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Geometric Approximation Algorithms *2011*

exact algorithms for dealing with geometric objects are complicated hard to implement in practice and slow over the last 20 years a theory of geometric approximation algorithms has emerged these algorithms tend to be simple fast and more robust than their exact counterparts this book is the first to cover geometric approximation algorithms in detail in addition more traditional computational geometry techniques that are widely used in developing such algorithms like sampling linear programming etc are also surveyed other topics covered include approximate nearest neighbor search shape approximation coresets dimension reduction and embeddings the topics covered are relatively independent and are supplemented by exercises close to 200 color figures are included in the text to illustrate proofs and ideas

Approximation Algorithms *2013-03-14*

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

Lectures on Proof Verification and Approximation Algorithms 2006-06-08

during the last few years we have seen quite spectacular progress in the area of approximation algorithms for several fundamental optimization problems we now actually know matching upper and lower bounds for their approximability this textbook like tutorial is a coherent and essentially self contained presentation of the enormous recent progress facilitated by the interplay between the theory of probabilistically checkable proofs and aproximation algorithms the basic concepts methods and results are presented in a unified way to provide a smooth introduction for newcomers these lectures are particularly useful for advanced courses or reading groups on the topic

Design and Analysis of Approximation Algorithms *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

Advances in Optimization and Approximation *2013-12-01*

this book is a collection of research papers in optimization and approximation dedicated to professor minyi yue of the institute of applied mathematics beijing china the papers provide a broad spectrum of research on optimization problems including scheduling location assignment linear and nonlinear programming problems as well as problems in molecular biology the emphasis of the book is on algorithmic aspects of research work in optimization special attention is paid to approximation algorithms including heuristics for combinatorial approximation problems approximation algorithms for global optimization problems and applications of approximations in real problems the work provides the state of the art for researchers in mathematical programming operations research theoretical

computer science and applied mathematics

Approximation Algorithms and Semidefinite Programming *2012-01-10*

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

Approximation, Randomization and Combinatorial Optimization. Algorithms and Techniques 2005-08-08

this book constitutes the joint refereed proceedings of the 8th international workshop on approximation algorithms for combinatorial optimization problems approx 2005 and the 9th international workshop on randomization and computation random 2005 held in berkeley ca usa in august 2005 the volume contains 41 carefully reviewed papers selected by the two program committees from a total of 101 submissions among the issues addressed are design and analysis of approximation algorithms hardness of approximation small space and data streaming algorithms sub linear time algorithms embeddings and metric space methods mathematical programming methods coloring and partitioning cuts and connectivity geometric problems game theory and applications network design and routing packing and covering scheduling design and analysis of randomized algorithms randomized complexity theory pseudorandomness and derandomization random combinatorial structures random walks markov chains expander graphs and randomness extractors probabilistic proof systems random projections and embeddings error correcting codes average case analysis property testing computational learning theory and other applications of approximation and randomness

Handbook of Approximation Algorithms and Metaheuristics *2007-05-15*

delineating the tremendous growth in this area the handbook of approximation algorithms and metaheuristics covers fundamental theoretical topics as well as advanced practical applications it is the first book to comprehensively study both approximation algorithms and metaheuristics starting with basic approaches the handbook presents the methodologies to design and analyze efficient approximation algorithms for a large class of problems and to establish inapproximability results for another class of problems it also discusses local search neural networks and metaheuristics as well as multiobjective problems sensitivity analysis and stability after laying this foundation the book applies the methodologies to classical problems in combinatorial optimization computational geometry and graph problems in addition it explores large scale and emerging applications in networks bioinformatics vlsi game theory and data analysis undoubtedly sparking further developments in the field this handbook provides the essential techniques to apply approximation algorithms and metaheuristics to a wide range of problems in computer science operations research computer engineering and economics armed with this information researchers can design and analyze efficient algorithms to generate near optimal solutions for a wide range of computational intractable problems

Approximation and Online Algorithms *2020-01-24*

this book constitutes the thoroughly refereed workshop post proceedings of the 17th international workshop on approximation and online algorithms waoa 2019 held in munich germany in september 2019 as part of algo 2019 the 16 revised full papers presented together with one invited paper in this book were carefully reviewed and selected from 38 submissions topics of interest for waoa 2018 were graph algorithms inapproximability results network design packing and covering paradigms for the design and analysis of approximation and online algorithms parameterized complexity scheduling

problems algorithmic game theory algorithmic trading coloring and partitioning competitive analysis computational advertising computational finance cuts and connectivity geometric problems mechanism design resource augmentation and real world applications

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques 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 *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

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques *2006-08-11*

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

Stochastic Approximation and Recursive Algorithms and Applications *2006-05-04*

this book presents a thorough development of the modern theory of stochastic approximation or recursive stochastic algorithms for both constrained and unconstrained problems this second edition is a thorough revision although the main features and structure remain unchanged it contains many additional applications and results as well as more detailed discussion

