Memory-Efficient Nonequilibrium Green's Function Framework Built On Quantics Tensor Trains

Maksymilian Sroda

One of the challenges in diagrammatic simulations of nonequilibrium phenomena in lattice models is the large memory demand for storing momentum-dependent two-time correlation functions. This problem can be overcome with the recently introduced quantics tensor train (QTT) representation of multivariable functions. Here, we demonstrate nonequilibrium Green's function simulations with high momentum resolution, up to times which exceed the capabilities of standard implementations and are long enough to study, e.g., thermalization dynamics and transient Floquet physics during multi-cycle electric field pulses. The self-consistent calculation on the three-leg Kadanoff-Baym contour employs only QTT-compressed functions, and input functions which are either generated directly in QTT form, or obtained via quantics tensor cross interpolation.