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Computational Optimization and Applications in Engineering and Industry Springer Science & Business Media *Contemporary design in engineering and industry relies heavily on computer simulation and efficient algorithms to reduce the cost and to maximize the performance and sustainability as well as profits and energy efficiency. Solving an optimization problem correctly and efficiently requires not only the right choice of optimization algorithms and simulation methods, but also the proper implementation and insight into the problem of interest. This book consists of ten self-contained, detailed case studies of real-world optimization problems, selected from a wide range of applications and contributed from worldwide experts who are working in these exciting areas. Optimization topics and applications include gas and water supply networks, oil field production optimization, microwave engineering, aerodynamic shape design, environmental emergence modelling, structural engineering, waveform design for radar and communication systems, parameter estimation in laser experiment and measurement, engineering materials and network scheduling. These case studies have been solved using a wide range of optimization techniques, including particle swarm optimization, genetic algorithms, artificial bee colony, harmony search, adaptive error control, derivative-free pattern search, surrogate-based optimization, variable-fidelity modelling, as well as various other methods and approaches. This book is a practical guide to help graduates and researchers to carry out optimization for real-world applications. More advanced readers will also find it a helpful reference and aide memoire.* **Optimization in Engineering Models and Algorithms** Springer *This textbook covers the fundamentals of optimization, including linear, mixed-integer linear, nonlinear, and dynamic optimization techniques, with a clear engineering focus. It carefully describes classical optimization models and algorithms using an engineering problem-solving perspective, and emphasizes modeling issues using many real-world examples related to a variety of application areas. Providing an appropriate blend of practical applications and optimization theory makes the text useful to both practitioners and students, and gives the reader a good sense of the power of optimization and the potential difficulties in applying optimization to modeling real-world systems. The book is intended for undergraduate and graduate-level teaching in industrial engineering and other engineering specialties. It is also of use to industry practitioners, due to the inclusion of real-world applications, opening the door to advanced courses on both modeling and algorithm development within the industrial engineering and operations research fields.* **Modeling and Optimization in Space Engineering** Springer Science & Business Media *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.* **Fixed-Point Algorithms for Inverse Problems in Science and Engineering** Springer Science & Business Media *"Fixed-Point Algorithms for Inverse Problems in Science and Engineering" presents some of the most recent work from top-notch researchers studying projection and other first-order fixed-point algorithms in several areas of mathematics and the applied sciences. The material presented provides a survey of the state-of-the-art theory and practice in fixed-point algorithms, identifying emerging problems driven by applications, and discussing new approaches for solving these problems. This book incorporates diverse perspectives from broad-ranging areas of research including, variational analysis, numerical linear algebra, biotechnology, materials science, computational solid-state physics, and chemistry. Topics presented include: Theory of Fixed-point algorithms: convex analysis, convex optimization, subdifferential calculus, nonsmooth analysis, proximal point methods, projection methods, resolvent and related fixed-point theoretic methods, and monotone operator theory. Numerical analysis of fixed-point algorithms: choice of step lengths, of weights, of blocks for block-iterative and parallel methods, and of relaxation parameters; regularization of ill-posed problems; numerical comparison of various methods. Areas of Applications: engineering (image and signal reconstruction and decompression problems), computer tomography and radiation treatment planning (convex feasibility problems), astronomy (adaptive optics), crystallography (molecular structure reconstruction), computational chemistry (molecular structure simulation) and other areas. Because of the variety of applications presented, this book can easily serve as a basis for new and innovated research and collaboration.* **Soft Computing and its Engineering Applications Second International Conference, icSoftComp 2020, Changa, Anand, India, December 11-12, 2020, Proceedings** Springer Nature *This book constitutes the refereed proceedings of the Second International Conference on Soft Computing and its Engineering Applications, icSoftComp 2020, held in Changa, India, in December 2020. Due to the COVID-19 pandemic the conference was held online. The 24 full papers and 4 short papers presented were carefully reviewed and selected from 252 submissions. The papers present recent research on theory and applications in fuzzy computing, neuro computing, and evolutionary computing.* **Optimization Structure and Applications** Springer Science & Business Media *The 21 self-contained chapters in this book, include recent developments in several optimization-related topics such as decision theory, linear programming, turnpike theory, duality theory, convex analysis, and queueing theory. This work will be a valuable tool not only to specialists interested in the technical detail and various applications presented, but also to researchers interested in building upon the book's theoretical results.