QuTe Zentrum für Quantentechnologien

Quantum Technology Talks

UNIVERSITÄT DES SAARLANDES

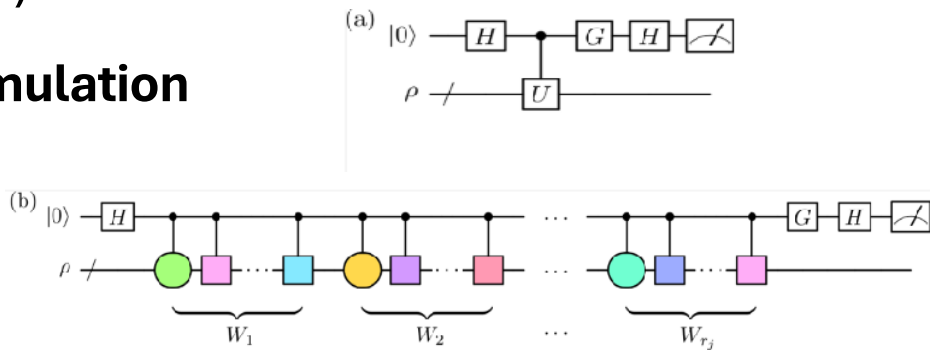
Prof. Dr. Mario Berta (RWTH Aachen)

Quantum algorithm design for many-body simulation

Date: **Monday, November 23, 2026**

Time: **12:00 – 13:00**

Location: Building E2 5, Auditorium III



Joint work with Šmíd, Meister, Bondesan and Berta, based on arXiv:2501.01412, arXiv:2510.04954, and arXiv:2608.28451.

Preparing thermal states is a central challenge in quantum simulation, with applications in condensed matter physics and quantum chemistry. I will introduce quantum Gibbs samplers, which are engineered dissipative dynamics whose stationary states are the desired thermal states. Their computational cost depends crucially on how quickly they converge. I will present polynomial-time preparation guarantees for interacting lattice fermions, followed by polylogarithmic mixing bounds in controlled weak- and strong-coupling regimes. Finally, I will show that accurate preparation of the full state is often unnecessary. Namely, under quasi-local, rapidly mixing dynamics, local observables and energy densities equilibrate in a time independent of system size at fixed accuracy. This enables faster algorithms for extracting thermal properties but also opens the door to classical simulation methods. Together, these results connect rigorous convergence guarantees to physically relevant tasks and clarify the opportunities of quantum advantage in thermal simulation.
Joint work with Štěpán Šmíd, Richard Meister, and Roberto Bondesan, based on arXiv:2501.01412, arXiv:2510.04954, and arXiv:2608.28451.



Contact: peter.orth@uni-saarland.de, giovanna.morigi@physik.uni-saarland.de Website: www.uni-saarland.de/fachrichtung/physik/veranstaltungen/qis-seminar.html