Metaheuristics For Hard Optimization Methods And Case Studies 2006 Edition By Dri 1 2 O Johann Pi 1 2 Trowski Alain Siarry Patrick Taillard E 2005 Hardcover

For decades, optimization methods such as Fuzzy Logic, Artificial Neural Networks, Firefly, Simulated annealing, and Tabu search, have been capable of handling and tackling a wide range of real-world application problems in society and nature. Analysts have turned to these problem-solving techniques in the event during natural disasters and chaotic systems research. The Handbook of Research on Artificial Intelligence Techniques and Algorithms highlights the cutting edge developments in this promising research area. This premier reference work applies Meta-heuristics Optimization (MO) Techniques to real world problems in a variety of fields including business, logistics, computer science, engineering, and government. This work is particularly relevant to researchers, scientists, decision-makers, managers, and practitioners.

This book is a collection of the most recent approaches that combine metaheuristics and machine learning. Some of the methods considered in this book are evolutionary, swarm, machine learning, and deep learning. The chapters were classified based on the content; then, the sections are thematic. Different applications and implementations are included; in this sense, the book provides theory and practical content with novel machine learning and metaheuristic algorithms. The chapters were compiled using a scientific perspective. Accordingly, the book is primarily intended for undergraduate and postgraduate students of Science, Engineering, and Computational Mathematics and is useful in courses on Artificial Intelligence, Advanced Machine Learning, among others. Likewise, the book is useful for research from the evolutionary computation, artificial intelligence, and image processing communities.

Self-organisation, self-regulation, self-repair and self-maintenance are promising conceptual approaches for dealing with complex distributed interactive software and information-handling systems. Self-organising applications dynamically change their functionality and structure without direct user intervention, responding to changes in requirements and the environment. This is the first book to offer an integrated view of self-organisation technologies applied to distributed systems, particularly focusing on multiagent systems. The editors developed this integrated book with three aims: to explain self-organisation concepts and principles, using clear definitions and a strong theoretical background; to examine how self-organising behaviour can be modelled, analysed and systematically engineered into agent behaviour; and to assess the types of problems that can be solved using self-organising multiagent systems. The book comprises chapters covering all three dimensions, synthesising up-to-date research work and the latest technologies and applications. The book offers dedicated chapters on concepts such as self-organisation, emergence in natural systems, software agents, stigmergy, gossip, cooperation and immune systems. The book then explains how to engineer artificial self-organising software, in particular it examines methodologies and middleware infrastructures. Finally, the book presents diverse applications of self-organising software, such as constraint satisfaction, trust management, image recognition and networking. The book will be of interest to researchers working on emergent phenomena and adaptive systems. It will also be suitable for use as a graduate textbook, with chapter summaries and exercises, and an accompanying website that includes teaching slides, exercise solutions and research project outlines. Self-organisation, self-regulation, self-repair and self-maintenance are promising conceptual approaches for dealing with complex distributed interactive software and information-handling systems. Self-organising applications dynamically change their functionality and structure without direct user intervention, responding to changes in requirements and the environment. This is the first book to offer an integrated view of self-organisation technologies applied to distributed systems, particularly focusing on multiagent systems. The editors developed this integrated book with three aims: to explain self-organisation concepts and principles, using clear definitions and a strong theoretical background; to examine how self-organising behaviour can be modelled, analysed and systematically engineered into agent behaviour; and to assess the types of problems that can be solved using self-organising multiagent systems. The book comprises chapters covering all three dimensions, synthesising up-to-date research work and the latest technologies and applications. The book offers dedicated chapters on concepts such as self-organisation, emergence in natural systems, software agents, stigmergy, gossip, cooperation and immune systems. The book then explains how to engineer artificial self-organising software, in particular it examines methodologies and middleware infrastructures. Finally, the book presents diverse applications of self-organising software, such as constraint satisfaction, trust management, image recognition and networking. The book will be of interest to researchers working on emergent phenomena and adaptive systems. It will also be suitable for use as a graduate textbook, with chapter summaries and exercises, and an accompanying website that includes teaching slides, exercise solutions and research project outlines.

