

## **Variational quantum algorithms for nonlinear problems**

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### **Abstract:**

I will discuss how nonlinear problems including nonlinear partial differential equations can be efficiently solved by variational quantum computing. This is achieved by utilizing multiple copies of variational quantum states to treat nonlinearities efficiently and by introducing tensor networks as a programming paradigm. The key concepts of the algorithm are demonstrated for the nonlinear Schrödinger equation as a canonical example. I will demonstrate numerically that the variational quantum ansatz can be exponentially more efficient than matrix product states and present experimental proof-of-principle results obtained on an IBM Q device.