Quantum Coherent Systems for Ground-State Problems

Yunyan Lee[1], Ian R. Petersen[1] and Daoyi Dong[1]

[1]Australian National University, Canberra ACT 2601, Australia

We offer a perspective on solving ground-state problems in quantum chemistry using quantum coherent systems. Typically, such issues are addressed using Variational Quantum Algorithms (VQAs), which iteratively rely on classical optimization to update parameters. Utilizing the Quantum Stochastic Differential Equations (QSDEs) framework, we design a quantum system that naturally evolves toward a steady-state solution corresponding directly to the Hamiltonian's ground state, eliminating the need for classical optimization. Numerical simulations confirm the feasibility of this QSDE-based approach, demonstrating its potential as an efficient method for quantum ground-state preparation.