Modelling, Assessment, and Optimization of Energy Systems provides comprehensive methodologies for the thermal modelling of energy systems based on thermodynamic, exergoeconomic and exergoenviromental approaches. It provides advanced analytical approaches, assessment criteria and the methodologies to obtain analytical expressions from the experimental data. The concept of single-objective and multi-objective optimization with application to energy systems is provided, along with decision-making tools for multi-objective problems, multi-criteria problems, for simplifying the optimization of large energy systems, and for exergoeconomic improvement integrated with a simulator EIS method. This book provides a comprehensive methodology for modeling, assessment, improvement of any energy system with guidance, and practical examples that provide detailed insights for energy engineering, mechanical engineering, chemical engineering and researchers in the field of analysis and optimization of energy systems. Offers comprehensive analytical tools for the modeling and simulation of energy systems with applications for decision-making tools Provides methodologies to obtain analytical models

of energy systems for experimental data Covers decision-making tools in multi-objective problems

Metaheuristic Algorithms in Maritime Operations Optimization focuses on the seaside and port side problems regarding the maritime transportation. The book reviews and introduces the most important problems regarding the shipping network design, long-term and short-term scheduling and planning problems in both bulk and container shipping as well as liquid maritime transportation. Application of meta heuristic algorithm is important for these problems, as most of them are hard and time-consuming to be solved optimally.

This volume constitutes the proceedings of the 7th International Conference on Simulated Evolution and Learning, SEAL 2008, held in Melbourne, Australia, during December 7-10, 2008. The 65 papers presented were carefully reviewed and selected from 140 submissions. The topics covered are evolutionary learning; evolutionary optimisation; hybrid learning; adaptive systems; theoretical issues in evolutionary computation; and real-world applications of evolutionary computation techniques.

The chapter "Verifying a Solver for Linear Mixed Integer Arithmetic in Isabelle/HOL" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

Soft computing, as an engineering science, and statistics, as a classical branch of mathematics, emphasize different aspects of data analysis. Soft computing focuses on obtaining working solutions quickly, accepting approximations and unconventional approaches. Its strength lies in its flexibility to create models that suit the needs arising in applications. In addition, it emphasizes the need for intuitive and interpretable models, which are tolerant to imprecision and uncertainty. Statistics is more rigorous and focuses on establishing objective conclusions based on experimental data by analyzing the possible situations and their (relative) likelihood. It emphasizes the need for mathematical methods and tools to assess solutions and guarantee performance. Combining the two fields enhances the robustness and generalizability of data analysis methods, while preserving the flexibility to solve real-world problems efficiently and intuitively.

As technology continues to become more sophisticated, a computer's ability to understand, interpret, and manipulate natural language is also accelerating. Persistent research in the field of natural language processing enables an understanding of the world around us, in addition to opportunities for manmade computing to mirror natural language processes that have existed for centuries. Natural Language Processing: Concepts, Methodologies, Tools, and Applications is a vital reference source on the latest concepts, processes, and techniques for communication between computers and humans. Highlighting a range of topics such as machine learning, computational linguistics, and semantic analysis, this multi-volume book is ideally designed for computer engineers, computer and software developers, IT professionals, academicians, researchers, and upper-level students seeking current research on the latest trends in the field of natural language processing.

The book is a monograph in the cross disciplinary area of Computational Intelligence in Finance and elucidates a collection of practical and strategic Portfolio Optimization models in Finance, that employ Metaheuristics for their effective solutions and demonstrates the results using MATLAB implementations, over live portfolios invested across global stock universes. The book has been structured in such a way that, even novices in finance or metaheuristics should be able to comprehend and work on the hybrid models discussed in the book.

