Complexity And Approximation Combinatorial Optimization Problems And Their Approximability Properties By G Ausiello 2003 02 01

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Combinatorial Optimization - Christos H. Papadimitriou 2013-04-26
This 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; local search heuristics for NP-complete problems, more. 1982 edition.
Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - International Workshop on Approximation Algorithms for Combinatorial o 2003-08-13
This book constitutes the joint refereed proceedings of the 6th International Workshop on Approximation Algorithms for Optimization Problems, APPROX 2003 and of the 7th International Workshop on Randomization and Approximation Techniques in Computer Science, RANDOM 2003, held in Princeton, NY, USA in August 2003. The 33 revised full papers presented were carefully reviewed and selected from 74 submissions. Among the issues addressed are design and analysis of randomized and approximation algorithms, online algorithms, complexity theory, combinatorial structures, error-correcting codes, pseudorandomness, derandomization, network algorithms, random walks, Markov chains, probabilistic proof systems, computational learning, randomness in cryptography, and various applications.
Combinatorial Optimization - Bernhard Korte 2007-11-04
Now fully updated in a third edition, this is a comprehensive textbook on combinatorial optimization. It puts special emphasis on theoretical results and algorithms with provably good performance, in contrast to heuristics. The book contains complete but concise proofs, also for many deep results, some of which have not appeared in print before. Recent topics are covered as well, and numerous references are provided. This third edition contains a new chapter on facility location problems, an area which has been extremely active in the past few years. Furthermore there are several new sections and further material on various topics. New exercises and updates in the bibliography were added.
Approximation Algorithms - Vijay V. Vazirani 2002-12-05
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.
Probabilistic Combinatorial Optimization on Graphs - Cécile Murat 2013-03-01
This title provides a comprehensive survey over the subject of probabilistic combinatorial optimization, discussing probabilistic versions of some of the most paradigmatic combinatorial problems on graphs, such as the maximum independent set, the minimum vertex covering, the longest path and the minimum coloring.

Those who possess a sound knowledge of the subject mater will find the title of great interest, but those who have only some mathematical familiarity and knowledge about complexity and approximation theory will also find it an accessible and informative read.
Combinatorial Optimization - Christos H. Papadimitriou 1998-01-01
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.
Concepts of Combinatorial Optimization - Vangelis Th. Paschos 2014-09-09
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.
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.
Approximation and Complexity in Numerical Optimization - Panos M. Pardalos 2000-05-31
There has been much recent progress in approximation algorithms for nonconvex continuous and discrete

problems from both a theoretical and a practical perspective. In discrete (or combinatorial) optimization many approaches have been developed recently that link the discrete universe to the continuous universe through geomet ric, analytic, and algebraic techniques. Such techniques include global optimization formulations, semidefinite programming, and spectral theory. As a result new ap proximate algorithms have been discovered and many new computational approaches have been developed. Similarly, for many continuous nonconvex optimization prob lems, new approximate algorithms have been developed based on semidefinite pro gramming and new randomization techniques. On the other hand, computational complexity, originating from the interactions between computer science and numeri cal 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. A conference on Approximation and Complexity in Numerical Optimization: Con tinuous and Discrete Problems was held during February 28 to March 2, 1999 at the Center for Applied Optimization of the University of Florida.

Combinatorial Optimization Problems in Planning and Decision Making - Michael Z. Zgurovsky 2018-09-24
The book focuses on the next fields of computer science: combinatorial optimization, scheduling theory, decision theory, and computer-aided production management systems. It also offers a quick introduction into the theory of PSC-algorithms, which are a new class of efficient methods for intractable problems of combinatorial optimization. A PSC-algorithm is an algorithm which includes: sufficient conditions of a feasible solution optimality for which their checking can be implemented only at the stage of a feasible solution construction, and this construction is carried out by a polynomial algorithm (the first polynomial component of the PSC-algorithm); an approximation algorithm with polynomial complexity (the second polynomial component of the PSC-algorithm); also, for NP-hard combinatorial optimization problems, an exact subalgorithm if sufficient conditions were found, fulfilment of which during the algorithm execution turns it into a polynomial complexity algorithm. Practitioners and software developers will find the book useful for implementing advanced methods of production organization in the fields of planning (including operative planning) and decision making. Scientists, graduate and master students, or system engineers who are interested in problems of combinatorial optimization, decision making with poorly formalized overall goals, or a multiple regression construction will benefit from this book.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Maria Serna 2010-08-19
This book constitutes the joint refereed proceedings of the 13th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2010, and the 14th International Workshop on Randomization and Computation, RANDOM 2010, held in Barcelona, Spain, in September 2010. The 28 revised full papers of the APPROX 2010 workshop and the 29 revised full papers of the RANDOM 2010 workshop included in this volume, were carefully reviewed and selected from 66 and 61 submissions, respectively. APPROX focuses on algorithmic and complexity issues surrounding the development of efficient approximate solutions to computationally difficult problems. RANDOM is concerned with applications of randomness to computational and combinatorial problems.

