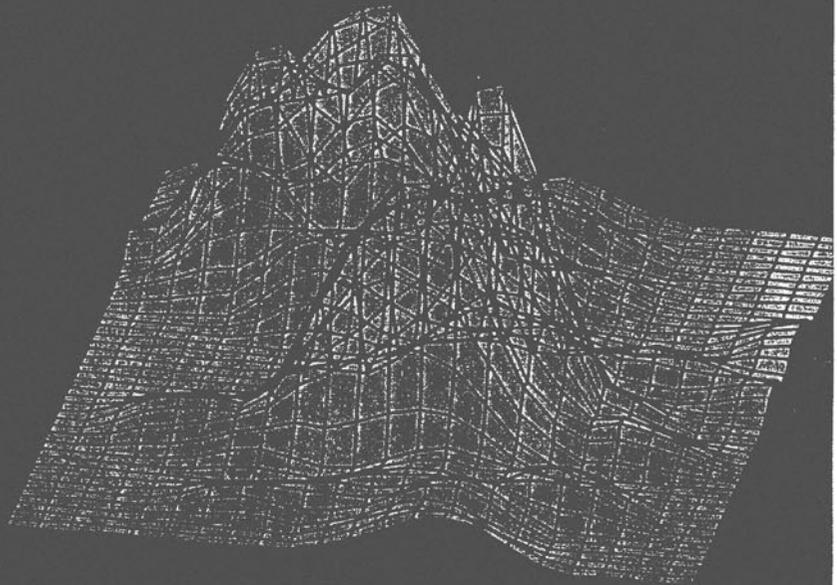


Statistics & Computing

W. Härdle · L. Simar
Editors

Computer Intensive Methods in Statistics



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Computer Intensive Methods in Statistics

With 34 Figures

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Preface

The computer has created new fields in statistic. Numerical and statistical problems that were untackable five to ten years ago can now be computed even on portable personal computers. A computer intensive task is for example the numerical calculation of posterior distributions in Bayesian analysis. The Bootstrap and image analysis are two other fields spawned by the almost unlimited computing power. It is not only the computing power through that has revolutionized statistics, the graphical interactiveness on modern statistical environments has given us the possibility for deeper insight into our data.

On November 21,22 1991 a conference on computer Intensive Methods in Statistics has been organized at the Université Catholique de Louvain, Louvain-La-Neuve, Belgium. The organizers were Jan Beirlant (Katholieke Universiteit Leuven), Wolfgang Härdle (Humboldt-Universität zu Berlin) and Léopold Simar (Université Catholique de Louvain and Facultés Universitaires Saint-Louis). The meeting was the XIIIth in the series of the Rencontre Franco-Belge des Statisticiens. Following this tradition both theoretical statistical results and practical contributions of this active field of statistical research were presented. The four topics that have been treated in more detail were: Bayesian Computing; Interfacing Statistics and Computers; Image Analysis; Resampling Methods. Selected and refereed papers have been edited and collected for this book.

1) Bayesian Computing.

In Bayesian analysis, the statistician is very often confronted with the problem of computing numerically posterior or predictive distributions. In the field of image analysis D.A. STEPHENS and A.F.M. SMITH show how the Bayesian idea of Gibbs sampling helps to solve computational problems in Edge-Detection. F. KLEIBERGEN and H.K. van DIJK analyse how the generation of matrix variate t drawings may be used to approximate the computation of posteriors in econometric problems. L. BAUWENS and A. RASQUERO consider high posterior density regions to solve the problem of testing residual autocorrelation.

2) Interfacing Statistics and Computers.

D. WOUTERS and L. VERMEIRE use the NAG library for the numerical construction of optimal critical regions in the gamma family and show how the Mathematica language can be used for the symbolic computation of a geodesic test in the Weibull family. A. ANTONIADES, J. BERRUYER and R. CARMONA report on teachware experiments centered around the use of a dedicated program in the learning of mathematical statistics and the practice of data analysis. In this program, graphical tools, random number generation, simulation techniques and bootstrap are integrated with the idea of guide undergraduates to modern statistical techniques.

3) Image Analysis.

In M. ROUSSIGNOL, V. JOUANE, M. MENVIELLE and P. TARITS a method for finding rock conductivities from electromagnetic measurements is presented. The method uses a stochastic algorithm to find a Bayesian estimator of the conductivities. Markov random field models are used in V. GRANVILLE and J.P. RASSON in image remote sensing. The technique is extended, in a unifying approach, in order to analyse problems of image segmentation, noise filtering and discriminant analysis. In A.P. KOROSTELEV and A.B. TSYBAKOV minimax linewise algorithms for image reconstruction are studied.

4) Resampling Methods.

Ph. VIEU presents a survey on theoretical results for bandwidth selection for kernel regression. The behavior of kernel estimates of a regression function depends heavily on the smoothing parameter, so for practical purpose it is important to ensure good properties of the estimates. M.A. GRUET, S. HUET and E. JOLIVET consider the bootstrap in regression problems. Four specific problems are considered: confidence intervals for parameters, calibration analysis in nonlinear situations, estimation of the covariance matrix of the estimates and confidence intervals for the regression function. Finally, Ph. BESSE and A. de FALGUEROLLES investigate the use of resampling methods in data analysis problems. More specifically, they study the problem of the choice of the dimension in principal components analysis. Different bootstrap and jackknife estimates are presented.

Several institutions have made the XIth Franco-Belgian Meeting of Statisticians possible; their financial help is gratefully acknowledged: CORE, the Center for Operation Research and Econometrics (Université Catholique de Louvain), SMASH, Séminaire de Mathématiques Appliquées aux Sciences Humaines (Facultés Universitaires Saint-Louis), KUL, Katholieke Universiteit Leuven, the Ministère de l'Éducation de la Communauté Française de Belgique and the FRNS, Fonds National de la Recherche Scientifique, all helped to make this meeting possible. We would like to thank all them. The organisation would not have been possible without the staff of CORE, in particular Sheila Verkaeren and Mariëtte Huysentruit. We cordially like to thank them.

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