This book presents an interesting sample of the latest advances in optimization techniques applied to electrical power engineering. It covers a variety of topics from various fields, ranging from classical optimization such as Linear and Nonlinear Programming and Integer and Mixed-Integer Programming to the most modern methods based on bio-inspired metaheuristics. The featured papers invite readers to delve further into emerging optimization techniques and their real application to case studies such as conventional and renewable energy generation, distributed generation, transport and distribution of electrical energy, electrical machines and power electronics, network optimization, intelligent systems, advances in electric mobility, etc.

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The authors stress the relative simplicity, efficiency, flexibility of use, and suitability of various approaches used to solve difficult optimization problems. The authors are experienced, interdisciplinary lecturers and researchers and in their explanations they demonstrate many shared foundational concepts among the key methodologies. This textbook is a suitable introduction for undergraduate and graduate students, researchers, and professionals in computer science, engineering, and logistics.

Hybrid Predictive Control for Dynamic Transport Problems develops methods for the design of predictive control strategies for nonlinear-dynamic hybrid discrete-/continuous-variable systems. The methodology is designed for real-time applications, particularly the study of dynamic transport systems. Operational and service policies are considered, as well as cost reduction. The control structure is based on a sound definition of the key variables and their evolution. A flexible objective function able to capture the predictive behaviour of the system variables is described. Coupled with efficient algorithms, mainly drawn from area of computational intelligence, this is shown to optimize performance indices for real-time applications. The framework of the proposed predictive control methodology is generic and, being able to solve nonlinear mixed integer optimization problems dynamically, is readily extendable to other industrial processes. The main topics of this book are: · hybrid predictive control (HPC) design based on evolutionary multiobjective optimization (EMO); · HPC based on EMO for dial-a-ride systems; and · HPC based on EMO for operational decisions in public transport systems. Hybrid Predictive Control for Dynamic Transport Problems is a comprehensive analysis of HPC and its application to dynamic transport systems. Introductory material on evolutionary algorithms is presented in summary in an appendix. The text will be of interest to control and transport engineers working on the operational optimization of transport systems and to academic researchers working with hybrid systems. The potential applications of the generic methods presented here to other process fields will make the book of interest to a wider group of researchers, scientists and graduate students working in other control-related disciplines.

The book presents recently developed efficient metaheuristic optimization algorithms and their applications for solving various optimization problems in civil engineering. The concepts can also be used for optimizing problems in mechanical and electrical engineering.

The Springer Handbook for Computational Intelligence is the first book covering the basics, the state-of-the-art and important applications of the dynamic and rapidly expanding discipline of computational intelligence. This comprehensive handbook makes readers familiar with a broad spectrum of approaches to solve various problems in science and technology. Possible approaches include, for example, those being inspired by biology, living organisms and animate systems. Content is organized in seven parts: foundations; fuzzy logic; rough sets; evolutionary computation; neural networks; swarm intelligence and hybrid computational intelligence systems. Each Part is supervised by its own Part Editor(s) so that high-quality content as well as completeness are assured.

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.

Contains case studies from engineering and operations research Includes commented literature for each chapter

Metaheuristics exhibit desirable properties like simplicity, easy parallelizability, and ready applicability to different types of optimization problems. After a comprehensive introduction to the field, the contributed chapters in this book include explanations of the main metaheuristics techniques, including simulated annealing, tabu search, evolutionary algorithms, artificial ants, and particle swarms, followed by chapters that demonstrate their applications to problems such as multiobjective optimization, logistics, vehicle routing, and air traffic management. The authors are leading researchers in this domain, with considerable teaching and applications experience, and the book will be of value to industrial practitioners, graduate students, and research academics.

