

An Equivariant Neural Decoder for Quantum Error Correction

Quantum error correction is a critical component for scaling up quantum computing. Given a quantum code, an optimal decoder maps the measured code violations to the most likely error that occurred, but its cost scales exponentially with the system size. Neural network decoders are an appealing solution since they can learn from data an efficient approximation to such a mapping and can automatically adapt to the noise distribution. In this work, we introduce a data efficient neural decoder that exploits the symmetries of the problem. We characterize the symmetries of the optimal decoder for the toric code and propose a novel equivariant architecture that achieves state of the art accuracy compared to previous neural decoders.

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