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[Poster]

## Big Data Analysis in Astrophysics and Physics: A Multidisciplinary Approach

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**Abstract:** The rapid growth of observational and computational datasets creates new challenges for the detection and interpretation of transient phenomena. This work in progress investigates the application of modern artificial intelligence methods, particularly Transformer architectures and attention mechanisms, to Big Data in astrophysics, ionospheric and geomagnetic physics, and molecular magnetism. Our current work focuses on long-term VLF observations of the ionosphere, containing signatures of solar flares, coronal mass ejections, solar energetic particle events, lightning, and other transient phenomena. We are developing Transformer-based models for the automatic detection and characterization of ionospheric disturbances using time- and frequency-domain information. In parallel, the approach is being explored for atomic and molecular datasets, with particular emphasis on molecular magnetism and the prediction of magnetic properties. The ongoing work aims to establish a transferable AI framework for heterogeneous scientific Big Data and demonstrate its potential for space-weather research and computational physics.

**Keywords:** Big Data, Artificial Intelligence, Transformer Models, Space Weather

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