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# Alexander Schrijver A Course In Combinatorial Optimization

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*Alexander Schrijver A Course In Combinatorial Optimization*

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## HEAVEN FELIPE

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Matt DeVos and Deborah A. Kent MIT Press

An accessible introduction to convex algebraic geometry and semidefinite optimization. For graduate students and researchers in mathematics and computer science.

**Combinatorial Reciprocity Theorems: An Invitation to Enumerative Geometric Combinatorics** Springer Science & Business Media

Mathematics of Computing -- General.

**Multiagent Systems** John Wiley & Sons

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.

Algorithms for Convex Optimization Elsevier

The book is an introductory textbook mainly for students of computer science and mathematics. Our guiding phrase is "what every theoretical computer scientist should know about linear programming". A major focus is on applications of linear programming, both in practice and in theory. The book is concise, but at the same time, the main results are covered with complete proofs and in sufficient detail, ready for presentation in class. The book does not require more prerequisites than basic linear algebra, which is summarized in an appendix. One of its main goals is to help the reader to see linear programming "behind the scenes".

**A Course in Combinatorial Optimization** John Wiley & Sons

Praise for the Third Edition "Researchers of any kind of extremal combinatorics or theoretical computer science will welcome the new edition of this book." - MAA Reviews Maintaining a standard of excellence that establishes *The Probabilistic Method* as the leading reference on probabilistic methods in combinatorics, the Fourth Edition continues to feature a clear writing style, illustrative examples, and illuminating exercises. The new edition includes numerous updates to reflect the most recent developments and advances in discrete mathematics and the connections to other areas in mathematics, theoretical computer science, and statistical physics. Emphasizing the methodology and techniques that enable problem-solving, *The Probabilistic Method*, Fourth Edition begins with a description of tools applied to probabilistic arguments, including basic techniques that

use expectation and variance as well as the more advanced applications of martingales and correlation inequalities. The authors explore where probabilistic techniques have been applied successfully and also examine topical coverage such as discrepancy and random graphs, circuit complexity, computational geometry, and derandomization of randomized algorithms. Written by two well-known authorities in the field, the Fourth Edition features: Additional exercises throughout with hints and solutions to select problems in an appendix to help readers obtain a deeper understanding of the best methods and techniques New coverage on topics such as the Local Lemma, Six Standard Deviations result in Discrepancy Theory, Property B, and graph limits Updated sections to reflect major developments on the newest topics, discussions of the hypergraph container method, and many new references and improved results *The Probabilistic Method*, Fourth Edition is an ideal textbook for upper-undergraduate and graduate-level students majoring in mathematics, computer science, operations research, and statistics. The Fourth Edition is also an excellent reference for researchers and combinatorists who use probabilistic methods, discrete mathematics, and number theory. Noga Alon, PhD, is Baumritter Professor of Mathematics and Computer Science at Tel Aviv University. He is a member of the Israel National Academy of Sciences and Academia Europaea. A coeditor of the journal *Random Structures and Algorithms*, Dr. Alon is the recipient of the Polya Prize, The Gödel Prize, The Israel Prize, and the EMET Prize. Joel H. Spencer, PhD, is Professor of Mathematics and Computer Science at the Courant Institute of New York University. He is the cofounder and coeditor of the journal *Random Structures and Algorithms* and is a Sloane Foundation Fellow. Dr. Spencer has written more than 200 published articles and is the coauthor of *Ramsey Theory*, Second Edition, also published by Wiley.

**Qualitative topics in integer linear programming** American Mathematical Soc.

The first book to introduce the rapidly developing subject of NIP theories, for students and researchers in model theory.

**Survey and Applications** Springer Science & Business Media

Graph algorithms are easy to visualize and indeed there already exists a variety of packages to animate the dynamics when solving problems from graph theory. Still it can be difficult to understand the ideas behind the algorithm from the dynamic display alone. CATBox consists of a software system for animating graph algorithms and a course book which we developed simultaneously. The software system presents both the algorithm and the graph and puts the user always in control of the actual code that is executed. In the course book, intended for readers at advanced undergraduate or graduate level, computer exercises and examples replace the usual

static pictures of algorithm dynamics. For this volume we have chosen solely algorithms for classical problems from combinatorial optimization, such as minimum spanning trees, shortest paths, maximum flows, minimum cost flows, weighted and unweighted matchings both for bipartite and non-bipartite graphs. Find more information at <http://schliep.org/CATBox/>.

