Stochastic Approximation and Its Applications

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Lennart Ljung,Georg Ch. Pflug,Harro Walk

Stochastic Approximation And Its Applications:

    Stochastic Approximation and Its Applications Hanfu Chen,2002-08-31 Estimating unknown parameters based on observation data conta ing information about the parameters is ubiquitous in diverse areas of both theory and application For example in system identification the unknown system coefficients are estimated on the basis of input output data of the control system in adaptive control systems the adaptive control gain should be defined based on observation data in such a way that the gain asymptotically tends to the optimal one in blind ch nel identification the channel coefficients are estimated using the output data obtained at the receiver in signal processing the optimal weighting matrix is estimated on the basis of observations in pattern classifi tion the parameters specifying the partition hyperplane are searched by learning and more examples may be added to this list All these parameter estimation problems can be transformed to a root seeking problem for an unknown function To see this let note the observation at time i e the information available about the unknown parameters at time It can be assumed that the parameter under estimation denoted by is a root of some unknown function This is not a restriction because for example may serve as such a function   *Stochastic Approximation and Its Applications* Han-Fu Chen,2013-04-18 Estimating unknown parameters based on observation data conta ing information about the parameters is ubiquitous in diverse areas of both theory and application For example in system identification the unknown system coefficients are estimated on the basis of input output data of the control system in adaptive control systems the adaptive control gain should be defined based on observation data in such a way that the gain asymptotically tends to the optimal one in blind ch nel identification the channel coefficients are estimated using the output data obtained at the receiver in signal processing the optimal weighting matrix is estimated on the basis of observations in pattern classifi tion the parameters specifying the partition hyperplane are searched by learning and more examples may be added to this list All these parameter estimation problems can be transformed to a root seeking problem for an unknown function To see this let note the observation at time i e the information available about the unknown parameters at time It can be assumed that the parameter under estimation denoted by is a root of some unknown function This is not a restriction because for example may serve as such a function   *Stochastic Approximation and Its Applications* Han-Fu Chen,2010-12-10 Estimating unknown parameters based on observation data conta ing information about the parameters is ubiquitous in diverse areas of both theory and application For example in system identification the unknown system coefficients are estimated on the basis of input output data of the control system in adaptive control systems the adaptive control gain should be defined based on observation data in such a way that the gain asymptotically tends to the optimal one in blind ch nel identification the channel coefficients are estimated using the output data obtained at the receiver in signal processing the optimal weighting matrix is estimated on the basis of observations in pattern classifi tion the parameters specifying the partition hyperplane are searched by learning and more examples may be added to this list All these parameter estimation problems can be

transformed to a root seeking problem for an unknown function To see this let note the observation at time i e the information available about the unknown parameters at time It can be assumed that the parameter under estimation denoted by is a root of some unknown function This is not a restriction because for example may serve as such a function

Stochastic approximation and its applications Madanlal T. Wasan,1967 *Stochastic Approximation and Recursive Algorithms and Applications* Harold Kushner,G. George Yin,2013-11-11 In recent years algorithms of the stochastic approximation type have found applications in new and diverse areas and new techniques have been developed for proofs of convergence and rate of convergence The actual and potential applications in signal processing have exploded New challenges have arisen in applications to adaptive control This book presents a thorough coverage of the ODE method used to analyze these algorithms Stochastic Approximation and Recursive Algorithms and Applications Harold Kushner,G. George Yin,2003-07-17 This book presents a thorough development of the modern theory of stochastic approximation or recursive stochastic algorithms for both constrained and unconstrained problems This second edition is a thorough revision although the main features and structure remain unchanged It contains many additional applications and results as well as more detailed discussion *Multidimensional Stochastic Approximation and Its Applications to Detection and Estimation* Anthony Katopis,1973 **Stochastic Approximation and Optimization of Random Systems** Lennart Ljung,Georg Ch. Pflug,Harro Walk,1992-03-31 The DMV seminar Stochastische Approximation und Optimierung zufalliger Systeme was held at Blaubeuren 28 5 4 6 1989 The goal was to give an approach to theory and application of stochas tic approximation in view of optimization problems especially in engineering systems These notes are based on the seminar lectures They consist of three parts I Foundations of stochastic approximation H Walk n Applicational aspects of stochastic approximation G PHug In Applications to adaptation ugorithms L Ljung The prerequisites for reading this book are basic knowledge in probability mathematical statistics optimization We would like to thank Prof M Barner and Prof G Fischer for the or ganization of the seminar We also thank the participants for their cooperation and our assistants and secretaries for typing the manuscript November 1991 L Ljung G PHug H Walk Table of contents I Foundations of stochastic approximation H Walk 1 Almost sure convergence of stochastic approximation procedures 2 2 Recursive methods for linear problems 17 3 Stochastic optimization under stochastic constraints 22 4 A learning model recursive density estimation 27 5 Invariance principles in stochastic approximation 30 6 On the theory of large deviations 43 References for Part I 45 11 Applicational aspects of stochastic approximation G PHug 7 Markovian stochastic optimization and stochastic approximation procedures 53 8 Asymptotic distributions 71 9 Stopping times 79 1O Applications of stochastic approximation methods 80 References for Part II 90 III Applications to adaptation algorithms L Computational Science and Its Applications - ICCSA 2010 David Taniar,Osvaldo Gervasi,Beniamino Murgante,Eric Pardede,Bernady O. Apduhan,2010-04-03 These multiple volumes LNCS volumes 6016 6017 6018 and 6019 consist of the peer reviewed papers from the 2010 International Conference on Compu tional Science

