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Johann Dréo - Alain Pétrowski
Patrick Siarry - Éric Taillard

Ouvrage coordonné par Patrick Siarry

Métaheuristiques pour l'optimisation difficile

Recuit simulé, recherche avec tabous, algorithmes évolutionnaires
et algorithmes génétiques, colonies de fourmis...

Avec trois études de cas détaillées

- Optimisation de réseaux UMTS (France Télécom R&D)
- Gestion de trafic aérien (ENAC)
- Optimisation de tournées de véhicules (ILOG)

EYROLLES

Metaheuristiques Pour Loptimisation Difficile

Patrick Siarry, Zbigniew Michalewicz



Metaheuristiques Pour L'optimisation Difficile:

Métaheuristiques pour l'optimisation difficile, 2003 Les métaheuristiques et leurs applications Les ingénieurs les économistes les décideurs se heurtent quotidiennement quel que soit leur secteur d'activité des problèmes d'optimisation Il peut s'agir de minimiser un coût de production d'optimiser le parcours d'un véhicule ou le rendement d'un portefeuille boursier de rationaliser l'utilisation de ressources d'améliorer les performances d'un circuit électronique de fournir une aide à la décision des managers etc Cet ouvrage présente une famille de techniques d'optimisation appelées métaheuristiques adaptées à la résolution de problèmes pour lesquels il est difficile de trouver un optimum global ou de bons optimaux locaux par des méthodes plus classiques Un ouvrage de référence illustré de cas La première partie de l'ouvrage présente les principales métaheuristiques recueillies par la recherche avec des algorithmes évolutionnaires et algorithmes génétiques colonies de fourmis La deuxième partie décrit différentes variantes et extensions de ces méthodes ainsi que de nouvelles voies de recherche Y sont également proposés des conseils méthodologiques techniques de modélisation comparaisons de méthodes et choix de la méthode la mieux adaptée à un problème donné La troisième partie présente trois études de cas : l'optimisation de réseaux de mobiles UMTS France Télécom R D gestion de trafic aérien ENAC optimisation de tournées de véhicules ILOG A qui s'adresse ce livre Aux ingénieurs et étudiants en mathématiques appliquées algorithmique recherche opérationnelle gestion de production économie et finance aide à la décision etc Aux ingénieurs enseignants chercheurs informaticiens industriels économistes et décideurs ayant à résoudre des problèmes complexes d'optimisation et d'aide à la décision Source 4e de couv

Advances in Metaheuristics for Hard Optimization Patrick Siarry, Zbigniew Michalewicz, 2007-12-06 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

Metaheuristics for Hard Optimization Johann Dréo, 2006 Contains case studies from engineering and operations research Includes commented literature for each chapter

Swarm Intelligence Based Optimization Patrick Siarry, Lhassane Idoumghar, Julien Lepagnot, 2016-11-25 This book constitutes the thoroughly refereed post conference proceedings of the Second International Conference on Swarm Intelligence Based Optimization ICSIBO 2016 held in Mulhouse France in June 2016 The 9 full papers presented were carefully reviewed and selected from 20 submissions They are centered around the following topics theoretical advances of swarm intelligence metaheuristics combinatorial discrete binary constrained multi objective multi modal dynamic noisy and large scale optimization artificial immune systems particle swarms ant colony bacterial foraging artificial bees fireflies algorithm hybridization of algorithms parallel distributed computing machine learning data mining data clustering decision making and multi agent systems based on swarm intelligence principles adaptation and applications of swarm intelligence principles to real world problems in various domains

Robust Control Optimization with Metaheuristics Philippe Feyel, 2017-02-21 In the automotive industry a Control Engineer must design a unique control law that is then tested and validated on a single prototype with a level of reliability high enough to meet a number of complex specifications on various systems In order to do this the Engineer uses an experimental iterative process Trial and Error phase which relies heavily on his or her experience This book looks to optimise the methods for synthesising servo controllers by making them more direct and thus quicker to design This is achieved by calculating a final controller to directly tackle the high end system specs

