

APPLICATIONS  
OF MATHEMATICS

STOCHASTIC  
MODELLING  
AND APPLIED  
PROBABILITY

35

Harold J. Kushner  
G. George Yin

# Stochastic Approximation and Recursive Algorithms and Applications

Second Edition



Springer

# Stochastic Approximation And Recursive Algorithms And Applications 2nd Edition

**Emilie Sanchez**



## **Stochastic Approximation And Recursive Algorithms And Applications 2nd Edition:**

**Stochastic Approximation and Recursive Algorithms and Applications** Harold Kushner, G. George Yin, 2006-05-04

The basic stochastic approximation algorithms introduced by Robbins and Monro and by Kiefer and Wolfowitz in the early 1950s have been the subject of an enormous literature both theoretical and applied. This is due to the large number of applications and the interesting theoretical issues in the analysis of dynamically defined stochastic processes. The basic paradigm is a stochastic difference equation such as  $Y_{n+1} = Y_n + \alpha_n (g(Y_n) + \epsilon_n)$  where  $Y_n$  takes its values in some Euclidean space,  $Y$  is a random variable and the step size  $\alpha_n$  is small and might go to zero as  $n \rightarrow \infty$ . In its simplest form  $Y_n$  is a parameter of a system and the random vector  $\epsilon_n$  is a function of  $n$  noise corrupted observations taken on the system when the parameter is set to  $Y_n$ . One recursively adjusts the parameter so that some goal is met asymptotically. This book is concerned with the qualitative and asymptotic properties of such recursive algorithms in the diverse forms in which they arise in applications. There are analogous continuous time algorithms but the conditions and proofs are generally very close to those for the discrete time case. The original work was motivated by the problem of finding a root of a continuous function  $g$  where the function is not known but the experimenter is able to take noisy measurements at any desired value of  $Y$ . Recursive methods for root finding are common in classical numerical analysis and it is reasonable to expect that appropriate stochastic analogs would also perform well.

**Stochastic Approximation and Recursive Algorithms and Applications**  
Harold Kushner, G. George Yin, 2014-01-15

**Stochastic Approximation Algorithms and Applications**, 1997  
There is a thorough treatment of rate of convergence, iterate averaging, high dimensional problems, ergodic cost problems, stability methods for correlated noise and decentralized and asynchronous algorithms.

**Handbook of Simulation Optimization**  
Michael C Fu, 2014-11-13  
The Handbook of Simulation Optimization presents an overview of the state of the art of simulation optimization providing a survey of the most well established approaches for optimizing stochastic simulation models and a sampling of recent research advances in theory and methodology. Leading contributors cover such topics as discrete optimization via simulation, ranking and selection, efficient simulation, budget allocation, random search methods, response surface methodology, stochastic gradient estimation, stochastic approximation, sample average approximation, stochastic constraints, variance reduction techniques, model based stochastic search methods and Markov decision processes. This single volume should serve as a reference for those already in the field and as a means for those new to the field for understanding and applying the main approaches. The intended audience includes researchers, practitioners and graduate students in the business, engineering, fields of operations research, management science, operations management and stochastic control as well as in economics, finance and computer science.

*Distributed Strategic Learning for Wireless Engineers* Hamidou Tembine, 2018-10-08  
Although valued for its ability to allow teams to collaborate and foster coalitional behaviors among the participants, game theory's application to networking systems is not without challenges. Distributed Strategic Learning for

Wireless Engineers illuminates the promise of learning in dynamic games as a tool for analyzing network evolution and underlines the potential pitfalls and difficulties likely to be encountered Establishing the link between several theories this book demonstrates what is needed to learn strategic interaction in wireless networks under uncertainty randomness and time delays It addresses questions such as How much information is enough for effective distributed decision making Is having more information always useful in terms of system performance What are the individual learning performance bounds under outdated and imperfect measurement What are the possible dynamics and outcomes if the players adopt different learning patterns If convergence occurs what is the convergence time of heterogeneous learning What are the issues of hybrid learning How can one develop fast and efficient learning schemes in scenarios where some players have more information than the others What is the impact of risk sensitivity in strategic learning systems How can one construct learning schemes in a dynamic environment in which one of the players do not observe a numerical value of its own payoffs but only a signal of it How can one learn unstable equilibria and global optima in a fully distributed manner The book provides an explicit description of how players attempt to learn over time about the game and about the behavior of others It focuses on finite and infinite systems where the interplay among the individual adjustments undertaken by the different players generates different learning dynamics heterogeneous learning risk sensitive learning and hybrid dynamics

