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 high-impact atmospheric and ocean science phenomena and create new educational pathways to develop a more diverse AI and environmental science workforce.

AI2ES News

Edited by Jayne-Marie Linguist, Dr. Amy McGovern, Dr. Philippe Tissot, Dr. Jason Liu, and Jennifer Warrillow

October 2023 Edition

Table of Contents

National Science Foundation ExpandAI

In October, AI2ES grew thanks to two new close partners' recipients of Expand AI grants from the National Science Foundation (NSF): "PARTNER: An AI/ML Collaborative for Southeast Florida Coastal Environmental Data and Modeling Center" and "PARTNER: Expand AI2ES for 4D Space-time Organization of Precipitation Processes and Extremes, Visualization Tools, and Workforce Development." These grants bring new collaborations with Florida International University (FIU) and San Diego State University (SDSU) to increase AI and Machine Learning capacity at Minority-Serving Institutions (MSIs) and Hispanic-Serving Institutions (HSIs), enhance education in AI, and broaden the workforce.

Florida International University

FIU is based in Miami, Florida and is home to more than 56,000 students. FIU's student body serves a diverse community of students and is an officially recognized MSI. FIU was established in 1965 under Senate Bill 711 to construct a public research university in Miami using an abandoned airfield as its new location. Today, FIU has grown to be an R1 institution and is among the 10 largest universities in the nation, offering associate, bachelors, masters, and doctoral degrees on campus and online. Their colors are blue and gold and their mascot is Roary the Panther.

San Diego State University

SDSU is based in San Diego, California and was established in 1897. The university is a federally recognizedHSI and has a student body of over 36,000. SDSU serves a diverse population of students of color, military members, and veterans and was ranked as a top college for LGBTQ+ students.

According to their website, "SDSU formally recognizes Native and Indigenous peoples as traditional stewards of the land on which our university resides, and respects the enduring relationship that exists between Indigenous peoples and their ancestral territories. At San Diego State University, we recognize the land as Kumeyaay."

Florida International University

San Diego State University

PARTNER: An AI/ML Collaborative for Southeast Florida Coastal Environmental Data and Modeling Center

The "PARTNER: An AI/ML Collaborative for Southeast Florida Coastal Environmental Data and Modeling Center" grant is led by FIU. This grant is a part of NSF's AI Research Institutes Alliances-Minority Participation programs. FIU will work with AI2ES to build the ExpandAI South Florida Coastal Environmental Data and Modeling Center. This ExpandAI Center will integrate research and educational AI/ML techniques to understand and predict issues related to the coastal environment of south Florida. The team consists of researchers and faculty across FIU and AI2ES. "I have the honor to lead a team of excellent researchers, including Co-PIs Leonardo Bobadilla, Jayantha Obeysekera, Philippe Tissot (TAMUCC), and Roy He (NCSU), as well as Senior Investigators Kevin Boswell, Todd Crowl, Wenqian Dong, Scott Graham, Dongsheng Luo, Amy McGovern (OU), and Cuong Nguyen, in establishing the South Florida Coastal Environmental Data and Modeling Center here at FIU," stated Jason Liu (qtd. from "New Center Expands AI for Better Understanding of South Florida's Environment").

Co-PI Philippe Tissot
TAMU-CC Conrad Blucher Institute for Surveying and Science Chair for Coastal Artificial Intelligence and Co-PI for AI2ES

Co-PI Ruoying He
NCSU Goodnight Innovation Distinguished Professor, Director of the Ocean Observing and Modeling Group, and Co-PI for AI2ES

SI Amy McGovern
OU Lloyd G. and Joyce Austin Presidential Professor, Director and PI of AI2ES

SI Viet Cuong Nguyen
FIU Assistant Professor at KFSCIS

SI Wenqian Dong
FIU Assistant Professor at KFSCIS

PI Jason Liu
FIU Endowed Computer Science Professor and Director of FIU's Knight Foundation School of Computing and Information Sciences (KFSCIS)

