Recent Advances In Convex Optimization

Advances in Convex Analysis and Global OptimizationConvex OptimizationRecent Advances in OptimizationLectures on Stochastic ProgrammingNetworked Multisensor Decision and Estimation FusionLectures on Convex OptimizationConvex Optimization AlgorithmsConvex OptimizationStatistical Inference Via Convex OptimizationRecent Advances in Computational OptimizationRecent Advances in Global OptimizationRecent Advances in Multidisciplinary Analysis and Optimization, Part 3Regularization, Optimization, Kernels, and Support Vector MachinesRecent Advances in Intelligent Control SystemsAdvances in Structural OptimizationConjugate Duality in Convex OptimizationOptimality Conditions in Convex OptimizationInfinite-Dimensional Optimization and ConvexityRecent Advances in Optimization and its Applications in EngineeringVector Optimization and Monotone Operators via Convex DualityRecent Advances and Historical Development of Vector OptimizationSemidefinite Optimization and Convex Algebraic GeometryNon-convex Optimization for Machine LearningConvex Analysis and OptimizationOpt ArtConvex Optimization & Euclidean Distance GeometryHandbook of Convex Optimization Methods in Imaging ScienceDistributed Optimization and Statistical Learning Via the Alternating Direction Method of MultipliersRecent Advances in System Modelling and OptimizationLectures on Modern

Convex OptimizationCode Generation for Embedded Convex OptimizationAnalog Circuits and Systems Optimization based on Evolutionary Computation TechniquesRecent Advances in Intelligent Paradigms and ApplicationsRecent Advances in Learning and ControlDelay-Adaptive Linear ControlRecent Advances in Optimization and its Applications in EngineeringConvex Optimization in Signal Processing and CommunicationsRecent Advances in Nonsmooth OptimizationRecent Advances in OptimizationModeling and Optimization in Space Engineering

Advances in Convex Analysis and Global Optimization

This volume is composed of invited papers on learning and control. The contents form the proceedings of a workshop held in January 2008, in Hyderabad that honored the 60th birthday of Doctor Mathukumalli Vidyasagar. The 14 papers, written by international specialists in the field, cover a variety of interests within the broader field of learning and control. The diversity of the research provides a comprehensive overview of a field of great interest to control and system theorists.

Convex Optimization

Recent Advances in Optimization

Digital systems that bring together the computing capacity for processing large bodies of information with the human cognitive capability are called intelligent systems. Building these systems has become one of the great goals of modem technology. This goal has both intellectual and economic incentives. The need for such intelligent systems has become more intense in the face of the global connectivity of the internet. There has become an almost insatiable requirement for instantaneous information and decision brought about by this confluence of computing and communication. This requirement can only be satisfied by the construction of innovative intelligent systems. A second and perhaps an even more significant development is the great advances being made in genetics and related areas of biotechnology. Future developments in biotechnology may open the possibility for the development of a true human-silicon interaction at the micro level, neural and cellular, bringing about a need for "intelligent" systems. What is needed to further the development of intelligent systems are tools to enable the representation of human cognition in a manner that allows formal manipulation. The idea of developing such an algebra goes back to Leibniz in the 17th century with his dream of a calculus ratiocinator. It wasn't until two hundred years later beginning with the work of Boole, Cantor and Frege that a formal mathematical logic for modeling human reasoning was developed. The introduction of the modem digital computer during the Second World War by von Neumann and others was a culmination of this intellectual trend.

Lectures on Stochastic Programming

Due to the increased capability, reliability, robustness, and survivability of systems with multiple distributed sensors, multi-source information fusion has become a crucial technique in a growing number of areas—including sensor networks, space technology, air traffic control, military engineering, agriculture and environmental engineering, and industrial control. Networked Multisensor Decision and Estimation Fusion: Based on Advanced Mathematical Methods presents advanced mathematical descriptions and methods to help readers achieve more thorough results under more general conditions than what has been possible with previous results in the existing literature. Examining emerging real-world problems, this book summarizes recent research developments in problems with unideal and uncertain frameworks. It presents essential mathematical descriptions and methods for multisensory decision and estimation fusion. Deriving thorough results under general conditions, this reference book: Corrects several popular but incorrect results in this area with thorough mathematical ideas Provides advanced mathematical methods, which lead to more general and significant results Presents updated systematic developments in both multisensor decision and estimation fusion, which cannot be seen in other existing books Includes numerous computer experiments that support every theoretical result The book applies recently developed convex optimization theory and high efficient algorithms in estimation fusion, which opens a very attractive research subject

on minimizing Euclidean error estimation for uncertain dynamic systems. Supplying powerful and advanced mathematical treatment of the fundamental problems, it will help to greatly broaden prospective applications of such developments in practice.

