on Thursdays 10:30-11:50pm in-person at HST T474.

Both 465/565 will meet for one combined Thursday 80-minute lecture/discussion session each week. I will do my best to run a Zoom session and record lectures.

Computer Labs on Fridays in MGH 044.

12:30-1:50pm
2:00-3:20pm

There are two 80-minute sections for completing hands-on computer exercises. Please attend the section you signed up for, unless approved by instructor that there is room to accomodate you working in the other section. Due to the lack of a TA, I will not be able to assist students in lab and students online, so there will not be a Zoom session for the labs.

Note: there is no final exam for this course.

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

By the end of this course, students in **both ENV H 465 and 565** should 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 within Public Health, 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 in **ENV H 565** should 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 80-minute lecture and a 80-minute 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 may be conducted

individually or in two-person student teams to allow for peer-learning and teamwork. The exercises will not be graded, however, a weekly graded quiz assignment will accompany each exercise. The quiz assignment will be due one week after the exercise, and will assess the student's learning from the exercise. Each quiz may be completed multiple times before the deadline, until the student gets correct answers and a full score on it.

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. Additionally, ENV H 465 students will complete reflections on two graduate students' rapid talk presentations.

For graduate students (ENV H 565), the last four weeks (approximately) 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 identify a real-world public health question that involves spatial data analysis, identify and collect spatial data to address their project objectives, and apply methods acquired from the lab exercises to analyze their project data. Students will go through an abbreviated "course journal" publishing process: students will summarize their final project's objectives, methods and findings in a draft paper, peer review each others' draft papers, and incorporate feedback into their final project paper. Students will have the option of sharing their project paper in a public course journal/digital repository. Finally, students will also share the goals and approach of their project with the rest of the ENV H 465/565 class, by presenting a 1-slide (2-min) rapid talk on one of the last 2 lecture days.

Please see the Assignment page on course Canvas site for the due dates of all exercises, assignments, and projects.

Student Assignments and Grading

For undergraduate students (ENV H 465):
Lab exercise quizes = 50%
Reflections assignment = 20%
Final project assignment = 30%

For graduate students in (ENV H 565):
Lab exercise quizes = 50%
Draft of project paper = 20%
Peer review of two student papers = 10%

Rapid talk presentation = 5%
Final project paper = 15%

For all students in both courses, after completing the hands-on lab exercises, students should complete and submit the quiz assignment on Canvas. The quiz assignment is due one week after the lab (at noon 12pm). Quizes may be repeated until the student arrives at the correct answers, and will be graded based on timely submission by the assignment due date. 10% of each quiz score will be deducted for each day late.

For undergraduate students (ENV H 465)

In addition the the weekly lab quizes, undergraduate students in ENVH 465 will have a final project assignment. Students should completely and concisely address questions 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.

Additionally, undergraduates in ENVH 465 will complete reflections assignment for two of the graduate students' rapid talk project presentations on the last two lecture dates. The reflections will be given a full score if the student submits reflections on time, otherwise the student will receive a score of zero on the assignment.

For graduate students (ENV H 565)

In addition to the weekly lab quizes, graduate students in ENVH 565 will conduct an original GIS analysis as a final project. Graduate students will be expected to identify a real-world public health question that involves spatial data analysis, identify and collect spatial data to address their project objectives, and apply methods acquired from the lab exercises to analyze their project data. A project paper should be prepared, following an abreviated "course journal" publishing process. The paper should summarize their project's objectives, methods and findings clearly and concisely (no more than 6-pages, single-spaced, not including figures & tables, or references). The paper should use the following headings: Abstract, Introduction, Methods, Results, Discussion, References, and use tables and figures judiciously to support and communicate findings. Maps should be of good quality (e.g., with symbol legends, scale bars, legible text). A Word template will be provided to facilate the formating of the paper. There will be a deadline to submit a draft of the paper. Students will peer review each others' draft paper. Students will incorporate feedback from the peer review, and submit their final paper by the final deadline. 10% of the score will be deducted for each day late for all assignments. Students will have the option to share their paper publically in a course journal/digital repository. Deciding to share or not share their paper in the course journal/digital repository does not affect grading.

