

Professor Bruce Brown
School of Mathematics and Statistics
University of New South Wales

Title: Aligning penalty function methods.

Abstract. Penalty function methods have been discussed widely in theoretical Statistics over recent years, occurring for example in smooth curve fitting, ridge regression, and the LASSO. The formulation typically involves the minimization of the sum of a conventional dispersion criterion such as least squares or minus log-likelihood, and a penalty term added to promote smoothness or parsimony. It is well-known that the method of choosing the penalty coefficient – the coefficient of the penalty term – has a big impact upon performance of the analysis.

The usual such method is cross-validation, choosing the penalty coefficient to minimize predictive mean-squared error (MSE). Although universally accepted – apparently – the use of cross-validation does raise some questions. Its mathematical structure may be separate from the problem formulation, making statistical inference difficult. And the MSE criterion may differ from those in the penalty function formulation, casting some doubt upon the internal logic of the scheme.

Can a method be used which is more intrinsic to the penalty function formulation, and thus increases the prospects of carrying out statistical inference? Perhaps – examples from smooth curve fitting and density estimation are discussed, where the penalty coefficient is estimated by an intrinsic non-parametric approach.