* **Optimization and Data Science: Trends and Applications 5th AIROYoung Workshop and AIRO PhD School 2021 Joint Event** Springer *This proceedings volume collects contributions from the 5th AIRO Young Workshop and AIRO PhD School 2021 joint event on "Optimization and Data Science: Trends and Applications", held online, from February 8 to 12, 2021. The joint event was organized by AIROYoung representatives and the Operations Research Group of the Department of Electrical Engineering and Information Technology of the University "Federico II" of Naples. The selected contributions represent the state-of-the-art knowledge related to different branches of research, such as data science, machine learning and combinatorial optimization. Therefore, this book is primarily addressed to researchers and PhD students of the operations research community. However, due to its interdisciplinary content, it will be of high interest for other closely related research communities. Moreover, this volume not only presents theoretical results but also covers real applications in computer science, engineering, economics, healthcare, and logistics, making it interesting for practitioners facing complex decision-making problems in these areas.* **Practical Optimization Algorithms and Engineering Applications** Springer Science & Business Media *Practical Optimization: Algorithms and Engineering Applications is a hands-on treatment of the subject of optimization. A comprehensive set of problems and exercises makes the book suitable for use in one or two semesters of a first-year graduate course or an advanced undergraduate course. Each half of the book contains a full semester's worth of complementary yet stand-alone material. The practical orientation of the topics chosen and a wealth of useful examples also make the book suitable for practitioners in the field.* **Transportation Systems Analysis Models and Applications** Springer Science & Business Media *"This book provides a rigorous and comprehensive coverage of transportation models and planning methods and is a must-have to anyone in the transportation community, including students, teachers, and practitioners." Moshe Ben-Akiva, Massachusetts Institute of Technology.* **Variational Analysis and Aerospace Engineering Mathematical Challenges for the Aerospace of the Future** Springer *This book presents papers surrounding the extensive discussions that took place from the 'Variational Analysis and Aerospace Engineering' workshop held at the Ettore Majorana Foundation and Centre for Scientific Culture in 2015. Contributions to this volume focus on advanced mathematical methods in aerospace engineering and industrial engineering such as computational fluid dynamics methods, optimization methods in aerodynamics, optimum controls, dynamic systems, the theory of structures, space missions, flight mechanics, control theory, algebraic geometry for CAD applications, and variational methods and applications. Advanced graduate students, researchers, and professionals in mathematics and engineering will find this volume useful as it illustrates current collaborative research projects in applied mathematics and aerospace engineering.* **Introduction to Applied Optimization** Springer Science & Business Media *This text presents a multi-disciplined view of optimization, providing students and researchers with a thorough examination of algorithms, methods, and tools from diverse areas of optimization without introducing excessive theoretical detail. This second edition includes additional topics, including global optimization and a real-world case study using important concepts from each chapter. Introduction to Applied Optimization is intended for advanced undergraduate and graduate students and will benefit scientists from diverse areas, including engineers.* **Applications of Artificial Intelligence in Engineering Proceedings of First Global Conference on Artificial Intelligence and Applications (GCAIA 2020)** Springer Nature *This book presents best selected papers presented at the First Global Conference on Artificial Intelligence and Applications (GCAIA 2020), organized by the University of Engineering & Management, Jaipur, India, during 8–10 September 2020. The proceeding will be targeting the current research works in the domain of intelligent systems and artificial intelligence.* **Nonlinear Optimization Applications Using the GAMS Technology** Springer Science & Business Media *Here is a collection of nonlinear optimization applications from the real world, expressed in the General Algebraic Modeling System (GAMS). The concepts are presented so that the reader can quickly modify and update them to represent real-world situations.* **Handbook of Financial Engineering** Springer Science & Business Media *This comprehensive handbook discusses the most recent advances within the field of financial engineering, focusing not only on the description of the existing areas in financial engineering research, but also on the new methodologies that have been developed for modeling and addressing financial engineering problems. The book is intended for financial engineers, researchers, applied mathematicians, and graduate students interested in real-world applications to financial engineering.