

Quantum Error Mitigation: Models, Methods, and Limitations



Colloquium talk
by

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In this colloquium, I will present an accessible introduction to quantum error mitigation, a set of techniques crucial for enhancing the reliability of quantum computations on pre-fault tolerant quantum devices. As quantum hardware continues to advance, we are entering a regime where the exploration of near-term applications are within reach—yet full fault tolerance remains out of scope. Error mitigation offers a practical pathway to extract useful computational results despite the presence of noise. I will discuss the foundational models and methods used in error mitigation, including techniques such as zero-noise extrapolation, probabilistic error cancellation. Emphasis will be placed on the assumptions underlying these methods, particularly the experimental constraints and noise models they rely on. We will explore how these models are learned and validated, and how they influence the effectiveness of mitigation strategies. Furthermore, I will analyze the scaling behavior of these methods, highlighting both their potential and limitations as quantum systems grow in size and complexity.



Tuesday, 7 October, 16:30



HS C, Victor-Franz-Hess-Haus

Organizers: Katrin Erath-Dulitz, Hanns-Christoph Nägerl, Francine Marleau