

Solving Optimization Problems Using The Matlab

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Advanced Optimization and Decision-Making Techniques in Textile Manufacturing - Anindya Ghosh
2019-03-18

Optimization and decision making are integral parts of any manufacturing process and management system. The objective of this book is to demonstrate the confluence of theory and applications of various types of multi-criteria decision making and optimization techniques with reference to textile manufacturing and management. Divided into twelve chapters, it discusses various multi-criteria decision-making methods such as AHP, TOPSIS, ELECTRE, and optimization techniques like linear programming, fuzzy linear programming, quadratic programming, in textile domain. Multi-objective optimization problems have been dealt with two approaches, namely desirability function and evolutionary algorithm. Key Features Exclusive title covering textiles and soft computing fields including optimization and decision making Discusses concepts of traditional and non-traditional optimization methods with textile examples Explores pertinent single-objective and multi-objective optimizations Provides MATLAB coding in the Appendix to solve various types of multi-criteria decision making and optimization problems Includes examples and case studies related to textile engineering and management

Engineering Optimization - S. S. Rao 2000

A Rigorous Mathematical Approach To Identifying A Set Of Design Alternatives And Selecting The Best Candidate From Within That Set, Engineering Optimization Was Developed As A Means Of Helping Engineers To Design Systems That Are Both More Efficient And Less Expensive And To Develop New Ways Of Improving The Performance Of Existing Systems.Thanks To The Breathtaking Growth In Computer Technology That Has Occurred Over The Past Decade, Optimization Techniques Can Now Be Used To Find Creative Solutions To Larger, More Complex Problems Than Ever Before. As A Consequence, Optimization Is Now Viewed As An Indispensable Tool Of The Trade For Engineers Working In Many Different Industries, Especially The Aerospace, Automotive, Chemical, Electrical, And Manufacturing Industries.In Engineering Optimization, Professor Singiresu S. Rao Provides An Application-Oriented Presentation Of The Full Array Of Classical And Newly Developed Optimization Techniques Now Being Used By Engineers In A Wide Range Of Industries. Essential Proofs And Explanations Of The Various Techniques Are Given In A Straightforward, User-Friendly Manner, And Each Method Is Copiously Illustrated With Real-World Examples That Demonstrate How To Maximize Desired Benefits While Minimizing Negative Aspects Of Project Design.Comprehensive, Authoritative, Up-To-Date, Engineering Optimization Provides In-Depth Coverage Of Linear And Nonlinear Programming, Dynamic Programming, Integer Programming, And Stochastic Programming Techniques As Well As Several Breakthrough Methods, Including Genetic Algorithms, Simulated Annealing, And Neural Network-Based And Fuzzy Optimization Techniques.Designed To Function Equally Well As Either A Professional Reference Or A Graduate-Level Text, Engineering Optimization Features Many Solved Problems Taken From Several Engineering Fields, As Well As Review Questions, Important Figures, And Helpful References.Engineering Optimization Is A Valuable Working Resource For Engineers Employed In Practically All Technological Industries. It Is Also A Superior Didactic Tool For Graduate Students Of Mechanical, Civil, Electrical, Chemical And Aerospace Engineering.

Optimization of Power System Problems - Mahmoud Pesaran Hajiabbas 2020-01-06

This book presents integrated optimization methods and algorithms for power system problems along with their codes in MATLAB. Providing a reliable and secure power and energy system is one of the main

challenges of the new era. Due to the nonlinear multi-objective nature of these problems, the traditional methods are not suitable approaches for solving large-scale power system operation dilemmas. The integration of optimization algorithms into power systems has been discussed in several textbooks, but this is the first to include the integration methods and the developed codes. As such, it is a useful resource for undergraduate and graduate students, researchers and engineers trying to solve power and energy optimization problems using modern technical and intelligent systems based on theory and application case studies. It is expected that readers have a basic mathematical background.

Optimization - Jan Brinkhuis 2011-02-11

This self-contained textbook is an informal introduction to optimization through the use of numerous illustrations and applications. The focus is on analytically solving optimization problems with a finite number of continuous variables. In addition, the authors provide introductions to classical and modern numerical methods of optimization and to dynamic optimization. The book's overarching point is that most problems may be solved by the direct application of the theorems of Fermat, Lagrange, and Weierstrass. The authors show how the intuition for each of the theoretical results can be supported by simple geometric figures. They include numerous applications through the use of varied classical and practical problems. Even experts may find some of these applications truly surprising. A basic mathematical knowledge is sufficient to understand the topics covered in this book. More advanced readers, even experts, will be surprised to see how all main results can be grounded on the Fermat-Lagrange theorem. The book can be used for courses on continuous optimization, from introductory to advanced, for any field for which optimization is relevant.