Approximation and Online Algorithms 2018-04-19

this book constitutes the thoroughly refereed workshop post proceedings of the 15th international workshop on approximation and online algorithms waoa 2017 held in vienna austria in september 2017 as part of algo 2017 the 23 revised full papers presented in this book were carefully reviewed and selected from 50 submissions topics of interest for waoa 2017 were graph algorithms inapproximability results network design packing and covering paradigms for the design and analysis of approximation and online algorithms parameterized complexity scheduling problems algorithmic game theory coloring and partitioning competitive analysis computational advertising computational finance cuts and connectivity geometric problems mechanism design resource augmentation and real world applications

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques *2010-08-27*

this volume contains the papers presented at the 13th international wo shop on approximation algorithms for combinatorial optimization problems approx 2010 and the 14th international workshop on randomization and computation random 2010 which took place concurrently in universitat politècnica de catalunya upc barcelona spain during september 1 3 2010 approx focuses on algorithmic and complexity issues surrounding the dev opment of e cient approximate solutions to computationally di cult problems and was the 13th in the series after aalborg 1998 berkeley 1999 sa brücken 2000 berkeley 2001 rome 2002 princeton 2003 cambridge 2004 berkeley 2005 barcelona 2006 princeton 2007 boston 2008 and berkeley 2009 random is concerned with applications of randomness to computational and combinatorial problems and was the 14th workshop in the ries following bologna 1997 barcelona 1998 berkeley 1999 geneva 2000 berkeley 2001 harvard 2002 princeton 2003 cambridge 2004 berkeley 2005 barcelona 2006 princeton 2007 boston 2008 and berkeley 2009

Approximation, Randomization and Combinatorial Optimization. Algorithms and Techniques *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

The Design of Approximation Algorithms *2011-04-26*

discrete optimization problems are everywhere from traditional operations research planning problems such as scheduling facility location and network design to computer science problems in databases to advertising issues in viral marketing yet most such problems are np hard thus unless p np there are no efficient algorithms to find optimal solutions to such problems 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 part of the book is devoted to a single algorithmic technique which is then applied to several different problems the second part revisits the techniques but offers more sophisticated treatments of them the book also covers methods for proving that optimization problems are hard to approximate designed as a textbook for graduate level algorithms courses the book will also serve as a reference for researchers interested in the heuristic solution of discrete optimization problems

Approximation and Online Algorithms *2006-02-16*

this book constitutes the thoroughly refereed post proceedings of the third international workshop on approximation and online algorithms held in palma de in october 2005 the 26 revised full papers presented were carefully reviewed and selected from 68 submissions topics addressed by the workshop include algorithmic game theory approximation classes coloring and partitioning competitive analysis computational finance cuts and connectivity geometric problems and mechanism design

Algorithmics for Hard Problems 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

Efficient Approximation and Online Algorithms *2006-02-06*

this book provides a good opportunity for computer science practitioners and researchers to get in sync with current state of the art and future trends in the field of combinatorial optimization and online algorithms recent advances in this area are presented focusing on the design of efficient approximation and on line algorithms one central idea in the book is to use a linear program relaxation of the problem randomization and rounding techniques

Approximation and Online Algorithms *2022-01-01*

this book constitutes the thoroughly refereed workshop post proceedings of the 19th international workshop on approximation and online algorithms waoa 2021 held in september 2021 due to covid 19 pandemic the conference was held virtually the 16 revised full papers presented in this book were carefully reviewed and selected from 31 submissions the papers focus on the design and analysis of algorithms for online and computationally hard problems

Approximation and Online Algorithms *2005-02-09*

the 2nd workshop on approximation and online algorithms waoa 2004 focused on the design and analysis of algorithms for online and computationally hard problems both kinds of problems have a large number of applications arising from a variety of elds waoa 2004 took place in bergen norway from september 14 to september 16 2004 the workshop was part of the algo 2004 event which also hosted esa wabi iwpec and atmos topicsofinterestsforwaoa2004were applicationstogametheory appr imation classes coloring and partitioning competitive analysis computational nance cuts and connectivity geometric problems inapproximability results mechanism design network design routing packing and covering paradigms randomization techniques and scheduling problems in response to our call we received 47 submissions each submission was reviewed by at least 3 referees who judged the paper on originality quality and consistency with the topics of the conference based on the reviews the program committee selected 21 papers this volume contains the 21 selected papers and the two invited talks given by yossi azar and klaus jansen we thank all the authors who submitted papers to the workshop and we also kindly thank the local organizers of algo 2004

