Efficient And Adaptive Estimation For Semiparametric Models

Motion estimation is a long-standing cornerstone of image and video processing. Most notably, motion estimation serves as the foundation for many of today's ubiquitous video coding standards including H.264. Motion estimators also play key roles in countless other applications that serve the consumer, industrial, biomedical, and military sectors. Of the many available motion estimation techniques, optical flow is widely regarded as most flexible. The flexibility offered by optical flow is particularly useful for complex registration and interpolation problems, but comes at a considerable computational expense. As the volume and dimensionality of data that motion estimators are applied to continue to grow, that expense becomes more and more costly. Control grid motion estimators based on optical flow can accomplish motion estimation with flexibility similar to pure optical flow, but at a fraction of the computational expense. Control grid methods also offer the added benefit of representing motion far more compactly than pure optical flow. This booklet explores control grid motion estimation and provides implementations of the approach that apply to data of multiple dimensionalities. Important current applications of control grid methods including registration and interpolation are also developed.

This dissertation develops methodology for data-adaptive estimation of parameters defined on longitudinal data structures, while this abstract serves as an introduction to the material covered herein. The dissertation is organized into three related, but distinct chapters. Each chapter considers a similar data structure, wherein subjects are enrolled and followed over a period of time to obtain additional measurements, for example their failure status. During this followup period, subjects may drop out and therefore researchers are unable to observe the entire study population at all time points. Using the observed data, this dissertation develops asymptotically efficient estimators that may draw valid inferences on the original study population. Data from preventive vaccine trials serve as the motivation for much of the work in this dissertation. In such trials, subjects are randomized to receive an active vaccine or placebo vaccine and are subsequently followed over some period of time to ascertain infection status. This infection data may be augmented with pathogen genetic data. Scientific interest may lie in assessing the vaccine's efficacy to prevent infections of a certain genotype; this problem is considered in Chapter 1. Researchers may possess additional information on the expected incidence of an infection in the population under study. For example, such information may be ascertained from previous studies in the same population. In Chapter 2, we show how this information may be included in the estimation procedure to improve performance. The third and final chapter explores the construction of estimators that enjoy the unique property of being robust to model misspecification in terms of both estimation and inference drawn from the estimator.

This book focuses on the topic of improving software quality using adaptive control approaches. As software systems grow in complexity, some of the central challenges include their ability to self-manage and adapt at run time, responding to changing user

needs and environments, faults, and vulnerabilities. Control theory approaches presented in the book provide some of the answers to these challenges. The book weaves together diverse research topics (such as requirements engineering, software development processes, pervasive and autonomic computing, service-oriented architectures, on-line adaptation of software behavior, testing and QoS control) into a coherent whole. Written by world-renowned experts, this book is truly a noteworthy and authoritative reference for students, researchers and practitioners to better understand how the adaptive control approach can be applied to improve the quality of software systems. Book chapters also outline future theoretical and experimental challenges for researchers in this area. Contents:Prioritizing Coverage-Oriented Testing Process — An Adaptive-Learning-Based Approach and Case Study (Fevzi Belli, Mubariz Eminov, Nida Gökçe & W Eric Wong)Statistical Evaluation Methods for V&V of Neuro-Adaptive Systems (Y Liu, J Schumann & B Cukic)Adaptive Random Testing (Dave Towey)Transparent Shaping: A Methodology for Adding Adaptive Behavior to Existing Software Systems and Applications (S Masoud Sadjadi, Philip K McKinley & Betty H C Cheng)Rule Extraction to Understand Changes in an Adaptive System (Marjorie A Darrah & Brian J Taylor)Requirements Engineering Via Lyqpunov Analysis for Adaptive Flight Control Systems (Giampiero Campa, Marco Mammarella, Mario L Fravolini & Bojan Cukic)Quantitative Modeling for Incremental Software Process Control (Scott D Miller, Raymond A DeCarlo & Aditya P Mathur)Proactive Monitoring and Control of Workflow Execution in Adaptive Service-based Systems (Stephen S Yau & Dazhi Huang)Accelerated Life Tests and Software Aging (Rivalino Matias Jr & Kishor S Trivedi) Readership: Students, researchers and practitioners in software engineering, as well as applied optimization and control theory. Keywords:Software Quality;Control;Software Cybernetics