Energie, coopération méta-heuristiques et logique floue pour l'optimisation difficile Julien Autuori, 2014 Au cours de cette thèse l'exploration de l'espace de solutions par des métaheuristiques est abordée Les métaheuristiques sont des méthodes d'optimisation utilisées pour résoudre des problèmes NP difficile Elles explorent alors l'espace de recherche pour trouver les meilleures solutions Dans un premier temps l'ensemble des solutions est modélisé par un espace unidimensionnel par une Méthode de Conversion de l'Espace de recherche MCE Des méthodes sont proposées pour valuer l'exploration de l'espace de recherche par une métaheuristique en identifiant les zones explorées et inexplorées Ces méthodes sont utilisées pour orienter l'exploration de l'espace de recherche d'une méthode d'optimisation La convergence est améliorée en accentuant la recherche dans les zones explorées Pour sortir des minimums locaux l'exploration est diversifiée en la dirigeant vers les zones inexplorées En associant l'exploration du voisinage des solutions et ces méthodes cartographiques il est possible d'améliorer les performances des métaheuristiques Plusieurs algorithmes mono objectifs et multiobjectifs sont implémentés en version classique hybride par la recherche locale et par la MCE Le Flexible Job Shop Problem FJSP est utilisé comme problème de référence Les expérimentations avec les algorithmes hybrides montrent une amélioration des performances

Modelling, Computation and Optimization in Information Systems and Management Sciences Le Thi Hoai An, Pascal Bouvry, Pham Dinh Tao, 2008-10-25 Constitutes the refereed proceedings of the Second International Conference MCO 2008 Metz France September 2008 This title organizes the papers in topical sections on optimization and decision making data mining theory systems and applications computer vision and image processing and computer communications and networks

The Vehicle Routing Problem: Latest Advances and New Challenges Bruce L. Golden, S. Raghavan, Edward A. Wasil, 2008-07-20 Theoretical research and practical applications in the field of vehicle routing started in 1959 with the truck dispatching problem posed by Dantzig and Ramser 1st the optimum routing of a fleet of gasoline delivery trucks between a bulk terminal and a large number of service stations supplied by the terminal Using a method based on a linear programming formulation their hand calculations produced a near optimal solution with four routes to a problem with twelve service stations The authors proclaimed No practical applications of the method have been made as yet In the nearly 50 years since the Dantzig and Ramser paper appeared work in the field has exploded dramatically Today a Google Scholar search of the words vehicle routing problem VRP yields more than 21 700 entries The June 2006 issue of OR MS Today provided a survey of 17 vendors of commercial routing software whose

packages are currently capable of solving average size problems with 1 000 stops 50 routes and two hour hard time windows in two to ten minutes 2 In practice vehicle routing may be the single biggest success story in operations research For example each day 103 500 drivers at UPS follow computer generated routes The drivers visit 7 9 million customers and handle an average of 15 6 million packages 3 Metaheuristic Optimization for the Design of Automatic Control Laws Guillaume Sandou,2013-09-03 The classic approach in Automatic Control relies on the use of simplified models of the systems and reformulations of the specifications In this framework the control law can be computed using deterministic algorithms However this approach fails when the system is too complex for its model to be sufficiently simplified when the designer has many constraints to take into account or when the goal is not only to design a control but also to optimize it This book presents a new trend in Automatic Control with the use of metaheuristic algorithms These kinds of algorithm can optimize any criterion and constraint and therefore do not need such simplifications and reformulations The first chapter outlines the author s main motivations for the approach which he proposes and presents the advantages which it offers In Chapter 2 he deals with the problem of system identification The third and fourth chapters are the core of the book where the design and optimization of control law using the metaheuristic method particle swarm optimization is given The proposed approach is presented along with real life experiments proving the efficiency of the methodology Finally in Chapter 5 the author proposes solving the problem of predictive control of hybrid systems **Optimization in Engineering Sciences** Dan Stefanoiu,Pierre Borne,Dumitru Popescu,Florin Gheorghe Filip,Abdelkader El Kamel,2014-10-30 The purpose of this book is to present the main metaheuristics and approximate and stochastic methods for optimization of complex systems in Engineering Sciences It has been written within the framework of the European Union project ERRIC Empowering Romanian Research on Intelligent Information Technologies which is funded by the EU s FP7 Research Potential program and has been developed in co operation between French and Romanian teaching researchers Through the principles of various proposed algorithms with additional references this book allows the reader to explore various methods of implementation such as metaheuristics local search and populationbased methods It examines multi objective and stochastic optimization as well as methods and tools for computer aided decision making and simulation for decision making *Heuristics for Optimization and Learning* Farouk Yalaoui,Lionel Amodeo,El-Ghazali Talbi,2020-12-15 This book is a new contribution aiming to give some last research findings in the field of optimization and computing This work is in the same field target than our two previous books published Recent Developments in Metaheuristics and Metaheuristics for Production Systems books in Springer Series in Operations Research Computer Science Interfaces The challenge with this work is to gather the main contribution in three fields optimization technique for production decision general development for optimization and computing method and wider spread applications The number of researches dealing with decision maker tool and optimization method grows very quickly these last years and in a large number of fields We may be able to read nice and worthy works from research developed in