Approximation and Online Algorithms 2004-02-03

the workshop on approximation and online algorithms waoa 2003 focused on the design and analysis of algorithms for online and computationally hard problems both kinds of problems have a large number of applications ar ing from a variety of elds the workshop also covered experimental research on approximation and online algorithms waoa 2003 took place in budapest hungary from september 16 to september 18 the workshop was part of the algo 2003 event which also hosted esa 2003 wabi 2003 and atmos 2003 topicsofinterestforwaoa2003were competitiveanalysis inapproximab ityresults randomizationtechniques approximationclasses scheduling coloring and partitioning cuts and connectivity packing and covering geometric pr lems network design and applications to game theory and nancial problems in response to our call for papers we received 41 submissions each submission was reviewed by at least 3 referees who judged the papers on originality quality and consistency with the topics of the conference based on these reviews the program committee selected 19 papers for presentation at the workshop and for publication in this proceedings this volume contains the 19 selected papers and 5 invited abstracts from an aracne minisymposium which took place as part of waoa

Approximation Methods for Polynomial Optimization *2012-07-25*

polynomial optimization have been a hot research topic for the past few years and its applications range from operations research biomedical engineering investment science to quantum mechanics linear algebra and signal processing among many others in this brief the authors discuss some important subclasses of polynomial optimization models arising from various applications with a focus on approximations algorithms with guaranteed worst case performance analysis the brief presents a clear view of the basic ideas underlying the design of such algorithms and the benefits are highlighted by illustrative examples showing the possible applications this timely treatise will appeal to researchers and graduate students in the fields of optimization computational mathematics operations research industrial engineering and computer science

Approximation and Online Algorithms *2012-03-26*

this book constitutes the thoroughly refereed post proceedings of the 9th international workshop on approximation and online algorithms waoa 2011 held in saarbrücken germany in september 2011 the 21 papers presented were carefully reviewed and selected from 48 submissions the volume also contains an extended abstract of the invited talk of prof klaus jansen the workshop on approximation and online algorithms focuses on the design and analysis of algorithms for online and computationally hard problems both kinds of problems have a large number of applications in a wide variety of fields topics of interest for waoa 2011 were algorithmic game theory approximation classes coloring and partitioning competitive analysis computational finance cuts and connectivity geometric problems inapproximability results mechanism design network design packing and covering paradigms for design and analysis of approximation and online algorithms parameterized complexity randomization techniques and scheduling problems

Approximation and Online Algorithms *2006-02-13*

this book constitutes the thoroughly refereed post proceedings of the third international workshop on approximation and online algorithms held in palma de in october 2005 the 26 revised full papers presented were carefully reviewed and selected from 68 submissions topics addressed by the workshop include algorithmic game theory approximation classes coloring and partitioning competitive analysis computational finance cuts and connectivity geometric problems and mechanism design

Approximation and Online Algorithms *2017-01-06*

this book constitutes the thoroughly refereed post workshop proceedings of the 14th international workshop on approximation and online algorithms waoa 2016 held in aarhus denmark in august 2016 as part of algo 2016 the 16 revised full papers presented together with 2 invited lectures were carefully reviewed and selected from 33 submissions topics of interest for waoa 2016 were coloring and partitioning competitive analysis network design packing and covering paradigms for design and analysis of approximation and online algorithms randomization techniques real world applications and scheduling problems

Approximation, Randomization, and Combinatorial Optimization. Algorithms and Techniques *2012-07-20*

this book constitutes the joint refereed proceedings of the 15th international workshop on approximation algorithms for combinatorial optimization problems approx 2012 and the 16th international workshop on randomization and computation random 2012 held in cambridge massachusetts usa in august 2011 the volume contains 28 contributed papers selected by the approx program committee out of 70 submissions and 28 contributed papers selected by the random program committee out of 67 submissions 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

Fixed Points 2014-05-10

fixed points algorithms and applications covers the proceedings of the first international conference on computing fixed points with applications held in the department of mathematical sciences at clemson university clemson south carolina on june 26 28 1974 this book is composed of 21 chapters and starts with reviews of finding roots of polynomials by pivoting procedures and the relations between convergence and labeling in approximation algorithm the next chapters deal with the principles of complementary pivot theory and the markovian decision chains the method of continuation for brouwer fixed point calculation a fixed point approach to stability in cooperative games and computation of fixed points in a nonconvex region other chapters discuss a computational comparison of fixed point algorithms the fundamentals of union jack triangulations and some aspects of mann s iterative method for approximating fixed points the final chapters consider the application of fixed point algorithms to the analysis of tax policies and the pricing for congestion in telephone networks this book will prove useful to mathematicians computer scientists and advance mathematics students

Randomization, Approximation, and Combinatorial Optimization. Algorithms and Techniques 2004-04-22

this book constitutes the refereed proceedings of the third international workshop on randomization and approximation techniques in computer science random 99 held jointly with the second international workshop on approximation algorithms for combinatorial optimization problems approx 99 in berkeley california in august 1999 the volume presents 24 revised full papers selected from 44 submissions and four invited contributions the papers present a wealth of new results and document the state of the art in the areas covered by the workshop