Linear Programming with MATLAB - Michael C. Ferris 2007-01-01

A self-contained introduction to linear programming using MATLAB® software to elucidate the development of algorithms and theory. Exercises are included in each chapter, and additional information is provided in two appendices and an accompanying Web site. Only a basic knowledge of linear algebra and calculus is required.

Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK® - S. Sumathi 2017-07-26

Considered one of the most innovative research directions, computational intelligence (CI) embraces techniques that use global search optimization, machine learning, approximate reasoning, and connectionist systems to develop efficient, robust, and easy-to-use solutions amidst multiple decision variables, complex constraints, and tumultuous environments. CI techniques involve a combination of learning, adaptation, and evolution used for intelligent applications. Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® explores the performance of CI in terms of knowledge representation, adaptability, optimality, and processing speed for different real-world optimization problems. Focusing on the practical implementation of CI techniques, this book: Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch, harmonic reduction, load frequency control and automatic voltage regulation, job shop scheduling, multidepot vehicle routing, and digital image watermarking Explains the impact of CI on power systems, control systems, industrial automation, and image processing through the above-mentioned applications Shows how to apply CI algorithms to constraint-based optimization problems using MATLAB® m-files and

Simulink models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB/ Simulink provides a valuable reference for industry professionals and advanced undergraduate, postgraduate, and research students.

Convex Optimization - Stephen Boyd 2004-03-08

A comprehensive introduction to the tools, techniques and applications of convex optimization.

New Optimization Algorithms in Physics - Alexander K. Hartmann 2006-03-06

Many physicists are not aware of the fact that they can solve their problems by applying optimization algorithms. Since the number of such algorithms is steadily increasing, many new algorithms have not been presented comprehensively until now. This presentation of recently developed algorithms applied in physics, including demonstrations of how they work and related results, aims to encourage their application, and as such the algorithms selected cover concepts and methods from statistical physics to optimization problems emerging in theoretical computer science.

Nonlinear Optimization in Electrical Engineering with Applications in MATLAB® - Mohamed Bakr 2013-09-09

Nonlinear Optimization in Electrical Engineering with Applications in MATLAB® provides an introductory course on nonlinear optimization in electrical engineering, with a focus on applications such as the design of electric, microwave, and photonic circuits, wireless communications, and digital filter design.

Nature-Inspired Optimization Algorithms - Xin-She Yang 2014-02-17

Nature-Inspired Optimization Algorithms provides a systematic introduction to all major nature-inspired algorithms for optimization. The book's unified approach, balancing algorithm introduction, theoretical background and practical implementation, complements extensive literature with well-chosen case studies to illustrate how these algorithms work. Topics include particle swarm optimization, ant and bee algorithms, simulated annealing, cuckoo search, firefly algorithm, bat algorithm, flower algorithm, harmony search, algorithm analysis, constraint handling, hybrid methods, parameter tuning and control, as well as multi-objective optimization. This book can serve as an introductory book for graduates, doctoral students and lecturers in computer science, engineering and natural sciences. It can also serve a source of inspiration for new applications. Researchers and engineers as well as experienced experts will also find it a handy reference. Discusses and summarizes the latest developments in nature-inspired algorithms with comprehensive, timely literature Provides a theoretical understanding as well as practical implementation hints Provides a step-by-step introduction to each algorithm

Optimization Methods in Finance - Gerard Cornuejols 2006-12-21

Optimization models play an increasingly important role in financial decisions. This is the first textbook devoted to explaining how recent advances in optimization models, methods and software can be applied to solve problems in computational finance more efficiently and accurately. Chapters discussing the theory and efficient solution methods for all major classes of optimization problems alternate with chapters illustrating their use in modeling problems of mathematical finance. The reader is guided through topics such as volatility estimation, portfolio optimization problems and constructing an index fund, using techniques such as nonlinear optimization models, quadratic programming formulations and integer programming models respectively. The book is based on Master's courses in financial engineering and comes with worked examples, exercises and case studies. It will be welcomed by applied mathematicians, operational researchers and others who work in mathematical and computational finance and who are seeking a text for self-learning or for use with courses.