Design and Analysis of Approximation Algorithms - Ding-Zhu Du 2011-11-18
This book is intended to be used as a textbook for graduate students studying theoretical computer science. It can also be used as a reference book for researchers in the area of design and analysis of approximation algorithms. Design and Analysis of Approximation Algorithms is a graduate course in theoretical computer science taught widely in the universities, both in the United States and abroad. There are, however, very few textbooks available for this course. Among those available in the market, most books follow a problem-oriented format; that is, they collected many important combinatorial optimization problems and their approximation algorithms, and organized them based on the types, or applications, of problems, such as geometric-type problems, algebraic-type problems, etc. Such arrangement of materials is perhaps convenient for a researcher to look for the problems and algorithms related to his/her work, but is difficult for a student to capture the ideas underlying the various algorithms. In the new book proposed here, we

follow a more structured, technique-oriented presentation. We organize approximation algorithms into different chapters, based on the design techniques for the algorithms, so that the reader can study approximation algorithms of the same nature together. It helps the reader to better understand the design and analysis techniques for approximation algorithms, and also helps the teacher to present the ideas and techniques of approximation algorithms in a more unified way.

Introduction to Combinatorial Optimization - Ding-Zhu Du 2022-10-28
Introductory courses in combinatorial optimization are popular at the upper undergraduate/graduate levels in computer science, industrial engineering, and business management/OR, owed to its wide applications in these fields. There are several published textbooks that treat this course and the authors have used many of them in their own teaching experiences. This present text fills a gap and is organized with a stress on methodology and relevant content, providing a step-by-step approach for the student to become proficient in solving combinatorial optimization problems. Applications and problems are considered via recent technology developments including wireless communication, cloud computing, social networks, and machine learning, to name several, and the reader is led to the frontiers of combinatorial optimization. Each chapter presents common problems, such as minimum spanning tree, shortest path, maximum matching, network flow, set-cover, as well as key algorithms, such as greedy algorithm, dynamic programming, augmenting path, and divide-and-conquer. Historical notes, ample exercises in every chapter, strategically placed graphics, and an extensive bibliography are amongst the gems of this textbook.

Integer Programming and Combinatorial Optimization - Friedrich Eisenbrand 2010-06-09
Theidea ofa refereedconferencefor the mathematicalprogrammingcommunity was proposed by Ravi Kannan and William Pulleyblank to the Mathematical Programming Society (MPS) in the late 1980s. Thus IPCO was born, and MPS has sponsored the conference as one of its main events since IPCO I at the University of Waterloo in 1990. The conference has become the main forum for recent results in Integer Programming and Combinatorial Optimization in the non-Symposium years. This volume compiles the papers presented at IPCO XIV held June 9-11, 2010, at EPFL in Lausanne. The scope of papers considered for IPCO XIV is likely broader than at IPCO I. This is sometimes due to the wealth of new questions and directions brought from related areas. It can also be due to the successful application of "math programming" techniques to models not tra- tionally considered. In any case, the interest in IPCO is greater than ever and this is re?ected in both the number (135) and quality of the submissions. The ProgrammeCommittee with 13 memberswasalsoIPCO'slargest. We thankthe members of the committee, as well as their sub-reviewers, for their exceptional (and time-consuming) work and especially during the online committee meeting held over January. The process resulted in the selection of 34 excellent research papers which were presented in non-parallel sessions over three days in L- sanne. Unavoidably, this has meant that many excellent submissions were not able to be included.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Sanjeev Arora 2003-12-15
This book constitutes the joint refereed proceedings of the 6th International Workshop on Approximation Algorithms for Optimization Problems, APPROX 2003 and of the 7th International Workshop on Randomization and Approximation Techniques in Computer Science, RANDOM 2003, held in Princeton, NY, USA in August 2003. The 33 revised full papers presented were carefully reviewed and selected from 74 submissions. Among the issues addressed are design and analysis of randomized and approximation algorithms, online algorithms, complexity theory, combinatorial structures, error-correcting codes, pseudorandomness, derandomization, network algorithms, random walks, Markov chains, probabilistic proof systems, computational learning, randomness in cryptography, and various applications.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Leslie Ann Goldberg 2011-08-05
This book constitutes the joint refereed proceedings of the 14th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2011, and the 15th International Workshop on Randomization and Computation, RANDOM 2011, held in Princeton, New Jersey, USA, in August 2011. The volume presents 29 revised full papers of the APPROX 2011 workshop, selected from 66 submissions,