Evolutionary algorithms are becoming increasingly attractive across various disciplines, such as operations research, computer science, industrial engineering, electrical engineering, social science and economics. Introduction to Evolutionary Algorithms presents an insightful, comprehensive, and up-to-date treatment of evolutionary algorithms. It covers such hot topics as: • genetic algorithms, • differential evolution, • swarm intelligence, and • artificial immune systems. The reader is introduced to a range of applications, as Introduction to Evolutionary Algorithms demonstrates how to model real world problems, how to encode and decode individuals, and how to design effective search operators according to the chromosome structures with examples of constraint optimization, multiobjective optimization, combinatorial optimization, and supervised/unsupervised learning. This emphasis on practical applications will benefit all students, whether they choose to continue their academic career or to enter a particular industry. Introduction to Evolutionary Algorithms is intended as a textbook or self-study material for both advanced undergraduates and graduate students. Additional features such as recommended further reading and ideas for research projects combine to form an accessible and interesting pedagogical approach to this widely used discipline.

The four-volume set LNCS 6016 - 6019 constitutes the refereed proceedings of the International Conference on Computational Science and Its Applications, ICCSA 2010, held in Fukuoka, Japan, in March 2010. The four volumes contain papers presenting a wealth of original research results in the field of computational science, from foundational issues in computer science and mathematics to advanced applications in virtually all sciences making use of computational techniques. The topics of the fully refereed papers are structured according to the five major conference themes: computational methods, algorithms and scientific application, high performance computing and networks, geometric modelling, graphics and visualization, advanced and emerging applications, and information systems and technologies. Moreover, submissions from more than 30 special sessions and workshops contribute to this publication. These cover These cover topics such as geographical analysis, urban modeling, spatial statistics, wireless and ad hoc networking, logical, scientific and computational aspects of pulse phenomena in transitions, high-performance computing and information visualization, sensor network and its applications, molecular simulations structures and processes, collective evolutionary systems, software engineering processes and applications, molecular simulations structures and processes, internet communication security, security and privacy in pervasive computing environments, and mobile communications.

This book highlights state-of-the-art developments in metaheuristics research. It examines all aspects of metaheuristic research including new algorithmic developments, applications, new research challenges, theoretical developments, implementation issues, in-depth experimental studies. The book is divided into two sections. Part I is focused on new optimization and modeling techniques based on metaheuristics. The chapters in this section cover topics from multi-objective problems with fuzzy data with triangular-valued objective functions, to hyper-heuristics optimization methodology, designing genetic algorithms, and also the cuckoo search algorithm. The techniques described help to enhance the usability and increase the potential of metaheuristic algorithms. Part II showcases advanced metaheuristic approaches to solve real-life applications issues. This includes an examination of scheduling, the vehicle routing problem, multimedia sensor network, supplier selection, bin packing, objects tracking, and radio frequency identification. In the fields covered in the chapters are of high-impact applications of metaheuristics. The chapters offer innovative applications of metaheuristics that have a

potential of widening research frontiers. Altogether, this book offers a comprehensive look at how researchers are currently using metaheuristics in different domains of design and application.

Data science is a multi-disciplinary field that uses scientific methods, processes, algorithms, and systems to extract knowledge and insights from structured (labeled) and unstructured (unlabeled) data. It is the future of Artificial Intelligence (AI) and a necessity of the future to make things easier and more productive. In simple terms, data science is the discovery of data or uncovering hidden patterns (such as complex behaviors, trends, and inferences) from data. Moreover, Big Data analytics/data analytics are the analysis mechanisms used in data science by data scientists. Several tools, such as Hadoop, R, etc., are used to analyze this large amount of data to predict valuable information and for decision-making. Note that structured data can be easily analyzed by efficient (available) business intelligence tools, while most of the data (80% of data by 2020) is in an unstructured form that requires advanced analytics tools. But while analyzing this data, we face several concerns, such as complexity, scalability, privacy leaks, and trust issues. Data science helps us to extract meaningful information or insights from unstructured or complex or large amounts of data (available or stored virtually in the cloud). Data Science and Data Analytics: Opportunities and Challenges covers all possible areas, applications with arising serious concerns, and challenges in this emerging field in detail with a comparative analysis/taxonomy. FEATURES Gives the concept of data science, tools, and algorithms that exist for many useful applications Provides many challenges and opportunities in data science and data analytics that help researchers to identify research gaps or problems Identifies many areas and uses of data science in the smart era Applies data science to agriculture, healthcare, graph mining, education, security, etc. Academicians, data scientists, and stockbrokers from industry/business will find this book useful for designing optimal strategies to enhance their firm's productivity.

