

CSDS 500 Spring 2023 Colloquium

11:30 AM to 12:30 PM
Thursday, February 16, 2023
White 411

Zoom Meeting ID: 960 3821 4850 Passcode: 836092

“Classical Simulators as Quantum Error Mitigators via Circuit Cutting”

Abstract: We are currently in the Noisy Intermediate Scale Quantum (NISQ) era of quantum computing, where noise mitigation techniques are crucial to obtaining reliable results. However, the error mitigation subcircuits introduce noise associated with the additional gates and ancillas that they require to run alongside the main circuit on the quantum hardware. In this talk, I'll introduce the Simulated Quantum Error Mitigation (SQEM) framework, which allows us to obtain highly accurate results on quantum devices in a scalable way.

In this talk, I'll first discuss the circuit cutting technique, and its scalability issue. Then a brief overview of the state-of-the-art quantum error mitigation techniques. I'll discuss the SQEM framework that provides noiseless error mitigation by running the circuit separately on quantum hardware and a classical simulator. SQEM performs error mitigation qubit by qubit and then provides a way to combine the different probabilities from each of the individual qubit error mitigation runs such that the full circuit is error mitigated. Finally, I'll demonstrate the results by applying our framework to the VQE hardware-efficient ansatz achieving estimated ground state energies very close to the noise-free simulation results.



Ji Liu
Argonne National Laboratory

Bio: Ji Liu is a postdoctoral researcher at Argonne National Laboratory. His research focuses on improving the programmability, debuggability, and reliability of quantum computers. He currently works on quantum compiler optimization and noise mitigation techniques for NISQ computers. He received his Ph.D. from North Carolina State University, where he developed runtime debugging schemes (quantum assertions), and quantum compiler optimizations.

This is to certify that _____ attended this seminar. Certified by _____.
Certificates of attendance and other evidence of CPD activity should be retained by the attendee for auditing purposes.



CASE SCHOOL
OF ENGINEERING

CASE WESTERN RESERVE
UNIVERSITY