

NONLINEAR OPTIMIZATION AND ITS APPLICATIONS

Deterministic Global Optimization Theory, Methods and Applications

Christodoulos A. Floudas



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Deterministic Global Optimization Theory Methods And Applications 1st Edition

**Yaroslav D. Sergeyev, Dmitri E.
Kvasov, Annabella Astorino**



Deterministic Global Optimization Theory Methods And Applications 1st Edition:

Deterministic Global Optimization Christodoulos A. Floudas, 2000 This book provides a unified and insightful treatment of deterministic global optimization It introduces theoretical and algorithmic advances that address the computation and characterization of global optima determine valid lower and upper bounds on the global minima and maxima and enclose all solutions of nonlinear constrained systems of equations Among its special features the book Introduces the fundamentals of deterministic global optimization Provides a thorough treatment of decomposition based global optimization approaches for biconvex and bilinear problems Covers global optimization methods for generalized geometric programming problems Presents in depth global optimization algorithms for general twice continuously differentiable nonlinear problems Provides a detailed treatment of global optimization methods for mixed integer nonlinear problems Develops global optimization approaches for the enclosure of all solutions of nonlinear constrained systems of equations Includes many important applications from process design synthesis control and operations phase equilibrium design under uncertainty parameter estimation azeotrope prediction structure prediction in clusters and molecules protein folding and peptide docking Audience This book can be used as a textbook in graduate level courses and as a desk reference for researchers in all branches of engineering and applied science applied mathematics industrial engineering operations research computer science economics computational chemistry and molecular biology *Deterministic Global Optimization* Christodoulos a Floudas, 2014-01-15

Deterministic Global Optimization Christodoulos A. Floudas, 2013-03-09 The vast majority of important applications in science engineering and applied science are characterized by the existence of multiple minima and maxima as well as first second and higher order saddle points The area of Deterministic Global Optimization introduces theoretical algorithmic and computational advances that i address the computation and characterization of global minima and maxima ii determine valid lower and upper bounds on the global minima and maxima and iii address the enclosure of all solutions of nonlinear constrained systems of equations Global optimization applications are widespread in all disciplines and they range from atomistic or molecular level to process and product level representations The primary goal of this book is three fold first to introduce the reader to the basics of deterministic global optimization second to present important theoretical and algorithmic advances for several classes of mathematical problems that include biconvex and bilinear problems signomial problems general twice differentiable nonlinear problems mixed integer nonlinear problems and the enclosure of all solutions of nonlinear constrained systems of equations and third to tie the theory and methods together with a variety of important applications *Deterministic Global Optimization* Daniel Scholz, 2011-11-06 This monograph deals with a general class of solution approaches in deterministic global optimization namely the geometric branch and bound methods which are popular algorithms for instance in Lipschitzian optimization d c programming and interval analysis It also introduces a new concept for the rate of convergence and analyzes several bounding operations reported in the literature

from the theoretical as well as from the empirical point of view Furthermore extensions of the prototype algorithm for multicriteria global optimization problems as well as mixed combinatorial optimization problems are considered Numerical examples based on facility location problems support the theory Applications of geometric branch and bound methods namely the circle detection problem in image processing the integrated scheduling and location makespan problem and the median line location problem in the three dimensional space are also presented The book is intended for both researchers and students in the areas of mathematics operations research engineering and computer science Optimization and Optimal Control Altannar Chinchuluun, Panos M. Pardalos, Rentsen Enkhbat, Ider Tseveendorj, 2010-07-07 Optimization and optimal control are the main tools in decision making Because of their numerous applications in various disciplines research in these areas is accelerating at a rapid pace Optimization and Optimal Control Theory and Applications brings together the latest developments in these areas of research as well as presents applications of these results to a wide range of real world problems This volume can serve as a useful resource for researchers practitioners and advanced graduate students of mathematics and engineering working in research areas where results in optimization and optimal control can be applied

Models, Algorithms, and Technologies for Network Analysis Valery A. Kalyagin, Alexey I. Nikolaev, Panos M. Pardalos, Oleg A. Prokopyev, 2017-06-23 This valuable source for graduate students and researchers provides a comprehensive introduction to current theories and applications in optimization methods and network models Contributions to this book are focused on new efficient algorithms and rigorous mathematical theories which can be used to optimize and analyze mathematical graph structures with massive size and high density induced by natural or artificial complex networks Applications to social networks power transmission grids telecommunication networks stock market networks and human brain networks are presented Chapters in this book cover the following topics Linear max min fairness Heuristic approaches for high quality solutions Efficient approaches for complex multi criteria optimization problems Comparison of heuristic algorithms New heuristic iterative local search Power in network structures Clustering nodes in random graphs Power transmission grid structure Network decomposition problems Homogeneity hypothesis testing Network analysis of international migration Social networks with node attributes Testing hypothesis on degree distribution in the market graphs Machine learning applications to human brain network studies This proceeding is a result of The 6th International Conference on Network Analysis held at the Higher School of Economics Nizhny Novgorod in May 2016 The conference brought together scientists and engineers from industry government and academia to discuss the links between network analysis and a variety of fields

