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An Efficient Algorithm for Maximum-Entropy Extension of Block-Circulant Covariance Matrices

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This paper deals with maximum entropy completion of partially specified block-circulant matrices. Since positive definite symmetric circulants happen to be covariance matrices of stationary periodic processes, in particular of stationary reciprocal processes, this problem has applications in signal processing, in particular to image modeling. Maximum entropy completion is strictly related to maximum likelihood estimation subject to certain conditional independence constraints. The maximum entropy completion problem for block-circulant matrices is a nonlinear problem which has recently been solved by the authors, although leaving open the problem of an efficient computation of the solution. The main contribution of this paper is to provide an efficient algorithm for computing the solution. Simulation shows that our iterative scheme outperforms various existing approaches, especially for large dimensional problems. A necessary and sufficient condition for the existence of a positive definite circulant completion for unitary bandwidth and block-size is also provided.

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