Control Grid Motion Estimation for Efficient Application of Optical Flow

Adaptive Filters

Adaptive and Efficient Quantile Estimation

Nonparametric Methods

Quantification of Uncertainty: Improving Efficiency and Technology

Accurate estimation and tracking of power quality disturbances requires efficient adaptive model based techniques which should have elegant structures to be implemented in practical systems. Adaptive filters have been used as a popular estimator to track the time-varying power quality events, but the performance is limited due to higher order nonlinearity exists in system dynamics. Harmonics generated in the generation and distribution system are one of the critical power quality issues to be addressed properly. Least mean square (LMS) and recursive least square (RLS) based adaptive estimation models can be used to track the harmonic amplitudes and phases in practical

power system applications. Due to time varying nature of harmonic parameters, modifications have to be incorporated in adaptive filters based modeling during estimation of the harmonic parameters and decaying DC components present in the distorted power signals. Volterra expansions can be combined with the adaptive filtering to improve the estimation accuracy and enhance the convergence rate of the estimation model. Normal mode theory provides an efficient description of signals which propagate axially in the SOFAR channel and are detectable at long ranges. Mode amplitudes and their second order statistics are useful in studies of long-range acoustic propagation and for applications such as Matched Mode Processing (MMP) and Matched Field Tomography (MFT). The purpose of this research is to investigate techniques for estimating the average power in the modes of a signal given pressure measurements from a vertical line array. This thesis develops the problem of mode estimation within a general array processing framework which includes both deterministic and stochastic characterizations of the modal structure. A review of conventional modal beamforming indicates that these methods provide poor resolution in low signal-to-noise ratio environments. This is not surprising since standard estimation techniques rely on minimizing a squared error criterion without regard to the ambient noise. The primary contribution of this thesis is an adaptive estimator for coherent modes that is based on a method suggested by Ferrara and Parks for array processing using diversely-polarized antennas. Two formulations of the adaptive method are investigated using a combination of analytical techniques and numerical simulations. The performance evaluation considers the following issues: (i) power level of the noise, (ii) orthogonality of the sampled modeshapes, (iii) number of data snapshots, and (iv) coherence of the signal. The new approach is fundamentally different from other modal estimators such as those used in MMP because it is data-adaptive and maximizes the received power instead of minimizing the squared error. As a result, the new methods perform significantly better than least squares in high noise environments. Specifically, the Ferrara/Parks formulations are able to maintain nulls in the modal spectrum since they do not suffer the bias error that significantly affects the least squares processor. A second contribution of the thesis is an extension of the coherent

estimator to facilitate estimation of phase-randomized modes. Although the results of this work are preliminary, the extended formulation appears to offer several advantages over least squares in certain cases.

Stable autoregressive models of known finite order are considered with martingale differences errors scaled by an unknown nonparametric time-varying function generating heterogeneity. An important special case involves structural change in the error variance, but in most practical cases the pattern of variance change over time is unknown and may involve shifts at unknown discrete points in time, continuous evolution or combinations of the two. This paper develops kernel-based estimators of the residual variances and associated adaptive least squares (ALS) estimators of the autoregressive coefficients. These are shown to be asymptotically efficient, having the same limit distribution as the infeasible generalized least squares (GLS). Comparisons of the efficient procedure and ordinary least squares (OLS) reveal that least squares can be extremely inefficient in some cases while nearly optimal in others. Simulations show that, when least squares work well, the adaptive estimators perform comparably well, whereas when least squares work poorly, major efficiency gains are achieved by the new estimators.

Mathematical Statistics and Applications

From Deconvolution to Lévy Processes

Adaptive Computational Methods for Partial Differential Equations

Celebrating Statistics

Essays on History and Methodology

Adaptive filtering is a topic of immense practical and theoretical value, having applications in areas ranging from digital and wireless communications to biomedical systems. This book enables readers to gain a gradual and solid introduction to the subject, its applications to a variety of topical problems, existing limitations, and extensions of current theories. The book consists of eleven parts?each part containing a series of focused lectures and ending with bibliographic comments, problems, and computer projects with MATLAB solutions.

