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Evolutionary Multi-Criterion Optimization - Ricardo H.C. Takahashi 2011-03-25
This book constitutes the refereed proceedings of the 6th International Conference on Evolutionary Multi-Criterion Optimization, EMO 2011, held in Ouro Preto, Brazil, in April 2011. The 42 revised full papers presented were carefully reviewed and selected from 83 submissions. The papers deal with fundamental questions of EMO theory, such as the development of algorithmically efficient tools for the evaluation of solution-set quality , the theoretical questions related to solution archiving and others. They report on the continuing effort in the development of algorithms, either for dealing with particular classes of problems or for new forms of processing the problem information. Almost one third of the papers is related to EMO applications in a diversity of fields. Eleven papers are devoted to promote the interaction with the related field of Multi-Criterion Decision Making (MCDM).
Design and Optimization of Thermal Systems - Yogesh Jaluria 2007-12-13
Thermal systems play an increasingly symbiotic role alongside mechanical systems in varied applications spanning materials processing, energy conversion, pollution, aerospace, and automobiles. Responding to the need for a flexible, yet systematic approach to

designing thermal systems across such diverse fields, Design and Optimization of Thermal
Metaheuristics for Bi-level Optimization - El-Ghazali Talbi 2013-04-09
This book provides a complete background on metaheuristics to solve complex bi-level optimization problems (continuous/discrete, mono-objective/multi-objective) in a diverse range of application domains. Readers learn to solve large scale bi-level optimization problems by efficiently combining metaheuristics with complementary metaheuristics and mathematical programming approaches. Numerous real-world examples of problems demonstrate how metaheuristics are applied in such fields as networks, logistics and transportation, engineering design, finance and security.
Optimization in Quality Control - Khalaf S. Sultan 2012-12-06
Optimization in Quality Control presents a broad survey of the state of the art in optimization in quality, and focuses on industrial and national competitiveness. Each chapter has been carefully developed and refereed anonymously by experts in the area of optimization in quality control. Some of the topics covered in this volume include: fundamentals of optimization techniques contemporary approaches to optimization models in process control economic design of control charts determining

optimal target values in multiple criteria economic selection models examining quality improvement schemes by trading off between expected warranty servicing costs and increasing manufacturing costs designing optimal inspection plans. This book will serve as an important reference source for academics, professionals and researchers.

Engineering Optimization - Singiresu S. Rao 2019-10-30
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.

An Enduring Quest - Ferd Leimkuhler 2019-07-15
The process of industrialization that began over two hundred years ago is continuing to change the way people work and live, and doing it very rapidly, in places like China and India. At the forefront of this movement is the profession of industrial engineering that develops and applies the technology that drives industrialization. This book describes how industrial engineering evolved over the past two centuries developing methods and principles for the planning, design, and control of production and service systems. The story focuses on the growth of the discipline at Purdue University where it helped shape the university itself and made substantial contributions to the industrialization of America and the world. The story includes colorful and creative people like Frank and Lillian Gilbreth of Cheaper by the Dozen fame. Lillian was the first lady of American engineering as well a founder of Purdue's Industrial Engineering.

The CRC Handbook of Thermal Engineering - Frank Kreith 2000-02-01
This book is unique in its in-depth coverage of heat transfer and fluid mechanics including numerical and computer methods, applications, thermodynamics and fluid mechanics. It will serve as a comprehensive resource for professional engineers well into the new millennium. Some of the material will be drawn from the "Handbook of Mechanical Engineering," but with expanded information in such areas as compressible flow and pumps, conduction, and desalination.

Introduction to Optimum Design - Jasbir Arora 2011-08-17
Introduction to Optimum Design is the most widely used textbook in engineering optimization and optimum design courses. It is intended for use in a first course on engineering design and optimization at the undergraduate or graduate level within engineering departments of all disciplines, but primarily within mechanical, aerospace and civil engineering. The basic approach of the text is to describe an organized approach to engineering design optimization in a rigorous yet simplified manner, illustrate various concepts and procedures with simple examples, and demonstrate their applicability to engineering design problems. Formulation of a design problem as an optimization problem is

emphasized and illustrated throughout the text. Excel and MATLAB are featured throughout as learning and teaching aids. The 3rd edition has been reorganized and enhanced with new material, making the book even more appealing to instructors regardless of the level they teach the course. Examples include moving the introductory chapter on Excel and MATLAB closer to the front of the book and adding an early chapter on practical design examples for the more introductory course, and including a final chapter on advanced topics for the purely graduate level course. Basic concepts of optimality conditions and numerical methods are described with simple and practical examples, making the material highly teachable and learnable. Applications of the methods for structural, mechanical, aerospace and industrial engineering problems. Introduction to MATLAB Optimization Toolbox. Optimum design with Excel Solver has been expanded into a full chapter. Practical design examples introduce students to usage of optimization methods early in the book. New material on several advanced optimum design topics serves the needs of instructors teaching more advanced courses.

