The vision of AI2ES is to create trustworthy Artificial Intelligence (AI) methods for diverse environmental science (ES) users that will revolutionize our understanding and prediction of highimpact atmospheric and ocean science phenomena and create new educational pathways to develop a more diverse AI and environmental science workforce.



# **AI2ES News**

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Yosemite National Park, CA

#### **Summer Research Programs**

This month's AI2ES Newsletter covers several internship opportunities across the country that AI2ES students pursued this summer. From Monterey, California to Silver Spring, Maryland, The eight undergraduates featured in this newsletter edition are tackling new opportunities and developing essential research skills that they will carry home to their respective AI2ES institutions. Thank you again to Hector Marrero-Colominas. Savannah Stephenson, Beto Estrada, and Christian Duff of TAMU-CC; Haley Perez, Michael Yu, and Max Sasser of OU; and Eleanor Salm of UW - Madison, for participating in this series of articles for July!

## July 2023 Edition

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#### **REU Program at OU**

For many undergraduate students looking for their first research opportunity outside of the classroom, a Research Experiences for Undergraduates (REU) program is the perfect chance to explore their interests. The University of Oklahoma's (OU) National Weather Center REU program in Atmospheric & Geographic Sciences is a summer research opportunity that welcomes students to the campus in Norman, OK. The NWC REU has been in existence for 25 years. They work with other programs at OU, including NOAA's Hollings Scholars and more. When AI2ES was founded, they welcomed the addition of AI2ES students into their cohorts and provided extensive career and professional training to the NWC REU students as well as the AI2ES REU students.

This year's AI2ES REU program contains a plethora of backgrounds and converging fields of research, culminating in advanced AI projects that further the research started by AI2ES members. Hector Marrero-Colominas, a Computer Science major at Del Mar College and Undergraduate Research Assistant (UGRA) at TAMU-CC's AI2ES institute, joined four other students to discuss their REU experiences in a new place, or new research environment, this summer.

Upon arriving at Norman, Hector found the company of four strikingly different yet friendly researchers: Haley Perez, a senior Computer Science major at OU; Max Sasser, aMeteorology major at OU; Eleanor Salm, a Data Science and Atmospheric Oceanic Sciences major at University of Wisconsin - Madison; and Michael Yu, who is a triple major in Piano Performance, Computer Science, and Math at OU. The REU students this year each had different motivations to join the program. Haley said, "I was interested in working under Dr. McGovern directly, as her research lined up with some of my interests such as bias and ethics within the sphere of AI." While this is Haley's first summer with AI2ES, Max finally found himself free to participate in the REU program after taking on a different internship the previous year. Hector sought the experience of "a new place, new research and new mentors" outside of his South Texas home. With the diverse REU candidates and AI pioneers at OU, Hector found much more than a simple change of scenery.

In Norman, the five REU students discovered a new side of research, whether continuing their projects started at OU or beginning new ones during the summer. Each student had a different level of experience with AI before this opportunity; by the summer's end, the REU students could all boast a new comfort with the application of AI to research in Environmental Sciences.

Max joined AI2ES shortly before the beginning of the REU program, working with an extension of Mel Wilson's comparative visibility model that is used to predict atmospheric visibility from camera images. After experimenting with Mel's model, Max is now familiar enough with the research to "create a codebook that will give out instructions on how to select good reference image candidates" in future research using camera images.

Michael Yu, delivering a phenomenal presentation on his research with U-Nets this summer, describes his efforts to make AI created data less blurry by manipulating his model's loss function. This is important as many AI models produce forecasts that are not sharp enough to be considered realistic.



Eleanor Salm of UW-Madison, in her first research opportunity outside of the classroom, discovered the depth to which researchers will go to provide results for their project. Eleanor was able to work with XAI and actually work in the package that the XAI technique was developed in and edit it" to fit the needs of her research. "We had been working on the model for weeks and the XAI technique itself", she said, so when she finally looked to edit their XAI technique entirely, the process "was something I've always thought of as against the law!" as this is rarely accomplished by an undergraduate researcher. This REU program allowed students to completely reform their initial conceptions and notions about research with AI, leading to changes in their career paths.

