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Model Building in Mathematical Programming Springer
One has to make everything as simple as possible but, never more simple. Albert Einstein Discovery consists of seeing what every body has seen and thinking what nobody has thought. Albert S. ent_Gyorgy; The primary goal of this book is to provide an introduction to the theory of Interior Point Methods (IPMs) in Mathematical Programming. At the same time, we try to present a quick overview of the impact of extensions of IPMs on smooth nonlinear optimization and to demonstrate the potential of IPMs for solving difficult practical problems. The Simplex Method has dominated the theory and practice of mathematical pro gramming since 1947 when Dantzig discovered it. In the fifties and sixties several attempts were made to develop alternative solution methods. At that time the prin cipal base of interior point methods was also developed, for example in the work of Frisch (1955), Caroll (1961), Huard (1967), Fiacco and McCormick (1968) and Dikin (1967). In 1972 Klee and Minty made explicit that in the worst case some variants of the simplex method may require an exponential amount of work to solve Linear Programming (LP) problems. This was at the time when complexity theory became a topic of great interest. People started to classify mathematical programming prob lems as efficiently (in polynomial time) solvable and as difficult (NP-hard) problems. For a while it remained open whether LP was solvable in polynomial time or not. The break-through resolution ofthis problem was obtained by Khachijan (1989).

Springer Science & Business Media
In the last 25 years, the fuzzy set theory has been applied in many disciplines such as operations research, management science, control theory,artificial intelligence/expert system, etc. In this volume, methods and applications of fuzzy mathematical programming and possibilistic mathematical programming are first systematically and thoroughly reviewed and classified. This state-of-the-art survey provides readers with a capsule look into the existing methods, and their characteristics and applicability to analysis of fuzzy and possibilistic programming problems. To realize practical fuzzy modelling, we present solutions for real-world problems including production/manufacturing, transportation, assignment, game, environmental management, resource allocation, project investment, banking/finance, and agricultural economics. To improve flexibility and robustness of fuzzy mathematical programming techniques, we also present our expert decision-making support system IFLP which considers and solves all possibilities of a specific domain of (fuzzy) linear programming problems. Basic fuzzy set theories, membership functions, fuzzy decisions, operators and fuzzy arithmetic are introduced with simple numerical examples in aneasy-to-read and easy-to-follow manner. An updated bibliographical listing of 60 books, monographs or conference proceedings, and about 300 selected papers, reports or theses is presented in the end of this study.

Fuzzy Mathematical Programming and Fuzzy Matrix Games
Springer Science & Business Media
Setting out to bridge the gap between the theory of mathematical programming and the varied, real-world practices of industrial engineers, this work introduces developments in linear, integer, multiobjective, stochastic, network and dynamic programing. It details many relevant industrial-engineering applications.;College or university bookstores may order five or more copies at a special student price, available upon request from Marcel Dekker, Inc.

Concepts of Combinatorial Optimization John Wiley & Sons
This book covers local search for combinatorial optimization and its extension to mixed-variable optimization. Although not yet understood from the theoretical point of view, local search is the paradigm of choice for tackling large-scale real-life optimization problems. Today's end-users demand interactivity with decision support systems. For optimization software, this means obtaining good-quality solutions quickly. Fast iterative improvement methods, like local search, are suited to satisfying such needs. Here the authors show local search in a new light, in particular presenting a new kind of mathematical programming solver, namely LocalSolver, based on neighborhood search. First, an iconoclast methodology is presented to design and engineer local search algorithms. The authors' concern regarding industrializing local search approaches is of particular interest for practitioners. This methodology is applied to solve two industrial problems with high economic stakes. Software based on local search induces extra costs in development and maintenance in comparison with the direct use of mixed-integer linear programming solvers. The authors then move on to present the LocalSolver project whose goal is to offer the power of local search through a model-and-run solver for large-scale 0-1 nonlinear programming. They conclude by presenting their ongoing and future work on LocalSolver toward a full mathematical programming solver based on local search.

