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Unfolding using Denoising Diffusion (20+20)

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Unfolding detector distortions in experimental data is critical for enabling precision measurements in high-energy physics (HEP). However, traditional unfolding methods face challenges in scalability, flexibility, and dependence on simulations. We introduce a novel unfolding approach using conditional denoising diffusion probabilistic models (cDDPM). By modeling the conditional probability density between detector-level observations and truth-level particle properties from various physics processes, the cDDPM unfolding performance generalizes across varied simulated processes and kinematic distributions without retraining. We demonstrate proof-of-concept on toy models and evaluate on simulated Large Hadron Collider jets across different physics processes.

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