भारतीय खगोलभौतिकी संस्थान

INDIAN INSTITUTE OF ASTROPHYSICS

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स्नातक अध्ययन मंडल **Board of Graduate Studies.**

Visiting Student's Programme Seminar

Title: Deep Learning Based Data Reduction of KCOR Data.

Speaker: Mr. Amritansh Mehrotra
(MSc, Chandigarh University)

सार **Abstract**

Coronal Mass Ejections (CMEs) are powerful solar eruptions that can disrupt space weather, satellites, and communication systems. Studying CMEs requires high-quality observations of the solar corona, typically obtained using coronagraph images. The ground-based K-Coronagraph (K-COR) at Mauna Loa Solar Observatory (MLSO) provided routine white-light imaging of the inner corona (1.05–3R⊙) from 2014 to 2022, offering the closest regular observations to the solar disk among available coronagraphs. However, raw K-COR data are often contaminated by instrumental noise, atmospheric scattering, and various background artifacts, which obscure fine coronal structures and limit the accuracy of CME detection and characterization, especially at greater heliocentric distances (> 2R⊙). In this work, we present a deep learning-based image cleaning pipeline using convolutional neural networks (CNNs) to enhance the quality of KCOR images. Our approach involves creating a custom dataset consisting of both noisy and clean coronal images, enabling the CNN to learn noise patterns and effectively separate them from underlying solar features, including at the far end of the field of view, where the conventional methods often fail. We investigated both noisyclean and noisy-noisy training paradigms, which allow the model to generalize across different noise conditions and recover coronal structures with improved clarity and contrast. Preliminary results show that CNN-based cleaning significantly improves the signal-to-noise ratio and enhances the visibility of fine structures in the solar corona. This improvement is crucial for precise CME detection, kinematic studies, and morphological analysis, offering a substantial advantage over traditional image-processing techniques. Our work demonstrates the potential for deep learning for improved feature clarity and contrast, paving the way for more reliable CME detection and analysis.

बुधवार Wednesday 30, जुलाई July 2025

Time: 11:30 AM

प्रेक्षागृह Auditorium

सभी का स्वागत है All are welcome.