**TPSS/SUST 333 Understanding Agroecosystems: Visualization, Interpretation, Analysis and Application**

**3 credit**

**Instructor:**

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**Office hours:** by appointment

**Textbook:**  No Text

**Optional Additional Reading:**

* Weisberg, S. (2005). Computing Primer for Applied Linear Regression. *Using R*.
* James, G., Witten, D., Hastie, T., & Tibshirani, R. (2013). *An introduction to statistical learning* (Vol. 112, p. 18). New York: springer.
* Bergstrom, C.T. and West, J.D., 2021. Calling bullshit: the art of skepticism in a data-driven world. Random House Trade Paperbacks.

**Course Description:** This course is designed for students (in agriculture, environmental science, geography, sustainability studies and beyond) interested in developing a critical framework for understanding different ways of measuring, visualizing, and interpreting the different goals humans have for agroecosystems. We will explore the different value propositions that lead to agroecosystems being viewed as successful, viable, and sustainable. A focus on the types of data and ways these data can be visualized brings together research in agriculture, environmental science, philosophy, economics, and cultural studies with an ultimate interest in exploring how people interact and modify their environment and the way decisions impact both the stated goals and the inadvertent externalities. The course hopes to create sustainable and creative relationships between people, plants and the environment. This course will focus on the recent advances in analytical techniques which have allowed an unprecedented way of exploring interdependence of our natural and human-mediated systems.

**Course Purpose:** The purpose of this course is to prepare students to lean and implement principles of data analysis, visualization, and mapping. By the end of the semester students will be able to:

* Recognize the different forms data can take
* Recognize the different analysis that can be performed on different forms of data
* Gain experience with computational packages such as R
* Utilize data visualization and analysis techniques to interpret data
* Implement machine learning algorithms

**Course Audience:** This course is designed for upper division undergraduates who are interested in data analysis of agroecosystems

**Attendance:** Attendance is essential for successful completion of the course. Please notify the instructors by email should you be unable to attend class.

**Grading**

| Activities | Percent of total grade |
| --- | --- |
| Course Homework | 60 |
| In class quizzes | 10 |
| Final Presentation | 15 |
| Final Project | 15 |

**Letter Grade**

| A | 90% |
| --- | --- |
| B | 80-89% |
| C | 70-79% |
| Credit | 70-100% |
| No-credit | Less than 70% |

\*All students regardless of grading system chosen, are expected to complete all work assigned, a grade of incomplete will be given if assigned work has not completed by the end of the semester.

**Academic dishonesty and scholastic misconduct**

Academic dishonesty will not be tolerated for full definitions see UH Manoa policies. **(**[**http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm**](http://www.catalog.hawaii.edu/about-uh/campus-policies1.htm)**)**

**Disabilities**

Students with disabilities that impact their ability to participate in the course completely are encouraged to bring this to the attention of instructors so accommodations can be arranged.

**Policy on makeup examination for legitimate absences**

Students should not be penalized for absence due to unavoidable or legitimate circumstances. It is the responsibility of the student to notify instructors as soon as possible of such circumstances so arrangements can be made.

