

Characterization of matrix quadratic spaces with application to the estimation of covariance matrices

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Abstract

In this paper we give a general characterization of quadratic spaces of symmetric matrices which enables the characterization of the quadratic spaces of block matrices with separately linearly structured blocks, possibly with non-zero off-diagonal blocks. This characterization is applied to the problem of estimating covariance matrices with a linear block structure. For a quadratic structure, the appropriate estimation method is the least squares method. Otherwise, the shrinkage method is recommended. Since the properties of the estimator depend on the choice of the target space – a quadratic subspace of the structure space – it is necessary to characterize all such subspaces as possible.