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Sparse modeling study to extract charmonium spectral functions from lattice QCD data at finite temperature

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Charmonium spectral functions play an important role in studying properties of the hot and dense medium formed in relativistic heavy ion collisions since they carry important theoretical information on probes of the Quark-Gluon Plasma. However, obtaining the spectral function from the correlation function, which can be obtained from lattice QCD, is an ill-posed inverse problem. To address this problem, various techniques have been employed in lots of previous studies on extracting spectral functions from lattice QCD data. Sparse modeling (SpM) is one of such techniques, though it has not been widely applied.
We present spectral functions extracted from Euclidean-time correlation functions by using SpM. This method solves inverse problems by considering only the sparseness of the solution we seek. To check applicability of the method, we firstly test it with mock data which imitate charmonium correlation functions. We show that the method can reconstruct the resonance peaks in the spectral functions. Then, we extract charmonium spectral functions from correlation functions obtained from quenched lattice QCD at temperatures below and above the critical temperature. We show that this method yields results like those obtained with MEM and other methods.

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