Deterministic Global Optimization

Theory, Methods and Applications

Christodoulos A. Floudas

Deterministic Global Optimization Theory Methods And Applications 1st Edition

J. A. Tenreiro Machado,Necati Özdemir,Dumitru Baleanu

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   **Simplicial Global Optimization** Remigijus Paulavičius,Julius Žilinskas,2013-10-09 Simplicial Global Optimization is centered on deterministic covering methods partitioning feasible region by simplices This book looks into the advantages of simplicial partitioning in global optimization through applications where the search space may be significantly reduced while taking into account symmetries of the objective function by setting linear inequality constraints that are managed by initial partitioning The authors provide an extensive experimental investigation and illustrates the impact of various bounds types of subdivision strategies of candidate selection on the performance of algorithms A comparison of various Lipschitz bounds over simplices and an extension of Lipschitz global optimization with out the Lipschitz constant to the case of simplicial partitioning is also depicted in this text Applications benefiting from simplicial partitioning are examined in detail such as nonlinear least squares regression and pile placement optimization in grillage type foundations Researchers and engineers will benefit from simplicial partitioning algorithms such as Lipschitz branch and bound Lipschitz optimization without the Lipschitz constant heuristic partitioning presented This book will leave readers inspired to develop simplicial versions of other algorithms for global optimization and even use other non rectangular partitions for special applications   **Large-Scale Optimization with Applications** Lorenz T. Biegler,1997-08-07 A three week workshop on Large Scale Optimization was held at the IMA from July 10 to July 28 1995 as part of its summer program These workshops brought together some of the world s leading experts in the areas of

optimization inverse problems optimal design optimal control and molecular structures The content of these volumes represent a majority of the presentations at the three workshops The presentations and the subsequent articles published here are intended to be useful and accessible to both the mathematical programmers and those working in the applications Perhaps somewhat optimistically the hope is that the workshops and the proceedings will also initiate some long term research projects and impart to new researchers the excitement vitality and importance of this kind of cooperation to the applications and to applied mathematics *Multi-Objective Optimization in Chemical Engineering* Gade Pandu Rangaiah,Adrian Bonilla-Petriciolet,2013-03-20 For reasons both financial and environmental there is a perpetual need to optimize the design and operating conditions of industrial process systems in order to improve their performance energy efficiency profitability safety and reliability However with most chemical engineering application problems having many variables with complex inter relationships meeting these optimization objectives can be challenging This is where Multi Objective Optimization MOO is useful to find the optimal trade offs among two or more conflicting objectives This book provides an overview of the recent developments and applications of MOO for modeling design and operation of chemical petrochemical pharmaceutical energy and related processes It then covers important theoretical and computational developments as well as specific applications such as metabolic reaction networks chromatographic systems CO2 emissions targeting for petroleum refining units ecodesign of chemical processes ethanol purification and cumene process design Multi Objective Optimization in Chemical Engineering Developments and Applications is an invaluable resource for researchers and graduate students in chemical engineering as well as industrial practitioners and engineers involved in process design modeling and optimization **Frontiers in Global Optimization** Christodoulos A. Floudas,Panos M. Pardalos,2013-12-01 Global Optimization has emerged as one of the most exciting new areas of mathematical programming Global optimization has received a wide attraction from many fields in the past few years due to the success of new algorithms for addressing previously intractable problems from diverse areas such as computational chemistry and biology biomedicine structural optimization computer sciences operations research economics and engineering design and control This book contains refereed invited papers submitted at the 4th international confer ence on Frontiers in Global Optimization held at Santorini Greece during June 8 12 2003 Santorini is one of the few sites of Greece with wild beauty created by the explosion of a volcano which is in the middle of the gulf of the island The mystic landscape with its numerous mult extrema was an inspiring location particularly for researchers working on global optimization The three previous conferences on Recent Advances in Global Opti mization State of the Art in Global Optimization and Optimization in Computational Chemistry and Molecular Biology Local and Global approaches took place at Princeton University in 1991 1995 and 1999 respectively The papers in this volume focus on de terministic methods for global optimization stochastic methods for global optimization distributed computing methods in global optimization and applications of global optimiza tion in several branches of applied science and

engineering computer science computational chemistry structural biology and bio informatics *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