*Schedule and milestones:*

| **Date** | **Topic** | **Homework** | **Milestone** |
| --- | --- | --- | --- |
| Week 1 | Why are we doing this? Intentionality? What are you trying to achieve and go - agroecology definitions? | Articles for discussion  James, D., Wolff, R., & Wittman, H. (2023). Agroecology as a Philosophy of Life. *Agriculture and Human Values*, 1-14.  Figueroa-Helland, L., Thomas, C., & Aguilera, A. P. (2018). Decolonizing food systems: Food sovereignty, indigenous revitalization, and agroecology as counter-hegemonic movements. *Perspectives on Global Development and Technology*, *17*(1-2), 173-201.  Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D., & David, C. (2009). Agroecology as a science, a movement and a practice. A review. *Agronomy for sustainable development*, *29*, 503-515.  Runck, B., Streed, A., Wang, D. R., Ewing, P. M., Kantar, M. B., & Raghavan, B. (2023). State spaces for agriculture: A meta-systematic design automation framework. *PNAS Nexus*, *2*(4), pgad084. |  |
| Week 2 | Collecting and organizing data | Introduction to course website | Introductions |
| Week 3 | Introduction to R | How do you download R and what are the basics of working in a command line environment? | Homework 1 |
| Week 4 | Introduction to simulations and generating expectations | How to explore the command line syntax? |  |
| Week 5 | Data types and data description  *Goal: Understand that outcomes will be culturally mediated, qualitative and social outcomes that are not easily encompassed in data, latent variable introductions - not engaged but present the breadth of experimental forms, types and resolution of data, social indicators and qualitative* | How do computers look at data ? How are data represented and how does this influence the operations you can do? | Homework 2 |
| Week 6 | Distributions and outliers | What questions do you want to answer using your data? |  |
| Week 7 | Data on the landscape | Where is your data from and how did you collect it? | Homework 3 |
| Week 8 | Introduction to plotting / data visualization  *Goal: Understand how spatial data and remote sensing change understanding* | How can you visualize data? How can we map data? |  |
| Week 9 | Introduction to relationships (correlation, regression models, logistic regression for classification) | What is the relationship among variables and how do you fit a line? | Homework 4 |
| Week 10 | Introduction to variance and uncertainty | What is uncertainty and how do you measure it? Are things different? |  |
| Week 11 | Introduction to visualizing and exploring complex data | How can you simplify biological data into digestible portions that provide actionable inference? | Homework 5 |
| Week 12 | Introduction to clustering in agroecology | How can you find commonalities in biological data? |  |
| Week 13 | Machine learning to understand the landscape | How do you accurately classify biological data? | Homework 6 |
| Week 14 | Identifying the most influential drivers of biological data | What does it all mean? |  |
| Week 14 | Presentations | Present code and projects | Final Project |
| Week 15 | Full circle - outcomes / interpretations within these different conceptual frameworks - panel (three person, Dr. Albie Miles, Dr. Noa Lincoln, Dr. Jake Jungers) |  |  |

**Attendance policy:** Students who are enrolled in this course, but never attend will be flagged by the course instructor for non-participation before the last day to add/drop (for 100% tuition refund) deadline. Flagged students will be administratively dropped by the Office of the Registrar. Any changes to a student’s enrollment status may affect financial aid eligibility and can result in the return of some of all of federal student financial aid.

Use of Internet, mobile devices, and social media is allowed

**Statement on Disability:** If you have a disability and related access needs, please contact the KOKUA Program (Office for Students with Disabilities) at 956-7511, KOKUA@hawaii.edu, or go to Room 013 in the Queen Lili‘uokalani Center for Student Services. Please know that I will work with you and KOKUA to meet your access needs based on disability documentation. Kokua’s services are confidential and offered free of charge.

**Academic Integrity and Ethical Behavior**: Cheating, plagiarism, or other forms of academic dishonesty are not permitted within this course and are prohibited within the System-wide Student Conduct Code (EP 7.208). Examples include: fabrication, facilitation, cheating, plagiarism, and use of improper materials. Any incident of suspected academic dishonesty will be reported to the Office of Student Conduct for review and possible adjudication. Additionally, the instructor may take action in regards to the grade for the deliverable or course as they see fit.

**Office of Title IX**: (808) 956-2299 / t9uhm@hawaii.edu / https://manoa.hawaii.edu/titleix/

**Department of Public Safety: (**808)956-6911 (Emergency) / (808)956-8211 (non-Emergency) http://manoa.hawaii.edu/dps/

UH System Basic Needs include food and housing, childcare, mental health, financial resources and transportation, among others. Student basic needs security is critical for ensuring strong academic performance, persistence and graduation and overall student well-being. If you or someone you know are experiencing basic needs insecurity, please see the following resources: UH System Basic Needs