Pilot Course · 3 Credits · Pass/Fail · Spring 2027

AI in Marine & Earth Sciences

Learn how AI transformed your field — then use it yourself.

WHAT YOU WILL BE ABLE TO DO

Apply AI to real data Use AI tools on actual marine and earth-science datasets and interpret what the results mean scientifically.	**Evaluate AI critically** Identify when a model's results are misleading, physically implausible, or not to be trusted — a skill few scientists have.	**Show employers your work** Leave with a portfolio project you can present in a job interview at NOAA, a marine tech company, or a research lab.

WHY TAKE THIS COURSE

No prior AI or coding required Worked examples and starter templates are provided. You will also learn to use AI coding agents to generate code for your own problem. Working in pairs is optional.	**History before hype** Start with landmark AI systems that changed the field — species distribution models, satellite image classifiers, ENSO forecasts — then build your own analysis.

HALF THE SEMESTER IS YOURS — A PROJECT BUILT AROUND YOUR OWN INTERESTS

Data Analysis Track Apply AI tools to a real dataset from your field. Starter templates, worked examples, and AI coding agents help you get started — no prior coding required. Deliverable: a reproducible analysis you can show an employer.	**Critical Assessment Track** Rigorously evaluate an existing AI application in your field — does it work, under what conditions, and what are the risks? Deliverable: a professional assessment report.

Working in pairs is optional for both tracks — pairs each speak to their own work in the final presentation.

DESIGNED FOR STUDENTS IN

- Marine Biology
- Geosciences
- Environmental Sciences
- Natural Resources
- Fisheries
- Aquaculture
- Marine Affairs
- Other Related Programs

14 WEEKS, ORGANIZED AROUND REAL QUESTIONS

Weeks	Topics
1–2	Classical AI applications that changed the field
3–5	Species, habitats, ocean patterns, groundwater mapping
6–7	Clustering, remote sensing, time-series data literacy
8	AI in real jobs (guest speaker) + model trust & validation
9–11	Project kickoff, methods clinics, sanity checks
12–14	Project workshops and portfolio defense

COURSE DETAILS

When	Where	Credits	Level	Enrollment	Instructor
Mon & Wed, 3:00–4:15 pm	Bliss Hall 210	3 cr · Pass/Fail	Juniors & Seniors	Capped at 20–25	Meng (Matt) Wei

Sign up on E-Campus: OCG 494-0012 Special Problems And Independent Study In Oceanography

Questions? Contact Matt Wei (**matt-wei@uri.edu**) in Oceanography.

AI in Marine and Earth Sciences

Detailed Course Schedule — Spring 2027

Pilot Course · OCG 494 · Mon & Wed 3:00–4:15 pm · Bliss Hall 210· matt-wei@uri.edu

To sign up on E-Campus: OCG 494-0012: Special Problems And Independent Study In Oceanography

Two Project Tracks

Data Analysis Track: Apply AI tools to a real dataset. Provided notebooks and AI coding agents — no prior coding required. Deliverables: analysis, written report, presentation.

Critical Assessment Track: Rigorously evaluate an existing AI application in your field — does it work, under what conditions, and what are the risks? Deliverables: assessment report, annotated bibliography, presentation.

Group option: Pairs only. Submit a division-of-labor statement with your proposal. Each partner presents their own portion. Both partners receive the same grade.

Week-by-Week Schedule

Part 1 (Weeks 1–8, Jan 26 – Mar 17): Teaching & Review

Part 2 (Weeks 9–14, Mar 29 – May 3): Student Projects

Wk	Dates	Topic	Content & Notes
Part 1 — Teaching & Review			
1	Jan 26 (Tue)	Introduction	Course overview; meet your classmates; choose project track (and partner, if working in a pair); introduction to the problem-solving workflow. Project proposal assigned — due Week 3. Begin thinking about a question or application in your field that interests you.
2	Feb 1, 3	Classical Examples I	Landmark AI applications that entered marine and earth sciences: species distribution modeling (MaxEnt), automated plankton and fish identification from imagery, satellite image classification. For each: what was the scientific problem, what did AI add, what did the field learn?
3	Feb 8, 10	Classical Examples II	ENSO forecasting with deep learning, sea ice prediction, AI-assisted analysis of oceanographic and groundwater data. What made these applications succeed or struggle? Project proposal due end of week. Data Analysis Track: your scientific question, dataset idea, and partner (if any). Critical Assessment Track: the AI application you will evaluate, why it matters in your field, and partner (if any).
4	Feb 15, 17	Where Will Species Be Found?	Regression and classification through a species distribution lens. Interpreting model outputs: what makes a prediction ecologically plausible? [using, not deriving] — provided notebook for Data Analysis Track; published application paper for Critical Assessment Track to read and begin evaluating.
5	Feb 22, 24	How Do We Map What We Cannot Measure?	Random forests and ensemble methods for environmental mapping: interpolating sparse oceanographic measurements, mapping seafloor habitat, predicting soil and groundwater properties. Feature importance as a scientific diagnostic. [using, not deriving]
6	Mar 1, 3	What Patterns Do Ocean and Climate Data Hide?	PCA and clustering for oceanographic and geologic data. Interpreting emergent patterns against known physical regimes. Anomaly detection in environmental monitoring records. Milestone due end of week — Data Analysis Track: dataset confirmed and preliminary exploration complete. Critical Assessment Track: application chosen, key papers gathered, and initial evidence summary drafted.

