



LEAP

LEAP's Summer 2025 Education Programs: Concluding Reflections



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By Catherine Cha

LEAP's Summer 2025 [Research Experience for Undergraduates \(REU\)](#) and [Momentum Fellowship](#) Programs successfully concluded with students offering final research presentations at the Columbia Engineering Innovation Hub on Friday, August 1, 2025.

The REU Program, conducted in partnership with the Columbia University [Summer at SEAS](#) program, provides undergraduate students from around the country the chance to pursue synergistic innovations in data science and climate science, while engaging in enrichment, networking, and social activities. The Momentum Fellowship welcomes doctoral students in data science who are interested in participating in a summer research immersion in climate data science. They are afforded the opportunity to apply their data science and/or machine learning



skills in climate modeling and develop research interests in climate data science. Momentum Fellows also take responsibility for mentoring up to two REU students in their research project teams.

This Summer, under the direction and guidance of [Tian Zheng](#) (LEAP Deputy Director and Director of Education), [Candace Agonafir](#) (LEAP Associate Research Scientist and REU Program Coordinator), [Linnia Hawkins](#) (LEAP Associate Research Scientist and NSF NCAR Coordinator), and [Christina Torres](#)

(LEAP Graduate Research Assistant and Summer Students Coordinator), LEAP welcomed ten undergraduates to the REU Program, one student from the Summer at SEAS Program, and five doctoral students as Momentum Fellows. They kicked off their summer immersion with a two week-long Momentum Bootcamp, taught by LEAP Associate Research Scientist [Qingyuan Yang](#) and LEAP Graduate Research Assistant [Aya Lahlou](#). Yang and Lahlou helped the REU students, in particular, learn and understand Xarray (a Python package that processes climate data), basic concepts in climate modeling (such as parameterization), the fundamentals of machine learning, and how to incorporate models into practice with climate science applications. Hawkins taught a one-day course, *Climate Modeling 101*, to introduce students to the fundamentals of how climate models work.

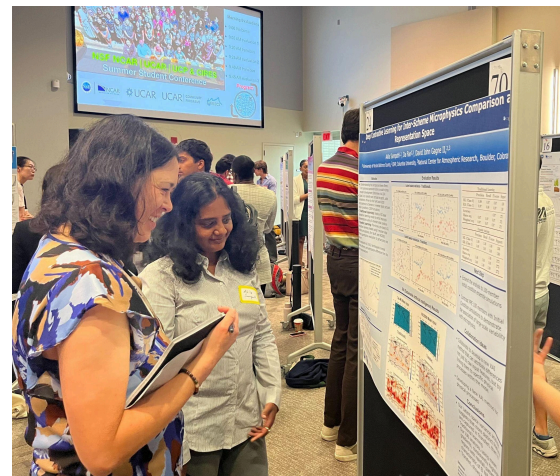
After the conclusion of Bootcamp, two research teams headed out to LEAP's partner institution, the [NSF National Center for Atmospheric Research \(NSF NCAR\)](#) based in Boulder, CO. There, Isabella Lu, Sarah Ryu, and Sudhanshu Kumar embarked on their project with Linnia Hawkins, [Katie Dagon](#), and [Daniel Kennedy](#), "*Using Machine Learning to Improve Climate Predictions: Reducing Uncertainty in the Land Carbon Sink*," while Tony Manriquez, Subashree Venkatasubramanian, and Akila Sampath received mentorship on their research project, "*Understanding Cloud Microphysical Process in Climate Models*," from [Da Fan](#), [David John Gagne II](#), and [Mike Pritchard](#). Akila appreciated "the chance to renew my climate modeling research skills in such a highly regarded environment." Sudhanshu especially enjoyed gaining "hands-on experience working on NCAR's high-performance computing systems, and exploring how ML can be applied to optimize CLM parameter uncertainties," and wished he had more time to dive deeper and further refine results. All students agreed with him



