

Introduction to quantum error mitigation

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September 17, 2024

Quantum computers can offer dramatic speed-ups over their classical counterparts for certain problems. However, noise remains the biggest impediment to realizing the full potential of quantum computing. While the theory of quantum error correction offers a solution to this challenge, a large-scale realization of fault tolerance is still pending. What can one hope to do then, with existing noisy processors? In this tutorial, we will discuss the basic concepts of a collection of experimental methods referred to as quantum error mitigation (QEM). We will approach these methods from a theoretical perspective and discuss the first protocols, zero noise extrapolation (ZNE) and probabilistic error cancellation (PEC), before moving to more recent advances in QEM. The lecture will conclude with some practical considerations and experimental results.