Handbook of Global Optimization R. Horst,Panos M. Pardalos,2013-12-11 Global optimization is concerned with the computation and characterization of global optima of nonlinear functions During the past three decades the field of global optimization has been growing at a rapid pace and the number of publications on all aspects of global optimization has been increasing steadily Many applications as well as new theoretical algorithmic and computational contributions have resulted The Handbook of Global Optimization is the first comprehensive book to cover recent developments in global optimization Each contribution in the Handbook is essentially expository in nature but scholarly in its treatment The chapters cover optimality conditions complexity results concave minimization DC programming general quadratic programming nonlinear complementarity minimax problems multiplicative programming Lipschitz optimization fractional programming network problems trajectory methods homotopy methods interval methods and stochastic approaches The Handbook of Global Optimization is addressed to researchers in mathematical programming as well as all scientists who use optimization methods to model and solve problems **Chemical Process Design and Integration** Robin Smith,2016-08-08 Written by a highly regarded author with industrial and academic experience this new edition of an established bestselling book provides practical guidance for students researchers and those in chemical engineering The book includes a new section on sustainable energy with sections on carbon capture and sequestration as a result of increasing environmental awareness and a companion website that includes problems worked solutions and Excel spreadsheets to enable students to carry out complex calculations **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 **Chemical Process** Robin Smith,2005-06-10 This book deals with the design and integration of chemical processes emphasizing the conceptual issues that are fundamental to the creation of the process Chemical process design requires the selection of a series of processing steps and their integration to form a complete manufacturing system The text emphasizes both the design and selection of the steps as individual operations and their integration Also the process will normally operate as part of an integrated manufacturing site consisting of a number of processes serviced by a common utility system The design of utility systems has been dealt with in the text so that the interactions between processes and the utility system and interactions between different processes through the utility system can be exploited to maximize the performance of the site as a whole Chemical processing should form part of a sustainable industrial activity For chemical processing this means that processes should use raw materials as efficiently as is economic and practicable both to prevent the production of waste that can be environmentally harmful and to preserve the reserves of raw materials as much as possible Processes should use as little energy as economic and practicable both to prevent the build up of carbon dioxide in the atmosphere from burning fossil fuels and to preserve reserves of fossil fuels Water must also be consumed in sustainable quantities that do not cause deterioration in the quality of the water source and the long term quantity of the reserves Aqueous and atmospheric emissions must not be environmentally harmful and solid waste to landfill must be avoided Finally all aspects of chemical processing must feature good health and safety practice It is important for the designer to understand the limitations of the methods used in chemical process design The best way to understand the limitations is to understand the derivations of the equations used and the assumptions on which the equations are based Where practical the derivation of the design equations has been included in the text The book is intended to provide a practical guide to chemical process design and integration for undergraduate and postgraduate students of chemical engineering practicing process designers and chemical engineers and applied chemists working in process development Examples have been included throughout the text Most of these examples do not require specialist software and can be performed on spreadsheet software Finally a number of exercises have been added at the end of each chapter to allow the reader to practice the calculation procedures

Introduction to Global Optimization Exploiting Space-Filling Curves Yaroslav D. Sergeyev,Roman G. Strongin,Daniela Lera,2013-08-13 Introduction to Global Optimization Exploiting Space Filling Curves provides an overview of classical and new results pertaining to the usage of space filling curves in global optimization The authors look at a family of derivative free numerical algorithms applying space filling curves to reduce the dimensionality of the global optimization problem along with a number of unconventional ideas such as adaptive strategies for estimating Lipschitz constant balancing global and local information to accelerate the search Convergence conditions of the described algorithms are studied in

depth and theoretical considerations are illustrated through numerical examples This work also contains a code for implementing space filling curves that can be used for constructing new global optimization algorithms Basic ideas from this text can be applied to a number of problems including problems with multiextremal and partially defined constraints and non redundant parallel computations can be organized Professors students researchers engineers and other professionals in the fields of pure mathematics nonlinear sciences studying fractals operations research management science industrial and applied mathematics computer science engineering economics and the environmental sciences will find this title useful