Networked Multisensor Decision and Estimation Fusion

"Recent Advances in Intelligent Control Systems" gathers contributions from workers around the world and presents them in four categories according to the style of control employed: fuzzy control; neural control; fuzzy neural control; and intelligent control. The contributions illustrate the interdisciplinary antecedents of intelligent control and contrast its results with those of more traditional control methods. A variety of design examples, drawn primarily from robotics and mechatronics but also representing process and production engineering, large civil structures, network flows, and others, provide instances of the application of computational intelligence for control. Presenting state-of-the-art research, this collection will be of benefit to researchers in automatic control, automation, computer science (especially artificial intelligence) and mechatronics while graduate students and practicing control engineers working with intelligent systems will find it a good source of study material.

Lectures on Convex Optimization

The microelectronics market, with special emphasis to the production of complex mixed-signal systems-on-chip (SoC), is driven by three main dynamics, time--market, productivity and managing complexity. Pushed by the progress in na- meter technology, the design teams are facing a curve of complexity that grows exponentially, thereby slowing down the productivity design rate. Analog design automation tools are not developing at the same pace of technology, once custom design, characterized by decisions taken at each step of the analog design flow, - lies most of the time on designer knowledge and expertise. Actually, the use of - sign management platforms, like the Cadences Virtuoso platform, with a set of - tegrated CAD tools and database facilities to deal with the design transformations from the system level to the physical implementation, can significantly speed-up the design process and enhance the productivity of analog/mixed-signal integrated circuit (IC) design teams. These design management platforms are a valuable help in analog IC design but they are still far behind the development stage of design automation tools already available for digital design. Therefore, the development of new CAD tools and design methodologies for analog and mixed-signal ICs is ess- tial to increase the designer's productivity and reduce design productivitygap. The work presented in this book describes a new design automation approach to the problem of sizing analog ICs.

Convex Optimization Algorithms

Leading experts provide the theoretical underpinnings of the subject plus tutorials on a wide range of applications, from automatic code generation to robust broadband beamforming. Emphasis on cutting-edge research and formulating problems in convex form make this an ideal textbook for advanced graduate courses and a useful self-study guide.

Convex Optimization

This authoritative book draws on the latest research to explore the interplay of high-dimensional statistics with optimization. Through an accessible analysis of fundamental problems of hypothesis testing and signal recovery, Anatoli Juditsky and Arkadi Nemirovski show how convex optimization theory can be used to devise and analyze near-optimal statistical inferences. Statistical Inference via Convex Optimization is an essential resource for optimization specialists who are new to statistics and its applications, and for data scientists who want to improve their optimization methods. Juditsky and Nemirovski provide the first systematic treatment of the statistical techniques that have arisen from advances in the theory of optimization. They focus on four well-known statistical problems—sparse recovery, hypothesis testing, and recovery from indirect observations of both signals and functions of signals—demonstrating how they can be solved more efficiently as convex optimization problems. The emphasis throughout is on achieving the best possible statistical performance. The construction of inference routines and the quantification of their statistical

performance are given by efficient computation rather than by analytical derivation typical of more conventional statistical approaches. In addition to being computation-friendly, the methods described in this book enable practitioners to handle numerous situations too difficult for closed analytical form analysis, such as composite hypothesis testing and signal recovery in inverse problems. Statistical Inference via Convex Optimization features exercises with solutions along with extensive appendixes, making it ideal for use as a graduate text.

