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Combinatorial Optimization Algorithms And Complexity Dover Books On Computer Science

What Are Combinatorial Algorithms? | Richard Karp and Lex Fridman Combinatorial Complexity Solution - Design of Computer Programs Solving Combinatorial Optimization Problems with Constraint Programming and OscaR JABEN INIA,#INTRODUCING BOOK \"COMBINATORIAL OPTIMIZATION\" Combinatorial optimization Quantum Algorithms For Combinatorial Optimisation Kevin Tierney - Search heuristics for solving combinatorial optimization problems with deep RL Combinatorial optimisation 1.1 Introduction What is Combinatorial Optimization? Meaning, Definition, Explanation | RealizeTheTerms UNSW Research - Algorithms Solving Combinatorial Optimization Problems - FUJITSU Quantum-Inspired Computing Digital Annealer ICAPS 2015: \"Advances in Combinatorial Optimization with Applications to Planning\" The Short-path Algorithm for Combinatorial Optimization Machine Learning Combinatorial Optimization Algorithms On the Existence of Optimal Algorithms
Optimal or Provably Near-Optimal Solutions
5th International Workshop, APPROX 2002, Rome, Italy, September 17-21, 2002. Proceedings
Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques
Algorithms and Complexity
Algorithmics for Hard Problems
Convex Optimization
Theory and Algorithms
Combinatorial Optimization Problems and Their Approximability Properties
Combinatorial Optimization
Algorithms and Complexity
10th International Workshop, APPROX 2007, and 11th International Workshop, RANDOM 2007, Princeton, NJ, USA, August 20-22, 2007, Proceedings
Approximation, Randomization and Combinatorial Optimization. Algorithms and Techniques
Approximation Algorithms
Handbook of Combinatorial Optimization
Algorithms and Complexity
Bioinspired Computation in Combinatorial Optimization

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Optimal or Provably Near-Optimal Solutions

Springer Science & Business Media
This book constitutes the refereed proceedings of the 19th European Conference on Evolutionary Computation in Combinatorial Optimization, EvoCOP 2019, held as part of Evo* 2019, in Leipzig, Germany, in April 2019, co-located with the Evo* 2019 events EuroGP, EvoMUSART and EvoApplications. The 14 revised full papers presented were carefully reviewed and selected from 37 submissions. The papers cover a wide spectrum of topics, ranging from the foundations of evolutionary computation algorithms and other search heuristics to their accurate design and application to both single- and multi-objective combinatorial optimization problems. Fundamental and methodological aspects deal with runtime analysis, the structural properties of fitness landscapes, the study of metaheuristics core components, the clever design of their search principles, and their careful selection and configuration. Applications cover domains such as scheduling, routing, partitioning and general graph problems.
5th International Workshop, APPROX 2002, Rome, Italy, September 17-21, 2002. Proceedings Springer Science & Business Media
This well-written textbook on combinatorial optimization puts special emphasis on theoretical results and algorithms with provably good performance, in contrast to heuristics. The book contains complete (but concise) proofs, as well as many deep results, some of which have not appeared in any previous books.
Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques Springer Science & Business Media
Historically, there is a close connection between geometry and optImization. This is illustrated by methods like the gradient method and the simplex method, which are associated with clear geometric pictures. In combinatorial optimization, however, many of the strongest and most frequently used algorithms are based on the discrete structure of the problems: the greedy algorithm, shortest path and alternating path methods, branch-and-bound, etc. In the last several years geometric methods, in particular polyhedral combinatorics, have played a more and more profound role in combinatorial optimization as well. Our book discusses two recent geometric algorithms that have turned out to have particularly interesting consequences in combinatorial optimization, at least from a theoretical point of view. These algorithms are able to utilize the rich body of results in polyhedral combinatorics. The first of these algorithms is the ellipsoid method, developed for nonlinear programming by N. Z. Shor, D. B. Yudin, and A. S. Nemirovskil. It was a great surprise when L. G. Khachiyan showed that this method can be adapted to solve linear programs in polynomial time, thus solving an important open theoretical problem. While the ellipsoid method has not proved to be competitive with the simplex method in practice, it does have some features which make it particularly suited for the purposes of combinatorial optimization. The second algorithm we discuss finds its roots in the classical "geometry of numbers", developed by

Minkowski. This method has had traditionally deep applications in number theory, in particular in diophantine approximation.

Algorithms and Complexity Springer Science & Business Media

This self-contained beginning graduate text covers linear and integer programming, polytopes, matroids and matroid optimization, shortest paths, and network flows.

