

G. A. Mikhailov

Optimization of Weighted

Monte Carlo Methods



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Optimization Of Weighted Monte Carlo Methods

Gautami Devar



Optimization Of Weighted Monte Carlo Methods:

Optimization of Weighted Monte Carlo Methods Gennadii A. Mikhailov, 1992-02-13 The Monte Carlo method is based on the numerical realization of natural or artificial models of the phenomena under considerations In contrast to classical computing methods the Monte Carlo efficiency depends weakly on the dimension and geometric details of the problem The method is used for solving complex problems of the radiation transfer theory turbulent diffusion chemical kinetics theory of rarefied gases diffraction of waves on random surfaces etc The Monte Carlo method is especially effective when using multi processor computing systems which allow many independent statistical experiments to be simulated simultaneously The weighted Monte Carlo estimates are constructed in order to diminish errors and to obtain dependent estimates for the calculated functionals for different values of parameters of the problem i e to improve the functional dependence In addition the weighted estimates make it possible to evaluate special functionals for example the derivatives with respect to the parameters There are many works concerned with the development of the weighted estimates In Chap 1 we give the necessary information about these works and present a set of illustrations The rest of the book is devoted to the solution of a series of mathematical problems related to the optimization of the weighted Monte Carlo estimates Optimization of Weighted Monte Carlo Methods Gennadii A. Mikhailov, 1992 The Monte Carlo method is based on the numerical realization of natural or artificial models of the phenomena under considerations In contrast to classical computing methods the Monte Carlo efficiency depends weakly on the dimension and geometric details of the problem The method is used for solving complex problems of the radiation transfer theory turbulent diffusion chemical kinetics theory of rarefied gases diffraction of waves on random surfaces etc The Monte Carlo method is especially effective when using multi processor computing systems which allow many independent statistical experiments to be simulated simultaneously The weighted Monte Carlo estimates are constructed in order to diminish errors and to obtain dependent estimates for the calculated functionals for different values of parameters of the problem i e to improve the functional dependence In addition the weighted estimates make it possible to evaluate special functionals for example the derivatives with respect to the parameters There are many works concerned with the development of the weighted estimates In Chap 1 we give the necessary information about these works and present a set of illustrations The rest of the book is devoted to the solution of a series of mathematical problems related to the optimization of the weighted Monte Carlo estimates *Numerical Modelling of Random Processes and Fields* V. A. Ogorodnikov, S. M. Prigarin, 2018-11-05 No detailed description available for Numerical Modelling of Random Processes and Fields **Adaptive Stochastic Methods** Dmitry G. Arseniev, Vladimir M. Ivanov, Maxim L. Korenevsky, 2018-01-09 This monograph develops adaptive stochastic methods in computational mathematics The authors discuss the basic ideas of the algorithms and ways to analyze their properties and efficiency Methods of evaluation of multidimensional integrals and solutions of integral equations are illustrated by multiple examples from mechanics theory of elasticity heat conduction and

fluid dynamics Contents Part I Evaluation of Integrals Fundamentals of the Monte Carlo Method to Evaluate Definite Integrals Sequential Monte Carlo Method and Adaptive Integration Methods of Adaptive Integration Based on Piecewise Approximation Methods of Adaptive Integration Based on Global Approximation Numerical Experiments Adaptive Importance Sampling Method Based on Piecewise Constant Approximation Part II Solution of Integral Equations Semi Statistical Method of Solving Integral Equations Numerically Problem of Vibration Conductivity Problem on Ideal Fluid Flow Around an Airfoil First Basic Problem of Elasticity Theory Second Basic Problem of Elasticity Theory Projectional and Statistical Method of Solving Integral Equations Numerically *Theory of Global Random Search* Anatoly A. Zhigljavsky, 2012-12-06 One service mathematics has rendered the Et moi si j'avais su comment en revenir je n'y serais point alle human mee It has put common sense back Jules Verne where it belongs on the topmost shelf next to the dusty canister labelled discarded non The series is divergent therefore we may be sense Eric T Bell able to do something with it O Heavieside Mathematics is a tool for thought A highly necessary tool in a world where both feedback and non linearities abound Similarly all kinds of parts of mathematics serve as tools for other parts and for other sciences Applying a simple rewriting rule to the quote on the right above one finds such statements as One service topology has rendered mathematical physics One service logic has rendered computer science One service category theory has rendered mathematics All arguably true And all statements obtainable this way form part of the raison d'être of this series Optimization Based Clearance of Flight Control Laws Andreas Varga, Anders Hansson, Guilhem Puyou, 2011-11-23 This book summarizes the main achievements of the EC funded 6th Framework Program project COFCLUO Clearance of Flight Control Laws Using Optimization This project successfully contributed to the achievement of a top level objective to meet society's needs for a more efficient safer and environmentally friendly air transport by providing new techniques and tools for the clearance of flight control laws This is an important part of the certification and qualification process of an aircraft a costly and time consuming process for the aeronautical industry The overall objective of the COFCLUO project was to develop and apply optimization techniques to the clearance of flight control laws in order to improve efficiency and reliability In the book the new techniques are explained and benchmarked against traditional techniques currently used by the industry The new techniques build on mathematical criteria derived from the certification and qualification requirements together with suitable models of the aircraft The development of these criteria and models are also presented in the book Because of wider applicability the optimization based clearance of flight control laws will open up the possibility to design innovative aircraft that today are out of the scope using classical clearance tools Optimization based clearance will not only increase safety but it will also simplify the whole certification and qualification process thus significantly reduce cost The achieved speedup will also support rapid modeling and prototyping and reduce time to market **Residual Life Prediction and Optimal Maintenance Decision for a Piece of Equipment** Changhua Hu, Hongdong Fan, Zhaoqiang Wang, 2021-07-30 This book addresses remaining life prediction and predictive maintenance of