Introduction to Mathematical Methods for Environmental Engineers and Scientists - Charles Prochaska 2018-06-15
The material in this book attempts to address mathematical calculations common to both the environmental science and engineering professionals. The book provides the reader with nearly 100 solved illustrative examples. The interrelationship between both theory and applications is emphasized in nearly all of the 35 chapters. One key feature of this book is that the solutions to the problems are presented in a stand-alone manner. Throughout the book, the illustrative examples are laid out in such a way as to develop the reader's technical understanding of the subject in question, with more difficult examples located at or near the end of each set. In presenting the text material, the authors have stressed the pragmatic approach in the application of mathematical tools to assist the reader in grasping the role of mathematical skills in environmental problem-solving situations. The book is divided up into five (V) parts: Introduction Analytical Analysis Numerical Analysis Statistical Analysis Optimization

Mechanical Engineers' Handbook, Volume 4 - Myer Kutz 2015-02-02
The engineer's ready reference for mechanical power and heat Mechanical Engineer's Handbook provides the most comprehensive coverage of the entire discipline, with a focus on explanation and analysis. Packaged as a modular approach, these books are designed to be used either individually or as a set, providing engineers with a thorough, detailed, ready reference on topics that may fall outside their scope of expertise. Each book provides discussion and examples as opposed to straight data and calculations, giving readers the immediate background they need while pointing them toward more in-depth information as necessary. Volume 4: Energy and Power covers the essentials of fluids, thermodynamics, entropy, and heat, with chapters dedicated to individual applications such as air heating, cryogenic engineering, indoor environmental control, and more. Readers will find detailed guidance toward fuel sources and their technologies, as well as a general overview of the mechanics of combustion. No single engineer can be a specialist in all areas that they are called on to work in the diverse industries and job functions they occupy. This book gives them a resource for finding the information they need, with a focus on topics related to the productions, transmission, and use of mechanical power and heat. Understand the nature of energy and its proper measurement and analysis Learn how the mechanics of energy apply to furnaces, refrigeration, thermal systems, and more Examine the and pros and cons of petroleum, coal, biofuel, solar, wind, and geothermal power Review the mechanical parts that generate, transmit, and store different types of power, and the applicable guidelines Engineers must frequently refer to data tables, standards, and other list-type references, but this book is different; instead of just providing the answer, it explains why the answer is what it is. Engineers will appreciate this approach, and come to find Volume 4: Energy and Power an invaluable reference.

Operations Research and Management Science Handbook - A. Ravi Ravindran 2016-04-19
Operations Research (OR) began as an interdisciplinary activity to solve complex military problems during World War II. Utilizing principles from

mathematics, engineering, business, computer science, economics, and statistics, OR has developed into a full fledged academic discipline with practical application in business, industry, government and military. Currently regarded as a body of established mathematical models and methods essential to solving complicated management issues, OR provides quantitative analysis of problems from which managers can make objective decisions. Operations Research and Management Science (OR/MS) methodologies continue to flourish in numerous decision making fields. Featuring a mix of international authors, Operations Research and Management Science Handbook combines OR/MS models, methods, and applications into one comprehensive, yet concise volume. The first resource to reach for when confronting OR/MS difficulties, this text – Provides a single source guide in OR/MS Bridges theory and practice Covers all topics relevant to OR/MS Offers a quick reference guide for students, researchers and practitioners Contains unified and up-to-date coverage designed and edited with non-experts in mind Discusses software availability for all OR/MS techniques Includes contributions from a mix of domestic and international experts The 26 chapters in the handbook are divided into two parts. Part I contains 14 chapters that cover the fundamental OR/MS models and methods. Each chapter gives an overview of a particular OR/MS model, its solution methods and illustrates successful applications. Part II of the handbook contains 11 chapters discussing the OR/MS applications in specific areas. They include airlines, e-commerce, energy systems, finance, military, production systems, project management, quality control, reliability, supply chain management and water resources. Part II ends with a chapter on the future of OR/MS applications.