Mathematical Programming with Data Perturbations II, Second Edition Springer Science & Business Media
This book discusses recent developments in mathematical programming and game theory, and the application of several mathematical models to problems in finance, games, economics and graph theory. All contributing authors are eminent researchers in their respective fields, from across the world. This book contains a collection of selected papers presented at the 2017 Symposium on Mathematical Programming and Game Theory at New Delhi during 9–11 January 2017. Researchers, professionals and graduate students will find the book an essential resource for current work in mathematical programming, game theory and their

applications in finance, economics and graph theory. The symposium provides a forum for new developments and applications of mathematical programming and game theory as well as an excellent opportunity to disseminate the latest major achievements and to explore new directions and perspectives.

Mathematical Programming Study John Wiley & Sons

This book presents a smooth and unified transitional framework from generalised fractional programming, with a finite number of variables and a finite number of constraints, to semi-infinite fractional programming, where a number of variables are finite but with infinite constraints. It focuses on empowering graduate students, faculty and other research enthusiasts to pursue more accelerated research advances with significant interdisciplinary applications without borders. In terms of developing general frameworks for theoretical foundations and real-world applications, it discusses a number of new classes of generalised second-order invex functions and second-order univex functions, new sets of second-order necessary optimality conditions, second-order sufficient optimality conditions, and second-order duality models for establishing numerous duality theorems for discrete minmax (or maxmin) semi-infinite fractional programming problems. In the current interdisciplinary supercomputer-oriented research environment, semi-infinite fractional programming is among the most rapidly expanding research areas in terms of its multi-facet applications empowerment for real-world problems, which may stem from many control problems in robotics, outer approximation in geometry, and portfolio problems in economics, that can be transformed into semi-infinite problems as well as handled by transforming them into semi-infinite fractional programming problems. As a matter of fact, in mathematical optimisation programs, a fractional programming (or program) is a generalisation to linear fractional programming. These problems lay the theoretical foundation that enables us to fully investigate the second-order optimality and duality aspects of our principal fractional programming problem as well as its semi-infinite counterpart.

Model Building in Mathematical Programming Elsevier

Operations Research is a field whose major contribution has been to propose a rigorous fonnulation of often ill-defmed problems pertaining to the organization or the design of large scale systems, such as resource allocation problems, scheduling and the like. While this effort did help a lot in understanding the nature of these problems, the mathematical models have proved only partially satisfactory due to the difficulty in gathering precise data, and in formulating objective functions that reflect the multi-faceted notion of optimal solution according to human experts. In this respect linear programming is a typical example of impressive achievement of Operations Research, that in its detenninistic fonn is not always adapted to real world decision-making : everything must be expressed in tenns of linear constraints ; yet the coefficients that appear in these constraints may not be so well-defined, either because their value depends upon other parameters (not accounted for in the model) or because they cannot be precisely assessed, and only qualitative estimates of these coefficients are available. Similarly the best solution to a linear programming problem may be more a matter of compromise between various criteria rather than just minimizing or maximizing a linear objective function. Lastly the constraints, expressed by equalities or inequalities between linear expressions, are often softer in reality that what their mathematical expression might let us believe, and infeasibility as detected by the linear programming techniques can often been coped with by making trade-offs with the real world.

Mathematical Programming and Game Theory for Decision Making CRC Press

Entropy optimization is a useful combination of classical engineering theory (entropy) with mathematical optimization. The resulting entropy optimization models have proved their usefulness with successful applications in areas such as image reconstruction, pattern recognition, statistical inference, queuing theory, spectral analysis, statistical mechanics, transportation planning, urban and regional planning, input-output analysis, portfolio investment, information analysis, and linear and nonlinear programming. While entropy optimization has been used in different fields, a good number of applicable solution methods have been loosely constructed without sufficient mathematical treatment. A systematic presentation with proper mathematical treatment of this material is needed by practitioners and researchers alike in all application areas. The purpose of this book is to meet this need. Entropy Optimization and Mathematical Programming offers perspectives that meet the needs of diverse user communities so that the users can apply entropy optimization techniques with complete comfort and ease. With this consideration, the authors focus on the entropy optimization problems in finite dimensional Euclidean space such that only some basic familiarity with optimization is