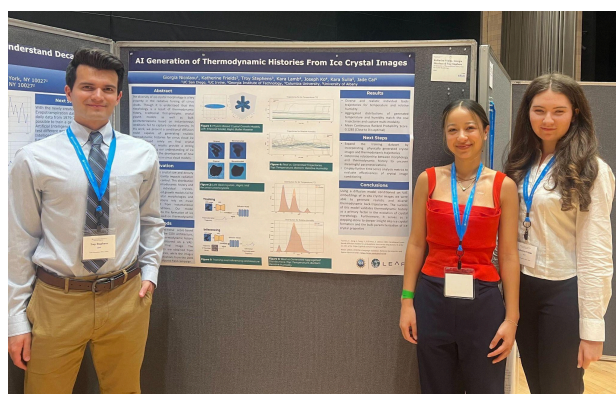
that “the environment was open and inclusive - everyone, from the PIs to REUs, interacted freely, making collaboration easy and meaningful.”



Our Boulder-based students also took advantage of the unique chance to live and work in Boulder, interfacing with NCAR scientists and staff, hiking at Chautauqua Park and Rocky Mountain National Park, exploring the sights and tastes of Pearl Street and the local farmer’s market, and participating in the 2025 Summer Student Conference Poster Session presented in conjunction with the [University Corporation for Atmospheric Research \(UCAR\)](#), [UCAR Community Programs \(UCP\)](#), and the [Cooperative Institute for Research in Environmental Sciences \(CIRES\)](#). “I really enjoyed being able to connect with so many scientists and students who have similar interests as me,” shared Sarah, “and I’ve learned so much about all the hard work and collaboration that goes into making earth system models, which has really given me an appreciation of the scientific community.” Isabella felt challenged to “figure out how to approach the questions I’m trying to answer or which path to take [in my research work].” Having never been to Boulder, CO, before, she and fellow LEAPers loved exploring a new location and being outdoors to take in beautiful vistas.



Meanwhile, back in New York City, three research teams shared suites at [Columbia University’s](#) Carlton Arms dormitory, gathering at the Innovation Hub to make progress on their research projects. Elliot Canter, Elijah Tavares, Eleanor Koo, and Mostafa Rezaali dove into their work with [Shuolin Li](#), [Yongquan Qu](#), and [Pierre Gentine](#) on “*Probabilistic Data Assimilation Enhances the Prediction of Observed Temperature Extremes.*” [Kara Lamb](#) and [Joseph Ko](#) mentored Katherine Fields, Troy Stephens, and Giorgia Nicolaou through their research on “*Using Generative AI to Improve Modeling of Cirrus Cloud Processes.*” Kaleb Florence, Brycen Lynch, and Shengjie Kris Liu worked with [Ensheng Weng](#) on his project, “*Tropical Forest Dynamics in a Changing Climate.*”

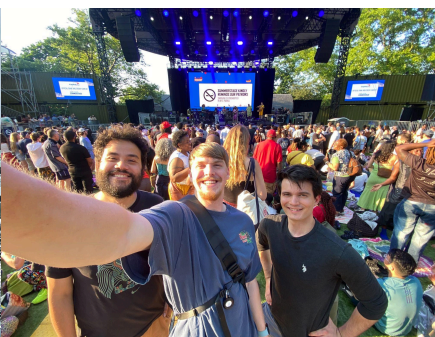


In addition to gaining hands-on experience with climate and environmental datasets, and applying classroom concepts to real-world challenges, Mostafa enjoyed working together as a team, and “having the chance to mentor REU students by providing research guidance, helping to troubleshoot challenges, and fostering a supportive environment to exchange ideas and learn from each other.” Certainly, the REU students arrived at LEAP from a variety of backgrounds, and discovered new fields and methods with which they had not previously interacted. Brycen, for example, expressed that “as a meteorology major with little background in coding, adapting to the conventions of Python and the accelerating field of data science pushed me far outside my comfort zone.” Katherine agreed that being stretched in this way afforded her “a degree of independence that allowed me to sharpen my research skills, and pursue ideas and methods I’ve always wanted to learn more about; the opportunity to learn from leading experts in the field has been invaluable and I’ve gained many new technical skills.” Katherine, Troy, and Giorgia also participated in the [Columbia University CUPP](#) Symposium, and according to Troy, “getting to communicate our project to interested spectators and seeing the projects of other researchers was a fantastic experience - a great way to connect with peers across disciplines.”

