

Remote Sensing for Environmental Health

UrbDP 598: College of Built Environments

EnvH 590: School of Public Health

Spring 2024
University of Washington

Wednesday and Friday, 1:30-2:50 PM

UW Architectural Hall 140

3 credits, graded

Tzu-Hsin Karen Chen, PhD (she/they)

Assistant Professor

Departments of Urban Design and Planning and

Environmental and Occupational Health Sciences

Email: kthchen@uw.edu

Office hour: Friday, 12:30pm – 1:30pm, Gould Hall, Room 418

Course Description

Physical properties and social activities of the urban space have significant impacts on human health. This course will give an overview of some fundamental characteristics of the environment and health issues and how different sensors respond to the characteristics as imaged by optical, microwave, thermal, and night-light sensors. Includes a final project based on the student's interests.

Course Learning Outcomes

At the conclusion of the course, students should be able to:

- Identify the physical and social properties in urban environments that are observable by remote sensing.
- Apply remote sensing data (optical, thermal, SAR, nighttime light) to study an urban issue.
- Use remote sensing methods to interpret the spatial patterns and trends of the selected topic regarding the urban environment.
- Familiar with data collection, analytics, and visualization on Google Earth Engine.

Evaluation

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|---------------------------------------|-----|
| • Reading presentation and discussion | 20% |
| • Lab exercise | 20% |
| • Midterm presentation | 20% |
| • Final project | 40% |

Final project (group work of 3-4 people):

Option 1: a media report focusing on storytelling and public communication (1200-1500 words), including identifying an environmental health related issue in a geographically defined region, using remote sensing data to present temporal change or spatial inequality of the environmental features, communicate the implications of these features for a health outcome(s) based on literature, and discuss policy suggestions. Target for submission to Seattle Times or other regional newspapers.

Option 2: a short research paper (2500-3000 words) focusing on empirical finding and scientific rigor. The report should be structured with the following sections: Introduction, Methods, Results, Discussion, References, using tables and figures judiciously to support and communicate findings. Target for submission to a peer-review journal.

For both options, maps should be of good quality (e.g., maps should be of good quality with symbol legends, scale bars, legible text).

Midterm presentation: Present the research proposal for the final project, including the background, proposed methods, and assessment of suitability of remote sensing data.

Lab exercise reports:

The lab exercise reports should include written answers and figures (screenshots) to address the questions and should be submitted by group.

Reading discussion: each student submits answer of the following questions on the Canvas's discussion board:

- a point that you find interesting from the article, which can be regarding the methodology or the scientific finding.
- a question or a critique, such as the weakness of the method, a bias in the research design, or an alternative approach you would prefer to adopt for your own research.

Reading presentation: Each group should present an overview on one week's readings and lead discussion with other students once in the quarter. The discussion should include at least one authoritative question, which is based the fact present in the paper and the purpose is to help participants digest the content of the reading, and one dialogic question, which is open to different points of view and the purpose is to encourage debate on an issue or understand various perspective that might arise when we engage in the reading materials.

Late Policy

All assignments are short and have at least one week of lead time to ensure you have ample time to complete them. We strongly suggest you start working on your assignments early, so that last minute challenges do not prevent timely submission of your assignments. In the event that you are unable to complete your assignment on time, a late policy, 10% of the score deduction each day, will be enforced to ensure fairness to other students. We do recognize that some challenges are simply insurmountable, for example, physical or mental illness or a family emergency. If you foresee further accommodations needed, we encourage you to use the Disability Resources for Students (DRS) as stated below.

Class content

Instruction will consist of two 80-minute sessions each week. The first session will include lecture, student presentations, and discussion; the second session will include a hands-on computer lab exercise and work on the final project. Each week will examine a specific environmental health topic with lecture, discussion, and readings demonstrating the use of remote sensing for spatiotemporal problem solving. The same topic will be explored with a hands-on exercise, which will provide practical experience with using Google Earth Engine and QGIS. The exercises and final project may be conducted individually or in two-person student teams to allow for peer-learning and teamwork.

Readings

- All course readings except textbook chapters are provided on [Canvas](#) under "Files".
- Textbook: Cardille, J. A., Crowley, M. A., Saah, D., & Clinton, N. E. (Eds.). (2023). *Cloud-based remote sensing with google earth engine: fundamentals and applications*. Springer Nature. [Free access](#).

Class schedule

Week	Topic	Lab
1	Introduction to remote sensing applications for environmental health	Intro to Google Earth Engine
2	Built environment and health	Image compositing, band, and indices
3	Socioeconomic activities and human mobility	Thresholding and masking
4	Refugee and humanitarian applications	Classification and accuracy assessment
5	Heat islands and thermal comfort	Midterm presentation
6	Climate extreme events and environmental hazards	Anomaly and change detection
7	Urban ecology and human-wildlife interface	Spatial pattern summary
8	Air pollution and wildfire	Long-term trend analysis
9	Global environmental change	Group work on final project
10	Final project presentation	

ACCESS AND ACCOMMODATIONS

Your experience in this class is important to us. 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.

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/>). 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/>).

USE OF GENERATIVE ARTIFICIAL INTELLIGENCE IN COURSEWORK

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 we can choose to be well-intentioned to improve science and communication. There are potential benefits of using AI

tools (e.g., ChatGPT) for various purposes, including but not limited to troubleshooting coding issues, searching for functions or tools, exploring literature content, checking grammar errors, and improving writing. Students who choose to use generative AI tools for their assignments are fully responsible for the output of their work. This means they should verify the accuracy of the information and reflect potential errors, fake content, or biases generated by the AI tools. Users should also be aware that inputs to AI tools may be used for the company's future purposes. It is important to avoid misconduct, including the submission of copyrighted, confidential, or personally identifiable information to these AI tools, as it grants permission to the AI company for using these contents. Also note that the use of Chat-GPT and similar tools does not alleviate the need to cite sources and references in your writing.

ACADEMIC INTEGRITY

Students at the University of Washington are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. UW is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, misuse of AI tools, and other misconduct are serious violations of [the University of Washington Student Conduct Code](#) (WAC 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](#).

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](#) and getting boosted with the updated COVID vaccines (available at [clinics and pharmacies, as well as through UW Medicine](#) and local health agencies).

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.

LAND ACKNOWLEDGEMENT

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.

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:

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.

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.

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 if you are comfortable with it.

BIAS CONCERNS

The Office of the Dean has a student concern policy [Links to an external site.](#), 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 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> [Links to an external site.](#). 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.

SEXUAL HARASSMENT

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

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. These are not acceptable.

If you have experienced sexual harassment, gender discrimination, including sexual assault, relationship or intimate partner violence, stalking, or other sexual misconduct during or outside the class, you have the right to make a formal complaint and request an investigation under Title IX. Information about Title IX reporting options is available at <https://www.washington.edu/titleix/report/>. The University also has other designated offices to help you avoid and/or report sexual harassment: SafeCampus (<https://www.washington.edu/safecampus/>); Office of the Ombud (<https://www.washington.edu/ombud/>); and University Complaint Investigation and Resolution Office (<https://www.washington.edu/uciro/>).