required of the reader.
Semi-Infinite Fractional Programming CRC Press
Volume 3 in a series which aims to discuss recent advances in the fields of mathematical programming and financial planning. Topics covered include: compound portfolio strategies; applications of financial decision-making; and multi-criteria applications of financial decision-making.
Methods and Applications Springer Science & Business Media
Game theory has already proved its tremendous potential for con?ict resolution problems in the ?elds of Decision Theory and Economics. In the recent past, there have been attempts to extend the results of crisp game theory to those con?ict resolution problems which are fuzzy in nature e.g. Nishizaki and Sakawa [61] and references cited there in. These developments have lead to the emergence of a new area in the literature called fuzzy games. Another area in the fuzzy decision theory, which has been growing very fast is the area of fuzzy mathematical programming and its applications to various branches of sciences, Engineering and Management. In the crisp scenario, there exists a beautiful relationship between two person zero sum matrix game theory and duality in linear p- gramming. It is therefore natural to ask if something similar holds in the fuzzy scenario as well. This discussion essentially constitutes the core of our presentation. The objective of this book is to present a systematic and focussed study of the application of fuzzy sets to two very basic areas of decision theory, namely Mathematical Programming and Matrix Game Theory.
Special Issue on New Trends in Mathematical Programming CRC Press
Discrete optimization problems are everywhere, from traditional operations research planning (scheduling, facility location and network design); to computer science databases; to advertising issues in viral marketing. Yet most such problems are NP-hard; unless P = NP, there are no efficient algorithms to find optimal solutions. This book shows how to design approximation algorithms: efficient algorithms that find provably near-optimal solutions. The book is organized around central algorithmic techniques for designing approximation algorithms, including greedy and local search algorithms, dynamic programming, linear and semidefinite programming, and randomization. Each chapter in the first section is devoted to a single algorithmic technique applied to several different problems, with more sophisticated treatment in the second section. The book also covers methods for proving that optimization problems are hard to approximate. Designed as a textbook for graduate-level algorithm courses, it will also serve as a reference for researchers interested in the heuristic solution of discrete optimization problems.
Topics in Contemporary Mathematical Analysis and Applications Milton, Australia : Jacaranda Press ; Oxford : B. Blackwell ; Toronto : J. Wiley
Mathematical Programming and Financial Objectives for Scheduling Projects focuses on decision problems where the performance is measured in terms of money. As the title suggests, special attention is paid to financial objectives and the relationship of financial objectives to project schedules and scheduling. In addition, how schedules relate to other decisions is treated in detail. The book demonstrates that scheduling must be combined with project selection and financing, and that scheduling helps to give an answer to the planning issue of the amount of resources required for a project. The author makes clear the relevance of scheduling to cutting budget costs. The book is divided into six parts. The first part gives a brief introduction to project management. Part two examines scheduling projects in order to maximize their net present value. Part three considers capital rationing. Many decisions on selecting or rejecting a project cannot be made in isolation and multiple projects must be taken fully into account. Since the requests for capital resources depend on the schedules of the projects, scheduling taken on more complexity. Part four studies the resource usage of a project in greater detail. Part five discusses cases where the processing time of an activity is a decision to be made. Part six summarizes the main results that have been accomplished.
Special Issue on Mathematical Programming with Data Perturbations Springer Science & Business Media
This work is concerned with theoretical developments in the area of mathematical programming, development of new algorithms and software and their applications in science and industry. It aims to expose recent mathematical developments to a larger audience in science and industry.
Proceedings of a Conference Held at the National Bureau of Standards Boulder, Colorado January 5–6, 1981 John Wiley & Sons
Presents research contributions and tutorial expositions on current methodologies for sensitivity, stability and approximation analyses of mathematical programming and related problem structures involving parameters. The text features up-to-date findings on important topics, covering such areas as the effect of perturbations on the performance of algorithms, approximation techniques for optimal control problems, and global error bounds for convex inequalities.
Interior Point Methods of Mathematical Programming CRC Press
Combinatorial optimization is a multidisciplinary scientific area,lying in the interface of three major scientific domains:mathematics, theoretical computer science and management. Thethree volumes of the Combinatorial Optimization series aim to covera wide range of topics in this area. These topics also dealwith fundamental notions and approaches as with several classicalapplications of combinatorial

optimization. Concepts of Combinatorial Optimization, is divided intothree parts: - On the complexity of combinatorial optimization problems,presenting basics about worst-case and randomized complexity; - Classical solution methods, presenting the two most-known methodsfor solving hard combinatorial optimization problems, that areBranch-and-Bound and Dynamic Programming; - Elements from mathematical programming, presenting fundamentalsfrom mathematical programming based methods that are in the heartof Operations Research since the origins of this field.

