Contribution ID: **186** Type: **Poster Presentation**

Bootstrap methods for digitized scalar field theory

Tuesday, 1 August 2023 18:43 (4 minutes)

General positivity constraints linking various powers of observables in energy eigenstates can be used to sharply locate acceptable regions for the energy eigenvalues, provided that efficient recursive methods are available to calculate the matrix elements. These recursive methods are derived by looking at the commutation relations of the observables with the Hamiltonian. We discuss how this self-consistent (bootstrap) approach can be applied to the study of digitized scalar field theory in the harmonic basis. Using known results, we develop the method by testing on quantum systems, including the harmonic and anharmonic oscillators. We report recent numerical results for up to four coupled anharmonic oscillators. From here, we consider the possibility of using the groundwork of this method as a means of studying phase transitions in 1+1 dimensions.

Topical area

Quantum Computing and Quantum Information

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Session Classification: Poster session