* **Applications of Mathematics and Informatics in Science and Engineering** Springer Science & Business *Analysis, assessment, and data management are core competencies for operation research analysts. This volume addresses a number of issues and developed methods for improving those skills. It is an outgrowth of a conference held in April 2013 at the Hellenic Military Academy and brings together a broad variety of mathematical methods and theories with several applications. It discusses directions and pursuits of scientists that pertain to engineering sciences. It is also presents the theoretical background required for algorithms and techniques applied to a large variety of concrete problems. A number of open questions as well as new future areas are also highlighted. This book will appeal to operations research analysts, engineers, community decision makers, academics, the military community, practitioners sharing the current "state-of-the-art," and analysts from coalition partners. Topics covered include Operations Research, Games and Control Theory, Computational Number Theory and Information Security, Scientific Computing and Applications, Statistical Modeling and Applications, Systems of Monitoring and Spatial Analysis.* **Jaya: An Advanced Optimization Algorithm and its Engineering Applications** Springer *This book introduces readers to the "Jaya" algorithm, an advanced optimization technique that*

can be applied to many physical and engineering systems. It describes the algorithm, discusses its differences with other advanced optimization techniques, and examines the applications of versions of the algorithm in mechanical, thermal, manufacturing, electrical, computer, civil and structural engineering. In real complex optimization problems, the number of parameters to be optimized can be very large and their influence on the goal function can be very complicated and nonlinear in character. Such problems cannot be solved using classical methods and advanced optimization methods need to be applied. The Jaya algorithm is an algorithm-specific parameter-less algorithm that builds on other advanced optimization techniques. The application of Jaya in several engineering disciplines is critically assessed and its success compared with other complex optimization techniques such as Genetic Algorithms (GA), Particle Swarm Optimization (PSO), Differential Evolution (DE), Artificial Bee Colony (ABC), and other recently developed algorithms. **Optimization and Applications 12th International Conference, OPTIMA 2021, Petrovac, Montenegro, September 27 – October 1, 2021, Proceedings** Springer Nature This book constitutes the refereed proceedings of the 12th International Conference on Optimization and Applications, OPTIMA 2021, held in Petrovac, Montenegro, in September-October 2021. The 22 full and 3 short papers presented were carefully reviewed and selected from 63 submissions. The papers are organized into the following topical sub-headings: mathematical programming, global optimization, discrete and combinatorial optimization, optimal control, optimization and data analysis, and game theory and mathematical economics. **Optimization Under Uncertainty with Applications to Aerospace Engineering** Springer Nature In an expanding world with limited resources, optimization and uncertainty quantification have become a necessity when handling complex systems and processes. This book provides the foundational material necessary for those who wish to embark on advanced research at the limits of computability, collecting together lecture material from leading experts across the topics of optimization, uncertainty quantification and aerospace engineering. The aerospace sector in particular has stringent performance requirements on highly complex systems, for which solutions are expected to be optimal and reliable at the same time. The text covers a wide range of techniques and methods, from polynomial chaos expansions for uncertainty quantification to Bayesian and Imprecise Probability theories, and from Markov chains to surrogate models based on Gaussian processes. The book will serve as a valuable tool for practitioners, researchers and PhD students. **Applications of Bat Algorithm and its Variants** Springer Nature This book highlights essential concepts in connection with the traditional bat algorithm and its recent variants, as well as its application to find optimal solutions for a variety of real-world engineering and medical problems. Today, swarm intelligence-based meta-heuristic algorithms are extensively being used to address a wide range of real-world optimization problems due to their adaptability and robustness. Developed in 2009, the bat algorithm (BA) is one of the most successful swarm intelligence procedures, and has been used to tackle optimization tasks for more than a decade. The BA's mathematical model is quite straightforward and easy to understand and enhance, compared to other swarm approaches. Hence, it has attracted the attention of researchers who are working to find optimal solutions in a diverse range of domains, such as N-dimensional numerical optimization, constrained/unconstrained optimization and linear/nonlinear optimization problems. Along with the traditional BA, its enhanced versions are now also being used to solve optimization problems in science, engineering and medical applications around the globe. **Optimization—Theory and Applications Problems with Ordinary Differential Equations** Springer Science & Business Media This book has grown out of lectures and courses in calculus of variations and optimization taught for many years at the University of Michigan to graduate students at various stages of their careers, and always to a mixed audience of students in mathematics and engineering. It attempts to present a balanced view of the subject, giving some emphasis to its connections with the classical theory and to a number of those problems of economics and engineering which have motivated so many of the present developments, as well as presenting aspects of the current theory, particularly value theory and existence