Integrated Urban Models Volume 2: New Research and Applications of Optimization and Dynamics (Routledge Revivals) - Stephen H. Putman 2014-04-04
Following on from Integrated Models Volume 1: Policy Analysis of Transportation and Lane Use (Routledge Library Editions, 2006), this book bridges the gap between the scholars and the practitioners of transportation and land-use modelling. First published in 1991, chapters discuss model-calibration and model-solution problems, describe a series of numerical and policy analyses, and propose potential directions for location and land-use research. This reissue will be of particular value to undergraduate and postgraduate geography students with an interest in integrated urban modelling; in particular, the research conducted in the field over the past two decades.

Optimization - Rajesh Kumar Arora 2015-05-06
Choose the Correct Solution Method for Your Optimization ProblemOptimization: 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

Spectral Algorithms - Ravindran Kannan 2009
Spectral methods refer to the use of eigenvalues, eigenvectors, singular values and singular vectors. They are widely used in Engineering, Applied Mathematics and Statistics. More recently, spectral methods have found numerous applications in Computer Science to "discrete" as well "continuous" problems. Spectral Algorithms describes modern applications of spectral methods, and novel algorithms for estimating spectral parameters. The first part of the book presents applications of spectral methods to problems from a variety of topics including combinatorial optimization, learning and clustering. The second part of the book is motivated by efficiency considerations. A feature of many modern applications is the massive amount of input data. While sophisticated algorithms for matrix computations have been developed over a century, a more recent development is algorithms based on "sampling on the y" from massive matrices. Good estimates of singular values and low rank approximations of the whole matrix can be provably derived from a sample. The main emphasis in the second part of the book is to present these sampling methods with rigorous error bounds. It also presents recent extensions of spectral methods from matrices to tensors and their applications to some combinatorial optimization problems.
Engineering Optimization - G. V. Reklaitis 1983

A basic text for engineering students and practicing engineers dealing with design problems in all engineering disciplines. Optimization algorithms are developed through illustrative examples. Includes numerical results on the efficiencies of various algorithms, comparison of constrained-optimization methods, and strategies for optimization studies. Also includes several actual case studies.

Engineering Optimization - R. Russell Rhinehart 2018-03-14
An Application-Oriented Introduction to Essential Optimization Concepts and Best Practices Optimization is an inherent human tendency that gained new life after the advent of calculus; now, as the world grows increasingly reliant on complex systems, optimization has become both more important and more challenging than ever before. Engineering Optimization provides a practically-focused introduction to modern engineering optimization best practices, covering fundamental analytical and numerical techniques throughout each stage of the optimization process. Although essential algorithms are explained in detail, the focus lies more in the human function: how to create an appropriate objective function, choose decision variables, identify and incorporate constraints, define convergence, and other critical issues that define the success or failure of an optimization project. Examples, exercises, and homework throughout reinforce the author's "do, not study" approach to learning, underscoring the application-oriented discussion that provides a deep, generic understanding of the optimization process that can be applied to any field. Providing excellent reference for students or professionals, Engineering Optimization: Describes and develops a variety of algorithms, including gradient based (such as Newton's, and Levenberg-Marquardt), direct search (such as Hooke-Jeeves, Leapfrogging, and Particle Swarm), along with surrogate functions for surface characterization Provides guidance on optimizer choice by application, and explains how to determine appropriate optimizer parameter values Details current best practices for critical stages of specifying an optimization procedure, including decision variables, defining constraints, and relationship modeling Provides access to software and Visual Basic macros for Excel on the companion website, along with solutions to examples presented in the book Clear explanations, explicit equation derivations, and practical examples make this book ideal for use as part of a class or self-study, assuming a basic understanding of statistics, calculus, computer programming, and engineering models. Anyone seeking best practices for "making the best choices" will find value in this introductory resource.

Multi-Objective Optimization in Chemical Engineering - Gade Pandu Rangaiah 2013-03-20
For reasons both financial and environmental, there is a perpetual need to optimize the design and operating conditions of industrial process systems in order to improve their performance, energy efficiency, profitability, safety and reliability. However, with most chemical engineering application problems having many variables with complex inter-relationships, meeting these optimization objectives can be challenging. This is where Multi-Objective Optimization (MOO) is useful to find the optimal trade-offs among two or more conflicting objectives. This book provides an overview of the recent developments and applications of MOO for modeling, design and operation of chemical, petrochemical, pharmaceutical, energy and related processes. It then covers important theoretical and computational developments as well as specific applications such as metabolic reaction networks, chromatographic systems, CO_2 emissions targeting for petroleum refining units, ecodesign of chemical processes, ethanol purification and cumene process design. Multi-Objective Optimization in Chemical Engineering: Developments and Applications is an invaluable resource for researchers and graduate students in chemical engineering as well as industrial practitioners and engineers involved in process design, modeling and optimization.

