Accessing finite energy density with tensor networks and quantum devices

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Tensor networks are a family of ansatzes that provide efficient approximations for the low energy and thermal equilibrium states of low-dimensional quantum many-body systems. But describing highly excited states or out-of-equilibrium setups with them is much harder. These are therefore the natural problems in which quantum devices can potentially find the earliest advantage.

Energy filters allow us to access properties of the system at finite energy densities. They can be efficiently realized by quantum simulators or computers, which simulate the quantum dynamics, combined with classical filtering and sampling. But also replacing the quantum evolution by its classical simulation with tensor networks provides a new tool to classically compute dynamical and finite energy properties of much larger systems than allowed by other methods.