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Towards Universal Unfolding using Denoising Diffusion

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Correcting for detector effects in experimental data, particularly through unfolding, is critical for enabling precision measurements in high-energy physics. However, traditional unfolding methods face challenges in scalability, flexibility, and dependence on simulations. We introduce a novel approach to multidimensional particle-wise unfolding using conditional Denoising Diffusion Probabilistic Models (cDDPM). Our method utilizes the cDDPM for a non-iterative, flexible posterior sampling approach, incorporating distribution moments as conditioning information, which exhibits a strong inductive bias that allows it to generalize to unseen physics processes without explicitly assuming the underlying distribution. Our results highlight the potential of this method as a step towards a "universal" unfolding tool that reduces dependence on truth-level assumptions.

Track

Unfolding

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