ICFO

SEMINAR: Lie-Algebraic Classical Simulation of Quantum Dynamics

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11:00 to 12:00
Seminar Room

Understanding which quantum computations genuinely require quantum resources is a central question in quantum computing. Lie-algebraic simulation approaches this problem in the Heisenberg picture by exploiting the algebraic structure of quantum dynamics. When the evolution of relevant observables closes within an efficiently accessible polynomial-dimensional operator space, quantum mean values can be computed classically without simulating the full quantum state. In this talk, I will introduce the underlying framework and present recent advances extending its scope beyond free-fermionic and Gaussian dynamics. These include constructive simulation methods for structured qubit circuits and new exact simulation regimes for interacting bosonic systems. I will illustrate their practical applications through numerical studies of quantum many-body dynamics. Together, these results provide new tools for studying and verifying quantum systems and help sharpen the classical baseline against which claims of quantum advantage must be assessed.

Hosted by: Prof. Dr. Antonio Acin