Co-PI Leonardo Bobadilla
FIU Associate Professor at KFSCIS

Co-PI Jayantha Obeysekera
FIU Research Professor and Director of Sea Level Solutions Center

SI Kevin Boswell
FIU Director of the Marine Biology Program and leader of the Marine Ecology and Acoustics

SI Todd Crowl
FIU Director of the Institute of Environment

SI Scott Graham
FIU Assistant Director of Research at KFSCIS and Associate Director of Coordination and Strategy at FIU's CREST CAChE

Research Plan

The ExpandAI Center will increase FIU's capacity to develop and promote AI/ML techniques for coastal environmental science in its region. The Center will become a clearing house for data collection, analysis, and dissemination for scientists across the environmental sciences. The Center's goals focus on three topics:

- coastal environmental data sharing
- foundational research of trustworthy AI
- use-inspired AI/ML coastal environmental science research

Coastal environmental data sharing will be led by PI Liu and SI Crowl along with Co-PIs Obeysekera, Bobadilla, and Tissot. The aim of this crosscutting thrust is to address the limitations of current dataset archives. The data sharing team will create a data and model repository called *EnviStor* to integrate diverse data and research activities in coastal environmental science. *EnviStor* will also support collaborative interdisciplinary research in south Florida's natural environments.
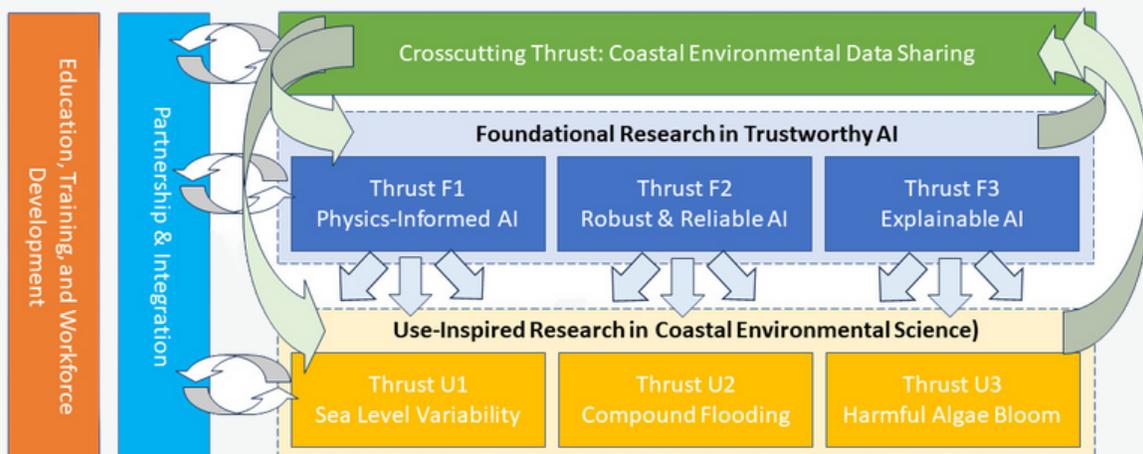
The Center's research in trustworthy AI will be conducted through three thrusts, each with their own team, goals, and tasks. SI Dong, Co-PIs Bobadilla and Tissot, and PI Liu will lead Thrust F1: Physics-Informed AI.

Thrust F1 will integrate physics domain knowledge into AI models to reduce data requirements and increase training and predictions. The team will study various methods of physical variables then select predictors in environmental applications. After studying these methods and predictors, the team will then use physics to guide the construction of model techniques. The AI model constructed during this project will also be supervised using physics constraints and laws to improve model accuracy.