This research began in the summer of 2006. During that summer a method was developed to estimate the gravity gradient as well as the nadir vector of a Plug-and-Play [PNP] satellite. This was done based on the assumptions that there were perturbations in the satellite model that kept the satellite from knowing this information a priori. An indirect adaptive estimation scheme was used to accomplish this goal. However it is impractical to do this for each perturbation in the plant. By the very nature of PNP Satellites, there could be errors in among other things,

reaction wheel mounting/orientation, star tracker location/orientation, satellite center of mass (COM), and payload location/orientation. An adaptive scheme to estimate each error is not efficient and ultimately is not the goal. The goal is to accurately control the satellite despite the numerous and possibly large errors inherent in PNP Satellite models. Instead of using indirect adaptive methods to gain precise knowledge of the plant, direct adaptive control methods will be used to overcome the errors of the plant and gain precise control of the satellite. One way of overcoming the inaccuracies of the model is to assume the spacecraft dynamics are largely unknown. A shift in philosophy was then taken from indirect adaptive methods to direct methods. Direct Reference and Model Reference Adaptive Controller [DRAC & DMRAC] are then developed that will precisely and robustly control the attitude of a PNP satellite. The benefits demonstrated by the DMRAC methodologies extend well past plug and play satellites and could be utilized in any space application.

The first systematic, book-length treatment of the subject. Begins with a general introduction and the formal mathematical background behind qualitative and quantitative robustness. Stresses concepts. Provides selected numerical algorithms for computing robust estimates, as well as convergence proofs. Tables contain quantitative robustness information for a variety of estimates.

Adaptive Estimation of Autoregression Models with Time-Varying Variances

Festschrift for Constance Van Eeden

Efficient and Adaptive Estimation for Semiparametric Models

Papers in Honour of Sir David Cox on His 80th Birthday

Adaptive Control Approach for Software Quality Improvement

In adaptive estimation, it is often considered that an estimator has made a mistake if the component estimator chosen for use is not the most efficient for the distribution sampled. Theoretical and simulation results point to a fallacy in this line of thought. The Monte Carlo study involves extension of the Princeton Swindle to distributions conditional on a location-and scale free statistic, and to the uniform. The results give a partial explanation for the sometimes surprising robustness of adaptive L-estimators. (Author).

This book explores four guiding themes – reduced order modelling, high dimensional problems, efficient algorithms, and applications – by reviewing recent algorithmic and mathematical advances and the development of new research directions for uncertainty quantification in the context of partial differential equations with random inputs. Highlighting the most promising approaches for (near-) future improvements in the way uncertainty quantification problems in the partial differential equation setting are solved, and gathering contributions by leading international experts, the book's content will impact the scientific, engineering, financial, economic, environmental, social, and commercial sectors.

This book presents a detailed description of the development of statistical theory. In the mid twentieth century, the development of mathematical statistics underwent an enduring change, due to the advent of more refined mathematical tools. New concepts like sufficiency, superefficiency, adaptivity etc. motivated scholars to reflect upon the interpretation of mathematical concepts in terms of their real-world relevance. Questions concerning the optimality of estimators, for instance, had remained unanswered for decades, because a meaningful concept of optimality (based on the regularity of the estimators, the representation of their limit distribution and assertions about their concentration by means of Anderson's Theorem) was not yet available. The rapidly developing asymptotic theory provided approximate answers to questions for which non-asymptotic theory had found no satisfying solutions. In four engaging essays, this book presents a detailed description of how the use of mathematical methods stimulated the development of a statistical theory. Primarily focused on

methodology, questionable proofs and neglected questions of priority, the book offers an intriguing resource for researchers in theoretical statistics, and can also serve as a textbook for advanced courses in statisticc.

Robust Statistics

Adaptive Estimation of Autoregressive Models with Time-Varying Variances

Essays on Semiparametric Efficient Adaptive Estimation and Empirical Applications in Finance [microform]

Adaptive Estimation of Acoustic Normal Modes

A Conditional Property of Adaptive Estimators

This book deals with estimation in situations in which there is believed to be enough information to model parametrically some, but not all of the features of a data set. Such models have arisen in a wide context in recent years, and involve new nonlinear estimation procedures. Statistical models of this type are directly applicable to fields such as economics, epidemiology, and astronomy.

