Institute for Space Weather Sciences Colloquium

Thursday, 23rd of Oct 2025, 1:00pm ET

via Zoom (meeting ID: 955 9399 6954, password: isws)

Berkay Aydın, Georgia State University

Building Bridges: Contemporary Developments in Data-driven Space Weather Analytics

Space weather forecasting stands at the intersection of solar physics and data science/engineering. As the heliophysics community continues to expand its data-rich ecosystem, driven by a decade of multi-mission observations and open data initiatives, our ability to extract actionable knowledge depends increasingly on data-intensive methods and advanced cyberinfrastructure. We will explore the foundations of modern, data-driven space weather forecasting systems from an interdisciplinary perspective. We will discuss how scalable data pipelines, multimodal feature extraction, and interpretable machine learning can be harnessed to improve the prediction of solar transients and their terrestrial impacts. Emphasis will be placed on the importance of high-quality, standardized datasets; reproducible, open-source frameworks; and interpretable learning approaches that bridge the gap between domain understanding and operational forecasting. We will conclude with a forward-looking view on integrating physics-guided learning, intelligent data fusion, and cyberinfrastructure innovations to shape the next generation of space weather analytics.

Berkay Aydin is an Assistant Professor in the Department of Computer Science at Georgia State University. He received his B.Sc. degree in Computer Engineering from Bilkent University, Turkey, and M.S. and Ph.D. degrees in Computer Science from Georgia State University. His research lies at the intersection of data science, data management, computer vision, and high-performance computing, with a strong emphasis on spatial and temporal big data analytics. His work focuses on building scientific knowledge discovery systems through advanced data science and engineering techniques. A major theme of his research is solar astroinformatics, emphasizing the design and implementation of large-scale, explainable forecasting systems for solar transient events through multi-institutional collaborations. The overarching goal of this research is to enhance predictive capabilities for space weather events while providing interpretable outputs that support scientific understanding.