Statistical Inference Via Convex Optimization

There has been much recent progress in global optimization algorithms for nonconvex continuous and discrete problems from both a theoretical and a practical perspective. Convex analysis plays a fundamental role in the analysis and development of global optimization algorithms. This is due to the fact that virtually all nonconvex optimization problems can be described using differences of convex functions and differences of convex sets. A conference on Convex Analysis and Global Optimization was held June 5-9, 2000 at Pythagorian, Samos, Greece. It was in honor of the memory of C. Caratheodory (1873-1950). It was endorsed by the Mathematical Programming Society (MPS) and by the Society for industrial and Applied Mathematics (SIAN) Activity Group in Optimization. This volume contains a selection of refereed papers based on invited and contributing talks presented at the conference. The

two themes of convexity and global optimization pervade the book. The conference provided a forum for researchers working on different aspects of convexity and global optimization to present their recent discoveries, and to interact with people working on complementary aspects of mathematical programming. Audience: Faculty, graduate students, and researchers in mathematical programming, computer science, and engineering.

Recent Advances in Computational Optimization

The contributions appearing in this book give an overview of recent research done in optimization and related areas, such as optimal control, calculus of variations, and game theory. They do not only address abstract issues of optimization theory, but are also concerned with the modeling and computer resolution of specific optimization problems arising in industry and applied sciences.

Recent Advances in Global Optimization

Surveys the theory and history of the alternating direction method of multipliers, and discusses its applications to a wide variety of statistical and machine learning problems of recent interest, including the lasso, sparse logistic regression, basis pursuit, covariance selection, support vector machines, and many others.

Recent Advances in Multidisciplinary

Analysis and Optimization, Part 3

Regularization, Optimization, Kernels, and Support Vector Machines

Here is a book devoted to well-structured and thus efficiently solvable convex optimization problems, with emphasis on conic quadratic and semidefinite programming. The authors present the basic theory underlying these problems as well as their numerous applications in engineering, including synthesis of filters, Lyapunov stability analysis, and structural design. The authors also discuss the complexity issues and provide an overview of the basic theory of state-of-the-art polynomial time interior point methods for linear, conic quadratic, and semidefinite programming. The book's focus on well-structured convex problems in conic form allows for unified theoretical and algorithmical treatment of a wide spectrum of important optimization problems arising in applications.

Recent Advances in Intelligent Control Systems

A fun and stunningly illustrated introduction to the art of linear optimization Linear optimization is a powerful modeling method for discovering the best solution to a problem among a set of available alternatives. It is one of today’s most important branches of mathematics and computer science—and also a surprisingly rich medium for creating breathtaking

works of art. Opt Art takes readers on an entertaining tour of linear optimization and its applications, showing along the way how it can be used to design visual art. Robert Bosch provides a lively and accessible introduction to the geometric, algebraic, and algorithmic foundations of optimization. He presents classical applications, such as the legendary Traveling Salesman Problem, and shows how to adapt them to make optimization art—opt art. Each chapter in this marvelously illustrated book begins with a problem or puzzle and demonstrates how the solution can be derived using a host of artistic methods and media, including 3D printing, laser cutting, and computer-controlled machining. Bosch focuses on mathematical modeling throughout—converting a problem into a workable mathematical form, solving it using optimization techniques, and examining the results, which can take the form of mosaics, line drawings, and even sculpture. All you need is some high-school algebra, geometry, and calculus to follow along. Featuring more than a hundred illustrations and photos of Bosch's own art, Opt Art demonstrates how mathematics and computing can be used to create beauty and express emotion through amazing works of art.

Advances in Structural Optimization

The caratheodory approach; Infinite-dimensional optimization; Duality theory.

Conjugate Duality in Convex Optimization

This monograph presents the main complexity theorems in convex optimization and their corresponding algorithms. It begins with the fundamental theory of black-box optimization and proceeds to guide the reader through recent advances in structural optimization and stochastic optimization. The presentation of black-box optimization, strongly influenced by the seminal book by Nesterov, includes the analysis of cutting plane methods, as well as (accelerated) gradient descent schemes. Special attention is also given to non-Euclidean settings (relevant algorithms include Frank-Wolfe, mirror descent, and dual averaging), and discussing their relevance in machine learning. The text provides a gentle introduction to structural optimization with FISTA (to optimize a sum of a smooth and a simple non-smooth term), saddle-point mirror prox (Nemirovski's alternative to Nesterov's smoothing), and a concise description of interior point methods. In stochastic optimization it discusses stochastic gradient descent, mini-batches, random coordinate descent, and sublinear algorithms. It also briefly touches upon convex relaxation of combinatorial problems and the use of randomness to round solutions, as well as random walks based methods.