Solving Optimization Problems with MATLAB® - Dingyü Xue 2020-04-06

This book focuses on solving optimization problems with MATLAB. Descriptions and solutions of nonlinear equations of any form are studied first. Focuses are made on the solutions of various types of optimization problems, including unconstrained and constrained optimizations, mixed integer, multiobjective and dynamic programming problems. Comparative studies and conclusions on intelligent global solvers are also provided.

Solving Applied Mathematical Problems with MATLAB - 2008-11-03

This textbook presents a variety of applied mathematics topics in science and engineering with an emphasis on problem solving techniques using MATLAB. The authors provide a general overview of the MATLAB

language and its graphics abilities before delving into problem solving, making the book useful for readers without prior MATLAB experi

Optimization in Practice with MATLAB - Achille Messac 2015-03-19

This textbook is designed for students and industry practitioners for a first course in optimization integrating MATLAB® software.

Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK® - S. Sumathi 2018-09-03

Considered one of the most innovative research directions, computational intelligence (CI) embraces techniques that use global search optimization, machine learning, approximate reasoning, and connectionist systems to develop efficient, robust, and easy-to-use solutions amidst multiple decision variables, complex constraints, and tumultuous environments. CI techniques involve a combination of learning, adaptation, and evolution used for intelligent applications. Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® explores the performance of CI in terms of knowledge representation, adaptability, optimality, and processing speed for different real-world optimization problems. Focusing on the practical implementation of CI techniques, this book: Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch, harmonic reduction, load frequency control and automatic voltage regulation, job shop scheduling, multidepot vehicle routing, and digital image watermarking Explains the impact of CI on power systems, control systems, industrial automation, and image processing through the above-mentioned applications Shows how to apply CI algorithms to constraint-based optimization problems using MATLAB® m-files and Simulink® models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® provides a valuable reference for industry professionals and advanced undergraduate, postgraduate, and research students.

Design Optimization using MATLAB and SOLIDWORKS - Krishnan Suresh 2021-04-29

A hands-on text integrating mathematics, numerics and applications of optimization, with MATLAB code illustrating every concept.

Applied Linear Algebra and Optimization Using MATLAB - Rizwan Butt 2011

Designed for engineers, computer scientists, and physicists or for use as a textbook in computational courses, Applied Linear Algebra & Optimization Using MATLAB, provides the reader with numerous applications, m-files, and practical examples to solve problems. Balancing theoretical concepts with computational speed and accuracy, the book includes numerous short programs in MATLAB that can be used to solve problems involving systems of linear equations, matrices, vectors, computer graphics, and more. The book is accompanied by a CD-ROM with all of the figures, m-files for all of the programs, and MATLAB simulations from industry. Complete solutions and Microsoft PowerPoint slides are available to instructors for use as a textbook.

Optimization - Rajesh Kumar Arora 2015-05-06

Choose the Correct Solution Method for Your Optimization Problem Optimization: Algorithms and Applications presents a variety of solution techniques for optimization problems, emphasizing concepts rather than rigorous mathematical details and proofs. The book covers both gradient and stochastic methods as solution techniques for unconstrained and co

Project Optimization - Reyolando M.L.R.F. Brasil 2021-10-04

A comprehensive and easy to understand introduction to a wide range of tools to help designers to optimize their projects. The authors are engineers and therefore many of the examples are on engineering applications, but the techniques presented are common to various areas of knowledge and pervade disciplinary divisions. The book describes the fundamental ideas, mathematical and graphic methods and shows how to use Matlab and EXCEL for optimization.