and 29 revised full papers of the RANDOM 2011 workshop, selected from 64 submissions. They were carefully reviewed and selected for inclusion in the book. In addition two abstracts of invited talks are included. APPROX focuses on algorithmic and complexity issues surrounding the development of efficient approximate solutions to computationally difficult problems. RANDOM is concerned with applications of randomness to computational and combinatorial problems.

Combinatorial Optimization and Applications - Weili Wu 2020-12-04
This volume constitutes the proceedings of the 14th International Conference on Combinatorial Optimization and Applications, COCOA 2020, held in Dallas, TX, USA, in December 2020. The 55 full papers presented in this volume were carefully reviewed and selected from 104 submissions. The papers are grouped into the following topics: Approximation Algorithms; Scheduling; Network Optimization; Complexity and Logic; Search, Facility and Graphs; Geometric Problem; Sensors, Vehicles and Graphs; and Graph Problems. Due to the Corona pandemic this event was held virtually.

Combinatorial Optimization and Applications - Donghyun Kim 2018-12-06
The conference proceeding LNCS 11346 constitutes the refereed proceedings of the 12th International Conference on Combinatorial Optimization and Applications, COCOA 2018, held in Atlanta, GA, USA, in December 2018. The 50 full papers presented were carefully reviewed and selected from 106 submissions. The papers cover most aspects of t graph algorithms, routing and network design problems, scheduling algorithms, network optimization, combinatorial algorithms, approximation algorithms, paths and connectivity problems and much more.

Complexity and Approximation - Ding-Zhu Du 2020-02-20
This Festschrift is in honor of Ker-I Ko, Professor in the Stony Brook University, USA. Ker-I Ko was one of the founding fathers of computational complexity over real numbers and analysis. He and Harvey Friedman devised a theoretical model for real number computations by extending the computation of Turing machines. He contributed significantly to advancing the theory of structural complexity, especially on polynomial-time isomorphism, instance complexity, and relativization of polynomial-time hierarchy. Ker-I also made many contributions to approximation algorithm theory of combinatorial optimization problems. This volume contains 17 contributions in the area of complexity and approximation. Those articles are authored by researchers over the world, including North America, Europe and Asia. Most of them are co-authors, colleagues, friends, and students of Ker-I Ko.

Algorithmics for Hard Problems - Juraj Hromkovič 2010-12-09
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.

Approximation Algorithms for Combinatorial Optimization - Klaus Jansen 2002-09-02
This book constitutes the refereed proceedings of the 5th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2002, held in Rome, Italy in September 2002. The 20 revised full papers presented were carefully reviewed and selected from 54 submissions. Among the topics addressed are design and analysis of approximation algorithms, inapproximability results, online problems, randomization techniques, average-case analysis, approximation classes, scheduling

problems, routing and flow problems, coloring and partitioning, cuts and connectivity, packing and covering, geometric problems, network design, and applications to game theory and other fields.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Irit Dinur 2009-08-06
This book constitutes the joint refereed proceedings of the 12th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2009, and the 13th International Workshop on Randomization and Computation, RANDOM 2009, held in Berkeley, CA, USA, in August 2009. The 25 revised full papers of the APPROX 2009 workshop and the 28 revised full papers of the RANDOM 2009 workshop included in this volume, were carefully reviewed and selected from 56 and 58 submissions, respectively. APPROX focuses on algorithmic and complexity issues surrounding the development of efficient approximate solutions to computationally difficult problems. RANDOM is concerned with applications of randomness to computational and combinatorial problems.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Josep Diaz 2006-08-29
This is the joint refereed proceedings of the 9th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2006 and the 10th International Workshop on Randomization and Computation, RANDOM 2006. The book presents 44 carefully reviewed and revised full papers. Among the topics covered are design and analysis of approximation algorithms, hardness of approximation problems, small spaces and data streaming algorithms, embeddings and metric space methods, and more.

Approximation, Randomization and Combinatorial Optimization. Algorithms and Techniques - Ashish Goel 2008-08-12
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.

