A multivariate generalization of Prony's method

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Abstract

Prony's method is a prototypical eigenvalue analysis based method for the reconstruction of a finitely supported complex measure on the unit circle from its moments up to a certain degree. In this talk, we give a generalization of this method to the multivariate case and prove simple conditions under which the problem admits a unique solution. In its simplest form, the reconstruction method consists of setting up a certain multilevel Toeplitz matrix of the moments, compute a basis of its kernel, and compute by some method of choice the set of common roots of the multivariate polynomials whose coefficients are given in the second step. We conclude with a further generalization to finitely supported measures on the unit sphere and several numerical experiments.

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