Engineering Optimization - Singiresu S. Rao 2019-11-12

The revised and updated new edition of the popular optimization book for engineers The thoroughly revised and updated fifth edition of Engineering Optimization: Theory and Practice offers engineers a guide to the important optimization methods that are commonly used in a wide range of industries. The author—a noted expert on the topic—presents both the classical and most recent optimizations approaches. The book

introduces the basic methods and includes information on more advanced principles and applications. The fifth edition presents four new chapters: Solution of Optimization Problems Using MATLAB; Metaheuristic Optimization Methods; Multi-Objective Optimization Methods; and Practical Implementation of Optimization. All of the book's topics are designed to be self-contained units with the concepts described in detail with derivations presented. The author puts the emphasis on computational aspects of optimization and includes design examples and problems representing different areas of engineering. Comprehensive in scope, the book contains solved examples, review questions and problems. This important book: Offers an updated edition of the classic work on optimization Includes approaches that are appropriate for all branches of engineering Contains numerous practical design and engineering examples Offers more than 140 illustrative examples, 500 plus references in the literature of engineering optimization, and more than 500 review questions and answers Demonstrates the use of MATLAB for solving different types of optimization problems using different techniques Written for students across all engineering disciplines, the revised edition of Engineering Optimization: Theory and Practice is the comprehensive book that covers the new and recent methods of optimization and reviews the principles and applications.

Metaheuristic Computation with MATLAB® - Erik Cuevas 2020-09-14

Metaheuristic algorithms are considered as generic optimization tools that can solve very complex problems characterized by having very large search spaces. Metaheuristic methods reduce the effective size of the search space through the use of effective search strategies. Book Features: Provides a unified view of the most popular metaheuristic methods currently in use Includes the necessary concepts to enable readers to implement and modify already known metaheuristic methods to solve problems Covers design aspects and implementation in MATLAB® Contains numerous examples of problems and solutions that demonstrate the power of these methods of optimization The material has been written from a teaching perspective and, for this reason, this book is primarily intended for undergraduate and postgraduate students of artificial intelligence, metaheuristic methods, and/or evolutionary computation. The objective is to bridge the gap between metaheuristic techniques and complex optimization problems that profit from the convenient properties of metaheuristic approaches. Therefore, engineer practitioners who are not familiar with metaheuristic computation will appreciate that the techniques discussed are beyond simple theoretical tools, since they have been adapted to solve significant problems that commonly arise in such areas.

Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/SIMULINK® - S. Sumathi 2018-09-03

Considered one of the most innovative research directions, computational intelligence (CI) embraces techniques that use global search optimization, machine learning, approximate reasoning, and connectionist systems to develop efficient, robust, and easy-to-use solutions amidst multiple decision variables, complex constraints, and tumultuous environments. CI techniques involve a combination of learning, adaptation, and evolution used for intelligent applications. Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® explores the performance of CI in terms of knowledge representation, adaptability, optimality, and processing speed for different real-world optimization problems. Focusing on the practical implementation of CI techniques, this book: Discusses the role of CI paradigms in engineering applications such as unit commitment and economic load dispatch, harmonic reduction, load frequency control and automatic voltage regulation, job shop scheduling, multidepot vehicle routing, and digital image watermarking Explains the impact of CI on power systems, control systems, industrial automation, and image processing through the above-mentioned applications Shows how to apply CI algorithms to constraint-based optimization problems using MATLAB® m-files and Simulink® models Includes experimental analyses and results of test systems Computational Intelligence Paradigms for Optimization Problems Using MATLAB®/ Simulink® provides a valuable reference for industry professionals and advanced undergraduate, postgraduate, and research students.

Optimization in Computational Chemistry and Molecular Biology - Christodoulos A. Floudas 2013-06-29

Optimization in Computational Chemistry and Molecular Biology: Local and Global Approaches covers recent developments in optimization techniques for addressing several computational chemistry and biology problems. A tantalizing problem that cuts across the fields of computational chemistry, biology,

medicine, engineering and applied mathematics is how proteins fold. Global and local optimization provide a systematic framework of conformational searches for the prediction of three-dimensional protein structures that represent the global minimum free energy, as well as low-energy biomolecular conformations. Each contribution in the book is essentially expository in nature, but of scholarly treatment. The topics covered include advances in local and global optimization approaches for molecular dynamics and modeling, distance geometry, protein folding, molecular structure refinement, protein and drug design, and molecular and peptide docking. Audience: The book is addressed not only to researchers in mathematical programming, but to all scientists in various disciplines who use optimization methods in solving problems in computational chemistry and biology.