Haley Perez best summarized the benefit that OU's summer REU program experience provided the five students interviewed. "Being with the right people can make or break an experience, and the multidisciplinary aspect of our studies really creates a good ecosystem here." The students, laughing playfully from the other side of the Zoom call, proved a gradual bond bred from both their research in the lab and in their shared time between work. Michael Yu concurred with her point, recognizing that "In my lab group, I am the only undergrad, so it's great to be surrounded by peers of the same level of experience." This comfort level with other researchers is most likely due to the new confidence each student discovered in their independent REU research.

"The fact that I was able to do a lot of the programming and coding and submitting tasks to the supercomputer on my own emboldened me as an undergraduate researcher constantly surrounded by post-docs and tenured faculty," Max stated. "In previous internships, I didn't have the skill set to do it, but this time I feel like I got to accomplish things on my own."

This newfound confidence is just a glimpse into a brighter future for students involved in OU's REU program. Haley stated, "I think it's really given me direction. Computer science is such a vast field, it feels like you're swimming in the ocean with everything you have to absorb as an undergrad. The REU let me taste what it's like to work with AI and machine learning, and I can see myself actually making a career out of it." Similarly, Hector Marrero-Colominas solidified his goal of one day achieving a Master's Degree in Computer Science. "It cemented my enjoyment of full-time research and the ability to code, connect with other researchers, et cetera," he stated. "It didn't change my path forward, but it really confirmed it for me." Whatever path chosen, these five students are prepared through the tools provided by their REU program to tackle any obstacle in their way.



REU students at OU (from left): Michael Yu, OU ; Eleanor Salm, UW-Madison; Haley Perez, OU, Max Sasser, OU; and Hector Marrero-Colominas, DMC



#### **Internship at NRL**

On the U.S. West Coast, two AI2ES undergraduate students were accepted into a truly unique summer research opportunity: the Naval Research Enterprise Internship Program (NREIP) in Monterey, California. Beto Estrada and Christian Duff, both undergraduate research assistants studying Computer Science at Texas A&M University - Corpus Christi, traveled from Corpus Christi to Monterey to take part in the 10week program hosted by the U.S. Naval Research Laboratory (NRL). Returning for his second internship with NRL, Beto was motivated to apply to the internship again after last year's session. "Besides location, which of course is very important, I was mostly interested in the community aspect of the internship. This is my second summer here and I very much enjoyed my time last year with my mentors as well as the other interns," he explained. The excitement Beto brought back to his home lab inspired Christian to join him for the summer 2023 program. "Guidance from Dr. Tissot and his connections, plus Beto's previous summer experience as an NRL NREIP intern, aided in my interest in NRL," Christian enthused.

After his second NRL NREIP internship, Beto continues to enjoy the benefits of his experiences in Monterey, which allowed him to gain experience working on real-world problems in a proper lab setting while receiving mentoring from professional scientists and engineers. Beyond this new research experience, the native Texan pair created new experiences and memories on the beautiful Central California coast.

Because of the nature of the NRL NREIP internship, much of the research conducted is "more hidden" than projects that Beto and Christian usually work on at TAMU-CC. While their efforts at home are highly visible and many stakeholders depend on their models to accurately predict water temperatures in the Laguna Madre, the NRL is much more constrained about the information they release to the public. However, the skills Beto and Christian gained are transferable to future research they conduct. Christian lists several new abilities gleaned from the NRL internship, including learning system-level programming, new familiarity with Python libraries, machine learning techniques for image and recognition. The technologies and caliber of research initiated by the NREIP allowed Beto and Christian to develop many skills related to data science and machine learning that they can apply at TAMU-CC and beyond.

