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Title: Provably exact AI meets particle physics

Abstract: Artificial intelligence and machine learning tools are now ubiquitous in both experimental and theoretical physics. In recent years, the exploitation of AI in physics has begun to evolve far beyond the application of algorithms originally designed for other purposes, birthing the new subfield of "ab-initio AI": novel approaches to AI that that draw from, and are motivated by, aspects of fundamental physics. In this context, I will discuss opportunities for machine learning, in particular generative models, to accelerate first-principles lattice quantum field theory calculations in particle and nuclear physics. Particular challenges in this context include incorporating complex (gauge) symmetries into model architectures, and scaling models to the large number of degrees of freedom of state-of-the-art numerical studies. I will show the results of proof-of-principle studies that demonstrate that sampling from generative models can be orders of magnitude more efficient than traditional sampling approaches in this context.