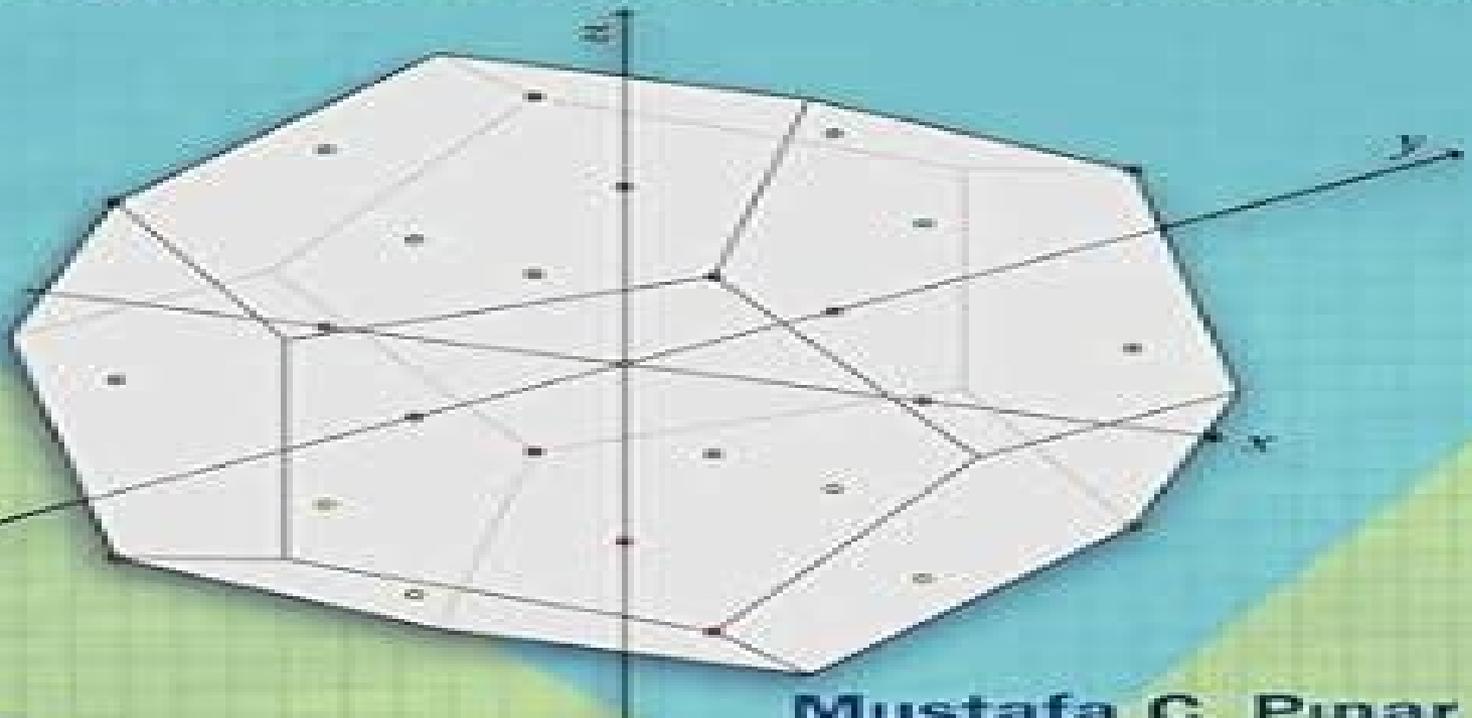


PROBLEMS AND SOLUTIONS FOR INTEGER AND COMBINATORIAL OPTIMIZATION

Building Skills in Discrete Optimization



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Discrete Optimization

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Nonlinear Discrete Optimization Shmuel Onn, 2010 This monograph develops an algorithmic theory of nonlinear discrete optimization It introduces a simple and useful setup which enables the polynomial time solution of broad fundamental classes of nonlinear combinatorial optimization and integer programming problems in variable dimension An important part of this theory is enhanced by recent developments in the algebra of Graver bases The power of the theory is demonstrated by deriving the first polynomial time algorithms in a variety of application areas within operations research and statistics including vector partitioning matroid optimization experimental design multicommodity flows multi index transportation and privacy in statistical databases This monograph is intended for graduate students and researchers It is accessible to anyone with standard undergraduate knowledge and mathematical maturity **Discrete Optimization** E. Boros, P.L. Hammer, 2003-03-19 One of the most frequently occurring types of optimization problems involves decision variables which have to take integer values From a practical point of view such problems occur in countless areas of management engineering administration etc and include such problems as location of plants or warehouses scheduling of aircraft cutting raw materials to prescribed dimensions design of computer chips increasing reliability or capacity of networks etc This is the class of problems known in the professional literature as discrete optimization problems While these problems are of enormous applicability they present many challenges from a computational point of view This volume is an update on the impressive progress achieved by mathematicians operations researchers and computer scientists in solving discrete optimization problems of very large sizes The surveys in this volume present a comprehensive overview of the state of the art in discrete optimization and are written by the most prominent researchers from all over the world This volume describes the tremendous progress in discrete optimization achieved in the last 20 years since the publication of *Discrete Optimization* 77 *Annals of Discrete Mathematics* volumes 4 and 5 1979 Elsevier It contains surveys of the state of the art written by the most prominent researchers in the field from all over the world and covers topics like neighborhood search techniques lift and project for mixed 0 1 programming pseudo Boolean optimization scheduling and assignment problems

