

# Methodology for the solution of high-dimensional statistical problems

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## Abstract

High-dimensional problems often appear in several studies, such as in medical studies in which the number of samples is less than the number of characteristics. In this case the corresponding design matrix is said to be high-dimensional. The solution of these problems is not unique and it is of great interest the way that a solution can be found. A usual choice is to keep the corresponding solution with the minimum norm. There are cases in which this solution is not a good one and regularization techniques have to be considered. A major issue is the classification of specific cases for which regularization is required or not. An analytical comparison among existing methods for estimating the coefficients of the model which corresponds to design matrices with correlated covariates is presented.

## References

1. Buccini, A., Reichel, L.: An  $\ell^p - \ell^q$  minimization method with cross-validation for the restoration of impulse noise contaminated images, *J. Comp. Appl. Math.* 375 (2020) 112824.
2. Choudalakis, S., Mitrouli, M., Polychronou, A., Roupa, P.: Solving High-Dimensional Problems in Statistical Modelling: A Comparative Study, *Mathematics* 9 (2021) 1806.
3. Georgiou, S. D.: Modelling by supersaturated designs, *Computational Statistics and Data Analysis* 53 (2008) 428-435.
4. Koukouvinos, C., Lappa, A., Mitrouli, M., Roupa, P., Turek, O.: Numerical methods for estimating the tuning parameter in penalized least squares problems, *Communications in Statistics-Simulation and Computation* (2019) 1-22.