Covariance matrix approximation in doubly multivariate models

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Abstract

Covariance matrix estimation is a challenging problem in multivariate statistics, especially for experiments with small sample size and a number of characteristics and time points. Such models are very often overparameterized and then the choice of particular covariance structure can be useful.

The aim of this talk is to find the best approximation of a positive definite matrix by a matrix from a given set of suitable structures with respect to some discrepancy function. For doubly multivariate data Kronecker product of covariance matrix for characteristics and covariance matrix for time points seems to be the most relevant structure. Moreover, one of those covariance structures can be additionally restricted by for example compound symmetry or autoregression of order one structure. In this talk three discrepancy functions: the Frobenius norm, the entropy loss function and the quadratic loss function will be presented.

Our goals are: approximation of a given matrix by a covariance structure (regularization), comparison of statistical properties of the best approximations (estimators) of the covariance matrix and maximum likelihood estimator and the use of the best approximation to calculate the discrepancies between the hypotheses in the power test studies.

Keywords

Covariance structure, Compound symmetry, Autoregression, Regularization.

References

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