Outside of their internship, Beto and Christian simply enjoyed the natural beauty of California. Beto recalled his favorite moment. "I was lucky enough to visit Yosemite National Park with nine other interns. It was a blast!" he declared. With the natural beauty and unique research opportunity offered by the NRL in Monterey, both students were able to discover a wider scope of post-graduation pathways for their work. Beto concluded that "whether it be graduate school, a federal position at NRL, or even a contractor position, there are many options to choose from, and I feel that I can't really go wrong with any of them."



Beto Estrada (third from left) and Christian Duff (second from right) with other NRL interns in Yosemite National Park, CA



#### **NOAA Summer Program**

Savannah Stephenson, Undergraduate Research Assistant at Texas A&M University-Corpus Christi, has been working with the National Oceanic and Atmospheric Administration (NOAA) as a José E. Serrano Educational Partnership Program with Minority Serving Institutions (EPP/MSI) Undergraduate Scholar. Savannah explained that as part of the program she will complete two NOAA internships, one this summer with the Center for Operational Oceanographic Products and Services and another next summer which she will decide on in the future.

Savannah's internship this summer is with the National Ocean Service, which is a part of NOAA; specifically, she is working with the Center for Operational Oceanographic Products and Services. In this internship, Savannah is working on NOAA's Coastal Inundation Dashboard.

"My project is to try to take the first steps in putting web cameras in the Dashboard so people can see what the water looks like in relation to the water level numbers they're seeing at one of the Dashboard stations," she explained. Her work at NOAA is similar to the Horace Caldwell Pier camera work she's been doing at AI2ES. When asked about the simi-



Savannah Stephenson (top left corner) and other NOAA program participants in Silver Spring, Maryland

larities, Savannah said, "It was suited for me because I had already worked on the camera that Marina (TAMU-CC PhD student Marina Vicens-Miquel) was using for her wet-dry shoreline project, so I already knew the angle that cameras should be in to get more information."

Savannah noted that risk communication and convergent science has played a large role in her work at NOAA. "Some of the other interns I'm working with are working on storymaps...so a lot of what they're having us do is communications based." So far, Savannah's favorite part of the internship was going to see the NOAA station in Washington, D.C. to learn about their acoustic and pressure water level sensors. During this visit, she saved the day when one of the NOAA employees forgot a screwdriver and had to use Savannah's knife instead. Since starting this internship, Savannah is now considering a career path focusing on Environmental Sciences. Savannah explained that with the scholarship program, she will get a direct hire from NOAA once she graduates. "It's made me consider working for NOAA after I graduate because I know I have this opportunity. I've worked in an office with people who work there. I know the culture and I know they're good people who want to help the world."



#### More Photos from This Month...



Christian Duff, TAMU-CC, making leaps and bounds (literally) in his research at Nisene Forest, Santa Cruz, CA



Savannah Stephenson, TAMU-CC, and other NOAA program members taking an in-the-field approach to their research

Beto Estrada, TAMU-CC (second from left) and Christian Duff, TAMU-CC (right side) discovering new views with other NRL interns in Yosemite National Park, CA



#### Code\_IT Summer Camp

Del Mar College (DMC) in Corpus Christi, Texas, hosted their third year of the Code\_IT summer camp for prospective sixth to eighth graders from the local community. As an AI2ES partner, DMC provides the next generation of researchers at the camp with coding, UAV piloting, AI skills, and the knowledge of how to apply those skills in their future careers. The camp welcomes TAMU-CC REU participants and AI2ES members each year to conduct their Site-Wide meeting (linked here) and present their research to the students; this offers the young coders a glimpse into what students can achieve after high school and which research opportunities are available to them after graduation. Visit the gallery below to see more photos from this year's "AI Day" at the Code\_IT camp on DMC's new Oso Creek campus. To see the TAMU-CC REU presentations, <u>click here</u>; Mel Wilson's master's thesis is also accessible at the link here on the AI2ES website.



<u>Click Here to view</u> <u>the gallery</u>

#### Poll

Click on the link here to take a quick poll over comfortability with AI!

Check back next month for results and further analysis of this poll in comparison with other participating groups!