In response to the US FDA's Critical Path Initiative, innovative adaptive designs are being used more and more in clinical trials due to their flexibility and efficiency, especially during early phase development. Handbook of Adaptive Designs in Pharmaceutical and Clinical Development provides a comprehensive and unified presentation of the princip

Order selection based on criteria by Akaike (1974), AIC, Schwarz (1978), BIC or Hannan and Quinn (1979) HIC is often applied in empirical examples. They have been used in the context of order selection of weakly dependent ARMA models, AR models with unit or explosive roots and in the context of regression or distributed lag regression models for weakly dependent data. On the other hand, it has been observed that data exhibits the so-called strong dependence in many areas. Because of the interest in this type of data, our main objective in this paper is to examine order selection for a distributed lag regression model that covers in a unified form weak and strong dependence. To that end, and because of the possible adverse properties of the aforementioned criteria, we propose a criterion function based on the decomposition of the variance of the innovations of the model in terms of their frequency components. Assuming that the order of the model is finite, say po , we show that the proposed criterion consistently estimates, po. In addition, we show that adaptive estimation for the parameters of the model is possible without knowledge of po . Finally, a small Monte-Carlo experiment is included to illustrate the finite sample performance of the proposed criterion.

Frontiers in Statistics

QUIET selected contributions

Robust and Efficient Adaptive Estimation of Binary-choice Regression Models

Research Directions in Computational Mechanics

Efficient and Adaptive Estimation for Semiparametric ModelsSpringer

Computational mechanics is a scientific discipline that marries physics, computers, and mathematics to emulate natural physical phenomena. It is a technology that allows scientists to study and predict the performance of various products--important for research and development in the industrialized world. This book describes current trends and future research directions in computational mechanics in areas where gaps exist in current knowledge and where major advances are crucial to continued technological developments in the United States.

During the last two decades, many areas of statistical inference have experienced phenomenal growth. This book

presents a timely analysis and overview of some of these new developments and a contemporary outlook on the various frontiers of statistics. Eminent leaders in the field have contributed 16 review articles and 6 research articles covering areas including semi-parametric models, data analytical nonparametric methods, statistical learning, network tomography, longitudinal data analysis, financial econometrics, time series, bootstrap and other re-sampling methodologies, statistical computing, generalized nonlinear regression and mixed effects models, martingale transform tests for model diagnostics, robust multivariate analysis, single index models and wavelets. This volume is dedicated to Prof. Peter J Bickel in honor of his 65th birthday. The first article of this volume summarizes some of Prof. Bickel's distinguished contributions. Contents:Our Steps on the Bickel Way (K Doksum & Y Ritov)Semiparametric Models: A Review of Progress since BKRW (1993) (J A Wellner et al.)Efficient Estimator for Time Series (A Schick & W Wefelmeyer)On the Efficiency of Estimation for a Single-Index Model (Y Xia & H Tong)Estimating Function Based Cross-Validation (M J Van der Laan & D Rubin)Powerful Choices: Tuning Parameter Selection Based on Power (K Doksum & C Schafer)Nonparametric Assessment of Atypicality (P Hall & J W Kay)Selective Review on Wavelets in Statistics (Y Wang)Model Diagnostics via Martingale Transforms: A Brief Review (H L Koul)Boosting Algorithms: With an Application to Bootstrapping Multivariate Time Series (P Bühlmann & R W Lutz)Bootstrap Methods: A Review (S N Lahiri)An Expansion for a Discrete Non-Lattice Distribution (F Götze & W R van Zwet)An Overview on Nonparametric and Semiparametric Techniques for Longitudinal Data (J Fan & R Li)Regressing Longitudinal Response Trajectories on a Covariate (H-G Müller & F Yao)Statistical Physics and Statistical Computing: A Critical Link (J D Servidea & X-L Meng)Network Tomography: A Review and Recent Developments (E Lawrence et al.)Likelihood Inference for Diffusions: A Survey (Y Aït-Sahalia)Nonparametric Estimation of Production Efficiency (B U Park et al.)Convergence and Consistency of Newton's Algorithm for Estimating Mixing Distribution (J K Ghosh & S T Tokdar)Mixed Models: An Overview (J Jiang & Z Ge)Robust Location and Scatter Estimators in Multivariate Analysis (Y Zuo)Estimation of the Loss of an Estimate (W H Wong) Readership: Advanced graduate students and researchers in statistics. Keywords:Semiparametrics;Financial Econometrics;Longitudinal Data;Efficient Estimation;Single Index;Atypicality;Martingale Transforms;Boosting;Non-Lattice Distributions;Longitudinal Data;Network Tomography;Mixed ModelsKey Features:Gathers contributions from renowned researchers such as Kjell Doksum and Peter HallA must-have volume for researchers in statistics