Integer Programming and Combinatorial Optimization - Daniel Bienstock 2004-05-24
This book constitutes the refereed proceedings of the 10th International Conference on Integer Programming and Combinatorial Optimization, IPCO 2004, held in New York City, USA in June 2004. The 32 revised papers presented were carefully reviewed and selected from 109 submissions. Among the topics addressed are vehicle routing, network management, mixed-integer programming, computational complexity, game theory, supply chain management, stochastic optimization problems, production scheduling, graph computations, computational graph theory, separation algorithms, local search, linear optimization, integer programming, graph coloring, packing, combinatorial optimization, routing, flow algorithms, 0/1 polytopes, and polyhedra.

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques - Prasad Raghavendra 2013-08-06
This book constitutes the proceedings of the 16th International Workshop on Approximation Algorithms for Combinatorial Optimization Problems, APPROX 2013, and the 17th International Workshop on Randomization and Computation, RANDOM 2013, held in August 2013 in the USA. The total of 48 carefully reviewed and selected papers presented in this volume consist of 23 APPROX papers selected out of 46 submissions, and 25 RANDOM papers selected out of 52 submissions. APPROX 2013 focuses on algorithmic and complexity theoretic issues relevant to the development of efficient approximate solutions to computationally difficult problems, while RANDOM 2013 focuses on applications of randomness to computational and combinatorial problems.

Handbook of Graph Theory, Combinatorial Optimization, and Algorithms - Krishnaiyan "KT" Thulasiraman 2016-01-05

The fusion between graph theory and combinatorial optimization has led to theoretically profound and practically useful algorithms, yet there is no book that currently covers both areas together. Handbook of Graph Theory, Combinatorial Optimization, and Algorithms is the first to present a unified, comprehensive treatment of both graph theory and c

Complexity and Approximation - Giorgio Ausiello 1999
This book documents the state of the art in combinatorial optimization, presenting approximate solutions of virtually all relevant classes of NP-hard optimization problems. The wealth of problems, algorithms, results, and techniques make it an indispensible source of reference for professionals. The text smoothly integrates numerous illustrations, examples, and exercises.

Complexity and Approximation - Giorgio Ausiello 2012-12-06
This book documents the state of the art in combinatorial optimization, presenting approximate solutions of virtually all relevant classes of NP-hard optimization problems. The wealth of problems, algorithms, results, and techniques make it an indispensible source of reference for professionals. The text smoothly integrates numerous illustrations, examples, and exercises.

Complexity in Numerical Optimization - P M Pardalos 1993-07-31
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:

Concepts of Combinatorial Optimization - Vangelis Th. Paschos 2012-12-27
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 Optimizationseries aims to cover a wide range of topics in this area. Thesetopics also deal with fundamental notions and approaches as withseveral classical applications of combinatorial optimization. Concepts of Combinatorial Optimization, is divided intothree parts: On the complexity of combinatorial optimization problems, thatpresents basics about worst-case and randomized complexity; Classical solution methods, that presents the two most-knownmethods for solving hard combinatorial

optimization problems, thatare Branch-and-Bound and Dynamic Programming; Elements from mathematical programming, that presentsfundamentals from mathematical programming based methods that arein the heart of Operations Research since the origins of thisfield.

Nonlinear Assignment Problems - Panos M. Pardalos 2000-11-30
Nonlinear Assignment Problems (NAPs) are natural extensions of the classic Linear Assignment Problem, and despite the efforts of many researchers over the past three decades, they still remain some of the hardest combinatorial optimization problems to solve exactly. The purpose of this book is to provide in a single volume, major algorithmic aspects and applications of NAPs as contributed by leading international experts. The chapters included in this book are concerned with major applications and the latest algorithmic solution approaches for NAPs. Approximation algorithms, polyhedral methods, semidefinite programming approaches and heuristic procedures for NAPs are included, while applications of this problem class in the areas of multiple-target tracking in the context of military surveillance systems, of experimental high energy physics, and of parallel processing are presented. Audience: Researchers and graduate students in the areas of combinatorial optimization, mathematical programming, operations research, physics, and computer science.