Numerical PDE-Constrained Optimization - Juan Carlos De los Reyes 2015-02-06

This book introduces, in an accessible way, the basic elements of Numerical PDE-Constrained Optimization, from the derivation of optimality conditions to the design of solution algorithms. Numerical optimization methods in function-spaces and their application to PDE-constrained problems are carefully presented. The developed results are illustrated with several examples, including linear and nonlinear ones. In addition, MATLAB codes, for representative problems, are included. Furthermore, recent results in the emerging field of nonsmooth numerical PDE constrained optimization are also covered. The book provides an overview on the derivation of optimality conditions and on some solution algorithms for problems involving bound constraints, state-constraints, sparse cost functionals and variational inequality constraints.

Iterative Methods for Optimization - C. T. Kelley 1999-01-01

This book presents a carefully selected group of methods for unconstrained and bound constrained optimization problems and analyzes them in depth both theoretically and algorithmically. It focuses on clarity in algorithmic description and analysis rather than generality, and while it provides pointers to the literature for the most general theoretical results and robust software, the author thinks it is more important that readers have a complete understanding of special cases that convey essential ideas. A companion to Kelley's book, Iterative Methods for Linear and Nonlinear Equations (SIAM, 1995), this book contains many exercises and examples and can be used as a text, a tutorial for self-study, or a reference. Iterative Methods for Optimization does more than cover traditional gradient-based optimization: it is the first book to treat sampling methods, including the Hooke-Jeeves, implicit filtering, MDS, and Nelder-Mead schemes in a unified way, and also the first book to make connections between sampling methods and the traditional gradient-methods. Each of the main algorithms in the text is described in pseudocode, and a collection of MATLAB codes is available. Thus, readers can experiment with the algorithms in an easy way as well as implement them in other languages.

Solving Optimization Problems with MATLAB® - Dingyü Xue 2020-04-06

This book focuses on solving optimization problems with MATLAB. Descriptions and solutions of nonlinear equations of any form are studied first. Focuses are made on the solutions of various types of optimization problems, including unconstrained and constrained optimizations, mixed integer, multiobjective and dynamic programming problems. Comparative studies and conclusions on intelligent global solvers are also provided.

Practical Numerical and Scientific Computing with MATLAB® and Python - Eihab B. M. Bashier 2020-03-18

Practical Numerical and Scientific Computing with MATLAB® and Python concentrates on the practical aspects of numerical analysis and linear and non-linear programming. It discusses the methods for solving different types of mathematical problems using MATLAB and Python. Although the book focuses on the approximation problem rather than on error analysis of mathematical problems, it provides practical ways to calculate errors. The book is divided into three parts, covering topics in numerical linear algebra, methods of interpolation, numerical differentiation and integration, solutions of differential equations, linear and non-linear programming problems, and optimal control problems. This book has the following advantages: It adopts the programming languages, MATLAB and Python, which are widely used among academics, scientists, and engineers, for ease of use and contain many libraries covering many scientific and engineering fields. It contains topics that are rarely found in other numerical analysis books, such as ill-conditioned linear systems and methods of regularization to stabilize their solutions, nonstandard finite differences methods for solutions of ordinary differential equations, and the computations of the optimal

controls. It provides a practical explanation of how to apply these topics using MATLAB and Python. It discusses software libraries to solve mathematical problems, such as software Gekko, pulp, and pyomo. These libraries use Python for solutions to differential equations and static and dynamic optimization problems. Most programs in the book can be applied in versions prior to MATLAB 2017b and Python 3.7.4 without the need to modify these programs. This book is aimed at newcomers and middle-level students, as well as members of the scientific community who are interested in solving math problems using MATLAB or Python.

Pyomo - Optimization Modeling in Python - William E. Hart 2012-02-15

This book provides a complete and comprehensive reference/guide to Pyomo (Python Optimization Modeling Objects) for both beginning and advanced modelers, including students at the undergraduate and graduate levels, academic researchers, and practitioners. The text illustrates the breadth of the modeling and analysis capabilities that are supported by the software and support of complex real-world applications. Pyomo is an open source software package for formulating and solving large-scale optimization and operations research problems. The text begins with a tutorial on simple linear and integer programming models. A detailed reference of Pyomo's modeling components is illustrated with extensive examples, including a discussion of how to load data from data sources like spreadsheets and databases. Chapters describing advanced modeling capabilities for nonlinear and stochastic optimization are also included. The Pyomo software provides familiar modeling features within Python, a powerful dynamic programming language that has a very clear, readable syntax and intuitive object orientation. Pyomo includes Python classes for defining sparse sets, parameters, and variables, which can be used to formulate algebraic expressions that define objectives and constraints. Moreover, Pyomo can be used from a command-line interface and within Python's interactive command environment, which makes it easy to create Pyomo models, apply a variety of optimizers, and examine solutions. The software supports a different modeling approach than commercial AML (Algebraic Modeling Languages) tools, and is designed for flexibility, extensibility, portability, and maintainability but also maintains the central ideas in modern AMLs.

