Institute for Space Weather Sciences Colloquium

Thursday, 8th of May 2025, 1:00pm ET

via Zoom (meeting ID: 917 2169 7568, password: isws)

India Jackson, NSF Atmospheric and Geospace Sciences Postdoctoral Fellow

Developing a Real-Time Solar Event Detection Framework Using CV/ML and Cloud Integration: An Invitation for Collaboration

We introduce an initiative to contribute to the growing momentum of machine learning (ML) and computer vision (CV) applications in heliophysics research. Our focus is on developing a near real-time framework for detecting solar events, tailored to automate the processing of images from sources such as the Solar Dynamics Observatory (SDO) and the Solar and Heliospheric Observatory's Large Angle and Spectrometric Coronagraph (SOHO/LASCO). This innovative framework, built on the Computer Vision Annotation Tool (CVAT), integrates a sophisticated AI/ML module that allows for comprehensive data and parameter extraction, validated with tools such as Helioviewer, DONKI, and CDAW. Our efforts are directed towards crafting automated tools for precise solar image segmentation, deploying a scalable cloud-based system for dynamic analysis, and establishing open-source pipelines for global research collaboration. We highlight the challenges faced in technology integration, the substantial potential to enhance space weather forecasting, and the critical need for collaborative engagement to refine and evolve these methodologies. A central feature of our project is the capability it provides users to create their own machine learning-ready datasets. The software supports exporting data in multiple formats including JSON, pickle, HDF5, etc., thereby facilitating extensive accessibility and utility of solar data for diverse research needs. We warmly invite participants to contribute their insights and join this community-driven initiative, aiming to collectively advance our ability to monitor and predict solar phenomena with unprecedented precision and flexibility.

Dr. India Jackson is a physicist, mathematician, and computer scientist who became the first Black woman to earn a PhD in Physics from Georgia State University. She holds MS degrees in Computer Science, Physics, and Mathematics, and a BS in Mathematics, all from GSU. She is currently an NSF Atmospheric and Geospace Sciences Postdoctoral Fellow, leading research on the onset and propagation of solar events that generate solar energetic particle streams. Her work applies AI/ML/CV based analysis of solar images from SDO and SOHO/LASCO to identify event signatures, which are then correlated with in-situ measurements from spacecraft including ACE, GOES, and the ISS to enhance machine learning predictions of radiation dose exposure in low Earth orbit. Her research spans heliophysics, machine learning, computer vision, and cloud computing, with a focus on developing open-source tools for space weather forecasting. Dr. Jackson has held research positions at NASA Goddard and Johnson Space Centers, participated in NASA's Heliophysics Mission Design School, and served as a research fellow at the Frontier Development Lab. She regularly contributes to public science communication, has appeared on NPR to discuss solar activity and space weather, and has been invited to pop culture conventions such as Dragon Con as a professional speaker.