theorems. However, the presentation of the theory is connected to and accompanied by many concrete problems of optimization, classical and modern, some more technical and some less so, some discussed in detail and some only sketched or proposed as exercises. No single part of the subject (such as the existence theorems, or the more traditional approach based on necessary conditions and on sufficient conditions, or the more recent one based on value function theory) can give a sufficient representation of the whole subject. This holds particularly for the existence theorems, some of which have been conceived to apply to certain large classes of problems of optimization. For all these reasons it is essential to present many examples (Chapters 3 and 6) before the existence theorems (Chapters 9 and 11-16), and to investigate these examples by means of the usual necessary conditions, sufficient conditions, and value function theory. **Stochastic and Global Optimization** Springer Science & Business Media In the paper we propose a model of tax incentives optimization for inve- ment projects with a help of the mechanism of accelerated depreciation. Unlike the tax holidays which influence on effective income tax rate, accelerated - preciation affects on taxable income. In modern economic practice the state actively use for an attraction of - vestment into the creation of new enterprises such mechanisms as accelerated depreciation and tax holidays. The problem under our consideration is the following. Assume that the state (region) is interested in realization of a certain investment project, for ex- ple, the creation of a new enterprise. In order to attract a potential investor the state decides to use a mechanism of accelerated tax depreciation. The foll- ing question arise. What is a reasonable principle for choosing depreciation rate? From the state's point of view the future investor's behavior will be rat- nal. It means that while looking at economic environment the investor choose such a moment for investment which maximizes his expected net present value (NPV) from the given project. For this case both criteria and "investment rule" depend on proposed (by the state) depreciation policy. For the simplicity we will suppose that the purpose of the state for a given project is a maximi- tion of a discounted tax payments into the budget from the enterprise after its creation. Of course, these payments depend on the moment of investor's entry and, therefore, on the depreciation policy established by the state. **Mathematical Aspects of Network Routing Optimization** Springer Science & Business Media Before the appearance of broadband links and wireless systems, networks have been used to connect people in new ways. Now, the modern world is connected through large-scale, computational networked systems such as the Internet. Because of the ever-advancing technology of networking, efficient algorithms have become increasingly necessary to solve some of the problems developing in this area. "Mathematical Aspects of Network Routing Optimization" focuses on computational issues arising from the process of optimizing network routes, such as quality of the resulting links and their reliability. Algorithms are a cornerstone for the understanding of the protocols underlying multicast routing. The main objective in the text is to derive efficient algorithms, with or without guarantee of approximation. Notes have been provided for basic topics such as graph theory and linear programming to assist those who are not fully acquainted with the mathematical topics presented throughout the book. "Mathematical Aspects of Network Routing Optimization" provides a thorough introduction to the subject of algorithms for network routing, and focuses especially on multicast and wireless ad hoc systems. This book is designed for graduate students, researchers, and professionals interested in understanding the algorithmic and mathematical ideas behind routing in computer networks. It is suitable for advanced undergraduate students, graduate students, and researchers in the area of network algorithms.
Numerical Methods and Optimization Theory and Practice for Engineers Springer This text, covering a very large span of numerical methods and optimization, is primarily aimed at advanced undergraduate and graduate students. A background in calculus and linear algebra are the only mathematical requirements. The abundance of advanced methods and practical applications will be attractive to scientists and researchers working in different branches of engineering. The reader is progressively introduced to general numerical methods and optimization algorithms in each chapter. Examples accompany the various methods and guide the students to a better understanding of the applications. The user is often provided with the opportunity to verify their results with complex programming code. Each chapter ends with graduated exercises which furnish the student with new cases to study as well as ideas for exam/homework problems for the instructor. A set of programs made in MatlabTM is available on the author's personal website and presents both numerical and optimization methods. **Cohort Intelligence: A Socio-inspired Optimization Method** Springer This Volume discusses the underlying principles and analysis of the different concepts associated with an emerging socio-inspired optimization tool referred to as Cohort Intelligence (CI). CI algorithms have been coded in Matlab and are freely available from the link provided inside the book. The book demonstrates the ability of CI methodology for solving combinatorial problems such as Traveling Salesman Problem and Knapsack Problem in addition to real world applications from the healthcare, inventory, supply chain optimization