and Its Applications ICCSA2010 held in Fukuoka Japanduring March23 26 2010 ICCSA2010wasasuccessfuleventintheInternationalC ferences on Computational Science and Its Applications ICCSA conference ries previouslyheld in Suwon South Korea 2009 Perugia Italy 2008 Kuala Lumpur Malaysia 2007 Glasgow UK 2006 Singapore 2005 Assisi Italy 2004 Montreal Canada 2003 and as ICCS Amsterdam The Netherlands 2002 and San Francisco USA 2001 Computational science is a main pillar of most of the present research dustrial and commercial activities and plays a unique role in exploiting ICT novative technologies The ICCSA conference series has been providing a venue to researchers and industry practitioners to discuss new ideas to share complex problems and their solutions and to shape new trends in computational science ICCSA 2010 was celebrated at the host university Kyushu Sangyo Univ sity Fukuoka Japan as part of the university s 50th anniversary We would like to thank Kyushu Sangyo University for hosting ICCSA this year and for cluding this international event in their celebrations Also for the rst time this year ICCSA organized poster sessions that present on going projects on various aspects of computational sciences   *Martingale Limit Theory and Its Application* P. Hall,C. C. Heyde,2014-07-10 Martingale Limit Theory and Its Application discusses the asymptotic properties of martingales particularly as regards key prototype of probabilistic behavior that has wide applications The book explains the thesis that martingale theory is central to probability theory and also examines the relationships between martingales and processes embeddable in or approximated by Brownian motion The text reviews the martingale convergence theorem the classical limit theory and analogs and the martingale limit theorems viewed as the rate of convergence results in the martingale convergence theorem The book explains the square function inequalities weak law of large numbers as well as the strong law of large numbers The text discusses the reverse martingales martingale tail sums the invariance principles in the central limit theorem and also the law of the iterated logarithm The book investigates the limit theory for stationary processes via corresponding results for approximating martingales and the estimation of parameters from stochastic processes The text can be profitably used as a reference for mathematicians advanced students and professors of higher mathematics or statistics   Stochastic Approximation Vivek S. Borkar,2009-01-01   **Handbook of Monte Carlo Methods** Dirk P. Kroese,Thomas Taimre,Zdravko I. Botev,2013-06-06 A comprehensive overview of Monte Carlo simulation that explores the latest topics techniques and real world applications More and more of today s numerical problems found in engineering and finance are solved through Monte Carlo methods The heightened popularity of these methods and their continuing development makes it important for researchers to have a comprehensive understanding of the Monte Carlo approach Handbook of Monte Carlo Methods provides the theory algorithms and applications that helps provide a thorough understanding of the emerging dynamics of this rapidly growing field The authors begin with a discussion of fundamentals such as how to generate random numbers on a computer Subsequent chapters discuss key Monte Carlo topics and methods including Random variable and stochastic process generation Markov chain Monte Carlo featuring key algorithms such as