production planning location bin packing cutting planes vehicle routing and applications to graph theory mechanics chip design etc Key features state of the art surveys comprehensiveness prominent authors theoretical computational and applied aspects This book is a reprint of Discrete Applied Mathematics Volume 23 Numbers 1-3 **Discrete Optimization I**, 2000-04-01 Discrete Optimization I **Handbooks in Operations Research and Management Science** K. Aardal, George L. Nemhauser, R. Weismantel, 2005-12-08 The chapters of this Handbook volume cover nine main topics that are representative of recent theoretical and algorithmic developments in the field In addition to the nine papers that present the state of the art there is an article on the early history of the field The handbook will be a useful reference to experts in the field as well as students and others who want to learn about discrete optimization *Handbook on Modelling for Discrete Optimization* Gautam M. Appa, Leonidas Pitsoulis, H. Paul Williams, 2006-08-18 The primary reason for producing this book is to demonstrate and communicate the pervasive nature of Discrete Optimisation It has applications across a very wide range of activities Many of the applications are only known to specialists Our aim is to rectify this It has long been recognized that modelling is as important if not more important a mathematical activity as designing algorithms for solving these discrete optimisation problems Nevertheless solving the resultant models is also often far from straightforward Although in recent years it has become viable to solve many large scale discrete optimisation problems some problems remain a challenge even as advances in mathematical methods hardware and software technology are constantly pushing the frontiers forward The subject brings together diverse areas of academic activity as well as diverse areas of applications To date the driving force has been Operational Research and Integer Programming as the major extension of the well developed subject of Linear Programming However the subject also brings results in Computer Science Graph Theory Logic and Combinatorics all of which are reflected in this book We have divided the chapters in this book into two parts one dealing with general methods in the modelling of discrete optimisation problems and one with specific applications The first chapter of this volume written by Paul Williams can be regarded as a basic introduction of how to model discrete optimisation problems as Mixed Integer Programmes and outlines the main methods of solving them **Discrete Optimization Algorithms** Maciej M. Sysło, Narsingh Deo, Janusz S. Kowalik, 2006-01-01 Rich in publications the well established field of discrete optimization nevertheless features relatively few books with ready to use computer programs This book geared toward upper level undergraduates and graduate students addresses that need In addition it offers a look at the programs derivation and performance characteristics Subjects include linear and integer programming packing and covering optimization on networks and coloring and scheduling A familiarity with design analysis and use of computer algorithms is assumed along with knowledge of programming in Pascal The book can be used as a supporting text in discrete optimization courses or as a software handbook with twenty six programs that execute the most common algorithms in each topic area Each chapter is self contained allowing readers to browse at will **Discrete Optimization** E. Boros, P.L.