Algorithmics for Hard Problems Courier Corporation

Covering the basic techniques used in the latest research work, the author consolidates progress made so far, including some very recent and promising results, and conveys the beauty and excitement of work in the field. He gives clear, lucid explanations of key results and ideas, with intuitive proofs, and provides critical examples and numerous illustrations to help elucidate the algorithms. Many of the results presented have been simplified and new insights provided. Of interest to theoretical computer scientists, operations researchers, and discrete mathematicians.

Convex Optimization

MIT Press

Important text examines most significant algorithms for optimizing large systems and clarifying relations between optimization procedures. Initial chapter on linear and nonlinear programming provide the foundation for the rest of the book. Appendixes.

Theory and Algorithms Foundations and Trends (R) in Machine Learning

Theory of Linear and Integer Programming Alexander Schrijver Centrum voor Wiskunde en Informatica, Amsterdam, The Netherlands This book describes the theory of linear and integer programming and surveys the algorithms for linear and integer programming problems, focusing on complexity analysis. It aims at complementing the more practically oriented books in this field. A special feature is the author's coverage of important recent developments in linear and integer programming. Applications to combinatorial optimization are given, and the author also includes extensive historical surveys and bibliographies. The book is intended for graduate students and researchers in operations research, mathematics and computer science. It will also be of interest to mathematical historians. Contents 1 Introduction and preliminaries; 2 Problems, algorithms, and complexity; 3 Linear algebra and complexity; 4 Theory of lattices and linear diophantine equations; 5 Algorithms for linear diophantine equations; 6 Diophantine approximation and basis reduction; 7 Fundamental concepts and results on polyhedra, linear inequalities, and linear programming; 8 The structure of polyhedra; 9 Polarity, and blocking and anti-blocking polyhedra; 10 Sizes and the theoretical complexity of linear inequalities and linear programming; 11 The simplex method; 12 Primal-dual, elimination, and relaxation methods; 13 Khachiyan's method for linear programming; 14 The ellipsoid method for polyhedra more generally; 15 Further polynomiality results in linear programming; 16 Introduction to integer linear programming; 17 Estimates in integer linear programming; 18 The complexity of integer linear programming; 19 Totally unimodular matrices: fundamental properties and examples; 20 Recognizing total unimodularity; 21 Further theory related to total unimodularity; 22 Integral

polyhedra and total dual integrality; 23 Cutting planes; 24 Further methods in integer linear programming; Historical and further notes on integer linear programming; References; Notation index; Author index; Subject index

Combinatorial Optimization Problems and Their Approximability Properties

John Wiley & Sons
Clearly written graduate-level text considers the Soviet ellipsoid algorithm for linear programming; efficient algorithms for network flow, matching, spanning trees, and matroids; the theory of NP-complete problems; approximation algorithms, local search heuristics for NP-complete problems, more. "Mathematicians wishing a self-contained introduction need look no further." — American Mathematical Monthly. 1982 edition.
Combinatorial Optimization John Wiley & Sons
Bioinspired computation methods such as evolutionary algorithms and ant colony optimization are being applied successfully to complex engineering problems and to problems from combinatorial optimization, and with this comes the requirement to more fully understand the computational complexity of these search heuristics. This is the first textbook covering the most important results achieved in this area. The authors study the computational complexity of bioinspired computation and show how runtime behavior can be analyzed in a rigorous way using some of the best-known combinatorial optimization problems -- minimum spanning trees, shortest paths, maximum matching, covering and scheduling problems. A feature of the book is the separate treatment of single- and multiobjective problems, the latter a domain where the development of the underlying theory seems to be lagging practical successes. This book will be very valuable for teaching courses on bioinspired computation and combinatorial optimization. Researchers will also benefit as the presentation of the theory covers the most important developments in the field over the last 10 years. Finally, with a focus on well-studied combinatorial optimization problems rather than toy problems, the book will also be very valuable for practitioners in this field.
Algorithms and Complexity Courier Corporation
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.
10th International Workshop, APPROX

