

EDRIAN PAUL LIAO

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EDUCATION

Massachusetts Institute of Technology

PhD in Social & Engineering Systems, Institute for Data, Systems, and Society (IDSS)

Expected: May 2030

Cambridge, MA

Relevant Coursework: Econometric Data Science, Can Space Enabled Designs Advance Justice and Development?

Duke University, GPA: 3.91

BSE Electrical and Computer Engineering, Computer Science, Science and Society Certificate

May 2025

Durham, NC

Cum Laude | Senior Thesis: "*Toward Scalable Heat Interventions: A Gaussian Process and Spectral Perspective*"

Relevant Coursework: System Design for ML and Signal Processing, ML & Deep Neural Networks, Statistical Learning

RESEARCH INTERESTS

Community-centered AI for climate adaptation planning and disaster risk management in under-resourced rural and urban areas, AI and environmental policy frameworks in the developing world

RESEARCH EXPERIENCE

Spatial variance-informed causal inference model for mitigating urban heat

Jan 2024 – Present

ECE Independent Study @ Duke · Prof. David Carlson · [\[Report\]](#) [\[Code\]](#) [\[Poster\]](#)

Durham, NC

- Developed an interpretable spatial causal inference model to predict the temperature decrease associated with common urban heat mitigation strategies.
- Devised a novel data-driven methodology incorporating non-stationary Gaussian processes and power spectral density analysis** to extract the length scales that inform the spatial heterogeneity affecting the efficacy of urban heat interventions.
- Extracted and processed geospatial data from Google Earth Engine and leveraged Python geospatial libraries (e.g., GeoPandas, Rasterio) to handle spatial datasets, perform feature engineering, and generate inputs for urban heat mitigation modeling.

Vulnerability index for Angola's drought response system

June 2024 – Aug 2024

MIT Summer Research Program (MSRP) · Prof. Danielle Wood · Dr. Sharif Islam

Cambridge, MA

- Developed a comprehensive geospatial analysis pipeline using Python libraries** such as geopandas, rasterio, and matplotlib to analyze drought severity and socioeconomic vulnerability across 161 municipalities in Angola.
- Processed satellite data from the Soil Moisture Active Passive (SMAP) satellite to compute root-zone soil moisture indices, utilizing advanced statistical techniques and custom scripts for data extraction, normalization, and visualization.
- Generated bivariate choropleth maps and custom visualizations to **identify high-risk regions**, integrating GIS shapefiles with categorized drought severity and vulnerability indices for stakeholder decision-making.

Long-term earthquake prediction using time-series forecasting models

May 2023 – Dec 2023

Research Group @ Duke · Dr. Enmao Diao · [\[Code\]](#)

Durham, NC

- Built a benchmark dataset for long-term earthquake prediction** incorporating earthquake event features for improved predictive accuracy.
- Developed automated Python scripts to extract precise spatial and temporal data from 25 extensive earthquake catalogs, including the USGS and SAGE databases, as well as historical earthquake archives, enhancing data accuracy and processing efficiency.

Tracking climate change causes and impacts with satellites and AI

May – Jul 2022

Duke Climate+ · Prof. Kyle Bradbury · Prof. Jordan Malof · [\[Website\]](#) [\[Code\]](#) [\[Poster\]](#)

Durham, NC

- Developed automated Python image exporter to retrieve high-resolution satellite imagery from Landsat and Sentinel archives, leveraging Google Earth Engine's APIs and providing parameters such as date range, cloud cover, and pansharpening
- Designed a sampling pipeline to select satellite images based on a multivariate normal distribution, centered on the 30,000 most populous cities worldwide, enabling targeted analysis of urban and peri-urban areas.
- Contributed to a publication (see acknowledgements) that used our dataset to train self-supervised encoders to compensate for the lack of labelled data in the Global South.

PUBLICATIONS & ABSTRACTS

- [1] **Liao, E.P.**, Calhoun, Z., Carlson, D. (2024). *Lowering urban heat: How spatial causal inference can predict the efficacy of heat-reducing interventions*. Abstract accepted at the American Geophysical Union 2024.
- [2] **Liao, E.P.**, Calhoun, Z., Carlson, D. (2024). *Urban heat mitigation: Predicting the efficacy of heat-reducing interventions using spatial causal inference*. Abstract accepted at the NC Breathe Conference 2024 and awarded **Best Student Presenter**.
- [3] Islam, M.S., Kuwayama Y., Lu, C., **Liao, E.P.**, et al. (2024). *Assessing vulnerability to drought in Angola using multisource satellite Earth observations and socioeconomic data*. Manuscript submitted to the Global Environmental Change.
- [4] Calhoun, Z., Jiang, G., **Liao, E.P.**, et al. (2024). *Towards precision urban climate: how causal inference can help us better quantify the effect of greenspace on neighborhood air temperature*. Abstract accepted at the Association of Environmental Engineering and Science Professors (AEESP) Research & Education Conference 2025.