System Biology encompasses the knowledge from diverse fields such as Molecular Biology, Immunology, Genetics, Computational Biology, Mathematical Biology, etc. not only to address key questions that are not answerable by individual fields alone, but also to help in our understanding of the complexities of biological systems. Whole genome expression studies have provided us the means of studying the expression of thousands of genes under a particular condition and this technique had been widely used to find out the role of key macromolecules that are involved in biological signaling pathways. However, making sense of the underlying complexity is only possible if we interconnect various signaling pathways into human and computer readable network maps. These maps can then be used to classify and study individual components involved in a particular phenomenon. Apart from transcriptomics, several individual gene studies have resulted in adding to our knowledge of key components that are involved in a signaling pathway. It therefore becomes imperative to take into account of these studies also, while constructing our network maps to highlight the interconnectedness of the entire signaling pathways and the role of that particular individual protein in the pathway. This collection of articles will contain a collection of pioneering work done by scientists working in regulatory signaling networks and the use of large scale gene expression and omics data. The distinctive features of this book would be: Act a single source of information to understand the various components of different signaling network (roadmap of biochemical pathways, the nature of a molecule of interest in a particular pathway, etc.), Serve as a platform to highlight the key findings in this highly volatile and evolving field, and Provide answers to various techniques both related to microarray and cell signaling to the readers.

The success of metaheuristics on hard single-objective optimization problems is well recognized today. However, many real-life problems require taking into account several conflicting points of view corresponding to multiple objectives. The use of metaheuristic optimization techniques for multi-objective problems is the subject of this volume. The book includes selected surveys, tutorials and state-of-the-art research papers in this field, which were first presented at a free workshop jointly organized by the French working group on Multi-objective Mathematical Programming (PM2O) and the EURO working group on Metaheuristics in December 2002. It is the first book which considers both various metaheuristics and various kind of problems (e.g. combinatorial problems, real situations, non-linear problems) applied to multiple objective optimization. Metaheuristics used include: genetic algorithms, ant colony optimization, simulated annealing, scatter search, etc. Problems concern timetabling, vehicle routing, and more. Methodological aspects, such as quality evaluation, are also covered.

Finding exact solutions to many combinatorial optimization problems in busi ness, engineering, and science still poses a real challenge, despite the impact of recent advances in mathematical programming and computer technology. New fields of applications, such as computational biology, electronic commerce, and supply chain management, bring new challenges and needs for algorithms and optimization techniques. Metaheuristics are master procedures that guide and modify the operations of subordinate heuristics, to produce improved approx imate solutions to hard optimization problems with respect to more simple algorithms. They also provide fast and robust tools, producing high-quality solutions in reasonable computation times. The field of metaheuristics has been fast evolving in recent years. Tech niques such as simulated annealing, tabu search, genetic algorithms, scatter search, greedy randomized adaptive search, variable neighborhood search, ant systems, and their hybrids are currently among the most efficient and robust optimization strategies to find high-quality solutions to many real-life optimiza tion problems. A very large nmnber of successful applications of metaheuristics are reported in the literature and spread throughout many books, journals, and conference proceedings. A series of international conferences entirely devoted to the theory, applications, and computational developments in metaheuristics has been attracting an increasing number of participants, from universities and the industry.

"This book is a collection of the latest developments, models, and applications within the transdisciplinary fields related to metaheuristic computing, providing readers with insight into a wide range of topics such as genetic algorithms, differential evolution, and ant colony optimization"--Provided by publisher.

Many advances have recently been made in metaheuristic methods, from theory to applications. The editors, both leading experts in this field, have assembled a team of researchers to contribute 21 chapters organized into parts on simulated annealing, tabu search, ant colony algorithms, general purpose studies of evolutionary algorithms, applications of evolutionary algorithms, and metaheuristics.