**Geometric Algorithms and Combinatorial Optimization** Springer Science & Business Media  
This book offers a gentle introduction to the mathematics of both sides of game theory: combinatorial and classical. The combination allows for a dynamic and rich tour of the subject united by a common theme of strategic reasoning. Designed as a textbook for an undergraduate mathematics class and with ample material and limited dependencies between the chapters, the book is adaptable to a variety of situations and a range of audiences. Instructors, students, and independent readers alike will appreciate the flexibility in content choices as well as the generous sets of exercises at various levels.

MIT Press

With the advent of approximation algorithms for NP-hard combinatorial optimization problems, several techniques from exact optimization such as the primal-dual method have proven their staying power and versatility. This book describes a simple and powerful method that is iterative in essence and similarly useful in a variety of settings for exact and approximate optimization. The authors highlight the commonality and uses of this method to prove a variety of classical polyhedral results on matchings, trees, matroids and flows. The presentation style is elementary enough to be accessible to anyone with exposure to basic linear algebra and graph theory, making the book suitable for introductory courses in combinatorial optimization at the upper undergraduate and beginning graduate levels. Discussions of advanced applications illustrate their potential for future application in research in approximation algorithms.

**Combinatorial Optimization** Cambridge University Press

In the last few years, Algorithms for Convex Optimization have revolutionized algorithm design, both for discrete and continuous optimization problems. For problems like maximum flow, maximum matching, and submodular function minimization, the fastest algorithms involve essential methods such as gradient descent, mirror descent, interior point methods, and ellipsoid methods. The goal of this self-contained book is to enable researchers and professionals in computer science, data science, and machine learning to gain an in-depth understanding of these algorithms. The text emphasizes how to derive key algorithms for convex optimization from first principles and how to establish precise running time bounds. This modern text explains the success of these algorithms in problems of discrete optimization, as well as how these methods have significantly pushed the state of the art of convex optimization itself.

*Ant Colony Optimization* SIAM

Optimization Tools for Logistics covers the theory and practice of the main principles of operational research and the ways it can be applied to logistics and decision support with regards to common software. The book is supported by worked problems and examples from industrial case studies, providing a comprehensive tool for readers from a variety of industries. Covers simple explanations of the mathematical theories related to logistics Contains many problems and examples from industrial case studies Includes coverage of the use of readily available software; spreadsheets,

project managers, flows simulators

**Combinatorial Optimization** Cambridge University Press

Combinatorial reciprocity is a very interesting phenomenon, which can be described as follows: A polynomial, whose values at positive integers count combinatorial objects of some sort, may give the number of combinatorial objects of a different sort when evaluated at negative integers (and suitably normalized). Such combinatorial reciprocity theorems occur in connections with graphs, partially ordered sets, polyhedra, and more. Using the combinatorial reciprocity theorems as a leitmotif, this book unfolds central ideas and techniques in enumerative and geometric combinatorics. Written in a friendly writing style, this is an accessible graduate textbook with almost 300 exercises, numerous illustrations, and pointers to the research literature. Topics include concise introductions to partially ordered sets, polyhedral geometry, and rational generating functions, followed by highly original chapters on subdivisions, geometric realizations of partially ordered sets, and hyperplane arrangements.

*Optimization Tools for Logistics* Springer Science & Business Media

The first book to offer a comprehensive view of the LLL algorithm, this text surveys computational aspects of Euclidean lattices and their main applications. It includes many detailed motivations, explanations and examples.

**CATBox** John Wiley & Sons

An overview of the rapidly growing field of ant colony optimization that describes theoretical findings, the major algorithms, and current applications. The complex social behaviors of ants have been much studied by science, and computer scientists are now finding that these behavior patterns can provide models for solving difficult combinatorial optimization problems. The attempt to develop algorithms inspired by one aspect of ant behavior, the ability to find what computer scientists would call shortest paths, has become the field of ant colony optimization (ACO), the most successful and widely recognized algorithmic technique based on ant behavior. This book presents an overview of this rapidly growing field, from its theoretical inception to practical applications, including descriptions of many available ACO algorithms and their uses. The book first describes the translation of observed ant behavior into working optimization algorithms. The ant colony metaheuristic is then introduced and viewed in the general context of combinatorial optimization. This is followed by a detailed description and guide to all major ACO algorithms and a report on current theoretical findings. The book surveys ACO applications now in use, including routing, assignment, scheduling, subset, machine learning, and bioinformatics problems. AntNet, an ACO algorithm designed for the network routing problem, is described in detail. The authors conclude by summarizing the progress in the field and outlining future research directions. Each chapter ends with bibliographic material, bullet points setting out important ideas covered in the chapter, and exercises. Ant Colony Optimization will be of interest to academic and industry researchers, graduate students, and practitioners who wish to learn how to implement ACO algorithms.

