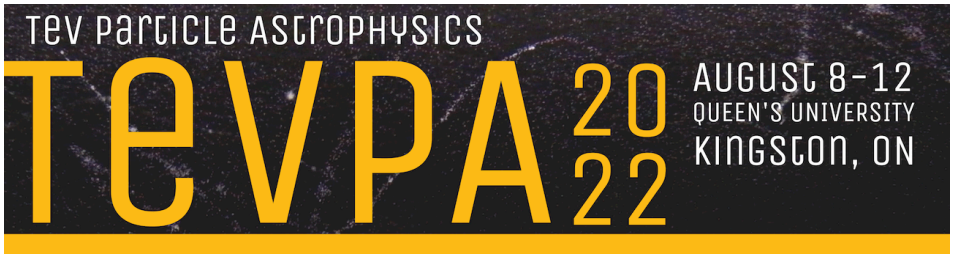

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A machine learning approach to searching dark matter subhalos in Fermi-LAT sources

Tuesday, 9 August 2022 14:00 (20 minutes)

Using the data from the Large Area Telescope (LAT), the Fermi-LAT collaboration continuously updates their catalogs, which now contain a few thousands of detected gamma-ray sources. Among them, around one third are of not yet identified origin, and they could contain signals from established source types or, most intriguing, new source types such as dark matter subhalos producing gamma-rays from dark matter self-annihilation. This possibility has been extensively investigated, finding competitive constraints on dark matter properties. Moreover, it has been shown that neural networks provide powerful methods to predict the classification of gamma-ray sources.
In this contribution we apply state-of-the-art machine learning methods for classification and anomaly detection to the gamma-ray sources in Fermi-LAT catalogs with the aim of identifying possible candidates of exotic gamma-ray sources, namely dark matter subhalos. By using established models from both N-body simulations and semi-analytical approaches for the subhalo distribution, we first simulate the properties of dark matter subhalo gamma-ray sources. We then carefully assess the detectability of this sample by using Fermi-LAT analysis tools. We present preliminary results of our machine learning analysis performed on the unidentified sources in the 4FGL-DR3.

Collaboration name

Primary author: NIPPEL, Kathrin

Co-authors: MANCONI, Silvia (Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen); BUTTER, Anja; KRAMER, Michael (Rheinisch Westfaelische Tech. Hoch. (DE))

Presenter: NIPPEL, Kathrin

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