Mathematical Programming The State of the Art JAI Press

The analysis and design of engineering and industrial systems has come to rely heavily on the use of optimization techniques. The theory developed over the last 40 years, coupled with an increasing number of powerful computational procedures, has made it possible to routinely solve problems arising in such diverse fields as aircraft design, material flow, curve fitting, capital expansion, and oil refining just to name a few. Mathematical programming plays a central role in each of these areas and can be considered the primary tool for systems optimization. Limits have been placed on the types of problems that can be solved, though, by the difficulty of handling functions that are not everywhere differentiable. To deal with real applications, it is often necessary to be able to optimize functions that while continuous are not differentiable in the classical sense. As the title of the book indicates, our chief concern is with (i) nondifferentiable mathematical programs, and (ii) two-level optimization problems. In the first half of the book, we study basic theory for general smooth and nonsmooth functions of many variables. After providing some background, we extend traditional (differentiable) nonlinear programming to the nondifferentiable case. The term used for the resultant problem is nondifferentiable mathematical programming. The major focus is on the derivation of optimality conditions for general nondifferentiable nonlinear programs. We introduce the concept of the generalized gradient and derive Kuhn-Tucker-type optimality conditions for the corresponding formulations.

Computers and Mathematical Programming Springer Science & Business Media

Though the volume covers 22 papers by 36 authors from 12 countries, the history in the background is bound to Hungary where, in 1973 Andras Pn§kopa started to lay the foundation of a scientific forum, which can be a regular meeting spot for experts of the world in the field. Since then, there has been a constant interest in that forum. Headed at present by Tamas Rapcsak, the Laboratory of Operations Research and Decisions Systems of the Computer and Automation Institute, Hungarian Academy of Sciences followed the tradition in every respect, namely conferences were organized almost in every second year and in the same stimulating area, in the Matra mountains. The basic fields were kept, providing opportunities for the leading personalities to give voice to their latest results. The floor has been widened recently for the young generation, ensuring this way both a real location for the past, present and future experts to meet and also the possibility for them to make the multicoloured rainbow of the fields unbroken and continuous. The volume is devoted to the memory of Steven Vajda, one of the pioneers on mathematical programming, born is Hungary. In 1992 he took part in the XIth International Conference on Mathematical Programming at Matrafiired where, with his bright personality, he greatly contributed to the good spirituality of the event. We thank Jakob Krarup for his reminiscence on the life and scientific activities of late Steven Vajda.

Recent Developments in Mathematical Programming Springer

This book presents theoretical results, including an extension of constant rank and implicit function theorems, continuity and stability bounds results for infinite dimensional problems, and the interrelationship between optimal value conditions and shadow prices for stable and unstable programs.

The Design of Approximation Algorithms CRC Press

Topics in Contemporary Mathematical Analysis and Applications encompasses several contemporary topics in the field of mathematical analysis, their applications, and relevancies in other areas of research and study. The readers will find developments concerning the topics presented to a reasonable extent with various new problems for further study. Each chapter carefully presents the related problems and issues, methods of solutions, and their possible applications or relevancies in other scientific areas. Aims at enriching the understanding of methods, problems, and applications Offers an understanding of research problems by presenting the necessary developments in reasonable details Discusses applications and uses of operator theory, fixed-point theory, inequalities, bi-univalent functions, functional equations, and scalar-objective programming, and presents various associated problems and ways to solve such problems This book is written for individual researchers, educators, students, and department libraries.

Mathematical Programming and Game Theory John Wiley & Sons

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.