POSTERS & TALKS

- [5] **Liao, E.P.** (2025). *Community-centered AI: Towards a collective approach in designing AI systems for climate and sustainability*. A 10-minute talk during the senior capstone project presentations of the Digital Intelligence certificate students at the Duke Initiative for Science and Society.
- [6] **Liao, E.P.**, Islam, M.S., Wood, D. (2024). *Socioeconomic vulnerability-drought severity (SV-DS) Index for Angola's Drought Decision Support System*. A 10-minute talk presented at the MIT Media Lab Summer Research Program Symposium 2024.
- [7] **Liao, E.P.**, Bradbury, K. (2023). *Planet-Tales: Climate change experiences in the rural Philippines*. Chosen to conduct a brief lecture during the Duke Merit Scholars Symposium 2023.
- [8] Leal, F.L., **Liao, E.P.**, Lagua, J., Viloria, G.A. (2025). *Optimal Mixture Factors of Kapok Fiber-Reinforced Coal Fly Ash Geopolymer Concrete Based On Compressive and Flexural Strength*. Won **Best Poster Award** during the 3rd International Conference on Climate Change Adaptation (CCA) and Disaster Risk Reduction Management (DRRM) held in Vietnam.

HONORS & AWARDS

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| Michael Hammer Fellowship , MIT Institute for Data, Systems, and Society | 2025 |
| • Coveted 1-year fellowship awarded to early-career researchers who are addressing significant societal challenges. | |
| Graduation with Departmental Distinction , Duke Electrical and Computer Engineering | 2025 |
| • Awarded, per recommendation of a faculty panel, to 9 outstanding ECE undergraduate students who have successfully defended their senior thesis, presented in a poster session, and written a project report. | |
| Tau Beta Pi , Engineering Honor Society | 2024 |
| • Inducted to the oldest engineering honor society in the US for high academic standing and exemplary character. | |
| Karsh International Scholarship , Duke University | 2021-2025 |

- A full-ride merit-based scholarship + \$21k research funding awarded to 10 intellectually and civically engaged international students.

HackDuke: Code for Good, Winner

2023

- 1 of the 4 track winners out of 200+ students and 37 hacks in a hackathon focused on building tech for social good

Outstanding Teaching Assistant Citation, Duke Electrical and Computer Engineering Dept.

2023

- Received the award "for exceptional dedication, clear communication, and attention to student learning."

SKILLS

Languages: Python, C, Java, LaTex, HTML/CSS, JavaScript, MATLAB, C++

Libraries: PyTorch, [\[Geospatial Python Libraries\]](#), Google Earth Engine, Google Firebase

Devops: Git, Linux, Bash, GitHub Projects, Agile Product Development

SELECTED PROJECTS

WildfireAI: A Wildfire Spread Prediction System

Spr 2025

Senior Design Capstone, System Design ML and Signal Processing · [\[Poster\]](#)

Durham, NC

PlanetTales: Climate change experiences in the rural Philippines and urban Europe

Jul 2023 - present

Passion Project, Climate Justice Narratives · [\[Website\]](#) [\[Code\]](#) [\[Poster\]](#)

Philippines, Europe

HarvestNet 2.0: Compressed CNNs and Augmented Dataset for Harvest Pile Detection

Spr 2024

Graduate Class Project, Deep Neural Networks · [\[Paper\]](#) [\[Code\]](#) [\[Poster\]](#)

Durham, NC

A Call for Better Cheap Labor Conditions within the AI Revolution

Spr 2024

Case Study, AI Ethics · [\[Paper\]](#)

Durham, NC

TEACHING EXPERIENCE

Teaching Assistant, Signals and Systems

Fall 2024

Teaching Assistant, Intro to Artificial Intelligence

Spr 2024

Teaching Assistant, Fundamentals of Electrical and Computer Engineering

Spr 2023, Fall 2023, Spr 2024

Teaching Assistant, Calculus I and II

Spr 2022, Fall 2022

VOLUNTEER EXPERIENCES

Mentor, CAUSE Philippines: College apps mentorship program for low-income Filipinos

2021 - Present

- Guide low-income Filipino high school students apply to colleges locally and abroad. Previous mentees have matriculated to **Georgia Institute of Technology, Duke University, and University of British Columbia (UBC)**.

Co-Founder, Duke Pamilya: Filipino Students Association

2022 - 2025

- Led the inception of the first Filipino organization at Duke that aims to celebrate and share Filipino culture with the Duke community.
- Initiated and led an annual donation drive for typhoon victims in the Philippines, raising funds (\$500) and awareness to support disaster-stricken communities.

Tech & Product Management Lead, Technify

2022 - 2024

- Volunteered for a pro-bono tech consulting group that builds websites and applications for non-profit organizations in the developing countries.

Co-Founder, Pi-oneers: STEM Education Non-profit

2020 - 2022

- Led 40 volunteer tutors in offering online STEM courses to 400+ underprivileged high school students in 50 provinces and 62 cities around the Philippines.
- Featured in two famous national news network in the Philippines, **Rappler** and **Subselfie**.

Co-Organizer, Project Manantaw: Initiative for typhoon victims in the Philippines

2020

- Initiated a systematic donation drive collecting \$8.5k to aid in the basic needs of 1000+ families in the Philippines affected by rampant strong typhoons.
- Included in the list of **2020 BalikTanaw: Remarkable Youth Initiatives** of the SDG Youth Action Forum Philippines.