Parallel Metaheuristics

A New Class of Algorithms

Edited by
Enrique Alba

Parallel Metaheuristics A New Class Of Algorithms

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Parallel Metaheuristics A New Class Of Algorithms:

   Parallel Metaheuristics Enrique Alba,2005-10-03 Solving complex optimization problems with parallel metaheuristics Parallel Metaheuristics brings together an international group of experts in parallelism and metaheuristics to provide a much needed synthesis of these two fields Readers discover how metaheuristic techniques can provide useful and practical solutions for a wide range of problems and application domains with an emphasis on the fields of telecommunications and bioinformatics This volume fills a long existing gap allowing researchers and practitioners to develop efficient metaheuristic algorithms to find solutions The book is divided into three parts Part One Introduction to Metaheuristics and Parallelism including an Introduction to Metaheuristic Techniques Measuring the Performance of Parallel Metaheuristics New Technologies in Parallelism and a head to head discussion on Metaheuristics and Parallelism Part Two Parallel Metaheuristic Models including Parallel Genetic Algorithms Parallel Genetic Programming Parallel Evolution Strategies Parallel Ant Colony Algorithms Parallel Estimation of Distribution Algorithms Parallel Scatter Search Parallel Variable Neighborhood Search Parallel Simulated Annealing Parallel Tabu Search Parallel GRASP Parallel Hybrid Metaheuristics Parallel Multi Objective Optimization and Parallel Heterogeneous Metaheuristics Part Three Theory and Applications including Theory of Parallel Genetic Algorithms Parallel Metaheuristics Applications Parallel Metaheuristics in Telecommunications and a final chapter on Bioinformatics and Parallel Metaheuristics Each self contained chapter begins with clear overviews and introductions that bring the reader up to speed describes basic techniques and ends with a reference list for further study Packed with numerous tables and figures to illustrate the complex theory and processes this comprehensive volume also includes numerous practical real world optimization problems and their solutions This is essential reading for students and researchers in computer science mathematics and engineering who deal with parallelism metaheuristics and optimization in general   *Handbook of Metaheuristics* Michel Gendreau,Jean-Yves Potvin,2018-09-20 The third edition of this handbook is designed to provide a broad coverage of the concepts implementations and applications in metaheuristics The book s chapters serve as stand alone presentations giving both the necessary underpinnings as well as practical guides for implementation The nature of metaheuristics invites an analyst to modify basic methods in response to problem characteristics past experiences and personal preferences and the chapters in this handbook are designed to facilitate this process as well This new edition has been fully revised and features new chapters on swarm intelligence and automated design of metaheuristics from flexible algorithm frameworks The authors who have contributed to this volume represent leading figures from the metaheuristic community and are responsible for pioneering contributions to the fields they write about Their collective work has significantly enriched the field of optimization in general and combinatorial optimization in particular Metaheuristics are solution methods that orchestrate an interaction between local improvement procedures and higher level strategies to create a process capable of escaping from local optima and performing a robust search of a solution

space In addition many new and exciting developments and extensions have been observed in the last few years Hybrids of metaheuristics with other optimization techniques like branch and bound mathematical programming or constraint programming are also increasingly popular On the front of applications metaheuristics are now used to find high quality solutions to an ever growing number of complex ill defined real world problems in particular combinatorial ones This handbook should continue to be a great reference for researchers graduate students as well as practitioners interested in metaheuristics   **Hybrid Metaheuristics** Francisco Almeida,2006-09-29 This book constitutes the refereed proceedings of the Third International Workshop on Hybrid Metaheuristics HM 2006 held in Gran Canaria Spain in October 2006 The 13 revised full papers presented together with one invited paper were carefully reviewed and selected from 42 submissions
    Hagenberg Research Bruno Buchberger,Michael Affenzeller,Alois Ferscha,Michael Haller,Tudor Jebelean,Erich Peter Klement,Peter Paule,Gustav Pomberger,Wolfgang Schreiner,Robert Stubenrauch,Roland Wagner,Gerhard Weiß,Wolfgang Windsteiger,2009-05-29 BrunoBuchberger This book is a synopsis of basic and applied research done at the various re search institutions of the Softwarepark Hagenberg in Austria Starting with 15 coworkers in my Research Institute for Symbolic Computation RISC I initiated the Softwarepark Hagenberg in 1987 on request of the Upper Aus trian Government with the objective of creating a scienti c technological and economic impulse for the region and the international community In the meantime in a joint e ort the Softwarepark Hagenberg has grown to the current 2009 size of over 1000 R D employees and 1300 students in six research institutions 40 companies and 20 academic study programs on the bachelor master s and PhD level The goal of the Softwarepark Hagenberg is innovation of economy in one of the most important current technologies software It is the message of this book that this can only be achieved and guaranteed long term by watering the root namely emphasis on research both basic and applied In this book we summarize what has been achieved in terms of research in the various research institutions in the Softwarepark Hagenberg and what research vision we have for the imminent future When I founded the Softwarepark Hagenberg in addition to the watering the root principle I had the vision that such a technology park can only prosper if we realize the magic triangle i e the close interaction of research academic education and business applications at one site see Figure 1   *Metaheuristics* El-Ghazali Talbi,2009-05-27 A unified view of metaheuristics This book provides a complete background on metaheuristics and shows readers how to design and implement efficient algorithms to solve complex optimization problems across a diverse range of applications from networking and bioinformatics to engineering design routing and scheduling It presents the main design questions for all families of metaheuristics and clearly illustrates how to implement the algorithms under a software framework to reuse both the design and code Throughout the book the key search components of metaheuristics are considered as a toolbox for Designing efficient metaheuristics e g local search tabu search simulated annealing evolutionary algorithms particle swarm optimization scatter search ant colonies bee colonies artificial immune systems for optimization problems Designing efficient metaheuristics for