chemical mechanical computing automotive and many other fields

Initiation à l'optimisation : métaheuristiques -

Problèmes à variables continues Dominique Barchiesi, Sameh Kessentini, 2020-03-17 Les métaheuristiques sont parmi les méthodes d'optimisation les plus faciles mettre en œuvre pour trouver la solution des problèmes difficiles voire impossibles résoudre directement en s'inspirant de phénomènes issus de la nature et des sciences Douze méthodes avec variantes sont présentées et les codes en Matlab GNU Octave sont donnés GA génétique DEvolution différentielle BBO biogeographie RS recuit simulé GSO Gravitationnel CRO réaction chimique PSO essaim de particules LUC lucioles ABC colonies d'abeilles artificielles GWO loup gris ACO colonies de fourmis BSO brainstorming Elles sont caractérisées comparées et les outils fournis permettent de les combiner les modifier ad libitum afin de les adapter des problèmes réels Des applications la thermique l'électronique l'agriculture la mécanique permettent d'étendre leur domaine d'application la résolution de problème inverse l'ajustement de modèle des résultats expérimentaux et la propagation d'incertitudes

Paradigms of Combinatorial Optimization Vangelis Th. Paschos, 2014-08-08 Combinatorial optimization is a multidisciplinary scientific area lying in the interface of three major scientific domains mathematics theoretical computer science and management The three volumes of the Combinatorial Optimization series aim to cover a wide range of topics in this area These topics also deal with fundamental notions and approaches as with several classical applications of combinatorial optimization Concepts of Combinatorial Optimization is divided into three parts On the complexity of combinatorial optimization problems presenting basics about worst case and randomized complexity Classical solution methods presenting the two most known methods for solving hard combinatorial optimization problems that are Branch and Bound and Dynamic Programming Elements from mathematical programming presenting fundamentals from mathematical programming based methods that are in the heart of Operations Research since the origins of this field

Stochastic Methods for Estimation and Problem Solving in Engineering Kadry,

Seifedine, 2018-03-02 Utilizing mathematical algorithms is an important aspect of recreating real world problems in order to make important decisions By generating a randomized algorithm that produces statistical patterns it becomes easier to find solutions to countless situations Stochastic Methods for Estimation and Problem Solving in Engineering provides emerging research on the role of random probability systems in mathematical models used in various fields of research While highlighting topics such as random probability distribution linear systems and transport profiling this book explores the use and behavior of uncertain probability methods in business and science This book is an important resource for engineers researchers students professionals and practitioners seeking current research on the challenges and opportunities of non deterministic probability models

Metaheuristics Patrick Siarry, 2016-12-24 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 **A Guided Tour of**