Introduction to Optimization for Chemical and Environmental Engineers - Louis Theodore 2018-07-20
"The authors—a chemical engineer and a civil engineer—have complimented each other in delivering an introductory text on optimization for engineers of all disciplines. It covers a host of topics not normally addressed by other texts. Although introductory in nature, it is

a book that will prove invaluable to me and my staff, and belongs on the shelves of practicing environmental and chemical engineers. The illustrative examples are outstanding and make this a unique and special book." —John D. McKenna, Ph.D., Principal, ETS, Inc., Roanoke, Virginia "The authors have adeptly argued that basic science courses—particularly those concerned with mathematics—should be taught to engineers by engineers. Also, books adopted for use in such courses should also be written by engineers. The readers of this book will acquire an understanding and appreciation of the numerous mathematical methods that are routinely employed by practicing engineers. Furthermore, this introductory text on optimization attempts to address a void that exists in college engineering curricula. I recommend this book without reservation; it is a library 'must' for engineers of all disciplines." —Kenneth J. Skipka, RTP Environmental Associates, Inc., Westbury, NY, USA Introduction to Optimization for Chemical and Environmental Engineers presents the introductory fundamentals of several optimization methods with accompanying practical engineering applications. It examines mathematical optimization calculations common to both environmental and chemical engineering professionals, with a primary focus on perturbation techniques, search methods, graphical analysis, analytical methods, linear programming, and more. The book presents numerous illustrative examples laid out in such a way as to develop the reader's technical understanding of optimization, with progressively difficult examples located at the end of each chapter. This book serves as a training tool for students and industry professionals alike. FEATURES Examines optimization concepts and methods used by environmental and chemical engineering practitioners. Presents solutions to real-world scenarios/problems at the end of each chapter. Offers a pragmatic approach to the application of mathematical tools to assist the reader in grasping the role of optimization in engineering problem-solving situations. Provides numerous illustrative examples. Serves as a text for introductory courses, or as a training tool forindustry professionals.
Evolutionary Algorithms in Engineering Applications - Dipankar

Dasgupta 2013-06-29
Evolutionary algorithms are general-purpose search procedures based on the mechanisms of natural selection and population genetics. They are appealing because they are simple, easy to interface, and easy to extend. This volume is concerned with applications of evolutionary algorithms and associated strategies in engineering. It will be useful for engineers, designers, developers, and researchers in any scientific discipline interested in the applications of evolutionary algorithms. The volume consists of five parts, each with four or five chapters. The topics are chosen to emphasize application areas in different fields of engineering. Each chapter can be used for self-study or as a reference by practitioners to help them apply evolutionary algorithms to problems in their engineering domains.
Foundations of Data Science - Avrim Blum 2020-01-23
This book provides an introduction to the mathematical and algorithmic foundations of data science, including machine learning, high-dimensional geometry, and analysis of large networks. Topics include the counterintuitive nature of data in high dimensions, important linear algebraic techniques such as singular value decomposition, the theory of random walks and Markov chains, the fundamentals of and important algorithms for machine learning, algorithms and analysis for clustering, probabilistic models for large networks, representation learning including topic modelling and non-negative matrix factorization, wavelets and compressed sensing. Important probabilistic techniques are developed including the law of large numbers, tail inequalities, analysis of random projections, generalization guarantees in machine learning, and moment methods for analysis of phase transitions in large random graphs. Additionally, important structural and complexity measures are discussed such as matrix norms and VC-dimension. This book is suitable for both undergraduate and graduate courses in the design and analysis of algorithms for data.
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.