2007, and 11th International Workshop, RANDOM 2007, Princeton, NJ, USA, August 20-22, 2007, Proceedings Cambridge University Press Computational complexity, originated from the interactions between computer science and numerical optimization, is one of the major theories that have revolutionized the approach to solving optimization problems and to analyzing their intrinsic difficulty. The main focus of complexity is the study of whether existing algorithms are efficient for the solution of problems, and which problems are likely to be tractable. The quest for developing efficient algorithms leads also to elegant general approaches for solving optimization problems, and reveals surprising connections among problems and their solutions. This book is a collection of articles on recent complexity developments in numerical optimization. The topics covered include complexity of approximation algorithms, new polynomial time algorithms for convex quadratic minimization, interior point algorithms, complexity issues regarding test generation of NP-hard problems, complexity of scheduling problems, min-max, fractional combinatorial optimization, fixed point computations and network flow problems. The collection of articles provide a broad spectrum of the direction in which research is going and help to elucidate the nature of computational complexity in optimization. The book will be a valuable source of information to faculty, students and researchers in numerical optimization and related areas. Contents:Average Performance of a Self-Dual Interior Point Algorithm for Linear Programming (K M Anstreicher et al.)The Complexity of Approximating a Nonlinear Program (M Bellare & P Rogaway)Algorithms for the Least Distance Problem (P Berman et al.)Translational Cuts for Convex Minimization (J V Burke et al.)Maximizing Concave Functions in Fixed Dimension (E Cohen & N Megiddo)The Complexity of Allocating Resources in Parallel: Upper and Lower Bounds (E J Friedman)Complexity Issues in Nonconvex Network Flow Problems (G M Guisewite & P M Pardalos)A Classification of Static Scheduling Problems (J W Herrmann et al.)Complexity of Single Machine Hierarchical Scheduling: A Survey (C-Y Lee & G Vairaktarakis)Performance Driven Graph Enchancement Problems (D Paik & S Sahni)Parametric Flows, Weighted Means of Cuts, and Fractional Combinatorial Optimization (T Radzik)Some Complexity Issues Involved in the Construction of Test Cases for NP-Hard Problems (L A Sanchis)Maximizing Nonlinear Concave Functions in Fixed Dimension (S Toledo)A Note on the Complexity of Fixed-Point Computation for Noncontractive Maps (C W Tsay & K Sikorski)Polynomial Time Weak Approximation Algorithms for Quadratic Programming (S A Vavasis)Complexity Results for a Class of Min-Max Problems with Robust Optimization Applications (G Yu & P Kouvelis)and other papers Readership: Applied mathematicians and computer scientists. keywords:

Approximation, Randomization and Combinatorial Optimization. Algorithms and Techniques Springer This is a supplementary volume to the major three-volume Handbook of Combinatorial Optimization set. It can also be regarded as a stand-alone volume presenting chapters dealing with various aspects of the subject in a self-contained way.

Approximation Algorithms Courier

Corporation
Combinatorial OptimizationAlgorithms and ComplexityCourier Corporation
Handbook of Combinatorial Optimization Springer
A complete, highly accessible introduction to one of today's mostexciting areas of applied mathematics One of the youngest, most vital areas of applied mathematics,combinatorial optimization integrates techniques fromcombinatorics, linear programming, and the theory of algorithms.Because of its success in solving difficult problems in areas fromtelecommunications to VLSI, from product distribution to airlinecrew scheduling, the field has seen a ground swell of activity overthe past decade. Combinatorial Optimization is an ideal introduction to thismathematical discipline for advanced undergraduates and graduatestudents of discrete mathematics, computer science, and operationsresearch. Written by a team of recognized experts, the text offersa thorough, highly accessible treatment of both classical conceptsand recent results. The topics include: * Network flow problems * Optimal matching * Integrality of polyhedra * Matroids * NP-completeness Featuring logical and consistent exposition, clear explanations ofbasic and advanced concepts, many real-world examples, and helpful,skill-building exercises, Combinatorial Optimization is certain tobecome the standard text in the field for many years to come.
Algorithms and Complexity Springer Science & Business Media
Covering network designs, discrete convex analysis, facility location and clustering problems, matching games, and parameterized complexity, this book discusses theoretical aspects of combinatorial optimization and graph algorithms. Contributions are by renowned researchers who attended NII Shonan meetings on this essential topic. The collection contained here provides readers with the outcome of the authors' research and productive meetings on this dynamic area, ranging from computer science and mathematics to operations research. Networks are ubiquitous in today's world: the Web, online social networks, and search-and-query click logs can lead to a graph that consists of vertices and edges. Such networks are growing so fast that it is essential to design algorithms to work for these large networks. Graph algorithms comprise an area in computer science that works to design efficient algorithms for networks. Here one can work on theoretical or practical problems where implementation of an algorithm for large networks is needed. In two of the chapters, recent results in graph matching games and fixed parameter tractability are surveyed. Combinatorial optimization is an intersection of operations research and mathematics, especially discrete mathematics, which deals with new questions and new problems, attempting to find an optimum object from a finite set of objects. Most problems in combinatorial optimization are not tractable (i.e., NP-hard). Therefore it is necessary to design an approximation algorithm for them. To tackle these problems requires the development and combination of ideas and techniques from diverse mathematical areas including complexity theory, algorithm theory, and matroids as well as graph theory, combinatorics, convex and nonlinear optimization, and discrete and convex geometry. Overall, the book presents recent progress in facility location, network design, and

discrete convex analysis.

