Speaker: André Carvalho

Title: Boosting performance of quantum algorithms using autonomous error-suppression

Place: Seminar room 915

Abstract:

Excitement about the promise of quantum computers is tempered by the reality that the hardware remains exceptionally fragile and error-prone, forming a bottleneck in the development of novel applications. In this talk we show how quantum control delivered by software can improve hardware performance at various levels of the stack. At the physical layer, we will show how model-based and also fully automated closed-loop approaches can be used to design logical gates that are more stable over time and resilient to hardware noise. We will also show a protocol that allows for the autonomous gate tune up across the full device. At the circuit level, we will describe a pre-processing pipeline consisting of compilation, crosstalk mitigation, optimized gate replacement, as well as a novel measurement error mitigation protocol in post-processing after the execution on the quantum device. We demonstrate that combining all the above strategies leads to dramatic improvements on algorithm performance in current NISQ devices. We observe over 1000X improvement in the success probability of both deterministic algorithms, such as QFT and BV, and hybrid algorithms such as QAOA and VQE.
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