Artificial Intelligence Research Pierre Marquis, Odile Papini, Henri Prade, 2020-05-08 The purpose of this book is to provide an overview of AI research ranging from basic work to interfaces and applications with as much emphasis on results as on current issues It is aimed at an audience of master students and Ph D students and can be of interest as well for researchers and engineers who want to know more about AI The book is split into three volumes the first volume brings together twenty three chapters dealing with the foundations of knowledge representation and the formalization of reasoning and learning Volume 1 Knowledge representation reasoning and learning the second volume offers a view of AI in fourteen chapters from the side of the algorithms Volume 2 AI Algorithms the third volume composed of sixteen chapters describes the main interfaces and applications of AI Volume 3 Interfaces and applications of AI This second volume presents the main families of algorithms developed or used in AI to learn to infer to decide Generic approaches to problem solving are presented ordered heuristic search as well as metaheuristics are considered Algorithms for processing logic based representations of various types first order formulae propositional formulae logic programs etc and graphical models of various types standard constraint networks valued ones Bayes nets Markov random fields etc are presented The volume also focuses on algorithms which have been developed to simulate specific intelligent processes such as planning playing learning and extracting knowledge from data Finally an afterword draws a parallel between algorithmic problems in operation research and in AI *Optimisation de la commande robuste par les métaheuristiques* Philippe Feyel, 2017-05-01 Dans l

industrie l automaticien doit concevoir une loi de commande unique pour satisfaire un cahier des charges complexe sur un grand nombre de syst mes Pour cela en fonction de son exp rience il emploie un processus it ratif chronophage bas sur le r glage et l exp rimentation ou la simulation Il s agit de la phase d essai erreur Dans cet ouvrage une m thodologie de synth se des correcteurs des asservissements plus efficace et moins co teuse est d velopp e Les probl mes de commande robuste sont reformul s pour l optimisation stochastique travers la synth se des correcteurs structur s partir de probl matiques de type H synth se ou encore synth se LPV L int r t de l approche formul e r side dans sa flexibilit et la prise en compte de contraintes exotiques complexes Une m thode originale de synth se de correcteurs structur s et robustes vis vis d exigences de haut niveau de forme quelconque est propos e sur la base d algorithmes volutionnaires tr s performants et comp titifs Cette m thodologie donne lieu la mise en oeuvre d un outil num rique de synth se de correcteur La validation de ces travaux a t r alis e sur des probl mes industriels tels que celui de la stabilisation inertielle de ligne de vis es Metaheuristics for Production

Systems El-Ghazali Talbi, Farouk Yalaoui, Lionel Amodeo, 2015-11-26 This book discusses the main techniques and newest trends to manage and optimize the production and service systems The book begins by examining the three main levels of

decision systems in production the long term strategic the middle term tactical and short term operational It also considers online management as a new level a sub level of the short term As each level encounters specific problems appropriate approaches to deal with these are introduced and explained These problems include the line design the line balancing optimization the physical layout of the production or service system the forecasting optimization the inventory management the scheduling etc Metaheuristics for Production Systems then explores logistic optimization from two different perspectives internal production management addressing issues of scheduling layout and line designs and external supply chain management focusing on transportation optimization supply chain evaluation and location of production The book also looks at NP hard problems that are common in production management These complex configurations may mean that optimal solutions may not be reached due to variables but the authors help provide a good solution for such problems The effective new results and solutions offered in this book should appeal to researchers managers and engineers in the production and service industries

Metaheuristics for Vehicle Routing Problems Nacima Labadie, Christian Prins, Caroline Prodhon, 2016-02-23 This book is dedicated to metaheuristics as applied to vehicle routing problems Several implementations are given as illustrative examples along with applications to several typical vehicle routing problems As a first step a general presentation intends to make the reader more familiar with the related field of logistics and combinatorial optimization This preamble is completed with a description of significant heuristic methods classically used to provide feasible solutions quickly and local improvement moves widely used to search for enhanced solutions The overview of these fundamentals allows appreciating the core of the work devoted to an analysis of metaheuristic methods for vehicle routing problems Those methods are exposed according to their feature of working either on a sequence of single solutions or on a set of solutions or even by hybridizing metaheuristic approaches with others kind of methods

Optimisation in Signal and Image Processing Patrick Siarry, 2013-03-01 This book describes the optimization methods most commonly encountered in signal and image processing artificial evolution and Parisian approach wavelets and fractals information criteria training and quadratic programming Bayesian formalism probabilistic modeling Markovian approach hidden Markov models and metaheuristics genetic algorithms ant colony algorithms cross entropy particle swarm optimization estimation of distribution algorithms and artificial immune systems

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