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Searches for exotic objects among Fermi-LAT gamma-ray sources with (weakly) supervised machine learning

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This contribution presents our approach to identify potential exotic objects in the gamma-ray sky using the Fermi-LAT 4FGL-DR3 catalog. We employ both supervised and unsupervised classification techniques to analyze the gamma-ray spectra of sources in the catalog.

For the supervised approach, we simulate realistic gamma-ray spectra and utilize them to train a classifier specifically designed to identify exotic objects, such as dark matter subhalos. These simulated spectra also play a crucial role in validating the performance of our unsupervised approach. By using weakly supervised learning, our goal is to identify subhalo-like objects without explicitly training the algorithm on spectra simulated from a specific dark matter model, thus generalizing towards model independent searches for exotic sources.

Our results demonstrate the effectiveness of both approaches in identifying subhalo-like objects. Overall, our work contributes to the ongoing search for dark matter subhalos and highlights the potential of utilizing a combination of supervised and unsupervised techniques in the exploration of exotic gamma-ray sources.

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