multi objective optimization problems Designing hybrid parallel and distributed metaheuristics Implementing metaheuristics on sequential and parallel machines Using many case studies and treating design and implementation independently this book gives readers the skills necessary to solve large scale optimization problems quickly and efficiently It is a valuable reference for practicing engineers and researchers from diverse areas dealing with optimization or machine learning and graduate students in computer science operations research control engineering business and management and applied mathematics *Cellular Genetic Algorithms* Enrique Alba,Bernabe Dorronsoro,2009-04-05 Cellular Genetic Algorithms defines a new class of optimization algorithms based on the concepts of structured populations and Genetic Algorithms GAs The authors explain and demonstrate the validity of these cellular genetic algorithms throughout the book with equal and parallel emphasis on both theory and practice This book is a key source for studying and designing cellular GAs as well as a self contained primary reference book for these algorithms *Handbook of Metaheuristic Algorithms* Chun-Wei Tsai,Ming-Chao Chiang,2023-05-30 Handbook of Metaheuristic Algorithms From Fundamental Theories to Advanced Applications provides a brief introduction to metaheuristic algorithms from the ground up including basic ideas and advanced solutions Although readers may be able to find source code for some metaheuristic algorithms on the Internet the coding styles and explanations are generally quite different and thus requiring expanded knowledge between theory and implementation This book can also help students and researchers construct an integrated perspective of metaheuristic and unsupervised algorithms for artificial intelligence research in computer science and applied engineering domains Metaheuristic algorithms can be considered the epitome of unsupervised learning algorithms for the optimization of engineering and artificial intelligence problems including simulated annealing SA tabu search TS genetic algorithm GA ant colony optimization ACO particle swarm optimization PSO differential evolution DE and others Distinct from most supervised learning algorithms that need labeled data to learn and construct determination models metaheuristic algorithms inherit characteristics of unsupervised learning algorithms used for solving complex engineering optimization problems without labeled data just like self learning to find solutions to complex problems Presents a unified framework for metaheuristics and describes well known algorithms and their variants Introduces fundamentals and advanced topics for solving engineering optimization problems e g scheduling problems sensors deployment problems and clustering problems Includes source code based on the unified framework for metaheuristics used as examples to show how TS SA GA ACO PSO DE parallel metaheuristic algorithm hybrid metaheuristic local search and other advanced technologies are realized in programming languages such as C and Python Decision Sciences Raghu Nandan Sengupta,Aparna Gupta,Joydeep Dutta,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 <u>Artificial Evolution</u> Pierre Collet,Nicolas Monmarché,Pierrick Legrand,Marc Schoenauer,Evelyne Lutton,2010-07-06 The LNCS series reports state of the art results in computer science reserch development and education at a high level and in both printed and electronic form Enjoying light cooperation with the R D community with numerous individuals as well as with prestigious organizations and societies LNCS has grown into the most comprehensive computer science research forum available The scope of LNCS including its subseries LNAI and LNBI spans the whole range of computer science and information technology including interdisciplinary topics in a variety of application fields In parallel to the printed book each new volume is published electronically in LNCS Online **Handbook of Research on Novel Soft Computing Intelligent Algorithms: Theory and Practical Applications** Vasant, Pandian M.,2013-08-31 This book explores emerging technologies and best practices designed to effectively address concerns inherent in properly optimizing advanced systems demonstrating applications in areas such as bio engineering space exploration industrial informatics information security and nuclear and renewable energies Provided by publisher <u>Modeling, Simulation and Optimization of Complex Processes HPSC 2018</u> Hans Georg Bock,Willi Jäger,Ekaterina Kostina,Hoang Xuan Phu,2020-12-01 This proceedings volume highlights a selection of papers presented at the 7th International Conference on High Performance Scientific Computing which took place in Hanoi Vietnam during March 19 23 2018 The conference has been organized by the Institute of Mathematics of the Vietnam Academy of Science and Technology the Interdisciplinary Center for Scientific Computing IWR of Heidelberg University and the Vietnam Institute for Advanced Study in Mathematics The contributions cover a broad interdisciplinary spectrum of scientific computing and showcase recent advances in theory methods and practical applications Subjects covered include numerical simulation methods for optimization and control machine learning parallel computing and software development as well as the applications of scientific computing in mechanical engineering airspace engineering environmental physics decision making hydrogeology material science and electric circuits **Mobile Intelligence** Laurence T. Yang,2010-02-08 Focuses on learning patterns and knowledge from data generated by mobile users and mobile technology Covers research and application issues in applying computational intelligence applications to