Approximation Algorithms for Combinatorial Optimization *1998-07*

computer simulation has become a basic tool in many branches of physics such as statistical physics particle physics or materials science the application of efficient algorithms is at least as important as good hardware in large scale computation this volume contains didactic lectures on such techniques based on physical insight the emphasis is on monte carlo methods introduction cluster algorithms reweighting and multihistogram techniques umbrella sampling efficient data analysis and optimization methods but aspects of supercomputing the solution of stochastic differential equations and molecular dynamics are also discussed the book addresses graduate students and researchers in theoretical and computational physics

Complexity and Approximation *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

Approximation Algorithms for NP-hard Problems 1997

this is the first book to fully address the study of approximation algorithms as a tool for coping with intractable problems with chapters contributed by leading researchers in the field this book introduces unifying techniques in the analysis of approximation algorithms approximation algorithms for np hard problems is intended for computer scientists and operations researchers interested in specific algorithm implementations as well as design tools for algorithms among the techniques discussed the use of linear programming primal dual techniques in worst case analysis semidefinite programming computational geometry techniques randomized algorithms average case analysis probabilistically checkable proofs and inapproximability and the markov chain monte carlo method the text includes a variety of pedagogical features definitions exercises open problems glossary of problems index and notes on how best to use the book

Approximation and Online Algorithms *2009-01-13*

this book constitutes the thoroughly refereed post workshop proceedings of the 6th international workshop on approximation and online algorithms waoa 2008 held in karlsruhe germany in september 2008 as part of the algo 2008 conference event the 22 revised full papers presented were carefully reviewed and selected from 56 submissions the workshop covered areas such as algorithmic game theory approximation classes coloring and partitioning competitive analysis computational finance cuts and connectivity geometric problems inapproximability results mechanism design network design packing and covering paradigms for design and analysis of approximation and online algorithms randomization techniques real world applications and scheduling problems

Lectures on Proof Verification and Approximation Algorithms *1998-02-25*

during the last few years we have seen quite spectacular progress in the area of approximation algorithms for several fundamental optimization problems we now actually know matching upper and lower bounds for their approximability this textbook like tutorial is a coherent and essentially self contained presentation of the enormous recent progress facilitated by the interplay between the theory of probabilistically checkable proofs and aproximation algorithms the basic concepts methods and results are presented in a unified way to provide a smooth introduction for newcomers these lectures are particularly useful for advanced courses or reading groups on the topic

Low Rank Approximation 2011-11-19

data approximation by low complexity models details the theory algorithms and applications of structured low rank approximation efficient local optimization methods and effective suboptimal convex relaxations for toeplitz hankel and sylvester structured problems are presented much of the text is devoted to describing the applications of the theory including system and control theory signal processing computer algebra for approximate factorization and common divisor computation computer vision for image deblurring and segmentation machine learning for information retrieval and clustering bioinformatics for microarray data analysis chemometrics for multivariate calibration and psychometrics for factor analysis software implementation of the methods is given making the theory directly applicable in practice all numerical examples are included in demonstration files giving hands on experience and exercises and matlab examples assist in the assimilation of the theory

Nonlinear Assignment Problems *2013-03-09*

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

Iterative Methods in Combinatorial Optimization *2011-04-18*

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

Randomization and Approximation Techniques in Computer Science 1997-06-25

astronomy is the oldest and most fundamental of the natural sciences from the early beginnings of civilization astronomers have attempted to explain not only what the universe is and how it works but also how it started how it evolved to the present day and how it will develop in the future the author a well known astronomer himself describes the evolution of astronomical ideas briefly discussing most of the instrumental developments using numerous figures to elucidate the mechanisms involved the book starts with the astronomical ideas of the egyptian and mesopotamian philosophers moves on to the greek period and then to the golden age of astronomy i e to copernicus galileo kepler and newton and ends with modern theories of cosmology written with undergraduate students in mind this book gives a fascinating survey of astronomical thinking

Combinatorial Optimization *2012-01-10*

this comprehensive textbook on combinatorial optimization places special emphasis on theoretical results and algorithms with provably good performance in contrast to heuristics it is based on numerous courses on combinatorial optimization and specialized topics mostly at graduate level this book reviews the fundamentals covers the classical topics paths flows matching matroids np completeness approximation algorithms in detail and proceeds to advanced and recent topics some of which have not appeared in a textbook before throughout it contains complete but concise proofs and also provides numerous exercises and references this fifth edition has again been updated revised and significantly extended with more than 60 new exercises and new material on various topics including cayley s formula blocking flows faster b matching separation multidimensional knapsack multicommodity max flow min cut ratio and sparsest cut thus this book represents the state of the art of combinatorial optimization

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