Numerical Computations: Theory and Algorithms Yaroslav D. Sergeyev, Dmitri E. Kvasov, Annabella Astorino, 2024-12-31 The three volume set LNCS 14476 14478 constitutes the post conference proceedings of the 4th International Conference on Numerical Computations Theory and Algorithms NUMTA 2023 held in Pizzo Calabro Italy during June 14 20 2023 The 45 full papers presented in this book together with 60 short papers were carefully reviewed and

selected from 170 submissions The papers focus on topics such as continuous and discrete single and multi objective problems local global and large scale optimization classification in machine learning optimal control and applications computational and applied mathematics such as approximation theory computational geometry computational fluid dynamics dynamical systems and differential equations numerical algebra etc and applications in engineering and science numerical models methods and software using traditional and emerging high performance computational tools and paradigms including the infinity and quantum computing and their application in artificial intelligence and data science bioinformatics economics and management engineering and technology mathematical education number theory and foundations of mathematics etc

The British National Bibliography Arthur James Wells,2000 **Parallel Computing Technologies** Victor Malyshkin,2015-07-24 This book constitutes the proceedings of the 13th International Conference on Parallel Computing Technologies PaCT 2015 held in Petrozavodsk Russia during August September 2015 The 37 full papers and 14 short papers presented were carefully reviewed and selected from 87 submissions The papers are organized in topical sections on parallel models algorithms and programming methods unconventional computing cellular automata distributed computing special processors programming techniques applications Theory, Algorithms, and Experiments in Applied Optimization Boris Goldengorin,2025-12-04 This book celebrates the remarkable contributions of Panos M Pardalos offering a comprehensive collection of 19 rigorously peer reviewed articles that span the breadth of his research interests From deterministic and stochastic global optimization to combinatorial optimization this volume provides insights into solving modern applied problems in planning theory support vector machines data mining supply chain optimization and more Readers will encounter a diverse array of topics including Pareto optimality game and equilibrium theory vehicle routing problems energy systems and financial markets Each article stands alone in its scientific methodological and practical individuality making this collection a must read for both junior university students and seasoned professionals The contributing authors many of whom are former students and now esteemed professors offer unique perspectives and cutting edge research findings This book is an invaluable resource for researchers academics and practitioners in fields such as operations research resource management computer science and data analysis Whether you are taking your first steps in optimization or are an advanced professional seeking to deepen your understanding this volume provides the tools and insights necessary to navigate the complex landscape of applied optimization problems *Encyclopedia of Optimization* Christodoulos A. Floudas,Panos M. Pardalos,2008-09-04 The goal of the Encyclopedia of Optimization is to introduce the reader to a complete set of topics that show the spectrum of research the richness of ideas and the breadth of applications that has come from this field The second edition builds on the success of the former edition with more than 150 completely new entries designed to ensure that the reference addresses recent areas where optimization theories and techniques have advanced Particularly heavy attention resulted in health science and transportation with entries such as Algorithms for Genomics Optimization and Radiotherapy

Treatment Design and Crew Scheduling Deterministic Flexibility Analysis Chuei-Tin Chang, Vincentius Surya Kurnia Adi, 2017-07-28 Traditionally design and control decisions are made in sequential stages over the life cycle of a chemical plant In the design phase the optimal operating conditions and the corresponding material and energy balance data are established mainly on the basis of economic considerations In the subsequent step the control systems are configured to maintain the key process conditions at the fixed nominal values Because it is often desirable to address the operability issues at the earliest possible stage before stipulation of control schemes the systematic incorporation of flexibility analysis in process synthesis and design has received considerable attention in recent years This book focuses to a large extent on computation and implementation methods of deterministic performance measures i e the steady state volumetric dynamic and temporal flexibility indices in various applications The formal definitions of several available performance indices their mathematical formulations and the corresponding algorithms and codes are provided in sufficient detail to facilitate implementation To show the utility of flexibility analyses the book presents several practical case studies including membrane modules and heat exchanger networks solar driven membrane distillation desalination systems and hybrid power generation systems It also includes MATLAB and GAMS codes Supercomputing Vladimir Voevodin, Sergey Sobolev, 2018-12-31 This book constitutes the refereed proceedings of the 4th Russian Supercomputing Days RuSCDays 2018 held in Moscow Russia in September 2018 The 59 revised full papers and one revised short paper presented were carefully reviewed and selected from 136 submissions The papers are organized in topical sections on parallel algorithms supercomputer simulation high performance architectures tools and technologies *Optimization of Complex Systems: Theory, Models, Algorithms and Applications* Hoai An Le Thi, Hoai Minh Le, Tao Pham Dinh, 2019-06-15 This book contains 112 papers selected from about 250 submissions to the 6th World Congress on Global Optimization WCGO 2019 which takes place on July 8 10 2019 at University of Lorraine Metz France The book covers both theoretical and algorithmic aspects of Nonconvex Optimization as well as its applications to modeling and solving decision problems in various domains It is composed of 10 parts each of them deals with either the theory and or methods in a branch of optimization such as Continuous optimization DC Programming and DCA Discrete optimization Network optimization Multiobjective programming Optimization under uncertainty or models and optimization methods in a specific application area including Data science Economics Finance Energy Water management Engineering systems Transportation Logistics Resource allocation Production management The researchers and practitioners working in Nonconvex Optimization and several application areas can find here many inspiring ideas and useful tools techniques for their works **Hemivariational Inequalities** Panagiotis D. Panagiotopoulos, 2012-12-06 The aim of the present book is the formulation mathematical study and numerical treatment of static and dynamic problems in mechanics and engineering sciences involving nonconvex and nonsmooth energy functions or nonmonotone and multivalued stress strain laws Such problems lead to a new type of variational forms the hemivariational