On Adaptive Tests

Spacecraft Attitude Control Using Direct Model Reference Adaptive Control

Oracle Efficient Estimation and Forecasting with the Adaptive LASSO and the Adaptive Group LASSO in Vector Autoregressions

Efficient Recursive Estimation and Adaptive Control in Stochastic Regression and ARMAX Models

Statistical Decision Theory and Related Topics V

The work is an application of adaptive estimation to temperature forecasting. It is presented as a feasibility study demonstrating the efficacy of the adaptive approach. The local station temperature forecasting problem is chosen to focus the discussion on the efficiency of the filtering algorithm by using only surface level single geographic location data. A diagnostic study is made to ascertain the appropriate statistical properties of the weather data for algorithm selection. A phenomenalistic approach is taken since no differential equation or complete quantitative description exists to describe the temperature process. The Lainiotis Filter is chosen for model identification and classification as well as prediction results. The Lainiotis Filter, given in the Partition Theorem, provides an efficient, powerful tool in the application of adaptive estimation techniques. The feasibility of the adaptive approach is established with comparative results with previous objective forecast methods while greatly reducing the amount and variety of required input data. (Author).

Finite Element Methods are used for numerous engineering applications where numerical solutions of partial differential equations are needed. As computers can now deal with the millions of parameters used in these methods, automatic error estimation and automatic adaptation of the utilised method (according to this error estimation), has become a hot research topic. This text offers comprehensive coverage of this new field of automatic adaptation and error estimation, bringing together the work of eight outstanding researchers in this field who have completed a six year national research project within the German Science Foundation. The result is a state-of-the-art work in true reference style. Each chapter is self-contained and covers theoretical, algorithmic and software presentations as well as solved problems. A main feature consists of several carefully elaborated benchmarks of 2D- and 3D- applications. * First book to go beyond the Finite Element Method in itself * Covers material from a new research area * Presents benchmarks of 2D- and 3D-applications * Fits with the new trend for genetic strategies in engineering

Stable autoregressive models of known finite order are considered with martingale differences errors scaled by an unknown nonparametric time-varying function generating heterogeneity. An important special case involves structural change in the error variance, but in most practical cases the pattern of variance change over time is unknown and may involve shifts at unknown discrete points in time, continuous evolution or combinations of the two. This paper develops kernel-based estimators of the residual variances and associated adaptive least squares (ALS) estimators of the autoregressive coefficients. These are shown to be asymptotically efficient, having the same limit distribution as the infeasible generalized least squares (GLS). Comparisons of the efficient procedure and the ordinary least squares (OLS) reveal that least squares can be extremely inefficient in some cases while nearly optimal in others. Simulations show that, when least squares work well, the adaptive estimators perform comparably well, whereas when least squares work poorly, major efficiency gains are achieved by the new estimators.

Efficient Computation of Global Illumination Based on Adaptive Density Estimation
Theory of Rank Tests
Application to Adaptive Estimation to Temperature Forecasting
Adaptive Efficient Estimation of Regression Coefficients when Some Regressors are Missing
Adaptive Estimation in Time Series Regression Models

List of participants; Elliptic equations; Parabolic equations; Hyperbolic equations.

