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Spectral reconstruction with Gaussian processes

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By extending standard Gaussian process regression to inference from indirect observations, one obtains a powerful non-parametric algorithm for the probabilistic treatment of ill-conditioned linear inverse problems. This makes it a promising ansatz for Fredholm integral inversion, of which the spectral reconstruction of correlation functions in quantum field theory is a particular instance. The approach allows to directly incorporate arbitrary linear operator constraints such as sum rules; furthermore, analytically known asymptotics of the spectral function can be included by applying Mercer's theorem for positive semi-definite kernels. In this talk, I will introduce the algorithm, discuss its relation to the Backus-Gilbert method, and present two applications: 1. The reconstruction of 2+1 flavor lattice QCD data for ghost and gluon propagators as well as the strong coupling constant. 2. The extraction of glueball masses from timelike interaction channels of the four-gluon vertex in Yang-Mills theory, computed with the functional renormalization group.

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