and Cross-Border transportation. The inherent ability of handling constraints based on probability distribution is also revealed and proved using these problems. **Advances in Engineering Research and Application Proceedings of the International Conference, ICERA 2018** Springer The International Conference on Engineering Research and Applications (ICERA 2018), which took place at Thai Nguyen University of Technology, Thai Nguyen, Vietnam on December 1–2, 2018, provided an international forum to disseminate information on latest theories and practices in engineering research and applications. The conference focused on original research work in areas including Mechanical ECERA Engineering, Materials and Mechanics of Materials, Mechatronics and Micro Mechatronics, Automotive Engineering, Electrical and Electronics Engineering, Information and Communication Technology. By disseminating the latest advances in the field, The Proceedings of ICERA 2018, Advances in Engineering Research and Application, helps academics and professionals alike to reshape their thinking on sustainable development. **Multicriteria Design Optimization Procedures and Applications** Springer Interest in the fascinating field of multicriteria optimization and its application to design processes has grown very quickly in recent years. Researchers and practising engineers will find this book an comprehensive presentation of this subject. After an introduction to multicriteria optimization and the advantages of using multicriteria techniques, the first part of the book presents methods and computer procedures for solving multicriteria optimum design problems including interactive methods and knowledge-based systems. The second part presents an extensive range of applications of these methods to design processes in the fol- lowing fields: mechanisms and dynamic systems, aircraft and space technology, machine tool design, metal forming and cast metal technology, civil and architectural engineering, and structures made of advanced materials. **Differential Evolution In Search of Solutions** Springer Science & Business Media Individuals and enterprises are looking for optimal solutions for the problems they face. Most problems can be expressed in mathematical terms, and so the methods of optimization render a significant aid. This book details the latest achievements in optimization. It offers comprehensive coverage on Differential Evolution, presenting revolutionary ideas in population-based optimization and shows the best known metaheuristics through the prism of Differential Evolution. **Multicriteria Design Optimization Procedures and Applications** Springer Science & Business Media Interest in the fascinating field of multicriteria optimization and its application to design processes has grown very quickly in recent years. Researchers and practising engineers will find this book an comprehensive presentation of this subject. After an introduction to multicriteria optimization and the advantages of using multicriteria techniques, the first part of the book presents methods and computer procedures for solving multicriteria optimum design problems including interactive methods and knowledge-based systems. The second part presents an extensive range of applications of these methods to design processes in the following fields: mechanisms and dynamic systems, aircraft and space technology, machine tool design, metal forming and cast metal technology, civil and architectural engineering, and structures made of advanced materials. **Optimization Methods, Theory and Applications** Springer This book presents the latest research findings and state-of-the-art solutions on optimization techniques and provides new research direction and developments. Both the theoretical and practical aspects of the book will be much beneficial to experts and students in optimization and operation research community. It selects high quality papers from The International Conference on Optimization: Techniques and Applications (ICOTA2013). The conference is an official conference series of POP (The Pacific Optimization Research Activity Group; there are over 500 active members). These state-of-the-art works in this book authored by recognized experts will make contributions to the development of optimization with its applications. **Optimization Problems and Their Applications 7th International Conference, OPTA 2018, Omsk, Russia, July 8-14, 2018, Revised Selected Papers** Springer This book constitutes extended, revised and selected papers from the 7th International Conference on Optimization Problems and Their Applications, OPTA 2018, held in Omsk, Russia in July 2018. The 27 papers presented in this volume were carefully reviewed and selected from a total of 73 submissions. The papers are listed in thematic sections, namely location problems, scheduling and routing problems, optimization problems in data analysis, mathematical programming, game theory and economical applications, applied optimization problems and metaheuristics. **Connected Dominating Set: Theory and Applications** Springer Science & Business Media The connected dominating set has been a classic subject studied in graph theory since 1975. Since the 1990s, it has been found to have important applications in communication networks, especially in wireless networks, as a virtual backbone. Motivated from those applications, many papers have been published in the literature during last 15 years. Now, the connected dominating set has become a hot research topic in computer science. In this book, we are going to collect recent developments on the connected dominating set, which presents the state of the art in the study of connected dominating sets. The book consists of 16 chapters. Except the 1st one, each chapter is devoted to one problem, and consists of three parts, motivation and overview, problem complexity analysis, and approximation algorithm designs, which will lead the reader to see clearly about the background, formulation, existing important research results, and open problems. Therefore, this would be a very valuable reference book for researchers in computer science and operations research, especially in areas of theoretical computer science, computer communication networks, combinatorial optimization, and discrete mathematics. **Continuous Nonlinear Optimization for Engineering Applications in GAMS Technology** Springer This book presents the theoretical details and computational performances of algorithms used for solving continuous nonlinear