Supply Chain Engineering - A. Ravi Ravindran 2016-04-19 Winner of 2013 IIE/Joint Publishers Book-of-the-Year AwardEmphasizing a quantitative approach, Supply Chain Engineering: Models and Applications provides state-of-the-art mathematical models, concepts, and solution methods important in the design, control, operation, and management of global supply chains. The text provides an understanding of

State of the Art in Global Optimization - Christodoulos A. Floudas 2013-12-01

Optimization problems abound in most fields of science, engineering, and tech nology. In many of these problems it is necessary to compute the global optimum (or a good approximation) of a multivariable function. The variables that define the function to be optimized can be continuous and/or discrete and, in addition, many times satisfy certain constraints. Global optimization problems belong to the complexity class of NP-hard prob lems. Such problems are very difficult to solve. Traditional descent optimization algorithms based on local information are not adequate for solving these problems. In most cases of practical interest the number of local optima increases, on the aver age, exponentially with the size of the problem (number of variables). Furthermore, most of the traditional approaches fail to escape from a local optimum in order to continue the search for the global solution. Global optimization has received a lot of attention in the past ten years, due to the success of new algorithms for solving large classes of problems from diverse areas such as engineering design and control, computational chemistry and biology, structural optimization, computer science, operations research, and economics. This book contains refereed invited papers presented at the conference on "State of the Art in Global Optimization: Computational Methods and Applications" held at Princeton University, April 28-30, 1995. The conference presented current re search on global optimization and related applications in science and engineering. The papers included in this book cover a wide spectrum of approaches for solving global optimization problems and applications.

Mechanical Engineers' Handbook, Volume 2 - Myer Kutz 2015-02-02 Full coverage of electronics, MEMS, and instrumentation and control in mechanical engineering This second volume of Mechanical Engineers' Handbook covers electronics, MEMS, and instrumentation and control, giving you accessible and in-depth access to the topics you'll encounter in the discipline: computer-aided design, product design for manufacturing and assembly, design optimization, total quality management in mechanical system design, reliability in the mechanical design process for sustainability, life-cycle design, design for remanufacturing processes, signal processing, data acquisition and

display systems, and much more. The book provides a quick guide to specialized areas you may encounter in your work, giving you access to the basics of each and pointing you toward trusted resources for further reading, if needed. The accessible information inside offers discussions, examples, and analyses of the topics covered, rather than the straight data, formulas, and calculations you'll find in other handbooks. Presents the most comprehensive coverage of the entire discipline of Mechanical Engineering anywhere in four interrelated books Offers the option of being purchased as a four-book set or as single books Comes in a subscription format through the Wiley Online Library and in electronic and custom formats Engineers at all levels will find Mechanical Engineers' Handbook, Volume 2 an excellent resource they can turn to for the basics of electronics, MEMS, and instrumentation and control.

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.

Differential Evolution In Chemical Engineering: Developments And Applications - Gade Pandu Rangaiah 2017-05-29
Optimization plays a key role in the design, planning and operation of chemical and related processes for several decades. Techniques for solving optimization problems are of deterministic or stochastic type. Of these, stochastic techniques can solve any type of optimization problems and can be adapted for multiple objectives. Differential evolution (DE), proposed about two decades ago, is one of the stochastic techniques. Its algorithm is simple to understand and use. DE has found many applications in chemical engineering.This unique compendium focuses on DE, its recent developments and applications in chemical engineering. It will cover both single and multi-objective optimization. The book contains a number of chapters from experienced editors, and also several chapters from active researchers in this area.

Multiple Approaches to Intelligent Systems - Ibrahim F. Imam 2004-05-19
We never create anything, We discover and reproduce. The Twelfth International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems has a distinguished theme. It is concerned with bridging the gap between the academic and the

industrial worlds of Artificial Intelligence (AI) and Expert Systems. The academic world is mainly concerned with discovering new algorithms, approaches, and methodologies; however, the industrial world is mainly driven by profits, and concerned with producing new products or solving customers' problems. Ten years ago, the artificial intelligence research gap between academia and industry was very broad. Recently, this gap has been narrowed by the emergence of new fields and new joint research strategies in academia. Among the new fields which contributed to the academic-industrial convergence are knowledge representation, machine learning, searching, reasoning, distributed AI, neural networks, data mining, intelligent agents, robotics, pattern recognition, vision, applications of expert systems, and others. It is worth noting that the end results of research in these fields are usually products rather than empirical analyses and theoretical proofs. Applications of such technologies have found great success in many domains including fraud detection, internet service, banking, credit risk and assessment, telecommunication, etc. Progress in these areas has encouraged the leading corporations to institute research funding programs for academic institutes. Others have their own research laboratories, some of which produce state of the art research.