Practical Optimization with MATLAB - Mircea Ancău 2019-10-03

This easy-to-follow guide provides academics and industrial engineers with a state-of-the-art numerical approach to the most frequent technical and economical optimization methods. In an engaging manner, it provides the reader with not only a systematic and comprehensive study, but also with necessary and directly implementable code written in the versatile and readily available platform Matlab. The book offers optimization methods for univariate and multivariate constrained or unconstrained functions, general optimization methods and multicriteria optimization methods; provides intuitively, step-by-step explained sample Matlab code, that can be easily adjusted to meet individual requirements; and uses a clear, concise presentation style, which will be suited to readers even without a programming background, as well as to students preparing for examinations in optimization methods.

Evolutionary Optimization Algorithms - Altaf Q. H. Badar 2021-10-30

This comprehensive reference text discusses evolutionary optimization techniques, to find optimal solutions for single and multi-objective problems. The text presents each evolutionary optimization algorithm along with its history and other working equations. It also discusses variants and hybrids of optimization techniques. The text presents step-by-step solution to a problem and includes software's like MATLAB and Python for solving optimization problems. It covers important optimization algorithms including single objective optimization, multi objective optimization, Heuristic optimization techniques, shuffled frog leaping algorithm, bacteria foraging algorithm and firefly algorithm. Aimed at senior undergraduate and graduate students in the field of electrical engineering, electronics engineering, mechanical engineering, and computer science and engineering, this text: Provides step-by-step solution for each evolutionary optimization algorithm. Provides flowcharts and graphics for better understanding of optimization techniques. Discusses popular optimization techniques include particle swarm optimization and genetic algorithm. Presents every optimization technique along with the history and working equations. Includes latest software like Python and MATLAB.

Engineering Optimization - Singiresu S. Rao 2009-07-20

Technology/Engineering/Mechanical Helps you move from theory to optimizing engineering systems in

almost any industry Now in its Fourth Edition, Professor Singiresu Rao's acclaimed text Engineering Optimization enables readers to quickly master and apply all the important optimization methods in use today across a broad range of industries. Covering both the latest and classical optimization methods, the text starts off with the basics and then progressively builds to advanced principles and applications. This comprehensive text covers nonlinear, linear, geometric, dynamic, and stochastic programming techniques as well as more specialized methods such as multiobjective, genetic algorithms, simulated annealing, neural networks, particle swarm optimization, ant colony optimization, and fuzzy optimization. Each method is presented in clear, straightforward language, making even the more sophisticated techniques easy to grasp. Moreover, the author provides: Case examples that show how each method is applied to solve real-world problems across a variety of industries Review questions and problems at the end of each chapter to engage readers in applying their newfound skills and knowledge Examples that demonstrate the use of MATLAB® for the solution of different types of practical optimization problems References and bibliography at the end of each chapter for exploring topics in greater depth Answers to Review Questions available on the author's Web site to help readers to test their understanding of the basic concepts With its emphasis on problem-solving and applications, Engineering Optimization is ideal for upper-level undergraduates and graduate students in mechanical, civil, electrical, chemical, and aerospace engineering. In addition, the text helps practicing engineers in almost any industry design improved, more efficient systems at less cost.

OPTIMIZATION FOR ENGINEERING DESIGN - KALYANMOY DEB 2012-11-18

This well-received book, now in its second edition, continues to provide a number of optimization algorithms which are commonly used in computer-aided engineering design. The book begins with simple single-variable optimization techniques, and then goes on to give unconstrained and constrained optimization techniques in a step-by-step format so that they can be coded in any user-specific computer language. In addition to classical optimization methods, the book also discusses Genetic Algorithms and Simulated Annealing, which are widely used in engineering design problems because of their ability to find global optimum solutions. The second edition adds several new topics of optimization such as design and manufacturing, data fitting and regression, inverse problems, scheduling and routing, data mining, intelligent system design, Lagrangian duality theory, and quadratic programming and its extension to sequential quadratic programming. It also extensively revises the linear programming algorithms section in the Appendix. This edition also includes more number of exercise problems. The book is suitable for senior undergraduate/postgraduate students of mechanical, production and chemical engineering. Students in other branches of engineering offering optimization courses as well as designers and decision-makers will also find the book useful. Key Features Algorithms are presented in a step-by-step format to facilitate coding in a computer language. Sample computer programs in FORTRAN are appended for better comprehension. Worked-out examples are illustrated for easy understanding. The same example problems are solved with most algorithms for a comparative evaluation of the algorithms.