Wk	Dates	Topic	Content & Notes
7	Mar 8, 10	Reading Environmental Data Products	Mon Mar 8: Remote sensing products, pre-trained classifiers, Google Earth Engine — SST, chlorophyll, land cover, sea ice. Wed Mar 10: Reading time-series data — tide gauges, ENSO indices, climate monitoring products; interpreting trends, seasonality, autocorrelation. Focus on literacy, not implementation.
8	Mar 15, 17	AI in Real Jobs + When Did AI Get It Wrong?	Mon Mar 15: Guest speaker — how AI is used at NOAA, USGS, a marine tech company, or environmental consultancy; Q&A on real workflows, skills, and career paths. Wed Mar 17: Model failures and trust — overfitting, data leakage, and bias through published case studies in marine and earth sciences. Validation strategies for environmental data. Critical Assessment Track: note how validation failures apply to your application.
Spring Break — Mar 22–26			
Part 2 — Student Projects			
9	Mar 29, 31	Project Kickoff	Mon Mar 29: Individual or pair 3-minute project pitches — both tracks present to class. Data Analysis Track: your question, dataset, and planned approach. Critical Assessment Track: the application you are evaluating, why it matters, and your evaluation framework. Class gives feedback. Wed Mar 31: One-on-one or pair consultations with instructor; methods selection workshop. Milestone due end of week — Data Analysis Track: draft methods plan. Critical Assessment Track: draft evaluation framework (criteria and evidence plan).
10	Apr 5, 7	Methods Clinic I	**Data Analysis Track:** Bring your biggest analytical or methodological challenge. Class works through it: does your approach make sense, what are the risks, what domain knowledge should constrain the results? **Critical Assessment Track:** Bring your most difficult evaluation question. Class works through it: what evidence would confirm or undermine the application's claims, what domain knowledge is needed to judge it fairly?
11	Apr 12, 14	Methods Clinic II + Sanity Checks	**Data Analysis Track:** Mon: Same format as Week 10. Wed: Sanity-checking AI results with domain knowledge — physical, ecological, and hydrological plausibility checks. Draft a plausibility checklist for your analysis. **Critical Assessment Track:** Mon: Same format as Week 10. Wed: Evaluating AI claims with domain knowledge — how to assess whether an application's reported performance holds up under scientific scrutiny. Draft a critical evaluation checklist for your application.
12	Apr 19, 21	Project Workshop I	**Data Analysis Track:** Mon: Structured peer feedback — present preliminary results informally (5 min). Is the analysis making scientific sense? What gaps remain? Wed: Individual or pair troubleshooting and writing workshop. Draft analysis due end of week. **Critical Assessment Track:** Mon: Structured peer feedback — present preliminary assessment informally (5 min). Are evaluation criteria well-grounded? Is evidence sufficient? Wed: Individual or pair writing workshop. Draft assessment report due end of week.
13	Apr 26, 28	Workshop II + Presentations I	Mon Apr 26: Presentation dry runs (5 min each); limitations workshop; final portfolio preparation. Presentation slides due start of week. Wed Apr 28: First presentation session — approximately half the class presents (7 min + 3 min Q&A each). Pairs present together, each partner speaks to their own work.
14	May 3 (Mon)	Final Presentations II	Remaining students/pairs present (7 min + 3 min Q&A each). Framed as a portfolio defense: work you could show an employer or include in a graduate school application. Data Analysis Track: scientific question, data, method, results, limitations, real-world relevance. Critical

Wk	Dates	Topic	Content & Notes
			Assessment Track: application overview, evaluation framework, evidence, verdict, implications for your field. Final written report and portfolio due May 10.

Assignment Summary

Assignment	Due	DAT = Data Analysis Track / CAT = Critical Assessment Track
Course survey & track selection	Week 1	Same for both — note partner if working in a pair
Project proposal (1 paragraph)	Week 3	DAT: question + dataset idea (+ division-of-labor if pair) / CAT: application + why it matters (+ division-of-labor if pair)
Short exercises (Weeks 2–8)	Weekly	Same for both tracks — readings and in-class case studies
Milestone: Scoping complete	End of Wk 6	DAT: dataset confirmed + preliminary exploration / CAT: application chosen + evidence summary drafted
Milestone: Project framework	End of Wk 9	DAT: draft methods plan / CAT: draft evaluation framework and criteria
Checklist	Week 11	DAT: plausibility checklist for analysis / CAT: critical evaluation checklist for application
Draft deliverable	End of Wk 12	DAT: draft analysis (notebook or workflow) / CAT: draft assessment report
Presentation slides	Start of Wk 13	Same for both tracks
Final presentation (7 min + 3 Q&A)	Apr 28 or May 3	Same for both tracks — equal standards; pairs present together
Final report + portfolio	May 10	DAT: analysis report + notebook/workflow / CAT: assessment report + annotated bibliography
Peer review & participation	Ongoing	Same for both tracks

No midterm or final exam. All assignments scaffold the final project. Both tracks graded on equivalent standards. Pair work graded as one shared deliverable — both partners receive the same grade.

All readings freely available online. Examples provided as notebooks students can run without writing code. AI coding agents demonstrated for students who wish to use them.