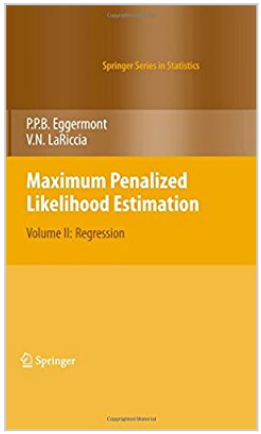

Maximum Penalized Likelihood Estimation: Volume II: Regression (Springer Series in Statistics)

By Paul P. Eggermont, Vincent N. LaRiccia

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Unique blend of asymptotic theory and small sample practice through simulation experiments and data analysis.

Novel reproducing kernel Hilbert space methods for the analysis of smoothing splines and local polynomials. Leading to uniform error bounds and honest confidence bands for the mean function using smoothing splines

Exhaustive exposition of algorithms, including the Kalman filter, for the computation of smoothing splines of arbitrary order.

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Editorial Review

Review

From the reviews:

“This book is meant for specialized readers or graduate students interested in the theory, computation and application of Nonparametric Regression to real data, and the new contributions of the authors. … For mathematically mature readers, the book would be a delight to read. … The authors have not only written a scholarly and very readable book but provide major new methods and insights. … it would help evaluate the methods as well as lead to teachable notes for a graduate course.” (Jayanta K. Ghosh, International Statistical Review, Vol. 79 (1), 2011)

“This book is the second volume of a three-volume textbook in the Springer Series in Statistics. … The second volume also belongs to the literature on nonparametric statistical inference and concentrates mainly on nonparametric regression. … The book can be used for two main purposes: as a textbook for M.S./Ph.D. students in statistics, operations research, and applied mathematics, and as a tool for researchers and practitioners in these fields who want to develop and to apply nonparametric regression methods.” (Yurij S. Kharin, Mathematical Reviews, Issue 2012 g)

From the Back Cover

This is the second volume of a text on the theory and practice of maximum penalized likelihood estimation. It is intended for graduate students in statistics, operations research and applied mathematics, as well as for researchers and practitioners in the field. The present volume deals with nonparametric regression.

The emphasis in this volume is on smoothing splines of arbitrary order, but other estimators (kernels, local and global polynomials) pass review as well. Smoothing splines and local polynomials are studied in the context of reproducing kernel Hilbert spaces. The connection between smoothing splines and reproducing kernels is of course well-known. The new twist is that letting the innerproduct depend on the smoothing parameter opens up new possibilities. It leads to asymptotically equivalent reproducing kernel estimators (without qualifications), and thence, via uniform error bounds for kernel estimators, to uniform error bounds for smoothing splines and via strong approximations, to confidence bands for the unknown regression function.

The reason for studying smoothing splines of arbitrary order is that one wants to use them for data analysis. Regarding the actual computation, the usual scheme based on spline interpolation is useful for cubic smoothing splines only. For splines of arbitrary order, the Kalman filter is the most important method, the intricacies of which are explained in full. The authors also discuss simulation results for smoothing splines and local and global polynomials for a variety of test problems as well as results on confidence bands for the unknown regression function based on undersmoothed quintic smoothing splines with remarkably good coverage probabilities.

P.P.B. Eggermont and V.N. LaRiccia are with the Statistics Program of the Department of Food and Resource Economics in the College of Agriculture and Natural Resources at the University of Delaware, and the authors of *Maximum Penalized Likelihood Estimation: Volume I: Density Estimation.*

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