Preface

This volume contains a selection of papers presented to the Third International Conference on the L_1-Norm and Related Methods, held in Neuchâtel, Switzerland, from August 11-15, 1997, as a Satellite Meeting to the 51st ISI Session in Istanbul. The conference included invited talks, contributed papers and a tutorial. A Summer School in Regression and Time Series Analysis for young graduate students and research workers ran in parallel.

The success of the 1987 and 1992 conferences on the Statistical Data Analysis based on the L_1-Norm and related methods made it evident that there is a need for regular conferences on the topic. For this reason we launched the third and happily brought together many new faces, especially those of younger statisticians.

This volume includes 38 invited papers listed under nine headings.

The Prologue contains two papers. One on measuring the performance of boundary-estimation methods by Peter Hall and Marc Raimondo and another by Roger Koenker on a new computational procedure for L_1. These two papers make the opening and closing lectures of the conference. Peter Hall and Marc Raimondo consider the problem of linear approximation to a curved boundary using a gridded data which is closely related to both curve estimation in statistics and rational approximation in number theory. They show that measures of performances based on the L_1 norm are more appropriate for the problem than those found in L_p norms for $p > 1$. Roger Koenker's breakthrough in computation of L_1 is rather different from the simplex method since it does not iterate around the exterior of the constraint set. When there are many observations, the simplex algorithm becomes too slow in computation since it has to pass through too many vertices to acheived the optimal solution. His algorithm starts in the interior of the constraint set and does penalized Newton steps with the log-barrier formulation designed to keep the algorithm in the interior.

Part one contains seven papers on estimation, testing and characterization. A new regression rank statistic for testing general hypothesis in a class of non-parametric linear model is introduced by Cornelius Gutenbrunner. In the same article, Gutenbrunner develops the asymptotic representation

of his regression rank statistics. Marc Hallin and Ivan Mizera study the unimodality and asymptotics of M-estimates. Marie Huškova, after describing the likelihood principle for the normally distributed errors, provides the reader with four L_1 type tests for the change point problem. The likelihood ratio, a Wald type, a score type and Bayesian type test statistics. She then studies the limit behavior of these tests statistics under the null hypothesis. Stephan Morgenthaler investigates the behaviour of residuals from L_1 fit in linear models of designed experiments. Stephan argues that the residuals obtained by L_1 fitting in classification models exhibit some weaknesses. Jana Jureckova, Klebanov and Silvelyn 20 (her signature) contribute two interesting papers on the inadmissibility of robust estimators with respect to the L_1-norm and the L_1 estimation in nonlinear regression and in nonlinear error-in-variables models. For testing the hypothesis $H_0 : L_\beta = L$ versus $H_1 : L_\beta \neq L$ in linear models, Christine Müller derives a Wald type test statistic based on the L_1-estimator with maximum relative power under the side condition that the maximum bias is bounded by some bias bound. A one-way classification model is given to clarify her L_1 test statistics.

Part two is on computational procedures, algorithms and computer packages. José Agullo proposes two new exact algorithms for the least median of squares and Mia Hubert and Peter Rousseeuw put forward new developments in their computer package PROGRESS. Bill Farebrother outlines the early history of traditional estimation of observational equations from the third century to Roger Boscovich passing through the Tobias Mayer method. Steve Portnoy explains his new findings on the computation of L_1 methods and shows that his method of computing is faster than computing least squares for large data sets with $n = 10^4$ observations. Steve together with Roger achieved their goal by replacing the simplex approach with interior point methods based on a stochastic preprocessing step that begins with a much smaller random subset of the data. I am sure that with this breakthrough algorithm the area of L_1 statistical data analysis takes a new turn in the future. Chris Adcock, Meade, Chepoi, Cogneau, Bernard Fichet and Fitzenberger add their new findings to this part and provide directions for future developments.

Statistical graphics are grouped together in Part three. Efstathia Bura, Simon Sheather and Joseph McKean present new ideas with the application of inverse regression for dimension reduction and Francesca Chiaramonte provides the foundation and philosophical reasoning behind a reduction paradigm. Elias Moreno proposes a Bayesian method of model selection. Wetzel describes key features of interactive method which construct CERES plots, a new class of plots that includes the partial residual plots for iden-

tification of curvature in regression models.

Time series analysis and financial statistics are the subject of Part four of this volume. Five articles by Gib Bassett, Hurst and Platen, Keith Knight, Hans Nyquist and Terui and Kariya discuss L_1 and L_2 methods for the analysis of time and money!

Bruce Brown, Tom Hettmansperger, Möttönen and Oja present the rank plot in the affine invariant case in Part five and Fernholz, Stute and Una-Alvarez, Gonzalez-Manteiga and Cadarso-Suarez contribute to this non-parametric part with new ideas in target estimation, model check and density estimation.

Part six contains three contributions on multivariate analysis. Biman Chakraborty and Probal Chaudhuri study an extension of rank regression techniques to multivariate models. Philip Milasevic and Deb Nolan present an original paper on mode and concentration estimation in multidimensions. Nolan dedicated her joint work to the memory of her co-author Milasevic. By means of empirical process theory, Deb and Milasevic provide the rate of convergence and limiting distributions of their estimators. Fraiman, Regina Liu and Jean Meloche study the estimation of multivariation density by probing depth. They consider a class of multivariate densities within which a density function f can be expressed as $f = g \circ D$ in some notion of data depth D and some real function g.