But it wasn’t all work and no play for the NYC cohort. LEAP Graduate Research Assistant [Dion Ho](#) led them on a tour of [Lamont-Doherty Earth Observatory \(LDEO\)](#),



with a special stop into the [LDEO Core Repository](#). The students also visited with LEAP's partner, the [American Museum of Natural History \(AMNH\)](#), where they took in the ["Invisible Worlds"](#) exhibit, explored the [Climate Wall](#) in the Hall of Planet Earth, and chatted privately with [Laura Moustakerski](#), writer/producer with AMNH's Science Visualization Group, about how she collaborates with scientists to develop museum exhibits. The group also had the chance to visit with the [New York Climate Exchange \(NYCE\)](#) on Governor's Island, as well as host NYCE interns at the Innovation Hub to engage in inspiring conversations about how to make progress in climate research, education, and adaptation. And of course, the summer of 2025 wouldn't be complete without taking in fireworks on the Fourth of July, the New York Aquarium, Coney Island, jazz performances, and the new "Superman" movie.



The students expressed special gratitude for their instructors and mentors. "Katie and Linnia treated us as collaborators, giving us room to think independently and supporting our ideas," reflected Sudhanshu. "Their mentorship extended beyond the project, offering me valuable advice on how to explore postdoc opportunities and shape future research directions." Giorgia gives a special shoutout to "Joe and Kara, who were incredible mentors," and Kaleb applauded the community of teamwork, where "any question I have has a solution if I ask; [my team and my PI] Ensheng has been amazing throughout this entire process." Shengjie even reached out to other LEAP affiliates, like Juan Nathaniel and Carla Roesch, who provided insights that helped his research team's project advance; "this is just one example that makes the collaborative environment at LEAP so rewarding!"



The appreciation was mutual. Yang, one of the Momentum Bootcamp instructors, loved hearing and answering the students' questions. "Some of their questions were very insightful and profound, which was very inspiring," he marveled. "I hope they remain curious about the different aspects of climate science." Lahlou enjoyed working with students who came to LEAP with varying skill levels, and felt doubly motivated to adapt to her students' needs, hoping that "they left with an appreciation for how fun

and creative climate modeling can be.” Hawkins shared that “the most enjoyable part [of teaching *Climate Modeling 101*] was exploring how disciplines as varied as computer science, atmospheric science, oceanography, biology, numerical mathematics, machine learning, economics, and policy must come together to build and apply these models. I hope students left with the understanding that there is space for people from any academic background to make meaningful contributions to climate science.”

Well done, Summer 2025 REU students and Momentum Fellows! It was a true pleasure to host you this summer. We hope you will stay in touch with LEAP, keep us updated on your continuing studies and research, and visit us often at LEAP’s NYC offices and NSF NCAR.

The Summer 2025 Research Presentations may be viewed below:

- **Project 1:** [Probabilistic Data Assimilation Enhances the Prediction of Observed Temperature Extremes](#) (Mostafa Rezaali, Elliot Canter, Elijah Tavares, Eleanor Koo)
- **Project 2:** [Tropical Forest Dynamics in a Changing Climate](#) (Shengjie Kris Liu, Kaleb Florence, Brycen Lynch)
- **Project 3:** [Developing Machine Learning Emulators to Constrain Parametric Uncertainty in Land Surface Modeling and Carbon Cycling](#) (Sudhanshu Kumar, Isabella Lu, Sarah Ryu)
- **Project 4:** [Understanding Cloud Microphysical Process in Climate Models](#) (Akila Sampath, Tony Manriquez, Subashree Venkatasubramanian)
- **Project 5:** [Using Generative AI to Improve Modeling of Cirrus Cloud Processes](#) (Giorgia Nicolaou, Katherine Fields, Troy Stephens)

Click here for more information about LEAP’s [education programs](#) and [upcoming events](#).

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