equipment It systematically summarizes the key research findings made by the author and his team and focuses on how to create equipment performance degradation and residual life prediction models based on the performance monitoring data produced by currently used and historical equipment Some of the theoretical results covered here have been used to make remaining life predictions and maintenance related decisions for aerospace products such as gyros and platforms Given its scope the book offers a valuable reference guide for those pursuing theoretical or applied research in the areas of fault diagnosis and fault tolerant control remaining life prediction and maintenance decision making

Simulation and the Monte Carlo Method Reuven Y. Rubinstein, 1981-05-14 This book provides the first simultaneous coverage of the statistical aspects of simulation and Monte Carlo methods their commonalities and their differences for the solution of a wide spectrum of engineering and scientific problems It contains standard material usually considered in Monte Carlo simulation as well as new material such as variance reduction techniques regenerative simulation and Monte Carlo optimization

Journal of Economic Literature ,1993 Techniques in Mathematical Modelling Gautami Devar, 2025-02-20 Techniques in Mathematical Modelling is a comprehensive textbook designed to provide students researchers and practitioners with a solid foundation in the principles techniques and applications of mathematical modelling We cover a wide range of topics from fundamental concepts and analytical techniques to validation methods and emerging trends Each chapter includes practical examples case studies and exercises to reinforce learning and demonstrate real world applications Our book emphasizes the interdisciplinary nature of mathematical modelling with applications in physics biology economics engineering social sciences and more We encourage hands on learning through practical exercises simulations and projects allowing readers to apply theoretical concepts to real world scenarios Additionally we explore emerging trends and challenges in the field including advancements in computational techniques data analytics and interdisciplinary collaborations Written in clear and accessible language Techniques in Mathematical Modelling caters to readers with varying levels of mathematical background making it suitable for undergraduate and graduate students as well as professionals *Russian Journal of Numerical Analysis and Mathematical Modelling* ,2001 *The Journal of Computational Finance* ,2002

Mathematical Theory of Reliability of Time Dependent Systems with Practical Applications Igor N. Kovalenko, Philip A. Pegg, 1997-07-16 One of the greatest problems in engineering is reliability The performance of all machinery degrades over time and unless counteraction is taken at some point any system will eventually fail Once a system fails there are a number of possible solutions the mathematical and statistical measurement and analysis of these solutions forms the mathematical theory of reliability The aim of the authors is to concentrate on aspects of particular importance in the mathematical theory of reliability of time dependent systems rather than give a general overview Particular emphasis is placed on fault tree analysis Monte Carlo methods and importance measures This book will be of particular interest to applied researchers and engineers working in areas where reliability is crucial Contents Introduction Markov and Semi Markov models as a basis for the

mathematical analysis of system reliability methods for investigating homogeneous and non homogeneous point processes
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rapid simulation of repairable systems with structure redundancy measures of reliability importance of components index

Soviet Journal of Numerical Analysis and Mathematical Modelling ,1991 *Soviet Mathematics* ,1989 **Soviet Mathematics - Doklady** ,1991 **Mathematical Reviews** ,2005 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 **Numerical Analysis and Its Applications** ,1996 **Optical Radiation Measurements** ,1996

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