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# Efficient estimation of trainability for variational quantum circuits

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Variational quantum algorithms are emerging as promising tools to tackle complex problems ranging from quantum chemistry to combinatorial optimization. These algorithms optimize the continuous parameters of a variational quantum circuit as to extremize a cost function encoding the task at hand. The optimization is achieved through gradient descent methods. Such models can suffer from the well-known curse of barren plateaus, which is characterized by an exponential vanishing of the cost function gradient with the system size, making training unfeasible for practical applications.

In this talk we will present an efficient method allowing to certify the trainability of a given ansatz 1. This method is scalable and open the path to the development of tailored AI tools to discover and optimize the architecture of variational quantum circuits for applications on near-term devices. We discuss a promissing example that makes use of the recent groundbreaking advances in the field of reinforcement learning.

1 Valentin Heyraud, Zejian Li, Kaelan Donatella, Alexandre Le Boité and Cristiano Ciuti, *Efficient estimation of trainability for variational quantum circuits* arXiv:2302.04649

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