This book features 15 chapters based on the Numerical and Evolutionary Optimization (NEO 2017) workshop, held from September 27 to 29 in the city of Tijuana, Mexico. The event gathered researchers from two complimentary fields to discuss the theory, development and application of state-of-the-art techniques to address search and optimization problems. The lively event included 7 invited talks and 64 regular talks covering a wide range of topics, from evolutionary computer vision and machine learning with evolutionary computation, to set oriented numeric and steepest descent techniques. Including

research submitted by the NEO community, the book provides informative and stimulating material for future research in the field.

Particle swarm optimization (PSO) is a population based stochastic optimization technique influenced by the social behavior of bird flocking or fish schooling.PSO shares many similarities with evolutionary computation techniques such as Genetic Algorithms (GA). The system is initialized with a population of random solutions and searches for optima by updating generations. However, unlike GA, PSO has no evolution operators such as crossover and mutation. In PSO, the potential solutions, called particles, fly through the problem space by following the current optimum particles. This book represents the contributions of the top researchers in this field and will serve as a valuable tool for professionals in this interdisciplinary field.

This two-volume book gathers the proceedings of the Sixth International Conference on Soft Computing for Problem Solving (SocProS 2016), offering a collection of research papers presented during the conference at Thapar University, Patiala, India. Providing a veritable treasure trove for scientists and researchers working in the field of soft computing, it highlights the latest developments in the broad area of "Computational Intelligence" and explores both theoretical and practical aspects using fuzzy logic, artificial neural networks, evolutionary algorithms, swarm intelligence, soft computing, computational intelligence, etc.

Modern optimization approaches have attracted many research scientists, decision makers and practicing researchers in recent years as powerful intelligent computational techniques for solving several complex real-world problems. The Handbook of Research on Modern Optimization Algorithms and Applications in Engineering and Economics highlights the latest research innovations and applications of algorithms designed for optimization applications within the fields of engineering, IT, and economics. Focusing on a variety of methods and systems as well as practical examples, this book is a significant resource for graduate-level students, decision makers, and researchers in both public and private sectors who are seeking research-based methods for modeling uncertain real-world problems. .

In recent years, interest in developing statistical and computational techniques for applied manufacturing engineering has been increased. Today, due to the great complexity of manufacturing engineering and the high number of parameters used, conventional approaches are no longer sufficient. Therefore, in manufacturing, statistical and computational techniques have achieved several applications, namely, modelling and simulation manufacturing processes, optimization manufacturing parameters, monitoring and control, computer-aided process planning, etc. The present book aims to provide recent information on statistical and computational techniques applied in manufacturing engineering. The content is suitable for final undergraduate engineering courses or as a subject on manufacturing at the postgraduate level. This book serves as a useful reference for academics, statistical and computational science researchers, mechanical, manufacturing and industrial engineers, and professionals in industries related to manufacturing engineering.

The book discusses advantages of the firefly algorithm over other well-known metaheuristic algorithms in various engineering studies. The book provides a brief outline of various application-oriented problem solving methods, like economic emission load dispatch problem, designing a fully digital controlled reconfigurable switched beam nonconcentric ring array antenna, image segmentation, span minimization in permutation flow shop scheduling, multi-objective load dispatch problems, image compression, etc., using FA and its variants. It also covers the use of the firefly algorithm to select features, as research has shown that the firefly algorithm generates precise and optimal results in terms of time and optimality. In addition, the book also explores the potential of the firefly algorithm to provide a solution to traveling salesman problem, graph coloring problem, etc