The first edition of Theory of Rank Tests (1967) has been the precursor to a unified and theoretically motivated treatise of the basic theory of tests based on ranks of the sample observations. For more than 25 years, it helped raise a generation of statisticians in cultivating their theoretical research in this fertile area, as well as in using these tools in their application oriented research. The present edition not only aims to revive this classical text by updating the findings but also by incorporating several other important areas which were either not properly developed before 1965 or have gone through an evolutionary development during the past 30 years. This edition therefore aims to fulfill the needs of academic as well as professional statisticians who want to pursue nonparametrics in their academic projects, consultation, and applied research works. Asymptotic Methods Nonparametrics Convergence of Probability Measures Statistical Inference

This volume presents selections of Peter J. Bickel's major papers, along with comments on their novelty and impact on the subsequent development of statistics as a discipline. Each of the eight parts concerns a particular area of research and provides new commentary by experts in the area. The parts range from Rank-Based Nonparametrics to Function Estimation and Bootstrap Resampling. Peter's amazing career encompasses the majority of statistical developments in the last half-century or about about half of the entire history of the systematic development of statistics. This volume shares insights on these exciting statistical developments with future generations of statisticians. The compilation of supporting material about Peter's life and work help readers understand the environment under which his research was conducted. The material will also inspire readers in their own research-based pursuits. This volume includes new photos of Peter Bickel, his biography, publication list, and a list of his students. These give the reader a more complete picture of Peter Bickel as a teacher, a friend, a colleague, and a family man.

Data-adaptive Estimation in Longitudinal Data Structures with Applications in Vaccine Efficacy Trials

Mathematical Statistics

Power System Harmonics Estimation Using Adaptive Filters

Efficient Adaptive Nonparametric Estimation in Heteroscedastic Regression Models

Efficient Estimation in the Two-sample Semiparametric Location-scale Model and the Orientation Shift Model

Sir David Cox is among the most important statisticians of the past half-century. He has made pioneering and highly influential contributions to a uniquely wide range of topics in statistics and applied probability. His teaching has inspired generations of students, and many well-known researchers have begun as his graduate students or have worked with him at early stages of their careers. Legions of others have been stimulated and enlightened by the clear, concise, and directexposition exemplified by his many books, papers, and lectures. This book presents a collection of chapters by major statistical researchers who attended a conference held at the University of Neuchatel in July 2004 to celebrate David Cox's 80th birthday. Each chapter is carefully crafted and collectivelypresent current developments across a wide range of

research areas from epidemiology, environmental science, finance, computing and medicine.Edited by Anthony Davison, Ecole Polytechnique Federale de Lausanne, Switzerland; Yadolah Dodge, University of Neuchatel, Switzerland; and N. Wermuth, Goteborg University, Sweden, with chapters by Ole E. Barndorff-Nielsen, Sarah C. Darby, Christina Davies, Peter J. Diggle, David Firth, Peter Hall, Valerie S. Isham, Kung-Yee Liang, Peter McCullagh, Paul McGale, Amilcare Porporato, Nancy Reid, Brian D. Ripley, Ignacio Rodriguez-Iturbe, Andrea Rotnitzky, Neil Shephard, Scott L. Zeger, andincluding a brief biography of David Cox, this book is suitable for students of statistics, epidemiology, environmental science, finance, computing and medicine, and academic and practising statisticians.

Classical developments. Linear models. Order statistics and empitical distribution. Estimation procedures. Stochastic aproximation and density estimation. Life testing and reliability. Miscellaneous topics. Applications. Tables.

The Fifth Purdue International Symposium on Statistical Decision The was held at Purdue University during the period of ory and Related Topics June 14-19,1992. The symposium brought together many prominent leaders and younger researchers in statistical decision theory and related areas. The format of the Fifth Symposium was different from the previous symposia in that in addition to the 54 invited papers, there were 81 papers presented in contributed paper sessions. Of the 54 invited papers presented at the sym posium, 42 are collected in this volume. The papers are grouped into a total of six parts: Part 1 - Retrospective on Wald's Decision Theory and Sequential Analysis; Part 2 - Asymptotics and Nonparametrics; Part 3 - Bayesian Analysis; Part 4 - Decision Theory and Selection Procedures; Part 5 - Probability and Probabilistic Structures; and Part 6 - Sequential, Adaptive, and Filtering Problems. While many of the papers in the volume give the latest theoretical developments in these areas, a large number are either applied or creative review papers.

Selected Proceedings of the Symposium on Estimating Functions

Selected Works of Peter J. Bickel

Error-controlled Adaptive Finite Elements in Solid Mechanics

Handbook of Adaptive Designs in Pharmaceutical and Clinical Development

Consistent Order Selection with Strongly Dependent Data and its Application to Efficient Estimation