**Cycle Representations of Markov Processes** Sophia L. Kalpazidou, 2007-03-06 This book provides new insight into Markovian dependence via the cycle decompositions It presents a systematic account of a class of stochastic processes known as cycle or circuit processes so called because they may be defined by directed cycles An important application of this approach is the insight it provides to electrical networks and the duality principle of networks This expanded second edition adds new advances which reveal wide ranging interpretations of cycle representations such as homologic decompositions orthogonality equations Fourier series semigroup equations and disintegration of measures The text includes chapter summaries as well as a number of detailed illustrations

*System Identification with Quantized Observations* Le Yi Wang, G. George Yin, Ji-Feng Zhang, Yanlong Zhao, 2010-05-18 This book presents recently developed methodologies that utilize quantized information in system identification and explores their potential in extending control capabilities for systems with limited sensor information or networked systems The results of these methodologies can be applied to signal processing and control design of communication and computer networks sensor networks mobile agents coordinated data fusion remote sensing telemedicine and other fields in which noise corrupted quantized data need to be processed System Identification with Quantized Observations is an excellent resource for graduate students systems theorists control engineers applied mathematicians as well as practitioners who use identification algorithms in their work

**Partially Observed Markov Decision Processes** Vikram Krishnamurthy, 2016-03-21 This book covers formulation algorithms and structural results of partially observed Markov decision processes whilst linking theory to real world applications in controlled sensing Computations are kept to a

minimum enabling students and researchers in engineering operations research and economics to understand the methods and determine the structure of their optimal solution Approximate Iterative Algorithms Anthony Louis Almudevar,2014-02-18 Iterative algorithms often rely on approximate evaluation techniques which may include statistical estimation computer simulation or functional approximation This volume presents methods for the study of approximate iterative algorithms providing tools for the derivation of error bounds and convergence rates and for the optimal design of such **Dynamic Systems and Applications** ,2006 Intelligent Systems and Automation Lotfi Beji,Samir Otmane,Azgal Abichou,2009-03-09 The aim of CISA 09 is to present the latest research and application results emerging from new research and technological developments of complex systems and intelligent machines acting on known or unknown virtual or real environments in an autonomous way or in cooperation with humans This field requires skills in automation and control perception of the environment human computer interfaces mechanics and design simulation etc It also aims at encouraging scientific cooperation between North and South and promoting scientific exchanges through a durable event **Newsletter** New Zealand Mathematical Society,2002 Stochastic Recursive Algorithms for Optimization S. Bhatnagar,H.L. Prasad,L.A. Prashanth,2012-08-11 Stochastic Recursive Algorithms for Optimization presents algorithms for constrained and unconstrained optimization and for reinforcement learning Efficient perturbation approaches form a thread unifying all the algorithms considered Simultaneous perturbation stochastic approximation and smooth fractional estimators for gradient and Hessian based methods are presented These algorithms are easily implemented do not require an explicit system model and work with real or simulated data Chapters on their application in service systems vehicular traffic control and communications networks illustrate this point The book is self contained with necessary mathematical results placed in an appendix The text provides easy to use off the shelf algorithms that are given detailed mathematical treatment so the material presented will be of significant interest to practitioners academic researchers and graduate students alike The breadth of applications makes the book appropriate for reader from similarly diverse backgrounds workers in relevant areas of computer science control engineering management science applied mathematics industrial engineering and operations research will find the content of value SIAM Journal on Control and Optimization Society for Industrial and Applied Mathematics,2008 **Mathematical Reviews** ,2005 **Dynamics of Continuous, Discrete & Impulsive Systems** ,2005 **Adaptive Control Variates in Monte Carlo Simulation** Sujin Kim,2006 *KI ...* ,2005 **Journal of Statistical Planning and Inference** ,1994 **Journal of Machine Learning Research** ,2007 An international forum covering all areas of machine learning

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