Bioinspired Computation in Combinatorial Optimization

Springer Science & Business Media Discrete optimization problems are everywhere, from traditional operations research planning (scheduling, facility location and network design); to computer science databases; to advertising issues in viral marketing. Yet most such problems are NP-hard; unless P = NP, there are no efficient algorithms to find optimal solutions. This book shows how to design approximation algorithms: efficient algorithms that find provably near-optimal solutions. The book is organized around central algorithmic techniques for designing approximation algorithms, including greedy and local search algorithms, dynamic programming, linear and semidefinite programming, and randomization. Each chapter in the first section is devoted to a single algorithmic technique applied to several different problems, with more sophisticated treatment in the second section. The book also covers methods for proving that optimization problems are hard to approximate. Designed as a textbook for graduate-level algorithm courses, it will also serve as a reference for researchers interested in the heuristic solution of discrete optimization problems.
Networks and Matroids Springer Algorithmic design, especially for hard problems, is more essential for success in solving them than any standard improvement of current computer tech nologies. Because of this, the design of algorithms for solving hard problems is the core of current algorithmic research from the theoretical point of view as well as from the practical point of view. There are many general text books on algorithmics, and several specialized books devoted to particular approaches such as local search, randomization, approximation algorithms, or heuristics. But there is no textbook that focuses on the design of algorithms for hard computing tasks, and that systematically explains, combines, and compares the main possibilities for attacking hard algorithmic problems. As this topic is fundamental for computer science, this book tries to close this gap. Another motivation, and probably the main reason for writing this book, is connected to education. The considered area has developed very dynami cally in recent years and the research on this topic discovered several profound results, new concepts, and new methods. Some of the achieved contributions are so fundamental that one can speak about paradigms which should be in cluded in the education of every computer science student. Unfortunately, this is very far from reality. This is because these paradigms are not sufficiently known in the computer science community, and so they are insufficiently com municated to students and practitioners.
Turing (A Novel about Computation) Springer Science & Business Media Since the publication of the first edition of our book, geometric algorithms and combinatorial optimization have kept growing at the same fast pace as before. Nevertheless, we do not feel that the ongoing research has made this book outdated. Rather, it seems that many of the new results build on the models, algorithms, and theorems presented here. For instance, the celebrated Dyer-Frieze-Kannan algorithm for approximating the volume of a convex body is based on the oracle model of convex bodies and uses the ellipsoid method as a preprocessing technique.

The polynomial time equivalence of optimization, separation, and membership has become a commonly employed tool in the study of the complexity of combinatorial optimization problems and in the newly developing field of computational convexity. Implementations of the basis reduction algorithm can be found in various computer algebra software systems. On the other hand, several of the open problems discussed in the first edition are still unsolved. For example, there are still no combinatorial polynomial time algorithms known for minimizing a submodular function or finding a maximum clique in a perfect graph. Moreover, despite the success of the interior point methods for the solution of explicitly given linear programs there is still no method known that solves implicitly given linear programs, such as those described in this book, and that is both practically and theoretically efficient. In particular, it is not known how to adapt interior point methods to such linear programs.

Geometric Algorithms and Combinatorial Optimization

CRC Press
A concise, comprehensive introduction to the topic of statistical physics of combinatorial optimization, bringing together theoretical concepts and algorithms from computer science with analytical methods from physics. The result bridges the gap between statistical physics and combinatorial optimization, investigating problems taken from theoretical computing, such as the vertex-cover problem, with the concepts and methods of theoretical physics. The authors cover rapid developments and analytical methods that are both extremely complex and spread by word-of-mouth, providing all the necessary basics in required detail. Throughout, the algorithms are shown with examples and calculations, while the proofs are given in a way suitable for graduate students, post-docs, and researchers. Ideal for newcomers to this young, multidisciplinary field.

Algorithms and Complexity Springer
This book constitutes the joint refereed proceedings of the 11th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2008 and the 12th International Workshop on Randomization and Computation, RANDOM 2008, held in Boston, MA, USA, in August 2008. The 20 revised full papers of the APPROX 2008 workshop were carefully reviewed and selected from 42 submissions and focus on algorithmic and complexity issues surrounding the development of efficient approximate solutions to computationally difficult problems. RANDOM 2008 is concerned with applications of randomness to computational and combinatorial problems and accounts for 27 revised full papers, also diligently reviewed and selected out of 52 workshop submissions.