mobile computing Delivers benefits to a wide range of applications Introduces the state of the art of computational intelligence to the mobile paradigm   Optimization Algorithms in Machine Learning Debashish Das,Ali Safaa Sadiq,Seyedali Mirjalili,2025-05-20 This book explores the development of several new learning algorithms that utilize recent optimization techniques and meta heuristics It addresses well known models such as particle swarm optimization genetic algorithm ant colony optimization evolutionary strategy population based incremental learning and grey wolf optimizer for training neural networks Additionally the book examines the challenges associated with these processes in detail This volume will serve as a valuable reference for individuals in both academia and industry   **Large-Scale Scientific Computing** Ivan Lirkov,Svetozar D. Margenov,Jerzy Waśniewski,2015-11-29 This book constitutes the thoroughly refereed post conference proceedings of the 10th International Conference on Large Scale Scientific Computations LSSC 2015 held in Sozopol Bulgaria in June 2015 The 49 revised full papers presented were carefully reviewed and selected from 64 submissions The general theme for LSSC 2015 was Large Scale Scientific Computing with a particular focus on the organized special sessions enabling exascale computation control and uncertain systems computational microelectronics from monte carlo to deterministic approaches numerical methods for multiphysics problems large scale models numerical methods parallel computations and applications mathematical modeling and analysis of PDEs describing physical problems a posteriori error control and iterative methods for maxwell type problems efficient algorithms for hybrid HPC systems multilevel methods on graphs and applications of metaheuristics to large scale problems   *Recent Advances in Evolutionary Computation for Combinatorial Optimization* Carlos Cotta,Jano van Hemert,2008-09-08 Combinatorial optimisation is a ubiquitous discipline whose usefulness spans vast applications domains The intrinsic complexity of most combinatorial optimisation problems makes classical methods unaffordable in many cases To acquire practical solutions to these problems requires the use of metaheuristic approaches that trade completeness for pragmatic effectiveness Such approaches are able to provide optimal or quasi optimal solutions to a plethora of difficult combinatorial optimisation problems The application of metaheuristics to combinatorial optimisation is an active field in which new theoretical developments new algorithmic models and new application areas are continuously emerging This volume presents recent advances in the area of metaheuristic combinatorial optimisation with a special focus on evolutionary computation methods Moreover it addresses local search methods and hybrid approaches In this sense the book includes cutting edge theoretical methodological algorithmic and applied developments in the field from respected experts and with a sound perspective   *8th International Conference on Practical Applications of Computational Biology & Bioinformatics (PACBB 2014)* Julio Saez-Rodriguez,Miguel P. Rocha,Florentino Fdez-Riverola,Juan F. De Paz Santana,2014-05-21 Biological and biomedical research are increasingly driven by experimental techniques that challenge our ability to analyse process and extract meaningful knowledge from the underlying data The impressive capabilities of next generation sequencing technologies together with novel and ever

