Special Issue

Machine Learning in Space Weather Prediction

Message from the Guest Editors

This Special Issue is dedicated to exploring the transformative role of machine learning (ML) in advancing space weather prediction. Space weather events—including solar flares, coronal mass ejections, and geomagnetic storms—pose significant risks to satellite operations, power grids, and astronaut safety. While traditional physics-based models often face challenges in capturing the nonlinear and complex dynamics of space plasmas, ML techniques such as deep learning, transfer learning, and uncertainty quantification offer powerful tools for analyzing multi-source space data and improving the forecasting of extreme events.

- machine learning
- space weather prediction
- solar flare forecasting
- coronal mass ejection (CME) detection
- geomagnetic storm modeling
- deep learning (e.g., CNN, LSTM, Transformer)
- radiation belt dynamics
- space plasma data analysis
- multi-source space data fusion
- transfer learning in space physics
- uncertainty quantification (UQ) for space weather
- reinforcement learning for space weather mitigation
- solar–terrestrial physics
- satellite anomaly prediction
- power grid space weather resilience

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Message from the Editor-in-Chief

As the world of science becomes ever more specialized, researchers may lose themselves in the deep forest of the ever increasing number of subfields being created. This open access journal *Applied Sciences* has been started to link these subfields, so researchers can cut through the forest and see the surrounding, or quite distant fields and subfields to help develop his/her own research even further with the aid of this multi-dimensional network.

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