USING EXPLAINABLE AI MODELS FOR PRECIPITATION RETRIEVALS TO BRIDGE NASA AND NOAA OBSERVATION SYSTEMS

Yixin Wen[1]*, Zhi Li*[2]*, Mathias Schreier*[3]

[1]University of Florida, Gainesville, FL, USA

[2]University of Oklahoma, Norman, OK, USA

[3]NASA/Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA

The Atmospheric Infrared Sounder (AIRS) and the Advanced Microwave Sounding Unit (AMSU), aboard NASA's Aqua satellite, are central for observing global water and energy cycles, representing thus far the most sophisticated atmospheric sounding systems. Precipitation estimates from two satellites help to not only improve the accuracy based upon their unique sounding natures but also contribute to creating a seamless mosaic of global precipitation observations. However, conventional retrieval algorithms seek empirical relations between atmospheric signatures and rainfall rates, which is shown to be problematic due to imperfect quantification algorithms and the inability to adapt to local environmental changes. Taking advantage of massive data volumes in recent years, this study demonstrates a data-driven approach (A Convolutional Neural Network-based precipitation segmentation plus decision tree-based precipitation mapping) to maximize the retrieval accuracy while more importantly, discover the "black-box model" interpretability for a better understanding of the underlying physical connections. The results suggest that Machine Learning (ML)-aided approach systematically reduces observational bias, compared with operational retrievals. Identifying precipitation pixels like segmentation tasks further reduce 130% of systematic errors. This study exemplifies the potential of using an ML-aided approach to improve precipitation estimation and provides means of interpreting the Artificial Intelligence models.

PRESENTER BIO: Dr. Wen has been working on development and evaluation of weather radar and satellite precipitation retrieval algorithms more than one decade. She is an expert on ground-based radar and satellite synergy research using physically-based approaches and AI methods.