Operations Research - Michael Carter 2018-08-06
Operations Research: A Practical Introduction is just that: a hands-on approach to the field of operations research (OR) and a useful guide for using OR techniques in scientific decision making, design, analysis and management. The text accomplishes two goals. First, it provides readers with an introduction to standard mathematical models and algorithms. Second, it is a thorough examination of practical issues relevant to the development and use of computational methods for problem solving. Highlights: All chapters contain up-to-date topics and summaries A succinct presentation to fit a one-term course Each chapter has references, readings, and list of key terms Includes illustrative and current applications New exercises are added throughout the text Software tools have been updated with the newest and most popular software Many students of various disciplines such as mathematics, economics, industrial engineering and computer science often take one course in operations research. This book is written to provide a succinct and efficient introduction to the subject for these students, while offering a sound and fundamental preparation for more advanced courses in linear and nonlinear optimization, and many stochastic models and analyses. It provides relevant analytical tools for this varied audience and will also serve professionals, corporate managers, and technical consultants.

Service Systems Engineering and Management - A. Ravi Ravindran 2018-04-18
Recipient of the 2019 IISE Institute of Industrial and Systems Engineers Joint Publishers Book-of-the-Year Award This is a comprehensive textbook on service systems engineering and management. It emphasizes the use of engineering principles to the design and operation of service enterprises. Service systems engineering relies on mathematical models and methods to solve problems in the service industries. This textbook covers state-of-the-art concepts, models and solution methods important in the design, control, operations and management of service enterprises. Service Systems Engineering and Management begins with a basic overview of service industries and their importance in today's economy. Special challenges in managing services, namely, perishability, intangibility, proximity and simultaneity are discussed. Quality of service metrics and methods for measuring them are then discussed. Evaluating the design and operation of service systems frequently involves the conflicting criteria of cost and customer service. This textbook presents two approaches to evaluate the performance of service systems – Multiple Criteria Decision Making and Data Envelopment Analysis. The textbook then discusses several topics in service systems engineering and management – supply chain optimization, warehousing and distribution, modern portfolio theory, revenue management, retail engineering, health systems engineering and financial services. Features: Stresses quantitative models and methods in service systems engineering and management Includes chapters on design and evaluation of service systems, supply chain engineering, warehousing

and distribution, financial engineering, healthcare systems, retail engineering and revenue management Bridges theory and practice Contains end-of-chapter problems, case studies, illustrative examples, and real-world applications Service Systems Engineering and Management is primarily addressed to those who are interested in learning how to apply operations research models and methods for managing service enterprises. This textbook is well suited for industrial engineering students interested in service systems applications and MBA students in elective courses in operations management, logistics and supply chain management that emphasize quantitative analysis.

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

Advances in Reliability and System Engineering - Mangey Ram 2016-11-30
This book presents original studies describing the latest research and developments in the area of reliability and systems engineering. It helps the reader identifying gaps in the current knowledge and presents fruitful areas for further research in the field. Among others, this book covers reliability measures, reliability assessment of multi-state systems, optimization of multi-state systems, continuous multi-state systems, new computational techniques applied to multi-state systems and probabilistic and non-probabilistic safety assessment.

Multi-objective Optimization: Techniques And Applications In Chemical Engineering (Second Edition) - Rangaiah Gade Pandu 2016-12-22
Optimization is now essential in the design, planning and operation of chemical and related processes. Although process optimization for multiple objectives was studied in the 1970s and 1980s, it has attracted active research in the last 15 years, spurred by the new and effective techniques for multi-objective optimization (MOO). To capture this renewed interest, this monograph presents recent research in MOO techniques and applications in chemical engineering. Following a brief introduction and review of MOO applications in chemical engineering since 2000, the book presents selected MOO techniques and many chemical engineering applications in detail. In this second edition, several chapters from the first edition have been updated, one chapter is completely revised and three new chapters have been added. One of the new chapters describes three MS Excel programs useful for MOO of application problems. All the chapters will be of interest to researchers in MOO and/or chemical engineering. Several exercises are included at the end of many chapters, for use by both practicing engineers and students.