inequalities which also lead to multivalued differential or integral equations Innovative numerical methods are presented for the treatment of realistic engineering problems This book is the first to deal with variational theory of engineering problems involving nonmonotone multivalued relations their mechanical foundation their mathematical study existence and certain approximation results and the corresponding eigenvalue and optimal control problems All the numerical applications give innovative answers to as yet unsolved or partially solved engineering problems e g the adhesive contact in cracks the delamination problem the sawtooth stress strain laws in composites the shear connectors in composite beams the semirigid connections in steel structures the adhesive grasping in robotics etc The book closes with the consideration of hemivariational inequalities for fractal type geometries and with the neural network approach to the numerical treatment of hemivariational inequalities

Geospatial Algebraic Computations Joseph Awange, Béla Paláncz, 2016-01-29 Improved geospatial instrumentation and technology such as in laser scanning has now resulted in millions of data being collected e g point clouds It is in realization that such huge amount of data requires efficient and robust mathematical solutions that this third edition of the book extends the second edition by introducing three new chapters Robust parameter estimation Multiobjective optimization and Symbolic regression Furthermore the linear homotopy chapter is expanded to include nonlinear homotopy These disciplines are discussed first in the theoretical part of the book before illustrating their geospatial applications in the applications chapters where numerous numerical examples are presented The renewed electronic supplement contains these new theoretical and practical topics with the corresponding Mathematica statements and functions supporting their computations introduced and applied This third edition is renamed in light of these technological advancements

Combining Interval, Probabilistic, and Other Types of Uncertainty in Engineering Applications Andrew Pownuk, Vladik Kreinovich, 2018-05-03 How can we solve engineering problems while taking into account data characterized by different types of measurement and estimation uncertainty interval probabilistic fuzzy etc This book provides a theoretical basis for arriving at such solutions as well as case studies demonstrating how these theoretical ideas can be translated into practical applications in the geosciences pavement engineering etc In all these developments the authors objectives were to provide accurate estimates of the resulting uncertainty to offer solutions that require reasonably short computation times to offer content that is accessible for engineers and to be sufficiently general so that readers can use the book for many different problems The authors also describe how to make decisions under different types of uncertainty The book offers a valuable resource for all practical engineers interested in better ways of gauging uncertainty for students eager to learn and apply the new techniques and for researchers interested in processing heterogeneous uncertainty

Evolutionary Algorithms and Chaotic Systems Ivan Zelinka, Sergej Celikovský, Hendrik Richter, Guanrong Chen, 2010-02-23 This book discusses the mutual intersection of two fields of research evolutionary computation which can handle tasks such as control of various chaotic systems and deterministic chaos which is investigated as a behavioral part of evolutionary algorithms

Multidisciplinary Scheduling: Theory and Applications Graham Kendall, Edmund K. Burke, Sanja Petrovic, Michel Gendreau, 2005-12-05 Multidisciplinary Scheduling Theory and Applications is a volume of nineteen reviewed papers that were selected from the sixty seven papers presented during the First Multidisciplinary International Conference of Scheduling MISTA This is the initial volume of MISTA the primary forum on interdisciplinary research on scheduling research Each paper in the volume has been rigorously reviewed and carefully copyedited to ensure its readability The MISTA volume focuses on the following leading edge topics Fundamentals of Scheduling Multi Criteria Scheduling Personnel Scheduling Scheduling in Space Scheduling the Internet Machine Scheduling Bin Packing Educational Timetabling Sports Scheduling and Transport Scheduling

Multi-Objective Memetic Algorithms Chi-Keong Goh, Yew Soon Ong, Kay Chen Tan, 2009-02-26 The application of sophisticated evolutionary computing approaches for solving complex problems with multiple conflicting objectives in science and engineering have increased steadily in the recent years Within this growing trend Memetic algorithms are perhaps one of the most successful stories having demonstrated better efficacy in dealing with multi objective problems as compared to its conventional counterparts Nonetheless researchers are only beginning to realize the vast potential of multi objective Memetic algorithm and there remain many open topics in its design This book presents a very first comprehensive collection of works written by leading researchers in the field and reflects the current state of the art in the theory and practice of multi objective Memetic algorithms Multi Objective Memetic algorithms is organized for a wide readership and will be a valuable reference for engineers researchers senior undergraduates and graduate students who are interested in the areas of Memetic algorithms and multi objective optimization

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