Optimizing Variational Quantum Circuits using Gaussian Process Surrogate Modeling with Trigonometric Kernels

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Hybrid quantum-classical variational algorithms prepare quantum states of interest by optimizing circuits directly on a quantum device. The efficiency of these algorithms relies heavily on the performance of the classical optimization algorithm. In this talk, we take a closer look at the cost function landscape generated by parametrized quantum circuits. We use our insights to model the landscape efficiently using a Gaussian Process Model (GPM) with a trigonometric kernel that is trained on sampled data. We present an optimization algorithm that leverages the GPM to determine an optimal sampling scheme for gradient estimation, resulting in reduced shot consumption. Our findings demonstrate that the developed approach surpasses state-of-the-art optimization algorithms in this field.

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