Stochastic global optimization is a very important subject, that has applications in virtually all areas of science and technology. Therefore there is nothing more opportune than writing a book about a successful and mature algorithm that turned out to be a good tool in solving difficult problems. Here we present some techniques for solving several problems by means of Fuzzy Adaptive Simulated Annealing (Fuzzy ASA), a fuzzy-controlled version of ASA, and by ASA itself. ASA is a sophisticated global optimization algorithm that is based upon ideas of the simulated annealing paradigm, coded in the C programming language and developed to statistically find the best global fit of a nonlinear constrained, non-convex cost function over a multi-dimensional space. By presenting detailed examples of its application we want to stimulate the reader's intuition and make the use of Fuzzy ASA (or regular ASA) easier for everyone wishing to use these tools to solve problems. We kept formal mathematical requirements to a minimum and focused on continuous problems, although ASA is able to handle discrete optimization tasks as well. This book can be used by researchers and practitioners in engineering and industry, in courses on optimization for advanced undergraduate and graduate levels, and also for self-study.

Improving the performance of existing technologies has always been a focal practice in the development of computational systems. However, as circuitry is becoming more complex, conventional techniques are becoming outdated and new research methodologies are being implemented by designers. Performance Optimization Techniques in Analog, Mix-Signal, and Radio-Frequency Circuit Design features recent advances in the engineering of integrated systems with prominence placed on methods for maximizing the functionality of these systems. This book emphasizes prospective trends in the field and is an essential reference source for researchers, practitioners, engineers, and technology designers interested in emerging research and techniques in the performance optimization of different circuit designs.

The two volume set LNCS 7491 and 7492 constitutes the refereed proceedings of the 12th International Conference on Parallel Problem Solving from Nature, PPSN 2012, held in Taormina, Sicily, Italy, in September 2012. The total of 105 revised full papers were carefully reviewed and selected from 226 submissions. The meeting began with 5 workshops which offered an ideal opportunity to explore specific topics in evolutionary computation, bio-inspired computing and metaheuristics. PPSN 2012 also included 8 tutorials. The papers are organized in topical sections on evolutionary computation; machine learning, classifier systems, image processing; experimental analysis, encoding, EDA, GP; multiobjective optimization; swarm intelligence, collective behavior, coevolution and robotics; memetic algorithms, hybridized techniques, meta and hyperheuristics; and applications.

Calculus has been used in solving many scientific and engineering problems. For optimization problems, however, the differential calculus technique sometimes has a drawback

when the objective function is step-wise, discontinuous, or multi-modal, or when decision variables are discrete rather than continuous. Thus, researchers have recently turned their interests into metaheuristic algorithms that have been inspired by natural phenomena such as evolution, animal behavior, or metallic annealing. This book especially focuses on a music-inspired metaheuristic algorithm, harmony search. Interestingly, there exists an analogy between music and optimization: each musical instrument corresponds to each decision variable; musical note corresponds to variable value; and harmony corresponds to solution vector. Just like musicians in Jazz improvisation play notes randomly or based on experiences in order to find fantastic harmony, variables in the harmony search algorithm have random values or previously-memorized good values in order to find optimal solution.

Optimization techniques have developed into a significant area concerning industrial, economics, business, and financial systems. With the development of engineering and financial systems, modern optimization has played an important role in service-centered operations and as such has attracted more attention to this field. Meta-heuristic hybrid optimization is a newly development mathematical framework based optimization technique. Designed by logicians, engineers, analysts, and many more, this technique aims to study the complexity of algorithms and problems. Meta-Heuristics Optimization Algorithms in Engineering, Business, Economics, and Finance explores the emerging study of meta-heuristics optimization algorithms and methods and their role in innovated real world practical applications. This book is a collection of research on the areas of meta-heuristics optimization algorithms in engineering, business, economics, and finance and aims to be a comprehensive reference for decision makers, managers, engineers, researchers, scientists, financiers, and economists as well as industrialists.

The book presents eight well-known and often used algorithms besides nine newly developed algorithms by the first author and his students in a practical implementation framework. Matlab codes and some benchmark structural optimization problems are provided. The aim is to provide an efficient context for experienced researchers or readers not familiar with theory, applications and computational developments of the considered metaheuristics. The information will also be of interest to readers interested in application of metaheuristics for hard optimization, comparing conceptually different metaheuristics and designing new metaheuristics.