optimization applications imbedded in GAMS. Aimed toward scientists and graduate students who utilize optimization methods to model and solve problems in mathematical programming, operations research, business, engineering, and industry, this book enables readers with a background in nonlinear optimization and linear algebra to use GAMS technology to understand and utilize its important capabilities to optimize algorithms for modeling and solving complex, large-scale, continuous nonlinear optimization problems or applications. Beginning with an overview of constrained nonlinear optimization methods, this book moves on to illustrate key aspects of mathematical modeling through modeling technologies based on algebraically oriented modeling languages. Next, the main feature of GAMS, an algebraically oriented language that allows for high-level algebraic representation of mathematical optimization models, is introduced to model and solve continuous nonlinear optimization applications. More than 15 real nonlinear optimization applications in algebraic and GAMS representation are presented which are used to illustrate the performances of the algorithms described in this book. Theoretical and computational results, methods, and techniques effective for solving nonlinear optimization problems, are detailed through the algorithms MINOS, KNITRO, CONOPT, SNOPT and IPOPT which work in GAMS technology. **Nonlinear Optimization with Engineering Applications** Springer Science & Business Media This textbook examines a broad range of problems in science and engineering, describing key numerical methods applied to real life. The case studies presented are in such areas as data fitting, vehicle route planning and optimal control, scheduling and resource allocation, sensitivity calculations and worst-case analysis. Chapters are self-contained with exercises provided at the end of most sections. Nonlinear Optimization with Engineering Applications is ideal for self-study and classroom use in engineering courses at the senior undergraduate or graduate level. The book will also appeal to postdocs and advanced researchers interested in the development and use of optimization algorithms. **Modeling and Optimization in Space Engineering State of the Art and New Challenges** Springer This book presents advanced case studies that address a range of important issues arising in space engineering. An overview of challenging operational scenarios is presented, with an in-depth exposition of related mathematical modeling, algorithmic and numerical solution aspects. The model development and optimization approaches discussed in the book can be extended also towards other application areas. The topics discussed illustrate current research trends and challenges in space engineering as summarized by the following list: • Next Generation Gravity Missions • Continuous-Thrust Trajectories by Evolutionary Neurocontrol • Nonparametric Importance Sampling for Launcher Stage Fallout • Dynamic System Control Dispatch • Optimal Launch Date of Interplanetary Missions • Optimal Topological Design • Evidence-Based Robust Optimization • Interplanetary Trajectory Design by Machine Learning • Real-Time Optimal Control • Optimal Finite Thrust Orbital Transfers • Planning and Scheduling of Multiple Satellite Missions • Trajectory Performance Analysis • Ascent Trajectory and Guidance Optimization • Small Satellite Attitude Determination and Control • Optimized Packings in Space Engineering • Time-Optimal Transfers of All-Electric GEO Satellites Researchers working on space engineering applications will find this work a valuable, practical source of information. Academics, graduate and post-graduate students working in aerospace, engineering, applied mathematics, operations research, and optimal control will find useful information regarding model development and solution techniques, in conjunction with real-world applications. **Optimal Quadratic Programming Algorithms With Applications to Variational Inequalities** Springer Science & Business Media Quadratic programming (QP) is one advanced mathematical technique that allows for the optimization of a quadratic function in several variables in the presence of linear constraints. This book presents recently developed algorithms for solving large QP problems and focuses on algorithms which are, in a sense optimal, i.e., they can solve important classes of problems at a cost proportional to the number of unknowns. For each algorithm presented, the book details its classical predecessor, describes its drawbacks, introduces modifications that improve its performance, and demonstrates these improvements through numerical experiments. This self-contained monograph can serve as an introductory text on quadratic programming for graduate students and researchers. Additionally, since the solution of many nonlinear problems can be reduced to the solution of a sequence of QP problems, it can also be used as a convenient introduction to nonlinear programming. **Approximation and Optimization