MATTER AND TECHNOLOGIES

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Impact of Quantum Noise on Training of QGANs

Current noisy intermediate-scale quantum devices suffer from various sources of intrinsic quantum noise. Overcoming the effects of noise is a major challenge, for which different error mitigation and error correction techniques have been proposed.

In this paper, we conduct a first study of the performance of quantum Generative Adversarial Networks (qGANs) in the presence of different types of quantum noise, focusing on a simplified use case in high-energy physics.

In particular, we explore the effects of readout and two-qubit gate errors on the qGAN training process. Simulating a noisy quantum device classically with IBM's Qiskit framework, we examine the threshold of error rates up to which a reliable training is possible. In addition, we investigate the importance of various hyperparameters for the training process in the presence of different error rates, and we explore the impact of readout error mitigation on the results.

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