Optimality Conditions in Convex Optimization

Mathematical optimization encompasses both a rich and rapidly evolving body of fundamental theory, and a variety of exciting applications in science and

engineering. The present book contains a careful selection of articles on recent advances in optimization theory, numerical methods, and their applications in engineering. It features in particular new methods and applications in the fields of optimal control, PDE-constrained optimization, nonlinear optimization, and convex optimization. The authors of this volume took part in the 14th Belgian-French-German Conference on Optimization (BFG09) organized in Leuven, Belgium, on September 14-18, 2009. The volume contains a selection of reviewed articles contributed by the conference speakers as well as three survey articles by plenary speakers and two papers authored by the winners of the best talk and best poster prizes awarded at BFG09. Researchers and graduate students in applied mathematics, computer science, and many branches of engineering will find in this book an interesting and useful collection of recent ideas on the methods and applications of optimization.

Infinite-Dimensional Optimization and Convexity

Recent Advances in Optimization and its Applications in Engineering

Convex Analysis is the calculus of inequalities while Convex Optimization is its application. Analysis is inherently the domain of the mathematician while Optimization belongs to the engineer. In laymanâ€™s terms, the mathematical science of Optimization is

the study of how to make a good choice when confronted with conflicting requirements. The qualifier Convex means: when an optimal solution is found, then it is guaranteed to be a best solution; there is no better choice. Any Convex Optimization problem has geometric interpretation. Conversely, recent advances in geometry and in graph theory hold Convex Optimization within their proofsâ€™ core. This book is about Convex Optimization, convex geometry (with particular attention to distance geometry), and nonconvex, combinatorial, and geometrical problems that can be relaxed or transformed into convex problems. A virtual flood of new applications follows by epiphany that many problems, presumed nonconvex, can be so transformed. International Edition III

Vector Optimization and Monotone Operators via Convex Duality

Convex optimization problems arise frequently in many different fields. This book provides a comprehensive introduction to the subject, and shows in detail how such problems can be solved numerically with great efficiency. The book begins with the basic elements of convex sets and functions, and then describes various classes of convex optimization problems. Duality and approximation techniques are then covered, as are statistical estimation techniques. Various geometrical problems are then presented, and there is detailed discussion of unconstrained and constrained minimization problems, and interior-point methods. The focus of

the book is on recognizing convex optimization problems and then finding the most appropriate technique for solving them. It contains many worked examples and homework exercises and will appeal to students, researchers and practitioners in fields such as engineering, computer science, mathematics, statistics, finance and economics.

Recent Advances and Historical Development of Vector Optimization

"Uncertainty is inherent in control systems. Consider the following example: as an aircraft flies, it consumes fuel, which causes its mass to decrease. In order to maintain stability, the autopilot mechanism must adapt to this (a priori unknown) change in mass. Delays also pose a challenge in control systems. If you have tried to maintain a comfortable water temperature while showering in a building with outdated plumbing, you will understand the difficulties that arise when a control system has significant delays: the controller (you) is forced to make decisions based on "old" information. The intersection of these two problems (estimating unknown parameters when a system has delays) poses a significant mathematical challenge. Delay-Adaptive Linear Control presents new mathematical techniques to handle the intersection of the two distinct types of uncertainty described above: adaptive constraints, and uncertainties caused by delays. Traditionally, the problems of adaption and delays have been treated separately. This book considers the intersection of these two problems,

developing new techniques for addressing different combinations of uncertainty-all within a single, unified framework. This work has applications in electrical and mechanical engineering (unmanned aerial vehicles, robotic manipulators), biomedical engineering (3D printing, neuromuscular electrical stimulation), and management and traffic science (supply chains, traffic flow), among others. Beyond its practical importance, this work is also of significant theoretical interest, as it addresses mathematical challenges involved in the analysis and design of these systems"--

Semidefinite Optimization and Convex Algebraic Geometry

This book presents recent theoretical and practical aspects in the field of optimization and convex analysis. The topics covered in this volume include: - Equilibrium models in economics. - Control theory and semi-infinite programming. - Ill-posed variational problems. - Global optimization. - Variational methods in image restoration. - Nonsmooth optimization. - Duality theory in convex and nonconvex optimization. - Methods for large scale problems.

