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Detecting New Physics as Novelty

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Generally, the novelty evaluators are classified into two categories: isolation-based and clustering (density)-based. Properly combining the evaluators from each category yields a third category, namely “synergy-based”, which may significantly improve efficiency, quality and applicability of novelty evaluation. We demonstrate these features by analyzing the performances of the three category of evaluators, using a variety of two dimensional Gaussian samples mimicking the collider events and subsequently apply the study to the LHC detection of the $t\bar{t}H$ Higgs physics and the gravity-mediated supersymmetry as novel events in the $t\bar{t}\gamma\gamma$ channel.

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