Computational Fluid Dynamics in Industrial Combustion - Charles E. Baukal, Jr. 2000-10-26
Although many books have been written on computational fluid dynamics (CFD) and many written on combustion, most contain very limited coverage of the combination of CFD and industrial combustion. Furthermore, most of these books are written at an advanced academic level, emphasize theory over practice, and provide little help to engineers who need to use CFD for combustion modeling. Computational Fluid Dynamics in Industrial Combustion fills this gap in the literature. Focusing on topics of interest to the practicing engineer, it codifies the many relevant books, papers, and reports written on this combined subject into a single, coherent reference. It looks at each topic from a somewhat narrow perspective to see how that topic affects modeling in industrial combustion. The editor and his team of expert authors address these topics within three main sections: Modeling Techniques-The basics of CFD modeling in combustion Industrial Applications-Specific applications of CFD in the steel, aluminum, glass, gas turbine, and petrochemical industries Advanced Techniques-Subjects rarely addressed in other texts, including design optimization, simulation, and visualization Rapid increases in computing power and significant advances in commercial CFD codes have led to a tremendous increase in the application of CFD to industrial combustion. Thorough and clearly representing the techniques and issues confronted in industry, Computational Fluid Dynamics in Industrial Combustion will help bring you quickly up to date on current methods and gain the ability to set up and solve the various types of problems you will encounter.
Genetic Algorithms and Engineering Optimization - Mitsuo Gen 1999-12-28
A comprehensive guide to a powerful new analytical tool by two of its foremost innovators The past decade has witnessed many exciting advances in the use of genetic algorithms (GAs) to solve optimization problems in everything from product design to scheduling and client/server networking. Aided by GAs, analysts and designers now routinely evolve solutions to complex combinatorial and multiobjective optimization problems with an ease and rapidity unthinkable withconventional methods. Despite the continued growth and refinement of this powerful analytical tool, there continues to be a lack of up-to-date guides to contemporary GA optimization principles and practices. Written by two of the world's leading experts in the field, this book fills that gap in the literature. Taking an intuitive approach, Mitsuo Gen and Runwei Cheng employ numerous illustrations and real-world examples to help readers gain a thorough understanding of basic GA concepts-including encoding, adaptation, and genetic optimizations-and to show how GAs can be used to solve an array of constrained, combinatorial, multiobjective, and fuzzy optimization problems. Focusing on problems commonly encountered in industry-especially in manufacturing-Professors Gen and Cheng provide in-depth coverage of advanced GA techniques for: * Reliability design * Manufacturing cell design * Scheduling * Advanced transportation problems * Network design and routing Genetic Algorithms and Engineering Optimization is an indispensable working resource for industrial engineers and designers, as well as systems analysts, operations researchers, and management scientists working in manufacturing and related industries. It also makes an excellent primary or supplementary text for advanced courses in industrial engineering, management science, operations research, computer science, and artificial intelligence.

Optimization in Food Engineering - Ferruh Erdogdu 2008-12-09
While mathematically sophisticated methods can be used to better understand and improve processes, the nonlinear nature of food processing models can make their dynamic optimization a daunting task. With contributions from a virtual who's who in the food processing industry, Optimization in Food Engineering evaluates the potential uses and limitations of optimization techniques for food processing, including classical methods, artificial intelligence-genetic algorithms, multi-objective optimization procedures, and computational fluid dynamics. The book begins by delineating the fundamentals and methods for analytical and numerical procedures. It then covers optimization techniques and how they specifically apply to food processing. The final

section digs deep into fundamental food processes and provides detailed explanation and examples from the most experienced and published authors in the field. This includes a range of processes from optimization strategies for improving the performance of batch reactors to the optimization of conventional thermal processing, microwave heating, freeze drying, spray drying, and refrigeration systems, to structural optimization techniques for developing beverage containers, optimization approaches for impingement processing, and optimal operational planning methodologies. Each chapter presents the required parameters for the given process with the optimization procedure to apply. An increasing part of the food processor's job is to optimize systems to squeeze more dollars out of overhead to offset rising utility and transportation costs. Logically combining optimization techniques from many sources into a single volume focused on food production processes, this book provides real solutions to increases in energy, healthcare, and product liability costs that impact the bottom line in food production.

Decision Sciences - Raghu Nandan Sengupta 2016-11-30
This handbook is an endeavour to cover many current, relevant, and essential topics related to decision sciences in a scientific manner. Using this handbook, graduate students, researchers, as well as practitioners from engineering, statistics, sociology, economics, etc. will find a new and refreshing paradigm shift as to how these topics can be put to use beneficially. Starting from the basics to advanced concepts, authors hope to make the readers well aware of the different theoretical and practical ideas, which are the focus of study in decision sciences nowadays. It includes an excellent bibliography/reference/journal list, information about a variety of datasets, illustrated pseudo-codes, and discussion of future trends in research. Covering topics ranging from optimization, networks and games, multi-objective optimization, inventory theory, statistical methods, artificial neural networks, times series analysis, simulation modeling, decision support system, data envelopment analysis, queueing theory, etc., this reference book is an attempt to make this area more meaningful for varied readers. Noteworthy features of this handbook are in-depth coverage of different topics, solved practical examples, unique datasets for a variety of examples in the areas of decision sciences, in-depth analysis of problems through colored charts, 3D diagrams, and discussions about software.