Non-convex Optimization for Machine Learning

This book investigates several duality approaches for vector optimization problems, while also comparing them. Special attention is paid to duality for linear vector optimization problems, for which a vector dual

that avoids the shortcomings of the classical ones is proposed. Moreover, the book addresses different efficiency concepts for vector optimization problems. Among the problems that appear when the framework is generalized by considering set-valued functions, an increasing interest is generated by those involving monotone operators, especially now that new methods for approaching them by means of convex analysis have been developed. Following this path, the book provides several results on different properties of sums of monotone operators.

Convex Analysis and Optimization

Includes a selection of papers that were presented at the Second International Conference on Computational Structures Technology, held in Athens, Greece, from 30 August - 1 September 1994.

Opt Art

Optimization is part of our everyday life. We try to organize our work in a better way and optimization occurs in minimizing time and cost or the maximization of the profit, quality and efficiency. Also many real world problems arising in engineering, economics, medicine and other domains can be formulated as optimization tasks. This volume is a comprehensive collection of extended contributions from the Workshop on Computational Optimization. This book presents recent advances in computational optimization. The volume includes important real world problems like parameter settings for con-

trolling processes in bioreactor, robot skin wiring, strip packing, project scheduling, tuning of PID controller and so on. Some of them can be solved by applying traditional numerical methods, but others need a huge amount of computational resources. For them it is shown that is appropriate to develop algorithms based on metaheuristic methods like evolutionary computation, ant colony optimization, constrain programming etc.

Convex Optimization & Euclidean Distance Geometry

In vector optimization one investigates optimization problems in an abstract setting which have a not necessarily real-valued objective function. This scientific discipline is closely related to multi-objective optimization and multi-criteria decision making. This book contains refereed contributions to the "International Conference on Vector Optimization" held at the Technical University of Darmstadt from August 4-7, 1986. This meeting was an interdisciplinary forum devoted to new results in the theory, to applications as well as to the solution of vector optimization problems which are relevant in practice. Because of the great variety of topics covered by the contributions, the 25 articles of this volume are organized in different sections: Historical retrospect, mathematical theory, goal setting and decision making, engineering applications, and related topics. The papers of the invited State-of-the-Art Tutorials given by Professors J.M. Borwein, H. Eschenauer, W. Stadler and P.L. Yu are also included.

Handbook of Convex Optimization Methods in Imaging Science

Optimality Conditions in Convex Optimization explores an important and central issue in the field of convex optimization: optimality conditions. It brings together the most important and recent results in this area that have been scattered in the literature—notably in the area of convex analysis—essential in developing many of the important results in this book, and not usually found in conventional texts. Unlike other books on convex optimization, which usually discuss algorithms along with some basic theory, the sole focus of this book is on fundamental and advanced convex optimization theory. Although many results presented in the book can also be proved in infinite dimensions, the authors focus on finite dimensions to allow for much deeper results and a better understanding of the structures involved in a convex optimization problem. They address semi-infinite optimization problems; approximate solution concepts of convex optimization problems; and some classes of non-convex problems which can be studied using the tools of convex analysis. They include examples wherever needed, provide details of major results, and discuss proofs of the main results.

