Lauren Hoffman

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Research Interests

Mechanisms and predictability of climate and weather extremes. Machine learning. eXplainable Artificial Intelligence (XAI). Atmosphere-ocean-ice interactions. Cryosphere.

Education

University of California San Diego **Graduation September 2023**
Ph.D. in Chemical Engineering
M.S. in Chemical Engineering, June 2019

University of San Diego **Graduation May 2016**
B.A./B.S. in Mechanical Engineering, with Mathematics and Chemistry Minor 3.98 Major GPA and Honors Program
Dean's List, First Honors

Research Experience

Postdoctoral Researcher, PI François Massonnet, Université Catholique de Louvain, Belgium **February 2024 – Present**
- Machine learning and explainable AI to predict and understand rapid ice loss in the Arctic on seasonal to interannual timescales.

Postdoctoral Researcher, PI Matt Mazloff, Scripps Institution of Oceanography, San Diego **October 2023 – January 2024**
- Evaluation of various explainable machine learning techniques for geoscience applications.
- Implementing an operational forecast system for sea-ice motion prediction using machine learning.

Graduate Researcher, PI Matt Mazloff, Scripps Institution of Oceanography, San Diego **June 2019 – September 2023**
- Upper ocean salinity response to atmospheric river events in the California Current System from observations and models.
- Machine learning and explainable AI to predict and understand sea-ice dynamics in the Arctic from remote sensing data.

Graduate Researcher, PI Andrea Tao, University of California San Diego **September 2018 – March 2019**
- Improving the properties of recycled polymer blends using colloidal dispersions of silver nanoparticles.

Research Assistant, PI Truc Ngo, University of San Diego **March 2018 – August 2018**
- Material characterization of 3D printed PMMA impregnated with drugs using supercritical carbon dioxide processing techniques.

Undergraduate Research Assistant & Honors Thesis, PI Truc Ngo, University of San Diego **March 2015 – June 2017**
- Worked with members of the rural village of El Cercado in the Dominican Republic and a liaison within the community to design a solar thermal water heater that would meet the needs of the community and give them ownership of the technology.

Teaching Experience

Instructor, University of California San Diego, Academic Connections **Summer 2020 & 2021**
- Course: Climate Change and the Ocean
- Developed and implemented a 4-week online course serving as a pre-college experience for high school students. Provided students with the opportunity to build research and communication skills by accessing, plotting, analyzing, and presenting real-world oceanographic data.

Teaching Assistant, University of California San Diego **September 2018 – December 2020**
- Courses: Introductory (x3) and advanced (x5) fluid mechanics; Material & energy balances (x1).
- Lead 5 hours of weekly discussion sessions where I gave supplementary lectures and helped students work through problems.

Mentorship

Undergraduate Student Mentor
- Kayli Matsuyoshi, Scripps Institution of Oceanography, Summer 2021
- Aniruddh Varadarajan, UCSD Jacobs School of Engineering, Fall 2020 - Spring 2021

Master's Student Mentor
- Antonio Martinez Soares, UCLouvain, Fall 2024 - present

Industry Experience

Lead Engineer, Primo Wind, Inc., San Diego, CA **June 2016 – June 2018**

- Implemented design solutions for a small wind turbine system that improved power output, structural stability, and optimized the sustainability of materials and manufacturing.

Honors & Awards

Interdisciplinary Research Award, UCSD	2021
Teaching Assistant Commendation "For Extraordinary Impact as a Teaching Assistant"	March – June 2020
Achievement Rewards for College Scientists (ARCS), $5,000	2015 – 2016
Alcala Award, Merit Based Scholarship, $20,000 annually	2011 – 2016
Tau Beta Pi, Engineering Honor Society	Fall 2015 – Present
Pi Tau Sigma, Engineering Honor Society	Spring 2016 – Present

Skills & Qualifications

Dedicated and enthusiastic researcher with expertise in machine learning, data analysis, remote sensing, and cryosphere sciences. Excellent scientific communication skills, whether it be teaching, presenting, publishing, or interacting with my team on the day-to-day.

- **Programming:** TensorFlow Keras, Machine learning, neural networks, explainable AI, MATLAB, Python, UNIX, C++
- **Numerical Models:** MITgcm
- **Simulation Software:** ANSYS, SolidWorks, Finite Element Analysis, Creo Parametric, GaBi Life Cycle Assessment
- **Language:** Intermediate Spanish and French

Activities and Service

Manuscript Peer Review – GRL, JGR: Atmospheres, Open Science Europe, Environmental Modelling and Software	
MPOWIR Mentor Group	November 2022 – Present
URGE Pod Member, Unlearning Racism in the Geosciences	January 2021 – December 2021
Engineers Without Borders, Fundraising Director	February 2013 – February 2015
Violinist –	2004 – Present
Athlete – climbing, surfing, hiking, backpacking, yoga	lifelong

Publications

Hoffman, L., F. Massonnet, A. Sticker (2025, *submitted*). Probabilistic forecasts of September Arctic sea ice extent at the interannual timescale with data-driven statistical models.

Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, P. Heimbach. (2025). Evaluating the trustworthiness of explainable artificial intelligence (XAI) methods applied to regression predictions of Arctic sea-ice motion. *Artificial Intelligence for the Earth Systems,* 4, e240027. DOI: 10.1175/AIES-D-24-0027.1.

Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, P. Heimbach, C. Bitz, K. Matsuyoshi. (2023). Machine learning for daily forecasts of Arctic sea-ice motion: an attribution assessment of model predictive skill. *Artificial Intelligence for the Earth Systems,* 2, 230004. DOI: 10.1175/AIES-D-23-0004.1.

Hoffman, L., M. Mazloff, S.T. Gille, D. Giglio, A. Varadarajan. (2022). Ocean Salinity Response to Atmospheric River Precipitation Events in the California Current System. *Journal of Physical Oceanography,* 52, 1867-1885. DOI: 10.1175/JPO-D-21-0272.1.

Ngo, T.T., **L. Hoffman**, G. Hoople, W. Trevena, U. Shakya, G. Barr. (2020). Surface morphology and drug loading characterization of 3D-printed methacrylate-based polymer facilitated by supercritical carbon dioxide. *The Journal of Supercritical Fluids*, 160, 104786. DOI: 10.1016/j.supflu.2020.104786

Hoffman, L., T.T. Ngo. (2018). Affordable solar thermal water heating solution for rural Dominican Republic. *Renewable Energy,* 115, 1220-1230. DOI: 10.1016/j.renene.2017.09.046.

Patents

McMahon, E., **L. Hoffman.** (2017). *High torque wind turbine blade, turbine, and associated systems and methods.* (U.S. Patent No. 9,797,370). U.S. Patent and Trademark Office. https://patents.google.com/patent/US9797370B1/en

Invited Talks

- Earth Science Information Partners (ESIP) Machine Learning Cluster Meeting. Virtual. 2025. Oral Presentation.
- Interagency Arctic Research Policy Committee (IARPC) Modelers' Community of Practice March 2024 Meeting – Combining Modeling and Machine Learning Approaches to Understanding the Arctic Earth System. Virtual. Oral Presentation.
- AI for the Study of Environmental Risk (AI4ER) Seminar Series, University of Cambridge, 2023. Cambridge, UK.
- American Meteorological Society Collective Madison Meeting, 17th Conference on Polar Meteorology and Oceanography 2022. Madison, WI. Oral presentation.
- NOAA Science Seminar Series 2022. Virtual. Oral presentation.

Guest Lectures

- Introduction to Machine Learning for Earth and Climate Science. *Forecast, Prediction, and Projection in Climate Science*. UCLouvain. Winter 2025.
- Introduction to Machine Learning for Earth and Climate Science. *Analysis of Physical Oceanographic Data* Course. Scripps Institution of Oceanography, Winter 2023.

Conferences, Meetings, and Seminars

- Kavli Institute for Theoretical Physics (KITP). *The Physics of Changing Polar Climate.* Santa Barbara, CA. 2025. Oral Presentation.
- American Meteorological Society Denver Summit, 18th Conference on Polar Meteorology and Oceanography. Denver, CO. 2025. Oral Presentation.
- Physical Oceanography Dissertation Symposium (PODS). Lihue, HI. 2024. Oral Presentation.
- Workshop on the Role of Sea Ice and its Variability in the Climate System. International Centre for Theoretical Physics (ICTP). Treiste, Italy. 2024. Poster.
- Earth and Climate (ELIC) Seminar Series, Université Catholique de Louvain. Louvain-la-Neuve, Belgium. 2024. Seminar.
- Mentoring Physical Oceanography Women to Increase Retention (MPOWIR) Pattullo Conference. Warrenton, VA. 2023.
- 54th International Liége Colloquium on Ocean Dynamics: Machine learning and data analysis in oceanography. Liége, Belgium. 2023. Poster
- SeaSAR 2023. Svalbard, Norway.
- Atmospheric and Ocean Sciences Forum, University of Colorado Boulder. Boulder, CO. 2023. Seminar.
- Scientific Machine Learning Symposium 2023. San Diego, CA. Poster.
- ECCO Annual Meeting 2023. Pasadena, CA. Oral presentation.
- 9th Annual FIRO Workshop. San Diego, CA. Poster.
- Observing, Modeling, and Understanding the Circulation of the Arctic Ocean and Sub-Arctic Seas Workshop 2022. Seattle, WA. Poster.
- Center for Western Weather Water Extremes (CW3E) Annual Meeting 2022. San Diego, CA. Poster.
- Ocean Salinity Conference 2022. New York, NY. Oral Presentation.
- UCSD Jacobs School of Engineering Research Expo 2022. San Diego, CA. Poster.
- Ocean Sciences Meeting 2022. Virtual. Oral presentation.
- American Meteorological Society 101st Annual Meeting 2021. Virtual. Oral presentation.
- International Atmospheric Rivers Conference Sponsored Symposium 2020. Virtual.
- Ocean Sciences Meeting 2020. San Diego, CA.
- Institute of Electronics and Engineering Global Humanitarian Technology Conference 2016. Seattle, WA. Poster.