Fundamentals of Optimization Techniques with Algorithms - Sukanta Nayak 2020-08-25

Optimization is a key concept in mathematics, computer science, and operations research, and is essential to the modeling of any system, playing an integral role in computer-aided design. Fundamentals of Optimization Techniques with Algorithms presents a complete package of various traditional and advanced optimization techniques along with a variety of example problems, algorithms and MATLAB® code optimization techniques, for linear and nonlinear single variable and multivariable models, as well as multi-objective and advanced optimization techniques. It presents both theoretical and numerical perspectives in a clear and approachable way. In order to help the reader apply optimization techniques in practice, the book details program codes and computer-aided designs in relation to real-world problems. Ten chapters cover, an introduction to optimization; linear programming; single variable nonlinear optimization; multivariable unconstrained nonlinear optimization; multivariable constrained nonlinear optimization; geometric programming; dynamic programming; integer programming; multi-objective optimization; and nature-inspired optimization. This book provides accessible coverage of optimization techniques, and helps the reader to apply them in practice. Presents optimization techniques clearly, including worked-out examples, from traditional to advanced Maps out the relations between optimization and other

mathematical topics and disciplines Provides systematic coverage of algorithms to facilitate computer coding Gives MATLAB® codes in relation to optimization techniques and their use in computer-aided design Presents nature-inspired optimization techniques including genetic algorithms and artificial neural networks

Applied Optimization with MATLAB Programming - P. Venkataraman 2009-03-23

Technology/Engineering/Mechanical Provides all the tools needed to begin solving optimization problems using MATLAB® The Second Edition of Applied Optimization with MATLAB® Programming enables readers to harness all the features of MATLAB® to solve optimization problems using a variety of linear and nonlinear design optimization techniques. By breaking down complex mathematical concepts into simple ideas and offering plenty of easy-to-follow examples, this text is an ideal introduction to the field. Examples come from all engineering disciplines as well as science, economics, operations research, and mathematics, helping readers understand how to apply optimization techniques to solve actual problems. This Second Edition has been thoroughly revised, incorporating current optimization techniques as well as the improved MATLAB® tools. Two important new features of the text are: Introduction to the scan and zoom method, providing a simple, effective technique that works for unconstrained, constrained, and global optimization problems New chapter, Hybrid Mathematics: An Application, using examples to illustrate how optimization can develop analytical or explicit solutions to differential systems and data-fitting problems Each chapter ends with a set of problems that give readers an opportunity to put their new skills into practice. Almost all of the numerical techniques covered in the text are supported by MATLAB® code, which readers can download on the text's companion Web site www.wiley.com/go/venkat2e and use to begin solving problems on their own. This text is recommended for upper-level undergraduate and graduate students in all areas of engineering as well as other disciplines that use optimization techniques to solve design problems.

Optimization in Chemical Engineering - Suman Dutta 2016-03-11

Optimization is used to determine the most appropriate value of variables under given conditions. The primary focus of using optimisation techniques is to measure the maximum or minimum value of a function depending on the circumstances. This book discusses problem formulation and problem solving with the help of algorithms such as secant method, quasi-Newton method, linear programming and dynamic programming. It also explains important chemical processes such as fluid flow systems, heat exchangers, chemical reactors and distillation systems using solved examples. The book begins by explaining the fundamental concepts followed by an elucidation of various modern techniques including trust-region methods, Levenberg–Marquardt algorithms, stochastic optimization, simulated annealing and statistical optimization. It studies the multi-objective optimization technique and its applications in chemical engineering and also discusses the theory and applications of various optimization software tools including LINGO, MATLAB, MINITAB and GAMS.

