Matrix Product State Simulations of Quantum Fields in Curved 1+1 Spacetime

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Abstract

While the dynamics of black hole evaporation and early-Universe physics are to some extentunderstood in principle, the computations necessary to produce concrete predictions fromthem are often intractable in practice. Here we show how tensor-network based numerics, which assign a manageably sparse representation to certain quantum states,can be used to perform them. As a first step wecompute the Hadamard-regularized stress-energy tensor of a 1+1-D massive Dirac field in various quantum states, demonstrating the Unruh effect in flat and curved spacetime.