

SEMINAR: Scalable Estimation and Dimension Demarcation in Large Quantum Systems

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15:00 to 16:00

Seminar Room

Quantum systems will only ever be as useful as the information we can extract from them. In this context, benchmarking and estimation in large entangled systems represent 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 even at 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 such novel techniques. Specifically, a probabilistic framework requiring, at best, only a single copy for entanglement detection is examined, together with the protocol for resource-efficient and device-independent quantum state verification, as well as the concept of selective quantum state tomography, which enables the estimation of arbitrary elements of an unknown state with a number of copies that is low and independent of the system's size. Additionally, I will present recent work [1] on optimized post-processing methods that demonstrate exponential advantages in sampling complexity over conventional approaches. These hyper-efficient techniques [2] define a dimensional demarcation for partial tomography and open a path for novel applications.

Hosted by: Prof. Dr. Antonio Acin