Algorithms, Complexity and Applications** Springer This book focuses on the development of approximation-related algorithms and their relevant applications. Individual contributions are written by leading experts and reflect emerging directions and connections in data approximation and optimization. Chapters discuss state of the art topics with highly relevant applications throughout science, engineering, technology and social sciences. Academics, researchers, data science practitioners, business analysts, social sciences investigators and graduate students will find the number of illustrations, applications, and examples provided useful. This volume is based on the conference Approximation and Optimization: Algorithms, Complexity, and Applications, which was held in the National and Kapodistrian University of Athens, Greece, June 29–30, 2017. The mix of survey and research content includes topics in approximations to discrete noisy data; binary sequences; design of networks and energy systems; fuzzy control; large scale optimization; noisy data; data-dependent approximation; networked control systems; machine learning ; optimal design; no free lunch theorem; non-linearly constrained optimization; spectroscopy. **Surrogate-Based Modeling and Optimization Applications in Engineering** Springer Science & Business Media Contemporary engineering design is heavily based on computer simulations. Accurate, high-fidelity simulations are used not only for design verification but, even more importantly, to adjust parameters of the system to have it meet given performance requirements. Unfortunately, accurate simulations are often computationally very expensive with evaluation times as long as hours or even days per design, making design automation using conventional methods impractical. These and other problems can be alleviated by the development and employment of so-called surrogates that reliably represent the expensive, simulation-based model of the system or device of interest but they are much more reasonable and analytically tractable. This volume features surrogate-based modeling and optimization techniques, and their applications for solving difficult and computationally expensive engineering design problems. It begins by presenting the basic concepts and formulations of the surrogate-based modeling and optimization paradigm and then discusses relevant modeling techniques, optimization algorithms and design procedures, as well as state-of-the-art developments. The chapters are self-contained with basic concepts and formulations along with applications and examples. The book will be useful to researchers in engineering and mathematics, in particular those who employ computationally heavy simulations in their design work. **Robust Discrete Optimization and Its Applications** Springer Science & Business Media This book deals with decision making in environments of significant data un certainty, with particular emphasis on operations and production management applications. For such environments, we suggest the use of the robustness ap proach to decision making, which assumes inadequate knowledge of the decision maker about the random state of nature and develops a decision that hedges against the worst contingency that may arise. The main motivating factors for a decision maker to use the robustness approach are: • It does not ignore uncertainty and takes a proactive step in response to the fact that forecasted values of uncertain parameters will not occur in most environments; • It applies to decisions of unique, non-repetitive nature, which are common in many fast and dynamically changing environments; • It accounts for the risk averse nature of decision makers; and • It recognizes that even though decision environments are fraught with data uncertainties, decisions are evaluated ex post with the realized data. For all of the above reasons, robust decisions are dear to the heart of opera tional decision makers. This book takes a giant first step in presenting decision support tools and solution methods for generating robust decisions in a variety of interesting application environments. Robust Discrete Optimization is a comprehensive mathematical programming framework for robust decision making. **Introduction to Applied Optimization** Springer Provides well-written self-contained chapters, including problem sets and exercises, making it ideal for the classroom setting; Introduces applied optimization to the hazardous waste blending problem; Explores linear programming, nonlinear programming, discrete optimization, global optimization, optimization under uncertainty, multi-objective optimization, optimal control and stochastic optimal control; Includes an extensive bibliography at the end of each chapter and an index; GAMS files of case studies for Chapters 2, 3, 4, 5, and 7 are linked to http://www.springer.com/math/book/978-0-387-76634-8; Solutions manual available upon adoptions. **Handbook of Optimization in Medicine** Springer Science & Business Media Handbook of Optimization in Medicine is devoted to examining the dramatic increase in the application of effective optimization techniques to the delivery of health care. The articles, written by experts, focus on models and algorithms that have led to more efficient and sophisticated treatments of patients. Topics covered include: optimization in medical imaging, classification and data mining with medical applications, treatment of epilepsy and other brain disorders, treatment of head-and-neck, prostate, and other cancers using conventional conformal and intensity-modulated radiation therapy as well as proton therapy, treatment selection for breast cancer based on new classification schemes, optimization for the genome project, optimal timing of organ transplants.