Hammer,2003-03-19 One of the most frequently occurring types of optimization problems involves decision variables which have to take integer values From a practical point of view such problems occur in countless areas of management engineering administration etc and include such problems as location of plants or warehouses scheduling of aircraft cutting raw materials to prescribed dimensions design of computer chips increasing reliability or capacity of networks etc This is the class of problems known in the professional literature as discrete optimization problems While these problems are of enormous applicability they present many challenges from a computational point of view This volume is an update on the impressive progress achieved by mathematicians operations researchers and computer scientists in solving discrete optimization problems of very large sizes The surveys in this volume present a comprehensive overview of the state of the art in discrete optimization and are written by the most prominent researchers from all over the world This volume describes the tremendous progress in discrete optimization achieved in the last 20 years since the publication of Discrete Optimization 77 Annals of Discrete Mathematics volumes 4 and 5 1979 Elsevier It contains surveys of the state of the art written by the most prominent researchers in the field from all over the world and covers topics like neighborhood search techniques lift and project for mixed 0 1 programming pseudo Boolean optimization scheduling and assignment problems production planning location bin packing cutting planes vehicle routing and applications to graph theory mechanics chip design etc Key features state of the art surveys comprehensiveness prominent authors theoretical computational and applied aspects This book is a reprint of Discrete Applied Mathematics Volume 23 Numbers 1 3 Discrete Optimization with Interval Data Adam

Kasperski,2008-04-06 Operations research often solves deterministic optimization problems based on elegant and concise representations where all parameters are precisely known In the face of uncertainty probability theory is the traditional tool to be appealed for and stochastic optimization is actually a significant sub area in operations research However the systematic use of prescribed probability distributions so as to cope with imperfect data is partially unsatisfactory First going from a deterministic to a stochastic formulation a problem may become intractable

A good example is when going from deterministic to stochastic scheduling problems like PERT From the inception of the PERT method in the 1950 s it was acknowledged that data concerning activity duration times is generally not perfectly known and the study of stochastic PERT was launched quite early Even if the power of today s computers enables the stochastic PERT to be addressed to a large extent still its solutions often require simplifying assumptions of some kind Another difficulty is that stochastic optimization problems produce solutions in the average For instance the criterion to be maximized is more often than not expected utility This is not always a meaningful strategy In the case when the underlying process is not repeated a lot of times let alone being one shot it is not clear if this criterion is realistic in particular if probability distributions are subjective Expected utility was proposed as a rational criterion from first principles by Savage In his view the subjective probability distribution was simply an artefact useful to implement a certain ordering of solutions **Novel Approaches to**

Hard Discrete Optimization Panos M. Pardalos, Henry Wolkowicz, During the last decade many novel approaches have been considered for dealing with computationally difficult discrete optimization problems Such approaches include interior point methods semidefinite programming techniques and global optimization More efficient computational algorithms have been developed and larger problem instances of hard discrete problems have been solved This progress is due in part to these novel approaches but also to new computing facilities and massive parallelism This volume contains the papers presented at the workshop on Novel Approaches to Hard Discrete Optimization The articles cover a spectrum of issues regarding computationally hard discrete problems *Novel Approaches to Hard Discrete Optimization* Panos M. Pardalos, Henry Wolkowicz, 2003 During the last decade many novel approaches have been considered for dealing with computationally difficult discrete optimization problems Such approaches include interior point methods semidefinite programming techniques and global optimization More efficient computational algorithms have been developed and larger problem instances of hard discrete problems have been solved This progress is due in part to these novel approaches but also to new computing facilities and massive parallelism This volume contains the papers presented at the workshop on Novel Approaches to Hard Discrete Optimization The articles cover a spectrum of issues regarding computationally hard discrete problems Discrete Optimization Frank Werner, 2024-07-17 This Special Issue reprint from Mathematics presents in addition to the Editorial 18 research papers in the field of Discrete Optimization The subjects addressed in this reprint cover a broad spectrum of subjects e g graphs and networks single and two machine scheduling and goal programming