evolving distinct types of omics data technologies have put an increasingly complex set of challenges for the growing fields of Bioinformatics and Computational Biology The analysis of the datasets produced and their integration call for new algorithms and approaches from fields such as Databases Statistics Data Mining Machine Learning Optimization Computer Science and Artificial Intelligence Clearly Biology is more and more a science of information requiring tools from the computational sciences In the last few years we have seen the surge of a new generation of interdisciplinary scientists that have a strong background in the biological and computational sciences In this context the interaction of researchers from different scientific fields is more than ever of foremost importance boosting the research efforts in the field and contributing to the education of a new generation of Bioinformatics scientists PACBB 14 contributes to this effort promoting this fruitful interaction PACBB 14 technical program included 34 papers spanning many different sub fields in Bioinformatics and Computational Biology Therefore the conference promotes the interaction of scientists from diverse research groups and with a distinct background such as computer scientists mathematicians or biologists **Evolutionary Computation in Combinatorial Optimization** Jens Gottlieb,2006-03-24 This book constitutes the refereed proceedings of the 6th European Conference on Evolutionary Computation in Combinatorial Optimization EvoCOP 2006 held in Budapest Hungary in April 2006 The 24 revised full papers presented were carefully reviewed and selected from 77 submissions The papers include coverage of evolutionary algorithms as well as various other metaheuristics like scatter search tabu search and memetic algorithms **Applications of Evolutionary Computation** Antonio M. Mora,Giovanni Squillero,2015-03-16 This book constitutes the refereed conference proceedings of the 18th International Conference on the Applications of Evolutionary Computation EvoApplications 2015 held in Copenhagen Spain in April 2015 colocated with the Evo 2015 events EuroGP EvoCOP and EvoMUSART The 72 revised full papers presented were carefully reviewed and selected from 125 submissions EvoApplications 2015 consisted of the following 13 tracks EvoBIO evolutionary computation machine learning and data mining in computational biology EvoCOMNET nature inspired techniques for telecommunication networks and other parallel and distributed systems EvoCOMPLEX evolutionary algorithms and complex systems EvoENERGY evolutionary computation in energy applications EvoFIN evolutionary and natural computation in finance and economics EvoGAMES bio inspired algorithms in games EvoIASP evolutionary computation in image analysis signal processing and pattern recognition EvoINDUSTRY nature inspired techniques in industrial settings EvoNUM bio inspired algorithms for continuous parameter optimization EvoPAR parallel implementation of evolutionary algorithms EvoRISK computational intelligence for risk management security and defence applications EvoROBOT evolutionary computation in robotics and EvoSTOC evolutionary algorithms in stochastic and dynamic environments Algorithm Portfolios Dimitris Souravlias,Konstantinos E. Parsopoulos,Ilias S. Kotsireas,Panos M. Pardalos,2021-03-24 This book covers algorithm portfolios multi method schemes that harness optimization algorithms into a joint framework to solve optimization problems It is expected to be a primary

reference point for researchers and doctoral students in relevant domains that seek a quick exposure to the field The presentation focuses primarily on the applicability of the methods and the non expert reader will find this book useful for starting designing and implementing algorithm portfolios The book familiarizes the reader with algorithm portfolios through current advances applications and open problems Fundamental issues in building effective and efficient algorithm portfolios such as selection of constituent algorithms allocation of computational resources interaction between algorithms and parallelism vs sequential implementations are discussed Several new applications are analyzed and insights on the underlying algorithmic designs are provided Future directions new challenges and open problems in the design of algorithm portfolios and applications are explored to further motivate research in this field   Activity Learning Diane J. Cook,Narayanan C. Krishnan,2015-02-23 Defines the notion of an activity model learned from sensor data and presents key algorithms that form the core of the field Activity Learning Discovering Recognizing and Predicting Human Behavior from Sensor Data provides an in depth look at computational approaches to activity learning from sensor data Each chapter is constructed to provide practical step by step information on how to analyze and process sensor data The book discusses techniques for activity learning that include the following Discovering activity patterns that emerge from behavior based sensor data Recognizing occurrences of predefined or discovered activities in real time Predicting the occurrences of activities The techniques covered can be applied to numerous fields including security telecommunications healthcare smart grids and home automation An online companion site enables readers to experiment with the techniques described in the book and to adapt or enhance the techniques for their own use With an emphasis on computational approaches Activity Learning Discovering Recognizing and Predicting Human Behavior from Sensor Data provides graduate students and researchers with an algorithmic perspective to activity learning

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