CIRC Symposium Series 2025-2026

Observing the Carbon Cycle from Space

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Much of what we know about our planet is derived from space-based observations. Over the past decades, national space agencies and commercial enterprises have launched more and more sophisticated sensors into various orbits around the Earth. This has expanded our understanding from hand-drawn weather maps to ever more accurate 7+ day global weather forecasts as well as deepening our understanding of the drivers of change in the Earth system. This is particularly true in regions that are difficult to study directly or are highly heterogeneous like the Tropics and polar regions as well as the global oceans. Underpinning these advances are carefully planned and implemented sensor technologies that are designed with a specific set of science questions in mind. The carbon cycle is a globally connected system that is also heterogeneous across spatial and temporal scales. Ecosystems are complex interactive systems where members compete for resources while also responding to weather and climate variations and human activities. The sum of these activities determines the long-term radiative forcing of the planet. Making things more complex is the fact that the seemingly most fragile ecosystems exist where we have the least traditional measurements: the Tropics and the Arctic. In this talk, I will present the way that we use remote sensing to measure different aspects of the carbon cycle such as biomass, fluxes of carbon into and out of ecosystems, human activities, and the long-term trajectory of the carbon cycle as seen from space. This will include discussions of contributions from key missions such as MODIS, OCO-2, SMAP, ECOSTRESS, TROPOMI, and others as well as the challenges associated to the use of satellite observations for Earth system inference.

INSIGHT: Explainable Weakly-Supervised Medical Image Analysis

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Due to their large sizes, volumetric scans and whole-slide pathology images (WSIs) are often processed by extracting embeddings from local regions and then an aggregator makes predictions from this set. However, current methods require post-hoc visualization techniques (e.g., Grad-CAM) and often fail to localize small yet clinically crucial details. To address these limitations, we introduce INSIGHT, a novel weakly-supervised aggregator that integrates heatmap generation as an inductive bias. Starting from pre-trained feature maps, INSIGHT employs a detection module with small convolutional kernels to capture fine details and a context module with a broader receptive field to suppress local false positives. The resulting internal heatmap highlights diagnostically relevant regions. On CT and WSI benchmarks, INSIGHT achieves state-of-the-art classification results and high weakly-labeled semantic segmentation performance.

Friday, February 20, 2026
11:30 am - 1 pm
Wegmans Hall 1400

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