Day 2

Zhihui Wang, NASA Ames Research Center; Universities Space Research Association

Title: Symmetry and Error Mitigation in Quantum Alternating Operator Ansatz

Abstract:
Quantum Alternating Operator Ansatz (QAOA) provides a platform for probing quantum advantage in optimization problems on NISQ hardware. By exploring symmetries in the system and the structure of unitaries in the algorithm, we proposed using problem-specific mixing operators to limit the quantum evolution within a subspace where the target state lives. As an example, in case of equality constraint, we studied the use of XY operators that preserve total Pauli Z. This QAOA variant, in the noiseless case, significantly outperforms the vanilla version of QAOA where the constraints are encoded as penalty in the cost Hamiltonian and the search is in the whole Hilbert space. In presence of noise, although the advantage still holds, error mitigation is needed for QAOA. I will overview our work on the design of QAOA in presence of symmetry, the implementation and compilation of XY-QAOA, its performance and error mitigation techniques in presence of noise.