Introduction to Global Optimization R. Horst,Panos M. Pardalos,Nguyen Van Thoai,2000-12-31 Most of the existing books on optimization focus on the problem of computing locally optimal solutions Global optimization is concerned with the computation and characterization of global optima of nonlinear functions Global optimization problems are widespread in the mathematical modeling of real world systems for a very broad range of applications During the past three decades many new theoretical algorithmic and computational contributions have helped to solve globally multi extreme problems arising from important practical applications Introduction to Global Optimization is the first comprehensive textbook that covers the fundamentals in global optimization The second edition includes algorithms applications and complexity results for quadratic programming concave minimization DC and Lipshitz problems decomposition algorithms for nonconvex optimization and nonlinear network flow problems Each chapter contains illustrative examples and ends with carefully selected exercises which are designed to help the student to get a grasp of the material and enhance their knowledge of global optimization methods Audience This textbook is addressed not only to students of mathematical programming but to all scientists in various disciplines who need global optimization methods to model and solve problems **Models and Algorithms for Global Optimization** Aimo Törn,Julius Žilinskas,2007-04-08 The research of Antanas Zilinskas has focused on developing models for global optimization implementing and investigating the corresponding algorithms and applying those algorithms to practical problems This volume dedicated to Professor Zilinskas on the occasion of his 60th birthday contains new survey papers in which leading researchers from the field present various models and algorithms for solving global optimization problems   11th International Symposium on Process Systems Engineering - PSE2012 ,2012-12-31 While the PSE community continues its focus on understanding synthesizing modeling designing simulating analyzing diagnosing operating controlling managing and optimizing a host of chemical and related industries using the systems approach the boundaries of PSE research have expanded considerably over the years While early PSE research was largely concerned with individual units and plants the current research spans wide ranges of scales in size molecules to processing units to plants to global multinational enterprises to global supply chain networks biological cells to ecological webs and time instantaneous molecular interactions to months of plant operation to years of strategic planning The changes and challenges brought about by increasing globalization and the the common global issues of energy sustainability and environment provide the

motivation for the theme of PSE2012 Process Systems Engineering and Decision Support for the Flat World Each theme includes an invited chapter based on the plenary presentation by an eminent academic or industrial researcher Reports on the state of the art advances in the various fields of process systems engineering Addresses common global problems and the research being done to solve them **Global Optimization Using Interval Analysis** Eldon Hansen,G. William Walster,2003-12-19 Employing a closed set theoretic foundation for interval computations Global Optimization Using Interval Analysis simplifies algorithm construction and increases generality of interval arithmetic This Second Edition contains an up to date discussion of interval methods for solving systems of nonlinear equations and global optimization problems It expands and improves various aspects of its forerunner and features significant new discussions such as those on the use of consistency methods to enhance algorithm performance Provided algorithms are guaranteed to find and bound all solutions to these problems despite bounded errors in data in approximations and from use of rounded arithmetic *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

Advances in Global Optimization David Gao,Ning Ruan,Wenxun Xing,2014-11-11 This proceedings volume addresses advances in global optimization a multidisciplinary research field that deals with the analysis characterization and computation of global minima and or maxima of nonlinear non convex and nonsmooth functions in continuous or discrete forms The volume contains selected papers from the third biannual World Congress on Global Optimization in Engineering combinatorial optimization duality theory topology optimization variational inequalities and complementarity problems numerical optimization stochastic models and simulation and complex simulation and supply chain analysis

Optimization Theory F. Giannessi,Panos M. Pardalos,Tamás Rapcsák,2013-12-01 This volume contains refereed papers based on the lectures presented at the XIV International Conference on Mathematical Programming held at Matrahaza Hungary between 27 31 March 1999 This conference was organized by the Laboratory of Operations Research and Deci sion Systems at the Computer and Automation Institute Hungarian Academy of Sciences The editors hope this volume will contribute to the theory and applications of mathematical programming As a tradition of these events the main purpose of the confer ence was to review and discuss recent advances and promising research trends concerning theory algorithms and applications in different fields of Optimization Theory and related areas such as Convex Analysis Complementarity Systems and Variational Inequalities The conference is traditionally held in the Matra Mountains and housed by the resort house of the Hungarian Academy of Sciences This was the 14th event of the long lasting series of conferences started in 1973 The organizers wish to express their thanks to the authors for their contributions in this volume and the anonymous referees for their valu able comments Special thanks are directed to our sponsors the Hun garian Academy of Sciences the National Committee for Technological Development the Hungarian National Science Foundation and last but not least the Hungarian Operational Research Society We would like to thank John Martindale from Kluwer Academic Publishers for helping us produce this volume Eva Nora Nagy for cor rections and proof readings and Peter Dombi for his excellent work on typesetting and editing the manuscript   *The British National Bibliography* Arthur James Wells,2000

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