the Metropolis Hastings method the Gibbs sampler and hit and run Discrete event simulation Techniques for the statistical analysis of simulation data including the delta method steady state estimation and kernel density estimation Variance reduction including importance sampling latin hypercube sampling and conditional Monte Carlo Estimation of derivatives and sensitivity analysis Advanced topics including cross entropy rare events kernel density estimation quasi Monte Carlo particle systems and randomized optimization The presented theoretical concepts are illustrated with worked examples that use MATLAB a related Web site houses the MATLAB code allowing readers to work hands on with the material and also features the author s own lecture notes on Monte Carlo methods Detailed appendices provide background material on probability theory stochastic processes and mathematical statistics as well as the key optimization concepts and techniques that are relevant to Monte Carlo simulation Handbook of Monte Carlo Methods is an excellent reference for applied statisticians and practitioners working in the fields of engineering and finance who use or would like to learn how to use Monte Carlo in their research It is also a suitable supplement for courses on Monte Carlo methods and computational statistics at the upper undergraduate and graduate levels   *Mathematics of Finance* George Yin,Qing Zhang,2004 Contains papers based on talks given at the first AMS IMS SIAM Joint Summer Research Conference on Mathematics of Finance held at Snowbird This book includes such topics as modeling estimation optimization control and risk assessment and management It is suitable for students interested in mathematical finance   *Nonlinear Filters* Sueo Sugimoto,Masaya Murata,Katsumi Ohnishi,Genshiro Kitagawa,Hisashi Tanizaki,Katsuji Uosaki,Kazufumi Ito,Kiyotugu Takaba,Masaaki Murata,Masaki Yamakita,Sarah A. King,Shinji Ishihara,Tohru Katayama,Yukihiro Kubo,2020-12-10 This book covers a broad range of filter theories algorithms and numerical examples The representative linear and nonlinear filters such as the Kalman filter the steady state Kalman filter the H infinity filter the extended Kalman filter the Gaussian sum filter the statistically linearized Kalman filter the unscented Kalman filter the Gaussian filter the cubature Kalman filter are first visited Then the non Gaussian filters such as the ensemble Kalman filter and the particle filters based on the sequential Bayesian filter and the sequential importance resampling are described together with their recent advances Moreover the information matrix in the nonlinear filtering the nonlinear smoother based on the Markov Chain Monte Carlo the continuous discrete filters factorized filters and nonlinear filters based on stochastic approximation method are detailed 1 Review of the Kalman Filter and Related Filters 2 Information Matrix in Nonlinear Filtering 3 Extended Kalman Filter and Gaussian Sum Filter 4 Statistically Linearized Kalman Filter 5 The Unscented Kalman Filter 6 General Gaussian Filters and Applications 7 The Ensemble Kalman Filter 8 Particle Filter 9 Nonlinear Smoother with Markov Chain Monte Carlo 10 Continuous Discrete Filters 11 Factorized Filters 12 Nonlinear Filters Based on Stochastic Approximation Method   *Scientific and Technical Aerospace Reports* ,1988-10   *NASA-University Conference on Manual Control* ,1970   *Annual NASA-University Conference on Manual Control* ,1969   *Bayesian Time Series Models* David Barber,A. Taylan Cemgil,Silvia

Chiappa,2011-08-11 The first unified treatment of time series modelling techniques spanning machine learning statistics engineering and computer science   Chaos Theory: Modeling, Simulation And Applications - Selected Papers From The 3rd Chaotic Modeling And Simulation International Conference (Chaos2010) Christos H Skiadas,Ioannis Dimotikalis,Charilaos Skiadas,2011-05-31 The work done in chaotic modeling and simulation during the last decades has changed our views of the world around us and has introduced new scientific tools methods and techniques Advanced topics of these achievements are included in this volume on Chaos Theory which focuses on Chaotic Modeling Simulation and Applications of the nonlinear phenomena This volume includes the best papers presented in the 3rd International Conference on CHAOS This interdisciplinary conference attracted people from many scientific fields dealing with chaos nonlinear dynamics fractals and the works presented and the papers included here are of particular interest that could provide a broad understanding of chaos in its various forms The chapters relate to many fields of chaos including Dynamical and Nonlinear Systems Attractors and Fractals Hydro Fluid Dynamics and Mechanics Chaos in Meteorology and Cosmology Chaos in Biology and Genetics Chaotic Control Chaos in Economy and Markets and Computer Composition and Chaotic Simulations including related applications   **Recursive Identification and Parameter Estimation** Han-Fu Chen,Wenxiao Zhao,2014-06-23 Recursive Identification and Parameter Estimation describes a recursive approach to solving system identification and parameter estimation problems arising from diverse areas Supplying a systematic description of recursive estimation methods it provides rigorous theoretical analysis of recursive solutions to problems of stochastic systems Presenting the material and proposed algorithms in a manner that makes it easy to understand the book provides readers with the modeling and identification skills required for successful theoretical research and effective applications

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