Fundamentals of Optimization - Mark French 2018-05-02

This textbook is for readers new or returning to the practice of optimization whose interest in the subject may relate to a wide range of products and processes. Rooted in the idea of “minimum principles,” the book introduces the reader to the analytical tools needed to apply optimization practices to an array of single- and multi-variable problems. While comprehensive and rigorous, the treatment requires no more than a basic understanding of technical math and how to display mathematical results visually. It presents a group of simple, robust methods and illustrates their use in clearly-defined examples. Distinct from the majority of optimization books on the market intended for a mathematically sophisticated audience who might want to develop their own new methods of optimization or do research in the field, this volume fills the void in instructional material for those who need to understand the basic ideas. The text emerged from a set of applications-driven lecture notes used in optimization courses the author has taught for over 25 years. The book is class-tested and refined based on student feedback, devoid of unnecessary abstraction, and ideal for students and practitioners from across the spectrum of engineering disciplines. It provides context through practical examples and sections describing commercial application of optimization ideas, such as how containerized freight and changing sea routes have been used to continually reduce the cost of moving freight across oceans. It also features 2D and 3D plots and an appendix illustrating the most widely used

MATLAB optimization functions.

MATLAB Optimization Techniques - Cesar Lopez 2014-11-12

MATLAB is a high-level language and environment for numerical computation, visualization, and programming. Using MATLAB, you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java. MATLAB Optimization Techniques introduces you to the MATLAB language with practical hands-on instructions and results, allowing you to quickly achieve your goals. It begins by introducing the MATLAB environment and the structure of MATLAB programming before moving on to the mathematics of optimization. The central part of the book is dedicated to MATLAB's Optimization Toolbox, which implements state-of-the-art algorithms for solving multiobjective problems, non-linear minimization with boundary conditions and restrictions, minimax optimization, semi-infinitely constrained minimization and linear and quadratic programming. A wide range of exercises and examples are included, illustrating the most widely used optimization methods.

Practical Optimization - Andreas Antoniou 2007-03-12

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.

Numerical Methods and Optimization - Éric Walter 2014-07-22

Initial training in pure and applied sciences tends to present problem-solving as the process of elaborating explicit closed-form solutions from basic principles, and then using these solutions in numerical applications. This approach is only applicable to very limited classes of problems that are simple enough for such closed-form solutions to exist. Unfortunately, most real-life problems are too complex to be amenable to this type of treatment. Numerical Methods – a Consumer Guide presents methods for dealing with them. Shifting the paradigm from formal calculus to numerical computation, the text makes it possible for the reader to · discover how to escape the dictatorship of those particular cases that are simple enough to receive a closed-form solution, and thus gain the ability to solve complex, real-life problems; · understand the principles behind recognized algorithms used in state-of-the-art numerical software; · learn the advantages and limitations of these algorithms, to facilitate the choice of which pre-existing bricks to assemble for solving a given problem; and · acquire methods that allow a critical assessment of numerical results. Numerical Methods – a Consumer Guide will be of interest to engineers and researchers who solve problems numerically with computers or supervise people doing so, and to students of both engineering and applied mathematics.

A Practical Approach to Metaheuristics using LabVIEW and MATLAB® - Pedro Ponce-Cruz 2020-06-08

Metaheuristic optimization has become a prime alternative for solving complex optimization problems in several areas. Hence, practitioners and researchers have been paying extensive attention to those metaheuristic algorithms that are mainly based on natural phenomena. However, when those algorithms are implemented, there are not enough books that deal with theoretical and experimental problems in a friendly manner so this book presents a novel structure that includes a complete description of the most important metaheuristic optimization algorithms as well as a new proposal of a new metaheuristic optimization named earthquake optimization. This book also has several practical exercises and a toolbox for MATLAB® and a toolkit for LabVIEW are integrated as complementary material for this book. These toolkits allow readers to move from a simulation environment to an experimentation one very fast. This book is suitable for researchers, students, and professionals in several areas, such as economics, architecture, computer science, electrical engineering, and control systems. The unique features of this book are as follows: Developed for researchers, undergraduate and graduate students, and practitioners A friendly description of the main metaheuristic optimization algorithms Theoretical and practical optimization examples A new earthquake optimization algorithm Updated state-of-the-art and research

optimization projects The authors are multidisciplinary/interdisciplinary lecturers and researchers who

have written a structure-friendly learning methodology to understand each metaheuristic optimization algorithm presented in this book.