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# Mathematical Picture Language Seminar

**Tuesday, March 21, 2023**  
**9:30 a.m. Boston time**

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## Contextual Subspace Variational Quantum Eigensolver

**Abstract:** Variational quantum algorithms have been the focus of much recent interest due to their tractability on current noisy intermediate scale quantum (NISQ) computers. One of the main variational quantum algorithms is the variational quantum eigensolver (VQE). VQE estimates eigenvalues of a quantum hamiltonian by repeated ansatz preparation and measurement. However, it remains very challenging for VQE to utilize all of the available qubits in current devices due to the large number of measurements required. This motivates modifications of VQE that could further reduce the resources required. We describe the contextual subspace variational quantum eigensolver (CS-VQE), an approximation method based on the standard variational quantum eigensolver (VQE). CS-VQE obtains a classical approximation to the ground state energy by solving a hidden variable model for a noncontextual approximation to the Hamiltonian. This approximation is then used to construct a smaller VQE instance that computes quantum corrections to this classical approximation in a contextual subspace. CS-VQE is an example of a genuinely hybrid NISQ algorithm in the sense that part of the answer is computed on the classical computer and part of the answer on the quantum computer.



Zoom QR Code & Link:

<https://harvard.zoom.us/j/779283357?pwd=MitXVm1pYUIJVzZqT3lwV2pCT1ZUQT09>

**<https://mathpicture.fas.harvard.edu/seminar>**