Quantum physics beyond the low-complexity regime: In theory and on a quantum computer

Philippe Faist[1, *]

[1] *Dahlem Center for Complex Quantum Systems, Freie Universität Berlin, Germany*

The past recent years have seen enormous progress on building ever more extensive and accurate hardware for quantum computing, enabling us to reliably manipulate ever more complex quantum states. I will try to offer a theoretical physicist's perspective on some modern topics of quantum information and computation with many qubits. I will discuss how concepts from the theory of quantum information and computation, in particular quantum circuit complexity, can inform our understanding of thermalization in complex chaotic quantum systems from an operational perspective. I will also discuss more practical, related developments in protecting fragile complex states from noise with quantum error-correcting codes.

* philippe.faist@fu-berlin.de; https://phfaist.com/