Graduate students in ENVH 565 will also prepare a final 2-minute "rapid talk" project presentation consisting of a single presentation slide. The presentation may be a "work in progress", focusing only on the goals and approaches (e.g., data and methods) being used for the project, rather than actual findings, because the presentations will be given before the final written project report is due. This

presentation will be delivered during the last 2 lecture days. 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/group work.
2. Read the assigned readings.
3. Complete lab exercises and submit weekly quizes on time.
4. Prepare and submit final project work on time.
5. Learn how to use citations: For ENVH 565 final project papers, 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: **https://guides.lib.uw.edu/research/citations/citation-basics (https://guides.lib.uw.edu/research/citations/citation-basics)) (https://guides.lib.uw.edu/research/citations/citation-basics)**

GIS software

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

You will be able to access GIS software on the computers during lab sessions.

Accessing technology outside of lab hours

Students may use the remote computing resources (terminal servers) offered by the Center for Studies in Demography & Ecology (CSDE). Please sign-up for an account and read their tutorial on Connecting to Windows Terminal Servers:
https://csde.washington.edu/computing/resources/#TS_Connecting (https://csde.washington.edu/computing/resources/#TS_Connecting)
https://csde.washington.edu/computing/tutorials/#TSWindows (https://csde.washington.edu/computing/tutorials/#TSWindows)

There are also GIS resources available through UW Libraries, including the Suzzallo Library's GIS Lab:
https://guides.lib.uw.edu/research/gis/resources (https://guides.lib.uw.edu/research/gis/resources)

Software is also available via the UW ESRI site license for installation on students' personal computers:
https://itconnect.uw.edu/uware/arcgis-esri/ (https://itconnect.uw.edu/uware/arcgis-esri/)

While this course's computer exercises are based on ArcGIS Pro, the skills are applicable to other GIS software, some of which are open source and freely available such as QGIS (**http://www.qgis.org/ (http://www.qgis.org/en/site/)**), but will not be supported in this course.

Increasingly R (**http://www.r-project.org/ (http://www.r-project.org/)**) is being used to perform spatial data analyses. Using R for spatial analyses will not be covered in this course. However, if you would like to learn R spatial analysis, please consider the Dr. Seto's online learning material and registering for independent study separate from this course:
https://www.edmundseto.com/edmundseto/introduction-to-spatial-analysis-for-r-a-focus-on-environmental-health/ (https://www.edmundseto.com/edmundseto/introduction-to-spatial-analysis-for-r-a-focus-on-environmental-health/)

Optional (not required) learning resources

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. ~$35 used on Amazon*).

ESRI GIS tutorials:
https://www.esri.com/en-us/arcgis/products/arcgis-online/resources (https://www.esri.com/en-us/arcgis/products/arcgis-online/resources)

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.

Illness Protocol

If you feel ill or exhibit respiratory or other symptoms, you should not come to class. Seek medical attention if necessary and notify your instructor(s) as soon as possible by email. UW Environmental Health & Safety recommends that you wear a well fitting mask while you are symptomatic.

Additional recommendations include getting your **annual flu shot (https://wellbeing.uw.edu/flu-vaccination/)** and getting boosted with the updated COVID vaccines.

Please check your email and CANVAS announcements daily BEFORE coming to class. If we need to conduct class remotely because the instructor or a guest speaker is unable to attend in person, we will

send all registered students an email and/or post a CANVAS announcement with a Zoom link for remote instruction or a plan for making up the class.

Communication and Writing Skills

Communication through writing and speaking is an important transferable skill for all career pathways. Establishing a strong foundation in communication skills will help you be successful throughout your future course work and career. Therefore, this course includes assignments with the goal to help you identify areas of strength and improvement in your communication. If you feel that you could benefit from additional opportunities to improve your writing skills in particular, a list of resources at the UW and others accessible online can be found on the SPH website **here (https://sph.washington.edu/sites/default/files/2020-09/Writing-Resources-9.24.20.pdf)** .

The Course Journal Concept

For the many years that I taught this course, students wrote and submited traditional "term papers" or "final reports" for their projects. As the course instructor, only I probably ever read these papers. And after grading, I'd toss these papers aside! It was never clear if these projects would be incorporated later into student theses or dissertation work, or would be shared in other ways. If not, it would be a tremendous waste of scholarly work and potentially practical and useful sharing of methodological approaches and findings. Students may benefit from being able to share their class work with a larger audience, including to gain credit for the innovation, work, and outcomes of their course projects among the broader scientific and public health practice community. As such, I've restructured the course so that students gain experience with the journal publishing process, including a mini-peer review process, and have the option to share their class project findings in a course journal/UW digital repository. It's optional, and students are not expected to post their papers if they do not want to.

