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Online-compatible unsupervised nonresonant anomaly detection

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There is a growing need for anomaly detection methods that can broaden the search for new particles in a model-agnostic manner. Most proposals for new methods focus exclusively on signal sensitivity. However, it is not enough to select anomalous events—there must also be a strategy to provide context to the selected events. We propose the first complete strategy for unsupervised detection of nonresonant anomalies that includes both signal sensitivity and a data-driven method for background estimation. Our technique is built out of two simultaneously trained autoencoders that are forced to be decorrelated from each other. This method can be deployed off-line for nonresonant anomaly detection and is also the first complete on-line-compatible anomaly detection strategy. We show that our method achieves excellent performance on a variety of signals prepared for the ADC2021 data challenge.

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