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Robust anomaly detection using NuRD

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Anomaly Detection algorithms, when used as triggering mechanisms in experiments like the LHC, can help make data collection more precise by predominantly capturing events on interest. To ensure the triggering events are of interest, these detection algorithms should be robust against nuisance kinematic variables and detector conditions. To achieve this robustness, popular detection models, built via autoencoders for example, have to go through a decorrelation stage, where the anomaly thresholds for the scores are decorrelated with the nuisances; this post-training procedure sacrifices detection accuracy. We propose a class of robust anomaly detection technique that accounts for nuisances in the prediction, called Nuisance-Randomized Distillation (NuRD). Our nuisance-aware anomaly detection methods we build with NuRD have shorter inference times than autoencoder-based methods and do not require the extra decorrelation step (and therefore do not suffer the associated accuracy loss).

Primary authors: PULI, Aahlad (New York University); GANDRAKOTA, Abhijith (Fermi National Accelerator Lab. (US)); ZHANG, Lily (New York University)

Presenter: GANDRAKOTA, Abhijith (Fermi National Accelerator Lab. (US))

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