More information on the rationale for, and different forms of course journals:
https://docs.pkp.sfu.ca/instructor-guide/en/ (https://docs.pkp.sfu.ca/instructor-guide/en/)

Important Policies & Resources

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, unauthorized use of artificial intelligence (AI) tools, and other misconduct are serious violations of the University of Washington **Student Conduct Code (WAC 478-121)** (https://apps.leg.wa.gov/WAC/default.aspx?cite=478-121) . We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH 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** (https://www.washington.edu/cssc/) .

Use of Generative Artificial Intelligence in Coursework

TL;DR -- It's allowed.

AI continues to be an emerging technology that offers promising use within all academic fields. The school has provided instructors with the flexibility to develop their own policies for appropriate use of AI for student's coursework. I believe that we should embrace new technologies, and view AI as part of the evolution of tools that have always been well-intentioned to improve science and communication. Word processors (helped to improve the formating and editting of our writting), spell-checking (helped to improve our spellling -- ah, that's spelling), grammer checking, etc. Today, it's common practice to criticize someone for having spelling and grammer errors and NOT having checked their writing with spell/grammer checkers. Obviously, generative AI tools, like Chat-GPT are a different type of tool. But, you should be the the judge of whether you feel that you're leaning too heavily on tools such as Chat-GPT to generate your ideas and your words, and whether it is hampering rather than helping your learning. Moreover, you should seriously consider whether AI generated content is factual and correct, and whether the content reflects your own thinking and understanding. Also note that the use of Chat-GPT and similar tools does not alleviate the need to cite sources and references in your writing.

Access and Accommodations

Your experience in this class is important to me. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law. If you have already established accommodations with Disability Resources for Students (DRS), please activate your accommodations via myDRS so we can discuss how they will be implemented 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 not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), contact DRS directly to set up an Access Plan. DRS facilitates the interactive process that establishes reasonable accommodations. Contact DRS at **disability.uw.edu** (https://depts.washington.edu/uwdrs/) .

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-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-request/)** .

Inclusion & Diversity

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

Classroom Climate

We are co-creators of our learning environment. It is our collective responsibility to develop a supportive learning environment for everyone. Listening with respect and an open mind, striving to understand others' views, and articulating your own point of view will help foster the creation of this environment. We engage our differences with the intent to build community, not to put down the other and distance our self from the other. Being mindful to not monopolize discussion and/or interrupt others will also help foster a dialogic environment.

The following guidelines can add to the richness of our discussion:

- We assume that persons are always doing the best that they can, including the persons in this learning environment.
- We acknowledge that systematic oppression exists based on privileged positions and specific to race, gender, class, religion, sexual orientation, and other social variables and identities.

- We posit that assigning blame to persons in socially marginal positions is counter-productive to our practice. We can learn much about the dominant culture by looking at how it constructs the lives of those on its social margins.
- While we may question or take issue with another class member's ideology, we will not demean, devalue, or attempt to humiliate another person based on her/his experiences, value system, or construction of meaning.
- We have a professional obligation to actively challenge myths and stereotypes about our own groups and other groups so we can break down the walls that prohibit group cooperation and growth. [Adapted from Lynn Weber Cannon (1990). Fostering positive race, class and gender dynamics in the classroom. *Women Studies Quarterly, 1 & 2, 126-134*.]

We are a learning community. As such, we are expected to engage with difference. Part of functioning as a learning community is to engage in dialogue in respectful ways that supports learning for all of us and that holds us accountable to each other. Our learning community asks us to trust and take risks in being vulnerable.

Here are some guidelines that we try to use in our learning process:

- LISTEN WELL and be present to each member of our group and class.
- Assume that I might miss things others see and see things others miss.
- Raise my views in such a way that I encourage others to raise theirs.
- Inquire into others' views while inviting them to inquire into mine.
- Extend the same listening to others I would wish them to extend to me.
- Surface my feelings in such a way that I make it easier for others to surface theirs.
- Regard my views as a perspective onto the world, not the world itself.
- Beware of either-or thinking.
- Beware of my assumptions of others and their motivations.
- Test my assumptions about how and why people say or do things.
- Be authentic in my engagement with all members of our class.

Pronouns

We share our pronouns because we strive to cultivate an inclusive environment where people of all genders feel safe and respected. We cannot assume we know someone's gender just by looking at them. So we invite everyone to share their pronouns.

Bias Concerns

The Office of the Dean has a **student concern policy (https://sph.washington.edu/students/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%C2%A0)** for immediate follow up. Bias concerns can be anonymously and confidentially reported via the online form found here: **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.