Distributed Optimization and Statistical Learning Via the Alternating Direction Method of Multipliers

Convex optimization is widely used, in many fields,

but is nearly always constrained to problems solved in a few minutes or seconds, and even then, nearly always with a human in the loop. The advent of parser-solvers has made convex optimization simpler and more accessible, and greatly increased the number of people using convex optimization. Most current applications, however, are for the design of systems or analysis of data. It is possible to use convex optimization for real-time or embedded applications, where the optimization solver is a part of a larger system. Here, the optimization algorithm must find solutions much faster than a generic solver, and often has a hard, real-time deadline. Use in embedded applications additionally means that the solver cannot fail, and must be robust even in the presence of relatively poor quality data. For ease of embedding, the solver should be simple, and have minimal dependencies on external libraries. Convex optimization has been successfully applied in such settings in the past. However, they have usually necessitated a custom, hand-written solver. This requires signficant time and expertise, and has been a major factor preventing the adoption of convex optimization in embedded applications. This work describes the implementation and use of a prototype code generator for convex optimization, CVXGEN, that creates high-speed solvers automatically. Using the principles of disciplined convex programming, CVXGEN allows the user to describe an optimization problem in a convenient, high-level language, then receive code for compilation into an extremely fast, robust, embeddable solver.

Recent Advances in System Modelling and Optimization

Optimization problems involving stochastic models occur in almost all areas of science and engineering, such as telecommunications, medicine, and finance. Their existence compels a need for rigorous ways of formulating, analyzing, and solving such problems. This book focuses on optimization problems involving uncertain parameters and covers the theoretical foundations and recent advances in areas where stochastic models are available. In Lectures on Stochastic Programming: Modeling and Theory, Second Edition, the authors introduce new material to reflect recent developments in stochastic programming, including: an analytical description of the tangent and normal cones of chance constrained sets; analysis of optimality conditions applied to nonconvex problems; a discussion of the stochastic dual dynamic programming method; an extended discussion of law invariant coherent risk measures and their Kusuoka representations; and in-depth analysis of dynamic risk measures and concepts of time consistency, including several new results.

Lectures on Modern Convex Optimization

Code Generation for Embedded Convex Optimization

This volume presents a selection of advanced case studies that address a substantial range of issues and

challenges arising in space engineering. The contributing authors are well-recognized researchers and practitioners in space engineering and in applied optimization. The key mathematical modeling and numerical solution aspects of each application case study are presented in sufficient detail. Classic and more recent space engineering problems – including cargo accommodation and object placement, flight control of satellites, integrated design and trajectory optimization, interplanetary transfers with deep space manoeuvres, low energy transfers, magnetic cleanliness modeling, propulsion system design, sensor system placement, systems engineering, space traffic logistics, and trajectory optimization – are discussed. Novel points of view related to computational global optimization and optimal control, and to multidisciplinary design optimization are also given proper emphasis. A particular attention is paid also to scenarios expected in the context of future interplanetary explorations. Modeling and Optimization in Space Engineering will benefit researchers and practitioners working on space engineering applications. Academics, graduate and post-graduate students in the fields of aerospace and other engineering, applied mathematics, operations research and optimal control will also find the book useful, since it discusses a range of advanced model development and solution techniques and tools in the context of real-world applications and new challenges.

Analog Circuits and Systems Optimization based on Evolutionary Computation Techniques

Mathematical optimization encompasses both a rich and rapidly evolving body of fundamental theory, and a variety of exciting applications in science and engineering. The present book contains a careful selection of articles on recent advances in optimization theory, numerical methods, and their applications in engineering. It features in particular new methods and applications in the fields of optimal control, PDE-constrained optimization, nonlinear optimization, and convex optimization. The authors of this volume took part in the 14th Belgian-French-German Conference on Optimization (BFG09) organized in Leuven, Belgium, on September 14-18, 2009. The volume contains a selection of reviewed articles contributed by the conference speakers as well as three survey articles by plenary speakers and two papers authored by the winners of the best talk and best poster prizes awarded at BFG09. Researchers and graduate students in applied mathematics, computer science, and many branches of engineering will find in this book an interesting and useful collection of recent ideas on the methods and applications of optimization.

Recent Advances in Intelligent Paradigms and Applications

An accessible introduction to convex algebraic geometry and semidefinite optimization. For graduate students and researchers in mathematics and computer science.

