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Quantum Probabilistic Diffusion Models

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We propose a quantum version of a generative diffusion model. In this algorithm, artificial neural networks are replaced with parameterized quantum circuits, in order to directly generate quantum states. We present both a full quantum and a latent quantum version of the algorithm; we also present a conditioned version of these models. The models' performances have been evaluated using quantitative metrics complemented by qualitative assessments. An implementation of a simplified version of the algorithm has been executed on real NISQ quantum hardware.

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