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Sexual Harassment

Sexual harassment is a form of harassment based on the recipient's sex that is characterized by:

1. Unwelcome sexual advances, requests for sexual favors, or other verbal or physical conduct of a sexual nature by a person who has authority over the recipient when:
   - Submission to such conduct is an implicit or explicit condition of the individual's employment, academic status, or ability to use University facilities and services, or
   - Submission to or rejection of the conduct affects tangible aspects of the individual's employment, academic status, or use of University facilities.
2. Unwelcome and unsolicited language or conduct that creates an intimidating, hostile, or offensive working or learning environment, or has the purpose or effect of unreasonably interfering with an individual's academic or work performance.

If you believe that you are being harassed, or have observed harassment, you can report it to SPH using the **bias concerns link (https://sph.washington.edu/about/diversity/bias-concerns)**. The University

also has designated offices to help you: **SafeCampus** (https://www.washington.edu/safecampus/) ; **Office of the Ombud** (https://www.washington.edu/ombud/) ; **Title IX Investigation Office** (https://www.washington.edu/titleix/report/) ; and **University Complaint Investigation and Resolution Office** (https://www.washington.edu/compliance/uciro/) .

Course Summary:

Date	Details	Due
Thu Sep 26, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880822&include_contexts=course_1747730)	10:30am to 12pm
Thu Oct 3, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880823&include_contexts=course_1747730)	10:30am to 12pm
Fri Oct 4, 2024	Quiz 1: Making a Map in ArcGIS Pro (https://canvas.uw.edu/courses/1747730/assignments/9650336)	due by 12pm
Thu Oct 10, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880824&include_contexts=course_1747730)	10:30am to 12pm
Fri Oct 11, 2024	Quiz 2 (https://canvas.uw.edu/courses/1747730/assignments/9653416)	due by 12pm
Thu Oct 17, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880825&include_contexts=course_1747730)	10:30am to 12pm
Fri Oct 18, 2024	Quiz 3 (https://canvas.uw.edu/courses/1747730/assignments/9653443)	due by 12pm

Date	Details	Due
Thu Oct 24, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880826&include_contexts=course_1747730)	10:30am to 12pm
Fri Oct 25, 2024	Quiz 4 (https://canvas.uw.edu/courses/1747730/assignments/9653444)	due by 12pm
Thu Oct 31, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880827&include_contexts=course_1747730)	10:30am to 12pm
Fri Nov 1, 2024	Quiz 5 (https://canvas.uw.edu/courses/1747730/assignments/9653445)	due by 12pm
Thu Nov 7, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880828&include_contexts=course_1747730)	10:30am to 12pm
Fri Nov 8, 2024	Quiz 6 (https://canvas.uw.edu/courses/1747730/assignments/9653467)	due by 12pm
Thu Nov 14, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880829&include_contexts=course_1747730)	10:30am to 12pm
Fri Nov 15, 2024	Quiz 7 (https://canvas.uw.edu/courses/1747730/assignments/9653468)	due by 12pm
Wed Nov 20, 2024	Slides for Project Presentation (565 students only) (https://canvas.uw.edu/courses/1747730/assignments/9446348)	due by 12pm
Thu Nov 21, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health	10:30am to 12pm

Date	Details	Due
	(https://canvas.uw.edu/calendar?event_id=3880830&include_contexts=course_1747730)	
Thu Nov 28, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880831&include_contexts=course_1747730)	10:30am to 12pm
Mon Dec 2, 2024	Draft Project Paper (https://canvas.uw.edu/courses/1747730/assignments/9617172)	due by 12pm
Thu Dec 5, 2024	ENV H 465/565 Au 24: Geographic Information Systems (GIS) In Public Health (https://canvas.uw.edu/calendar?event_id=3880832&include_contexts=course_1747730)	10:30am to 12pm
Fri Dec 6, 2024	Peer reviews (https://canvas.uw.edu/courses/1747730/assignments/9617175)	due by 12pm
Mon Dec 9, 2024	465 Final Assignment Due (https://canvas.uw.edu/courses/1747730/assignments/9446339)	due by 12pm
Thu Dec 12, 2024	Reflections (https://canvas.uw.edu/courses/1747730/assignments/9616836)	due by 12pm
Fri Dec 13, 2024	Revision of Project Paper (https://canvas.uw.edu/courses/1747730/assignments/9446340)	due by 12pm