Recent Advances in Learning and Control

Non-convex Optimization for Machine Learning takes an in-depth look at the basics of non-convex optimization with applications to machine learning. It introduces the rich literature in this area, as well as equips the reader with the tools and techniques needed to apply and analyze simple but powerful procedures for non-convex problems. Non-convex Optimization for Machine Learning is as self-contained as possible while not losing focus of the main topic of non-convex optimization techniques. The monograph initiates the discussion with entire chapters devoted to presenting a tutorial-like treatment of basic concepts in convex analysis and optimization, as well as their non-convex counterparts. The monograph concludes with a look at four interesting applications in the areas of machine learning and signal processing, and exploring how the non-convex optimization techniques introduced earlier can be used to solve these problems. The monograph also contains, for each of the topics discussed, exercises and figures designed to engage the reader, as well as extensive bibliographic notes pointing towards classical works and recent advances. Non-convex Optimization for Machine Learning can be used for a semester-length course on the basics of non-convex optimization with applications to machine learning. On the other hand, it is also possible to cherry pick individual portions, such the chapter on sparse recovery, or the EM algorithm, for inclusion in a broader course. Several courses such as those in machine learning, optimization, and signal processing may benefit from the inclusion of such topics.

Delay-Adaptive Linear Control

Nonsmooth optimization covers the minimization or maximization of functions which do not have the differentiability properties required by classical methods. The field of nonsmooth optimization is significant, not only because of the existence of nondifferentiable functions arising directly in applications, but also because several important methods for solving difficult smooth problems lead directly to the need to solve nonsmooth problems, which are either smaller in dimension or simpler in structure. This book contains twenty five papers written by forty six authors from twenty countries in five continents. It includes papers on theory, algorithms and applications for problems with first-order nondifferentiability (the usual sense of nonsmooth optimization) second-order nondifferentiability, nonsmooth equations, nonsmooth variational inequalities and other problems related to nonsmooth optimization. Contents:Hybrid Methods for Finding the Nearest Euclidean Distance Matrix (S Al-Homidan & R Fletcher)On Generalized Differentiability of Optimal Solutions and Its Application to an Algorithm for Solving Bilevel Optimization Problems (S Dempe)An Elementary Rate of Convergence Proof for the Deep Cut Ellipsoid Algorithm (J B G Frenk & J Gromicho)On Second-Order Directional Derivatives in Nonsmooth Optimization (L R Huang & K F Ng)Sensitivity of Solutions in Nonlinear Programming Problems with Nonunique Multipliers (A B Levy & R T Rockafellar)Necessary and Sufficient Conditions for Solution Stability of Parametric Nonsmooth Equations

(J-S Pang)Characterizations of Optimality for Homogeneous Programming Problems with Applications (A M Rubinov & B M Glover)A Globally Convergent Newton Method for Solving Variational Inequality Problems with Inequality Constraints (K Taji & M Fukushima)A Successive Approximation Quasi-Newton Process for Nonlinear Complementarity Problem (S-Z Zhou et al.)and other papers Readership: Students, academics and industry professionals. keywords:

Recent Advances in Optimization and its Applications in Engineering

This book will present the papers delivered at the first U.S. conference devoted exclusively to global optimization and will thus provide valuable insights into the significant research on the topic that has been emerging during recent years. Held at Princeton University in May 1991, the conference brought together an interdisciplinary group of the most active developers of algorithms for global optimization in order to focus the attention of the mathematical programming community on the unsolved problems and diverse applications of this field. The main subjects addressed at the conference were advances in deterministic and stochastic methods for global optimization, parallel algorithms for global optimization problems, and applications of global optimization. Although global optimization is primarily a mathematical problem, it is relevant to several other disciplines, including computer science, applied mathematics, physical chemistry, molecular biology,

statistics, physics, engineering, operations research, communication theory, and economics. Global optimization problems originate from a wide variety of mathematical models of real-world systems. Some of its applications are allocation and location problems and VLSI and data-base design problems. Originally published in 1991. The Princeton Legacy Library uses the latest print-on-demand technology to again make available previously out-of-print books from the distinguished backlist of Princeton University Press. These editions preserve the original texts of these important books while presenting them in durable paperback and hardcover editions. The goal of the Princeton Legacy Library is to vastly increase access to the rich scholarly heritage found in the thousands of books published by Princeton University Press since its founding in 1905.

