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Unsupervised Machine Learning in the Search for Dark and Semi-visible Jets

Much of dark matter (DM) research has focused on DM candidate particles which are heavy and have little interaction with baryonic matter. However, many theories have proposed DM candidates that do indeed interact with observable matter, particularly resulting in the formation of jets. In certain models, only a portion of dark hadrons produced in a collision will decay back to SM quarks, while the rest will pass through the detector undetected. Semi-visible jets (SVJ) occur when dark hadrons only partially decay to SM hadrons, while for dark jets, the dark hadrons decay fully. Since the final states involve unusual topologies, searches using traditional methods prove challenging to find evidence of resonant signal. New developments in recent years within machine learning community provides a unique opportunity for high-energy particle physics research. In this work is provided a review of anomaly detection methods and its applicability to dark and semi-visible jets in order to uncover new BSM physics.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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