

CPAESS Discovery Seminar



How AI is Transforming Solar Wind Research and Forecasting

DATE: Wednesday, August 19, 2026

TIME: 11:00 AM – 12:00 PM MT (VIRTUAL)

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Our Sun, while sustaining life on Earth, also constantly erupts streams of charged particles and bursts of plasma that fill the solar system and shape the space around Earth. These high energy events, known as space weather, can damage satellites, disturb power grids, and interrupt navigation and communication systems. However, forecasting these events accurately and in a timely manner remains a significant challenge. While simple empirical models are fast, they offer limited insight. Conversely, detailed physics-based simulations are accurate but too slow for real-time forecasting. Artificial intelligence is breaking this deadlock by integrating both approaches into an explainable learning pipeline.

In this talk, I will demonstrate how deep learning is advancing the forecasting of space weather drivers, particularly solar wind. By incorporating system information into the choice of architecture and training curriculum, these models provide significant enhancements in accuracy and generalizability. Additionally, feature attribution methods help clarify/discover which factors truly drive an event. I will also showcase how physics-informed neural operators can effectively emulate MHD solutions, accelerating heavy simulations from hours to seconds while maintaining physical fidelity.

SPEAKER
Dr. Prateek Mayank

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Dr. Prateek Mayank is a NASA Jack Eddy Postdoctoral Fellow at Univ. of Colorado, Boulder, working on space weather drivers using physics-based modeling and machine learning methods.



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