Convex Optimization in Signal Processing and Communications

The results presented in this book originate from the last decade research work of the author in the ?eld of duality theory in convex optimization. The reputation of duality in the optimization theory comes mainly from the major role that it plays in formulating necessary and suf?cient optimality conditions and, consequently, in generatingdifferent algorithmic approachesfor solving mathematical programming problems. The investigations made in this work prove the importance of the duality theory beyond these aspects and emphasize its strong connections with different topics in convex analysis, nonlinear analysis,

functional analysis and in the theory of monotone operators. The ?rst part of the book brings to the attention of the reader the perturbation approach as a fundamental tool for developing the so-called conjugate duality t- ory. The classical Lagrange and Fenchel duality approaches are particular instances of this general concept. More than that, the generalized interior point regularity conditions stated in the past for the two mentioned situations turn out to be p- ticularizations of the ones given in this general setting. In our investigations, the perturbationapproac hrepresentsthestartingpointforderivingnewdualityconc epts for several classes of convex optimization problems. Moreover, via this approach, generalized Moreau–Rockafellar formulae are provided and, in connection with them, a new class of regularity conditions, called closedness-type conditions, for both stable strong duality and strong duality is introduced. By stable strong duality we understand the situation in which strong duality still holds whenever perturbing the objective function of the primal problem with a linear continuous functional.

Recent Advances in Nonsmooth Optimization

Regularization, Optimization, Kernels, and Support Vector Machines offers a snapshot of the current state of the art of large-scale machine learning, providing a single multidisciplinary source for the latest research and advances in regularization, sparsity, compressed sensing, convex and large-scale optimization, kernel methods, and support vector machines. Consisting of

21 chapters authored by leading researchers in machine learning, this comprehensive reference: Covers the relationship between support vector machines (SVMs) and the Lasso Discusses multi-layer SVMs Explores nonparametric feature selection, basis pursuit methods, and robust compressive sensing Describes graph-based regularization methods for single- and multi-task learning Considers regularized methods for dictionary learning and portfolio selection Addresses non-negative matrix factorization Examines low-rank matrix and tensor-based models Presents advanced kernel methods for batch and online machine learning, system identification, domain adaptation, and image processing Tackles large-scale algorithms including conditional gradient methods, (non-convex) proximal techniques, and stochastic gradient descent Regularization, Optimization, Kernels, and Support Vector Machines is ideal for researchers in machine learning, pattern recognition, data mining, signal processing, statistical learning, and related areas.

Recent Advances in Optimization

This book provides a comprehensive, modern introduction to convex optimization, a field that is becoming increasingly important in applied mathematics, economics and finance, engineering, and computer science, notably in data science and machine learning. Written by a leading expert in the field, this book includes recent advances in the algorithmic theory of convex optimization, naturally complementing the existing literature. It contains a

unified and rigorous presentation of the acceleration techniques for minimization schemes of first- and second-order. It provides readers with a full treatment of the smoothing technique, which has tremendously extended the abilities of gradient-type methods. Several powerful approaches in structural optimization, including optimization in relative scale and polynomial-time interior-point methods, are also discussed in detail. Researchers in theoretical optimization as well as professionals working on optimization problems will find this book very useful. It presents many successful examples of how to develop very fast specialized minimization algorithms. Based on the author's lectures, it can naturally serve as the basis for introductory and advanced courses in convex optimization for students in engineering, economics, computer science and mathematics.

Modeling and Optimization in Space Engineering

This book covers recent advances in image processing and imaging sciences from an optimization viewpoint, especially convex optimization with the goal of designing tractable algorithms. Throughout the handbook, the authors introduce topics on the most key aspects of image acquisition and processing that are based on the formulation and solution of novel optimization problems. The first part includes a review of the mathematical methods and foundations required, and covers topics in image quality optimization and assessment. The second part of the book discusses concepts in image formation and

capture from color imaging to radar and multispectral imaging. The third part focuses on sparsity constrained optimization in image processing and vision and includes inverse problems such as image restoration and de-noising, image classification and recognition and learning-based problems pertinent to image understanding. Throughout, convex optimization techniques are shown to be a critically important mathematical tool for imaging science problems and applied extensively. Convex Optimization Methods in Imaging Science is the first book of its kind and will appeal to undergraduate and graduate students, industrial researchers and engineers and those generally interested in computational aspects of modern, real-world imaging and image processing problems.