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Classification of Fermi-LAT sources with deep learning

Tuesday, July 13, 2021 12:00 PM (12 minutes)

Machine learning techniques are powerful tools for the classification of unidentified gamma-ray sources. We present a new approach based on dense and recurrent deep neural networks to classify unidentified or unassociated gamma-ray sources in the last release of the Fermi-LAT catalog (4FGL-DR2). Our method uses the actual measurements of the photon energy spectrum and time series as input for the classification, instead of specific, hand-crafted features. We focus on different classification tasks: the separation between extragalactic sources, i.e. Active Galactic Nuclei (AGN), and Galactic pulsars, the further classification of pulsars into young and millisecond pulsars and the sub-classification of AGN into different types. Since our method is very flexible, we generalize it to include multiwavelength data on the energy and time spectra coming from different observatories, as well as to account for uncertainties in the measurements and in the predicted classes. Our list of high-confidence candidate sources labelled by the neural networks provides targets for further multiwavelength observations to identify their nature, as well as for population studies.

Keywords

gamma rays; catalog; machine learning; source classification

Collaboration

other Collaboration

Subcategory

Theoretical Methods

Primary author: Dr MANCONI, Silvia (Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen)

Co-authors: Dr BUTTER, Anja (Institut fur Theoretische Physik, Universitat Heidelberg); KEIL, Felicitas (RWTH Aachen); Prof. KRAEMER, Michael (RWTH Aachen); FINKE, Thorben (RWTH Aachen)

Presenter: Dr MANCONI, Silvia (Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen)

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