Lastly, the Center will work on three use-inspired research projects in coastal environmental science:

- sea level variability
- compound flooding
- harmful algae blooms

These projects will incorporate the research from the previous goals in Thrusts F1, 2, and 3. The use-inspired research will allow for collaborations between FIU, AI2ES, and other associated institutions such as Texas A&M University-Corpus Christi (TAMU-CC) and North Carolina State University (NCSU).
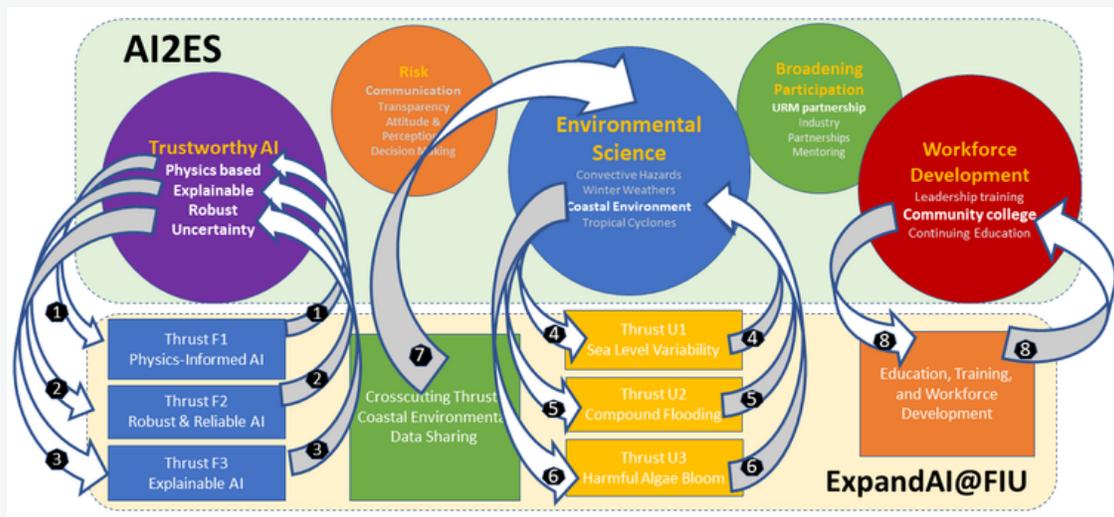
FIU and AI2ES will collaborate to expand research capacity of AI/ML at FIU, one of the largest HSI/MSIs in the United States. The University of Oklahoma (OU), TAMU-CC, and NCSU will provide AI/ML resources and experiences to FIU throughout the collaboration. Specifically, TAMU-CC and OU will work with FIU on the foundational trustworthy AI research during Thrusts F1 and F3. NCSU will be heavily involved in the use-inspired research projects.

Broader Impacts

The Center will work with two-year community colleges to bridge transfer students to four-year institutions. An undergraduate degree in data science will be created at FIU and is expected to support an interdisciplinary program with the computer sciences (AI/ML) and environmental sciences. Undergraduate, graduate, and transfer students at FIU will also have access to ample opportunities in impactful data science and coastal environmental research. The project will diversify and improve the AI/ML and environmental sciences workforce by training the next generation of researchers with the skills to succeed in academia and industry.

References

https://www.fiu.edu/index.html
https://www.collegeconsensus.com/wp-content/uploads/2016/12/FIU.jpg
https://www.sdsu.edu/
https://ca-times.brightspotcdn.com/dims4/default/ad428a9/2147483647/strip/true/crop/5464x3640+0+0/resize/1200x799!/quality/80/?url=https:%2F%2Fcalifornia-times-brightspot.s3.amazonaws.com%2F93%2F94%2Fcbec3c8b4b48a41523cdf27d206a%2F927947-sd-oe-tejada-esteban-ncc-001.jpg
https://www.cis.fiu.edu/new-center-for-ai-ml-collaborative-for-southeast-florida-coastal-environmental-data-and-modeling/

To learn more about FIU's ExpandAI program, visit https://climate-tech.cs.fiu.edu/
To learn more about AI2ES, visit https://www.ai2es.org/