Optimization Techniques in Computer Vision - Mongi A. Abidi 2016-12-06
This book presents practical optimization techniques used in image processing and computer vision problems. Ill-posed problems are introduced and used as examples to show how each type of problem is related to typical image processing and computer vision problems. Unconstrained optimization gives the best solution based on numerical minimization of a single, scalar-valued objective function or cost function. Unconstrained optimization problems have been intensively studied, and many algorithms and tools have been developed to solve them. Most practical optimization problems, however, arise with a set of constraints. Typical examples of constraints include: (i) pre-specified pixel intensity range, (ii) smoothness or correlation with neighboring information, (iii) existence on a certain contour of lines or curves, and (iv) given statistical or spectral characteristics of the solution. Regularized optimization is a special method used to solve a class of constrained optimization problems. The term regularization refers to the transformation of an objective function with constraints into a different objective function, automatically reflecting constraints in the unconstrained minimization process. Because of its simplicity and efficiency, regularized optimization has many application areas, such as image restoration, image reconstruction, optical flow estimation, etc. Optimization plays a major role in a wide variety of theories for image processing and computer vision. Various optimization techniques are used at different levels for these problems, and this volume summarizes and explains these techniques as applied to image processing and computer vision.

Handbook of Research on Natural Computing for Optimization Problems - Mandal, Jyotsna Kumar 2016-05-25
Nature-inspired computation is an interdisciplinary topic area that connects the natural sciences to computer science. Since natural

computing is utilized in a variety of disciplines, it is imperative to research its capabilities in solving optimization issues. The Handbook of Research on Natural Computing for Optimization Problems discusses nascent optimization procedures in nature-inspired computation and the innovative tools and techniques being utilized in the field. Highlighting empirical research and best practices concerning various optimization issues, this publication is a comprehensive reference for researchers, academicians, students, scientists, and technology developers interested in a multidisciplinary perspective on natural computational systems.

Engineering Optimization - A. Ravindran 2006-05-19
The classic introduction to engineering optimization theory and practice-- now expanded and updated Engineering optimization helps engineers zero in on the most effective, efficient solutions to problems. This text provides a practical, real-world understanding of engineering optimization. Rather than belaboring underlying proofs and mathematical derivations, it emphasizes optimization methodology, focusing on techniques and stratagems relevant to engineering applications in design, operations, and analysis. It surveys diverse optimization methods, ranging from those applicable to the minimization of a single-variable function to those most suitable for large-scale, nonlinear constrained problems. New material covered includes the duality theory, interior point methods for solving LP problems, the generalized Lagrange multiplier method and generalization of convex functions, and goal programming for solving multi-objective optimization problems. A practical, hands-on reference and text, Engineering Optimization, Second Edition covers: * Practical issues, such as model formulation, implementation, starting point generation, and more * Current, state-of-the-art optimization software * Three engineering case studies plus numerous examples from chemical, industrial, and mechanical engineering * Both classical methods and new techniques, such as successive quadratic programming, interior point methods, and goal programming Excellent for self-study and as a reference for engineering professionals, this Second Edition is also ideal for senior and graduate courses on engineering optimization, including television and online instruction, as well as for in-plant training.

Practical Chemical Process Optimization - Ioannis K. Kookos 2022-10-28
This text provides the undergraduate chemical engineering student with the necessary tools for problem solving in chemical or bio-engineering processes. In a friendly, simple, and unified framework, the exposition aptly balances theory and practice. It uses minimal mathematical concepts, terms, algorithms, and describes the main aspects of chemical process optimization using MATLAB and GAMS. Numerous examples and case studies are designed for students to understand basic principles of each optimization method and elicit the immediate discovery of practical applications. Problem sets are directly tied to real-world situations most commonly encountered in chemical engineering applications. Chapters are structured with handy learning summaries, terms and concepts, and problem sets, and individually reinforce the basics of particular optimization methods. Additionally, the wide breadth of topics that may be encountered in courses such as Chemical Process Optimization, Chemical Process Engineering, Optimization of Chemical Processes, are covered in this accessible text. The book provides formal introductions to MATLAB, GAMS, and a revisit to pertinent aspects of undergraduate calculus. While created for coursework, this text is also suitable for independent study. A full solutions manual is available to instructors who adopt the text for their course.