Locality and Error Mitigation of Quantum Circuits

Quantum Wednesday

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Today's Paper

Locality and Error Mitigation of Quantum Circuits

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In this work, we study and improve two leading error mitigation techniques, namely Probabilistic Error Cancellation (PEC) and Zero-Noise Extrapolation (ZNE), for estimating the expectation value of local observables. For PEC, we introduce a new estimator that takes into account the light cone of the unitary circuit with respect to a target local observable. Given a fixed error tolerance, the sampling overhead for the new estimator can be several orders of magnitude smaller than the standard PEC estimators. For ZNE, we also use light-cone arguments to establish an error bound that closely captures the behavior of the bias that remains after extrapolation.

https://arxiv.org/abs/2303.06496

Zero-Noise Extrapolation

1. something

Probabilistic Error Cancellation

1. something else

Key Concepts

Local Observable

1. something

Light Cone

1. something else

Assumptions

1.

What is an observables light cone?

Do we want these techniques in Mitiq?

1. Does this slot into our existing `execute_with_pec` function?
2. How does this perform as an observable O go from local to "unlocal".

Thank you!