Quantum Colloquium

Quantum verification with few copies

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As quantum technologies advance, the ability to engineer increasingly large quantum devices has experienced rapid development. In this context, verifying large entangled systems represents one of the main challenges in employing such systems for reliable quantum information processing. Though the most complete technique is undoubtedly full tomography, the inherent exponential increase of experimental and post-processing resources with system size makes this approach infeasible at even moderate scales. For this reason, there is currently an urgent need to develop novel methods that surpass these limitations. In this talk, I will review novel techniques [1] that enable efficient verification with a fixed number of resources (sampling complexity) and thus prove suitable for systems of arbitrary dimension. Specifically, a probabilistic framework for single-copy for entanglement detection and few-copy device-independent quantum state verification is reviewed. I will also present the selective quantum state tomography method, which enables estimating off-diagonal elements of an unknown density matrix with several copies independently of the system's size. These hyper-efficient techniques define a dimension demarcation for partial tomography and open a path for novel applications. References [1] J. Morris, V. Saggio, A. Goanin and B. Daki, Quantum Verification and Estimation with Few Copies, Adv. Quantum Technol. 2100118 (2022), https://doi.org/10.1002/qute.202100118.

Tuesday, May 21, 2024 11:00am - 12:00pm
Heinzel Seminar Room / Ground Floor / Office Building West

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