In Part seven, three papers by Anil Chaturvedi and Doug Carroll, Laurence Hubert, Phipps Arabie and Jacqueline Meulman and Boris Mirkin discuss different approches with L_p-norm to classification problems.

Fourteen of the fifty two invited papers appear at the end of volume in abstract form as they are published elsewhere.

If a volume or a manuscript has a prologue it should, in principle, have an epilogue. The volume is about L_1 methods in all area of statistics. As Roger Koenker stated in his paper in the prologue section: "Despite the best efforts of such distinguished advocates as Laplace (1789), Edgeworth (1888), and Kolmogorov (1931), methods of estimation based on minimizing sums of absolute errors have languished in the shade of the edifice that Gauss built on the foundation of least squares. Why?". The volume would not have been complete without some prognosis for the future of robust methodologies. This is why I took the liberty to call Peter Huber and asked him his permission to include his paper *Robustness: Where are we now ?* as an epilogue. I had remembered the story:

> Devil: *Master, Master, we are in serious trouble.*
> *On the planet Earth, Man has discovered the truth.*
> Master: *Don't worry, truth will soon become dogma.*

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To assure high standards, all papers were subjected to an intensive refereeing process involving at least one and often two referees. The papers once chosen were again subject to the Series Editor's selection. Based upon space and time not all papers submitted were accepted for publication. I am grateful to the following for their conscientious refereeing:

Name	Affiliation
José Agullo	Universidad de Alicante (Spain)
Gérard Antille	Université de Genève (CH)
Gib Basset	University of Illinois (USA)
Efstathia Bura	George Washington University (USA)
J. Douglas Caroll	Rutgers University (USA)
Victor Chepoi	Lab. De Biomathématique, Marseille (France)
Francesca Chiaromonte	Int. Inst. for Applied Systems Analysis (Austria)
Dennis Cook	University of Minnesota (USA)
David Draper	University of Bath (UK)
Jin-Chuan Duan	Hong Kong University of Science and Technology
Michel Dubois	Université de Neuchâtel (CH)
Bernard Fichet	Lab. De Biomathématique, Marseille (France)
Bernd Fitzenberger	Universität Konstanz (Germany)
Riccardo Gatto	Université de Neuchâtel, Neuchâtel (CH)
Wences. Gonzalez-Monteiga	University Santiago de compostela (Spain)
Marc Hallin	Université Libre de Bruxelles (Belgium)
Willem Heiser	Leiden University (NL)
Stéphane Héritier	Hôpital universitaire de Genève (CH)
Tom Hettmansperger	Penn State University, PA (USA)
Mia Hubert	University of Antwerp (Belgium)
Simon R. Hurst	Australian National University (Australia)
Marie Huskova	Charles University, Prague (CZ)
Jana Jureckova	Charles University, Prague (CZ)
Keith Knight	University of Toronto (Can)
Roger Koenker	University of Illinois (USA)
Regina Liu	Rutgers University (USA)
F.R. Mc Morris	University of Louisville (USA)
Joe McKean	Western Michigan University (USA)
Jean Meloche	University of British Columbia (Can)
Jacqueline Meulman	University of Leiden (NL)
Boris Mirkin	German Caner Research Center (Germany)
Elias Moreno	University of Granada (Spain)
Stephen Morgenthaler	Swiss Federal Institute of Technology (CH)
Christine Müller	Freie Universität Berlin (Germany)
Hans Nyquist	University of Umea (Sweden)
Wolfgang Polasek	Inst. of Statist. and Econometrics, Basel (CH)

Name	Affiliation
Stephen Portnoy	University of Illinois (USA)
Peter Rousseeuw	University of Antwerp (Belgium)
Allan Seheult	University of Durham (UK)
Simon Sheather	University New South Wales (Australia)
Arnold Stromberg	University of Kentucky (USA)
Maurizio Vichi	Università "G.D'Annunzio" di Chieti (Italy)
Joe Whittaker	Lancaster University (UK)
Lincheng Zhao	University of Science & Technology, Hefei (CN)
Silvelyne Zwanzig	Universität Hamburg (Germany)

Organising and hosting a conference even at this modest level, requires lot of courage, patience, and above all a responsible secretary. I was very fortunate to have a very dedicated one. I wish to express my gratitude to Melanie Miserez for handling with extreme care all the correspondence. I also owe a great debt of gratitude to Gérard Geiser for his outstanding TEX skill in the production of the volume and to Valentin Rousson who generously worked along with Gérard to make the production faster.

I wish to acknowledge the generous support of the Swiss National Science Foundation (Grant No 2101-49'913.96), the Swiss Academy of Humanities and Social Sciences and the University of Neuchâtel. Without the financial aid of these agencies the conference could not have been held.

I am grateful to all those who participated the conference, and to the organizers of the invited sessions Dennis Cook, Willem Heiser, Jana Jureckova, Regina Liu, Joe McKean, Stephan Morgenthaler, Hans Nyquist, Wolgang Polasek, Steve Portnoy, Peter Rousseeuw, Gabreila Stangenhaus, Takeaki Kaiya, Maurizio Vichi, Jinde Wang, and Joe Whittaker, and certainly, to the invited persons whose contribution made this volume possible.

Finally, on the other side of the Atlantic, David Ruppert, James Sanders and Patti Shankland, did not stop their encouragement. Having the volume ready in time represents a considerable investment of their efforts and I do thank them very sincerely.

It takes courage, good staff and a great number of colleagues to organize a conference. I certainly would not recommand this burden to anyone but the insane.

University of Neuchâtel
Switzerland
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Yadolah Dodge
Editor