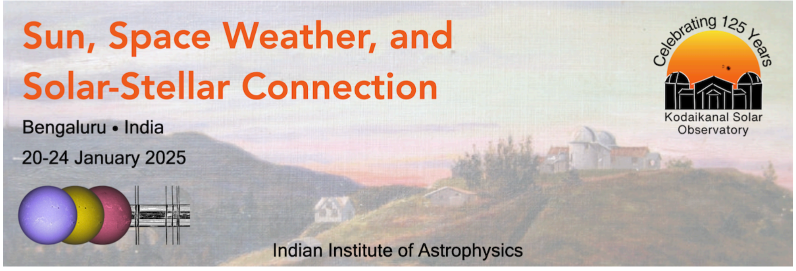

Contribution ID: **102** Type: **Poster**

Precise and Accurate Short-term Forecasting of Solar Energetic Particle Events with Multivariate Time-series Classifiers

Solar energetic particle (SEP) events are one of the most crucial aspects of space weather that require continuous monitoring and forecasting using robust methods. We demonstrate a proof of concept of using a data-driven supervised classification framework on a multivariate time-series data set covering solar cycles 22, 23, and 24. We implement ensemble modeling that merges the results from three proton channels (E>10 MeV, 50 MeV, and 100 MeV) and the long-band X-ray flux (1–8 Å) channel from the Geostationary Operational Environmental Satellite missions. Our task is binary classification, such that the aim of the model is to distinguish strong SEP events from nonevents. Here, strong SEP events are those crossing the Space Weather Prediction Center's "S1"threshold of solar radiation storm and proton uxes below that threshold are weak SEP events. In addition, we consider periods of nonoccurrence of SEPs following a flare with magnitudes⊠ C6.0 to maintain a natural imbalance of sample distribution. In our data set, there are 244 strong SEP events comprising the positive class. There are 189 weak events and 2460"SEP-quiet"periods for the negative class. We experiment with summary statistic, one-nearest neighbor, and supervised time-series forest (STSF) classifiers and compare their performance to validate our methods for prediction windows from 5 minutes up to 60 minutes. We find the STSF model to perform better under all circumstances. For an optimal classification threshold of ≈0.3 and a 60 minutes prediction window, we obtain a true skill statistic TSS= 0.850, Heidke skill score HSS= 0.878, and Gilbert skill score GSS= 0.783.

Contribution Type

Theme

Energetic Phenomena

Primary author: Dr ROTTI, Sumanth (Georgia State University)

Co-authors: Dr AYDIN, Berkay (Georgia State University); Prof. MARTENS, Petrus (Georgia State University)

Presenter: Dr ROTTI, Sumanth (Georgia State University)