Algebraic and Geometric Ideas in the Theory of Discrete Optimization Jesus A. De Loera, Raymond Hemmecke, Matthias Kopeck, 2013-01-31 In recent years many new techniques have emerged in the mathematical theory of discrete optimization that have proven to be effective in solving a number of hard problems This book presents these recent advances particularly those that arise from algebraic geometry commutative algebra convex and discrete geometry generating functions and other tools normally considered outside of the standard curriculum in optimization These new techniques all of which are presented with minimal prerequisites provide a transition from linear to nonlinear discrete optimization This book can be used as a textbook for advanced undergraduates or first year graduate students in mathematics computer science or operations research It is also appropriate for mathematicians engineers and scientists engaged in computation who wish to gain a deeper understanding of how and why algorithms work

Robust Discrete Optimization and Its Applications Panos Kouvelis, Gang Yu, 2013-03-09 This book deals with decision making in environments of significant data uncertainty with particular emphasis on operations and production management applications For such environments we suggest the use of the robustness approach to decision making which assumes inadequate knowledge of the decision maker about the random state of nature and develops a decision that hedges against the worst contingency that may arise The main motivating factors for a decision maker to use the robustness approach are It does not ignore uncertainty and takes a

proactive step in response to the fact that forecasted values of uncertain parameters will not occur in most environments It applies to decisions of unique non repetitive nature which are common in many fast and dynamically changing environments It accounts for the risk averse nature of decision makers and It recognizes that even though decision environments are fraught with data uncertainties decisions are evaluated ex post with the realized data For all of the above reasons robust decisions are dear to the heart of operational decision makers This book takes a giant first step in presenting decision support tools and solution methods for generating robust decisions in a variety of interesting application environments Robust Discrete Optimization is a comprehensive mathematical programming framework for robust decision making

Synthesis of Shape Morphing Compliant Mechanisms Kerr-Jia Lu,2004 **Principles and Practice of Constraint Programming** ,1999 *Discrete Optimization 2* P. L. Hammer,1979 **Integer and Combinatorial Optimization** Laurence A. Wolsey,George L. Nemhauser,2014-08-28 Rave reviews for INTEGER AND COMBINATORIAL OPTIMIZATION This book provides an excellent introduction and survey of traditional fields of combinatorial optimization It is indeed one of the best and most complete texts on combinatorial optimization available And with more than 700 entries it has quite an exhaustive reference list Optima A unifying approach to optimization problems is to formulate them like linear programming problems while restricting some or all of the variables to the integers This book is an encyclopedic resource for such formulations as well as for understanding the structure of and solving the resulting integer programming problems Computing Reviews This book can serve as a basis for various graduate courses on discrete optimization as well as a reference book for researchers and practitioners Mathematical Reviews This comprehensive and wide ranging book will undoubtedly become a standard reference book for all those in the field of combinatorial optimization Bulletin of the London Mathematical Society This text should be required reading for anybody who intends to do research in this area or even just to keep abreast of developments Times Higher Education Supplement London Also of interest INTEGER PROGRAMMING Laurence A Wolsey Comprehensive and self contained this intermediate level guide to integer programming provides readers with clear up to date explanations on why some problems are difficult to solve how techniques can be reformulated to give better results and how mixed integer programming systems can be used more effectively 1998 0 471 28366 5 260 pp
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