

Enhancing searches for resonances with machine learning and moment decomposition

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A key challenge in searches for resonant new physics is that classifiers trained to enhance potential signals must not induce localized structures. Such structures could result in a false signal when the background is estimated from data using sideband methods. A variety of techniques have been developed to construct classifiers which are independent from the resonant feature (often a mass). Such strategies are sufficient to avoid localized structures, but are not necessary. We develop a new set of tools using a novel moment loss function (Moment Decomposition or Mode) which relax the assumption of independence without creating structures in the background. By allowing classifiers to be more flexible, we enhance the sensitivity to new physics without compromising the fidelity of the background estimation.

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