Approximation Algorithms and Semidefinite Programming - Bernd Gärtner 2014-02-22
Semidefinite programs constitute one of the largest classes of optimization problems that can be solved with reasonable efficiency - both in theory and practice. They play a key role in a variety of research areas, such as combinatorial optimization, approximation algorithms, computational complexity, graph theory, geometry, real algebraic geometry and quantum computing. This book is an introduction to selected aspects of semidefinite programming and its use in approximation algorithms. It covers the basics but also a significant amount of recent and more advanced material. There are many computational problems, such as MAXCUT, for which one cannot reasonably expect to obtain an exact solution efficiently, and in such case, one has to settle for approximate solutions. For MAXCUT and its relatives, exciting recent results suggest that semidefinite programming is probably the ultimate tool. Indeed, assuming the Unique Games Conjecture, a plausible but as yet unproven hypothesis, it was shown that for these problems, known algorithms based on semidefinite programming deliver the best possible approximation ratios among all polynomial-time algorithms. This book follows the "semidefinite side" of these developments, presenting some of the main ideas behind approximation algorithms based on semidefinite programming. It develops the basic theory of semidefinite programming, presents one of the known efficient algorithms in detail, and describes the principles of some others. It also includes applications, focusing on approximation algorithms.

Complexity and Approximation - Giorgio Ausiello 2002-12-03
This book documents the state of the art in combinatorial optimization, presenting approximate solutions of virtually all relevant classes of NP-hard optimization problems. The wealth of problems, algorithms, results, and techniques make it an indispensable source of reference for professionals. The text smoothly integrates numerous illustrations, examples, and exercises.

The Making of a New Science - Giorgio Ausiello 2018-08-06
This book explains the development of theoretical computer science in its early stages, specifically from 1965 to 1990. The author is among the pioneers of theoretical computer science, and he guides the reader through the early stages of development of this new discipline. He explains the origins of the field, arising from disciplines such as logic, mathematics, and electronics, and he describes the evolution of the key principles of computing in strands such as computability, algorithms, and programming. But mainly it's a story about people – pioneers with diverse backgrounds and characters came together to overcome philosophical and institutional challenges and build a community. They collaborated on research efforts, they established schools and conferences, they developed the first related university courses, they taught generations of future researchers and practitioners, and they set up the key publications to communicate and archive their knowledge. The book is a fascinating insight into the field as it existed and evolved, it will be valuable reading for anyone interested in the history of computing.

Handbook of Combinatorial Optimization - Ding-Zhu Du 1999-10-31
This volume can be considered as a supplementary volume to the major three-volume Handbook of Combinatorial Optimization published by Kluwer. It can also be regarded as a stand-alone volume which

presents chapters dealing with various aspects of the subject including optimization problems and algorithmic approaches for discrete problems. Audience: All those who use combinatorial optimization methods to model and solve problems.

Handbook of Approximation Algorithms and Metaheuristics - Teofilo F. Gonzalez 2018-05-15
Handbook of Approximation Algorithms and Metaheuristics, Second Edition reflects the tremendous growth in the field, over the past two decades. Through contributions from leading experts, this handbook provides a comprehensive introduction to the underlying theory and methodologies, as well as the various applications of approximation algorithms and metaheuristics. Volume 1 of this two-volume set deals primarily with methodologies and traditional applications. It includes restriction, relaxation, local ratio, approximation schemes, randomization, tabu search, evolutionary computation, local search, neural networks, and other metaheuristics. It also explores multi-objective optimization, reoptimization, sensitivity analysis, and stability. Traditional applications covered include: bin packing, multi-dimensional packing, Steiner trees, traveling salesperson, scheduling, and related problems. Volume 2 focuses on the contemporary and emerging applications of methodologies to problems in combinatorial optimization, computational geometry and graphs problems, as well as in large-scale and emerging application areas. It includes approximation algorithms and heuristics for clustering, networks (sensor and wireless), communication, bioinformatics search, streams, virtual communities, and more. About the Editor Teofilo F. Gonzalez is a professor emeritus of computer science at the University of California, Santa Barbara. He completed his Ph.D. in 1975 from the University of Minnesota. He taught at the University of Oklahoma, the Pennsylvania State University, and the University of Texas at Dallas, before joining the UCSB computer science faculty in 1984. He spent sabbatical leaves at the Monterrey Institute of Technology and Higher Education and Utrecht University. He is known for his highly cited pioneering research in the hardness of approximation; for his sublinear and best possible approximation algorithm for k-tMM clustering; for introducing the open-shop scheduling problem as well as algorithms for its solution that have found applications in numerous research areas; as well as for his research on problems in the areas of job scheduling, graph algorithms, computational geometry, message communication, wire routing, etc.

Algorithmics for Hard Problems - Juraj Hromkovič 2013-03-14
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.

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Applications of Combinatorial Optimization - Vangelis Th. Paschos 2014-09-15
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