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Anomaly aware machine learning for dark matter direct detection at the DARWIN experiment

This talk presents a novel approach to dark matter direct detection using anomaly-aware machine learning techniques in the DARWIN next-generation dark matter direct detection experiment. I will introduce a semi-unsupervised deep learning pipeline that falls under the umbrella of generalized Simulation-Based Inference (SBI), an approach that allows one to effectively learn likelihoods straight from simulated data, without the need for complex functional dependence on systematics or nuisance parameters. I also present an inference procedure to detect non-background physics utilizing an anomaly function derived from the loss functions of the semi-unsupervised architecture. The pipeline's performance is evaluated using pseudo-data sets in a sensitivity forecasting task, and the results suggest that it offers improved sensitivity over traditional methods.

Primary Field of Research

Particle Physics

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