**Integer Programming** SIAM

The first edition won the award for Best 1990 Professional and Scholarly Book in Computer Science and Data Processing by the Association of American Publishers. There are books on algorithms that are rigorous but incomplete and others that cover masses of material but lack rigor. Introduction to

Algorithms combines rigor and comprehensiveness. The book covers a broad range of algorithms in depth, yet makes their design and analysis accessible to all levels of readers. Each chapter is relatively self-contained and can be used as a unit of study. The algorithms are described in English and in a pseudocode designed to be readable by anyone who has done a little programming. The explanations have been kept elementary without sacrificing depth of coverage or mathematical rigor. The first edition became the standard reference for professionals and a widely used text in universities worldwide. The second edition features new chapters on the role of algorithms, probabilistic analysis and randomized algorithms, and linear programming, as well as extensive revisions to virtually every section of the book. In a subtle but important change, loop invariants are introduced early and used throughout the text to prove algorithm correctness. Without changing the mathematical and analytic focus, the authors have moved much of the mathematical foundations material from Part I to an appendix and have included additional motivational material at the beginning.

Semidefinite Optimization and Convex Algebraic Geometry Princeton University Press

This book is an elegant and rigorous presentation of integer programming, exposing the subject's mathematical depth and broad applicability. Special attention is given to the theory behind the algorithms used in state-of-the-art solvers. An abundance of concrete examples and exercises of both theoretical and real-world interest explore the wide range of applications and ramifications of the theory. Each chapter is accompanied by an expertly informed guide to the literature and special topics, rounding out the reader's understanding and serving as a gateway to deeper study. Key topics include: formulations polyhedral theory cutting planes decomposition enumeration semidefinite relaxations Written by renowned experts in integer programming and combinatorial optimization, Integer Programming is destined to become an essential text in the field.

Analysis, Algorithms, and Engineering Applications Springer

The latest edition of the essential text and professional reference, with substantial new material on such topics as vEB trees, multithreaded algorithms, dynamic programming, and edge-based flow. Some books on algorithms are rigorous but incomplete; others cover masses of material but lack rigor. Introduction to Algorithms uniquely combines rigor and comprehensiveness. The book covers a

broad range of algorithms in depth, yet makes their design and analysis accessible to all levels of readers. Each chapter is relatively self-contained and can be used as a unit of study. The algorithms are described in English and in a pseudocode designed to be readable by anyone who has done a little programming. The explanations have been kept elementary without sacrificing depth of coverage or mathematical rigor. The first edition became a widely used text in universities worldwide as well as the standard reference for professionals. The second edition featured new chapters on the role of algorithms, probabilistic analysis and randomized algorithms, and linear programming. The third edition has been revised and updated throughout. It includes two completely new chapters, on van Emde Boas trees and multithreaded algorithms, substantial additions to the chapter on recurrence (now called "Divide-and-Conquer"), and an appendix on matrices. It features improved treatment of dynamic programming and greedy algorithms and a new notion of edge-based flow in the material on flow networks. Many exercises and problems have been added for this edition. The international paperback edition is no longer available; the hardcover is available worldwide.

Theory of Linear and Integer Programming American Mathematical Soc.

This book contains revised and extended versions of selected papers from the 5th International Conference on Pattern Recognition, ICPRAM 2016, held in Rome, Italy, in February 2016. The 13 full papers were carefully reviewed and selected from 125 initial submissions and describe up-to-date applications of pattern recognition techniques to real-world problems, interdisciplinary research, experimental and/or theoretical studies yielding new insights that advance pattern recognition methods.

Topics in Combinatorial Optimization Springer Science & Business Media

This book on functional analysis covers all the basics of the subject (normed, Banach and Hilbert spaces, Lebesgue integration and spaces, linear operators and functionals, compact and self-adjoint operators, small parameters, fixed point theory) with a strong focus on examples, exercises and practical problems, thus making it ideal as course material but also as a reference for self-study.

**Digraphs** SIAM

Extends the primal-dual method to the setting of online algorithms, and shows its applicability to a wide variety of fundamental problems.